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Public Incentives Harmful to Biodiversity

Sustainable Development

Report of the commission chaired by Guillaume Sainteny

Public Incentives Harmful to Biodiversity

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Foreword

Public debate has sometimes tended to equate preservation of biodiversity with the emblematic fate of certain endangered species. We now know the importance of protecting fauna and flora as a whole, not only in certain "hotspots" upon the earth, but even in our local meadows and lawns. Of course, this involves not only the variety of species – and thereby the planet's genetic heritage –, but also the many interactions between the latter (through pollination, predation and symbiosis) and the full scope of "services rendered" to mankind.

For even though we are not always aware of it, mankind benefits from the immense services freely provided by ecosystems. This is the source from which we draw our food, as well as fuel and building materials. Apart from these "appropriable" goods, biodiversity enables the purification of water, climate stabilisation and mitigation, and the regulation of floods, droughts and epidemics. In short, biodiversity is vital for us. Yet, throughout the world, an increasingly rapid rate of decline in biodiversity has been observed for several decades, giving rise to fears of serious upheavals in our environment.

Responsibility for this decline falls, in the first place, to mankind, which is also a potential victim thereof. The principal factors of deterioration of natural habitats originate from human activity: the increasing sealing of soils, which roads, car parks and airports cover with waterproof surfaces; the fragmentation of terrestrial habitats caused by transport infrastructures and the intensification of agricultural practices; the overexploitation of renewable natural sources and, at the forefront, fishing stocks and freshwater; pollution by nitrates, pesticides and other heavy metals; the introduction of invasive alien species and climate change etc.

So many pressures that are progressively reducing biodiversity. All, or almost all, of the sectors of our economy are concerned: industry, agriculture, drilling and quarrying activities, transport, tourism, housing, local recreational activities, etc. Although all have already undertaken significant efforts to reduce greenhouse gas emissions, initiatives with regard to the preservation of biodiversity continue to lag behind.

It is the duty of the authorities to contribute to bridging this gap. Moreover, they have a field of investigation at their disposal that has still been little explored: with a view to both virtue and effectiveness, they are able to closely scrutinise all public subsidies which, due to their side-effects or pernicious impacts, may prove harmful to biodiversity. Such a change was established as a priority by the Convention on Biological Diversity held in Nagoya in 2010. In its communication of 20 September 2011, the European Commission also calls for the adoption of the "*phasing-out*", by 2020, of *"environmentally harmful subsidies", "with due regard to the impact on people in need"*. At the national level, this objective is included among the undertakings made at the time of the "Grenelle de l'environnement" (the French national consultation process on environment) and in the National Strategy for Biodiversity presented by the Minister of Ecology on 19 May 2011.

This provides the context for the proceedings of the working group chaired by Guillaume Sainteny. The group of experts was assigned the task of listing subsidies for which a proven causal link with the decline of biodiversity can be shown to exist, and to propose possible courses of reform.

I would like to extend my warm thanks to the Chairman and to all of the members of the mission who took up this vast and complex task. Firstly, because public subsidies originate from many different sources – the State, regional authorities, Europe – and are also diverse in nature – they may involve subsidies, tax expenditure and extensions or partial application of regulations, etc. Last but not least, because it is not always easy to prove their impact upon biodiversity, and still less to assess it.

The working group has the merit of opening up numerous possible courses of reform, with regard to both general guidelines and concrete, achievable short-term recommendations. Each of the latter oblige public decision-makers to change their outlook, and raise the question of the difficulty of reconciling the defence of biodiversity with economic and social imperatives. We may therefore be sure that this work, which follows on from the reference report of Bernard Chevassus-au-Louis on the value of biodiversity[1], will provide "food for thought for many debates and reforms in the up coming years.

[1] Centre d'analyse stratégique (2009), L'approche économique de la biodiversité et des services liés aux écosystèmes (The economic approach to biodiversity and services related to eco systems), report of the commission chaired by Bernard Chevassus-au-Louis, Paris, La Documentation française, 400 p.

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Introduction

By letter of 27th July 2010, appended to this report, the Secretary of State for Ecology asked the Secretary of State for Forward Planning and the Development of the Digital Economy:

- to "draw up an exhaustive list of subsidies and fiscal incentives having an impact on the environment;
- to analyse possible harm caused to biodiversity by each of these measures in a qualitative and, where possible, quantitative manner.
- to propose courses of action for change and reform of these subsidies in order to reduce, or even put an end to their harmful impact on the environment".

In September 2010, the scope of the inquiry was simultaneously extended to fiscal expenditure and refocused on biodiversity.

In order to meet this requirement, the Centre d'Analyse Stratégique established a working group chaired by Guillaume Sainteny, assisted by Jean-Michel Salles, bringing together experts on biodiversity, economists, representatives of professional sectors, trade unions, associations for the protection of the environment and the administration. Its precise composition is shown in the appendices. The group was set up on 17 November 2010, in the presence of the Minister of Ecology, Sustainable Development, Transport and Housing, a sign of the importance attributed to its tasks.

It naturally drew inspiration from the work already conducted by the Strategic Analysis Centre, under the chairmanship of Bernard Chevassus-au-Louis, in order to define an economic approach to biodiversity and ecosystem services[1].

The context in which the group completed its task presented both favourable and unfavourable elements, which are worth recalling.

A recurrent and increasing concern at the international level

Over the last 30 years or so, the impact of public subsidies and fiscal expenditure on the environment has attracted increasing attention within international organisations such as the OECD, the International Energy Agency, the World Bank, the FAO, the United Nations Environment Programme, the G20, the European Environment Agency and the European commission, as well as within Anglo-Saxon countries.

The need for a reform of subsidies, initiatives and fiscal measures that are harmful to biodiversity is mentioned, time and time again, in a number of international texts.

Article 8.32 of the Agenda 21 programme adopted at the Rio Conference in 1992 states that the signatory countries shall "remove or reduce those subsidies that do not conform

[1] Centre d'analyse stratégique (2009), L'approche économique de la biodiversité et des services liés aux écosystèmes (The economic approach to biodiversity and services related to eco systems), report of the commission chaired by Bernard Chevassus-au-Louis, Paris, La Documentation française, 400 p; www.strategie.gouv.fr/content/rapport-biodiversite-%C2%AB-l%E2%80%99approche-economique-de-la-biodiversite-et-des-services-lies-aux-eco.

with sustainable development objectives", as well as "reform or recast existing structures of economic and fiscal incentives to meet environment and development objectives"[1].

The idea of "Restructuring taxation and phasing out harmful subsidies, where they exist" is also found in the Plan of Implementation of the World Summit on Sustainable Development, adopted at Johannesburg in 2002[2]. The European Commission mentioned this subject in its Green Paper of 2007[3].

More recently, these concerns have specifically focused on public subsidies that harm biodiversity. At Nagoya, in 2010, the Conference of the Parties of the Convention on Biological Diversity (CBD) adopted a strategic plan to limit global loss of biodiversity by 2020. One of the principal objectives is the reform, removal or reduction of harmful incentives and subsidies: "By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimise or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions."

The adoption of this Action Plan, the global success of the Nagoya Conference and the final publication of the TEEB Report[4], a few days before the beginning of the working group's activity, conferred increased legitimacy and relevance upon its role and the question referred to it.

The EU biodiversity strategy of 1998 recommends "the removal of incentives with perverse effects on the conservation and sustainable use of biological diversity"[5]. This intention is specified in the new biodiversity strategy of 2011.

Amongst its objectives, the European Commission sets the following (17 c): "to provide the right market signals for biodiversity conservation, including work to reform, phase out and eliminate harmful subsidies at both EU and Member State level"[6].

A little-studied question and the recent raising of awareness in France

France is a signatory, a Party or concerned by all international texts mentioned above. Nevertheless, it appears to have long remained indifferent and passive with regard to the growing importance of the question of subsidies that are harmful to the environment. It has been slow in taking this issue into account and has appeared little inclined to being influenced by this approach.

For all that, the scale of public subsidies and fiscal expenditure regarding numerous sectors is a characteristic of the French economy in general. The effects thereof have

[1] 8.32. In the short term, Governments should consider gradually building on experience with economic instruments and market mechanisms by undertaking to reorient their policies, keeping in mind national plans priorities and objectives, in order to: a) establish effective combinations of economic, regulatory and voluntary (self-regulatory) approaches; b) remove or reduce those subsidies that do not conform with sustainable development objectives; c) reform or recast existing structures of economic and fiscal incentives to meet environment and development objectives;

[2] See 20/p and 20/q.

[3] European Commission (2007), Green Paper on economic instruments concerning the environment.

[4] TEEB (2010), The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature, A Synthesis of the Approach, Conclusions and Recommendations of TEEB, 36 p.

[5] European Commission (1998), "Communication of 4 February 1998 on a European Community biodiversity strategy, COM(1998) 42.

[6] European Commission (2011), "Our life insurance, our natural capital: An EU biodiversity strategy to 2020", Communication from the Commission to the European Parliament, the Council, the economic and Social Committee and the Committee of the Regions, COM(2011) 244 final.

increased in recent years, contributing to the deterioration of public finances, the reduction of margins for manoeuvre in budget policy and macroeconomic initiative, the indebtedness of the country and the difficulty of reallocating resources for priority public policies etc.

However, oddly enough, until recently this overall situation has been approached with no connection to policies that contribute to sustainable development. This is perhaps due to the predominance, in France, of public environmental policies relying strongly upon regulatory instruments, which may be accompanied by public subsidies. However, in the name of intergenerational equity, sustainable development needs to take place without the previous generation building up excessive debt to the detriment of future generations.

Since the mid-2000s, France appears to have been becoming aware of the potentially harmful effects of certain public support upon the environment. Several factors, of varying importance, seem to be at the origin of this awakening: the increasing weight of public expenditure and public deficits, the development of environmental concerns at the international, European and national levels, the launch of the French General Review of Public Policies (French acronym: RGPP), the mobilisation around the "Grenelle de l'environnement" round Table[1] and increasing and recurrent pressure arising from the repeated international recommendations on this issue etc.

The protection of biodiversity constituted one of the priorities of the Environment Round Table. In his closing speech for the latter event, the French President pledged that *"in all public decisions, the cost in terms of biodiversity shall be taken into account"*.

Moreover, since 2007 the RGPP and the general revision of tax and social security deductions (French acronym: RGPO) have incorporated a measure of this type into their texts: "As from the first phase of the RGPP the guidelines of the Ministry of Ecology and Sustainable Development (MEDAD) are therefore as follows […] to ensure that fiscal expenditure is favourable to the environment […] *Fiscal expenditure has been closely examined within the framework of the RGPP project, with a concern to go back on fiscal expenditure having a negative or inadequate environmental impact"*.

This will to reform fiscal measures that are harmful to the environment is also found in the undertakings of the Round Table[2] and in the Planning Act no. 2009-967 of 3 August 2009 concerning its implementation, known as the "Grenelle 1 Act", which is specifically aimed at fiscal expenditure that is harmful to biodiversity.

Thus, Article 48 specifies that: "The Government presents the Parliament with an environmental impact assessment with regard to public subsidies of a budgetary or fiscal character. Public subsidies will be progressively reviewed in such a way as to ensure that they do not encourage harm to the environment. The State will ensure that the development aid programmes that it finances and takes part in, are environmentally friendly for the beneficiary countries and are concerned with ensuring the preservation of their biodiversity and, are in part, specifically devoted to these ends".

Article 26 states that "on the basis of an audit, the State will make an inventory of fiscal measures that are unfavourable to biodiversity and propose new tools enabling a progressive changeover to a tax system that is better adapted to environmental issues".

[1] The Grenelle de l'Environnement round table was an open debate in France in 2007 between representatives coming from NGOs, central and local governments, employers organizations, trade unions on environmental issues.

[2] Engagement no. 191: "Évaluation environnementale des lois et mesures fiscales" ["Environmental assessment of fiscal acts and measures"].

These two articles led to this question being taken up at the ministerial level. However, the Grenelle 1 Act contains other provisions which are not unconnected to the issues addressed by the ministers. It states that France will support the establishment of a reduced VAT rate on products with a low impact on biodiversity (art. 54). It confirms the doubling of tax credit in favour of organic farming (art. 31). It provides that financial incentives and fiscal measures with regard to housing and urban planning shall be re-examined in order to limit development in natural areas (art. 7)[1]. It announces an audit making it possible to specify the modalities according to which the "green and blue infrastructure" objective (in French "Trame verte et bleue"[2]) shall be taken into account with regard to the local tax system and State financial support (art. 24).

Difficulties related to the issues addressed

In spite of this relatively favourable background context, the working group encountered numerous difficulties. The first demand appearing in the mission statement came up against the problem of data access. Since some fiscal expenditure is not listed as such in the appendices to the Budget Bill (French acronym: PLF), "drawing up an exhaustive list" thereof therefore proved to be problematic. The working group therefore endeavoured to make its assessment as exhaustive as possible. Numerous public subsidies are neither listed nor detailed. This is the case, for example, for subsidies not included in the budget.

The content of other subsidies is not specified. Some appear to support a mixture of initiatives which are favourable and unfavourable to biodiversity, others are of an inherently mixed character. The subsidies of regional authorities do not appear to be consolidated. Certain *de facto* subsidies, such as the relaxing of regulations and the absence of internalisation of externalities, remained difficult to quantify. In the absence of cost accounting, the functional budgetary nomenclature used by the State does not enable immediate identification of subsidies that are potentially favourable or unfavourable to biodiversity. It was therefore necessary to undertake a long investigation, mission by mission, programme by programme, and initiative by initiative, according to the budgetary architecture put in place by the Institutional Act concerning Budgets (in French : *Loi organique relative aux lois de finances, often shortened as LOLF*). Although it has identified the principal factors, it has probably not enabled a completely exhaustive analysis.

Beyond the establishment of a working group, the mission statement observed that "interministerial management is proving to be necessary. It allows to mobilise all stakeholders, including the sectors benefiting from such subsidies". In order to meet this desired objective, the choice was made to include representatives of "all sectors as a whole, including those benefiting from such subsidies" in the working group from the outset. This resulted in new difficulties. It is of course always difficult to reform public support, whether in the form of public subsidies or fiscal expenditure. Sectors that benefit from such subsidies, which may represent substantial gains to them, quite naturally seek to maintain them, even when the initial justification no longer applies. Conversely, the financing of this support weighs upon taxpayers and, while the burden

[1] "II. Planning legislation needs to take the following objectives into account, within a deadline of one year of the publication of this Act: a) To fight against the decline of agricultural and natural land surface areas, regional authorities setting objectives with figures in this regard, after land area consumption indicators have been defined. Within six months of the publication of this Act, a study of reform of the tax system and possible incentives to limit the extension of developed land will be conducted; […] e) To organise economic management of resources and to re-examine fiscal measures and financial incentives with regard to housing and urban planning from this viewpoint."

[2] The objective of building a green and blue infrastructure is a measure originating from the Grenelle de l'Environment aimed at halting the decline of biodiversity through the preservation and restoration of ecological continuity.

thereof may appear light when each is considered separately, taken together they are heavy for the State and for taxpayers as a whole.

It was specified at the first meeting that the working group's objectives were not only budgetary (reducing the total amount of support) but most and foremost environmental (improved identification of existing support and, if possible, changing the methods of allocation to make it less harmful to biodiversity). Nevertheless, several members repeatedly put forward proposals in both written and spoken contributions for new norms, fines and taxes, methods of assignment of existing taxes, new public funding to be assigned to biodiversity and increasing State involvement.

This difficulty in fully coming to terms with the issues is attributable to a combination of three factors. Firstly, a perhaps insufficient awareness of the overall state of public finances and of the need for the rationalisation of public expenditure and the optimal allocation thereof. Secondly, a view of the tax system as essentially being a budgetary tool for tax and social security deductions and financing of policy, and not as a tool for creating incentives for more eco-efficient behaviour. Finally, an underestimation of the pernicious effects of public subsidies and fiscal expenditure that are harmful with regard to biodiversity and the environment in general.

In any case, the debate conducted within this working group and the report should help to challenge the culture of growing public expenditure in favour of a more balanced approach to such expenditure and its possible pernicious effects on biodiversity.

Scope of the Report

In the face of these difficulties and questions, the scope of the report needs to be specified at three levels: thematic, budgetary and geographical.

With regard to the first of these levels, the working group scrupulously followed the mission statement and the details provided by the originator. Its findings and recommendations cannot prejudice subsequent arbitration. The working group is fully aware that the continuation of public support identified as being harmful to biodiversity may be decided upon, in the short term, for other reasons. Such support may even generate positive effects with regard to other environmental issues, and may have been put in place to that end.

Regarding budgetary issues, chapter 1 specifies the forms of public support taken into account. In this respect the working group agreed to work upon the following forms of public support: budgetary subsidies, subsidies not included in the budget, fiscal expenditure, non-internalisation of environmental costs and support provided by the State and regional authorities, etc.

At the geographical level, the working group considered it appropriate to compare territorial criteria with criteria for public support, in order to determine the scope. Within this framework, four geographical aspects were selected.
The first relates to official development assistance (ODA). Admittedly, this type of public support goes to foreign countries and therefore does not impact French biodiversity. However, such support does indeed fall within the field of French public support. Furthermore, in view of the richness and fragility of the ecosystems of the countries that receive a major share of this ODA, it is possible, or even likely that an equal euro of harmful public expenditure leads to greater negative effects in these countries than in metropolitan France.

The second is concerned with marine biodiversity: 11 million km^2 of marine habitats and over 14,000 km^2 of coral reefs come under French authority. France neighbours 35 countries by sea. It possesses the second largest maritime domain in the world, after the United States, and the largest within the European Union (EU). For this reason, any European strategy for action, conservation and sustainable use of marine biodiversity cannot be successful without France.

The third aspect concerns French overseas. They fall entirely within the scope of the report for two reasons. On the one hand, levels of public support are higher there in relative terms than in metropolitan France. On the other hand, the richness and fragility of their biodiversity is greater. Four of the five French "hotspots" (out of 25) of world biodiversity are located in French overseas departments and territories: New Caledonia, Indian Ocean, Polynesia and the Caribbean (in addition to the Mediterranean). These territories host a natural heritage of world importance, including 10% of the planet's coral reefs and lagoons as well as 8 million hectares of tropical forest. The French National Museum of Natural History lists more than 240 vascular plants endemic to New Caledonia compared to 66 in mainland France. French Polynesia hosts 28 endemic bird species compared to a single species in metropolitan France. The French overseas territories are home to as many endemic species as Western Europe as a whole: 3,450 plant species and 380 species of vertebrates unique in the world. This uniqueness comes from their geographical position. The French overseas are present in both of the world's hemispheres, in three oceans and eight major geographical regions located in the southern, equatorial, tropical and sub-boreal zones.

The fourth aspect concerns metropolitan France. The territory of mainland France is richer in terms of biodiversity than most other EU countries. This area presents the fewest problems of inaccessibility of data, whilst the amounts at stake are the highest.

Organisation of the Report

There is a consensus in the scientific community in identifying five major causes of biodiversity loss. The Global Biodiversity Outlook of 2006 identifies them as follows: modification of habitats, overexploitation of resources, nitrogen and phosphorus pollution (the working group does not limit itself to these two pollutants), invasive alien species and climate change[1]. These causes are taken up in international debates, in the two European strategies and in the two national biodiversity strategies. The working group considered these five causes to be the main factors of loss of biodiversity in France – including in French overseas departments and territories and maritime territory. It therefore considered it logical to organise the report according to the latter factors and the negative impact of public support in this regard[2].

[1] Secretariat of the Convention on Biological Diversity (2006), Global Biodiversity Outlook 2, 2nd edition, Montreal, 82 p.

[2] Climate change is treated in conjunction with pollution. Indeed, one of the major causes of climate change lies in the emission of greenhouse gases such as carbon dioxide, methane and nitrous oxide as well as ozone. Moreover, these gases for the most part originate from pollution attributable to human activity. For this reason the report will study these two pressures together.

Summary

The impact of public subsidies on the environment has been drawing increasing attention over the last few decades, in particular within the OECD and the EU. Focus on biodiversity is more recent: in 2010, the Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) adopted a strategic plan. One of its main aims is to reform, eliminate or reduce such subsidies by 2020. The European Community biodiversity strategy has been recommending this since 1998. In France, the "Loi Grenelle I (Environmental Act of August 2009) explicitly provides that "the State, on the basis of on an audit, will review tax measures that are harmful to biodiversity and will propose new tools to allow a gradual transition towards a tax regime that will be more adapted to new environmental challenges."[1]. This act prompted the Centre d'Analyse Stratégique to set up, at the request of the Secretaries of State for Ecology and Planning, a group made up of experts in the field, economists, trade union representatives, businesses, environmental groups and members of Government.

This consultation encountered difficulties associated with identifying a number of subsidies that are neither reported or spelled out, assessing those characteristics that are harmful to biodiversity and characterising measures that need reform. Despite the quality of the contributions and the commitment of the rapporteurs, the work that has been conducted cannot be deemed to be genuinely complete. Nonetheless, the group strived to reach pragmatic recommendations which, if applied, would reduce harm to biodiversity.

The group therefore ruled out overly general considerations on current modes of development from its scope of analysis. It also strived not to develop issues linked to non-financial forms of intervention by public authorities, although such issues are frequently raised during debates.

On the other hand, the group strove to address the issue in a broad sense and with a positive spirit, which consisted of never deeming a subsidy to be unwarranted and therefore easily eliminated. Occasionally, government incentives do indeed constitute direct support for activities that, when carried out, can harm biodiversity. In such cases, the group, rather than aiming to eliminate them, sought to reorient them toward less harmful practices, keeping support sum constant. It tackled the issue starting with the major causes of anthropic pressure on biodiversity, an approach commonly used in international circles. Furthermore, it would appear that measures which today play a role in harming biodiversity are often the result of choices inherited from the past, when the issue was not adequately recognised.

• Definitions, methods and limitations

The notion of subsidy requires some clarification. In this report, the concept of public incentive harmful to biodiversity refers to three different notions:

- transfers of money from the State or regional authorities to private or, occasionnally, public actors;

[1] Articles 26 and 48 of Law No. 2009-967, the so-called *"Grenelle 1 Act"*.

- a governmental action likely to deliver an advantage in terms of revenue;
- failure to internalise certain external effects.

The working group settled upon an extensive definition of public subsidies harmful to biodiversity that simultaneously includes subsidies, tax credits, regulatory advantages and the failure to enforce or the partial enforcement of regulations as well as implicit subsidies.

In order to reform public subsidies harmful to biodiversity, several methodological frameworks have been put forward by the OECD, The Economics of Ecosystems and Biodiversity (TEEB) study, and the European Commission. The working group adopted a three-phased approach, consistent with the mission statement:

- a survey of public subsidies likely to be harmful to biodiversity;
- an attempt to describe certain links between public subsidies and the loss of biodiversity;
- recommendations on reconfiguring public subsidies identified as harmful.

A causal link between public subsidies and biodiversity can be tricky to establish because such links are often indirect or vague. A general framework called the DPSIR ("Driving forces-Pressures-States-Impacts-Responses") Model has been recommended by the OECD. This model involves selecting indicators, at the level of driving forces (drivers) as well as pressures (deterioration of habitat, overexploitation, pollution, invasions) and ecosystem responses. The group very quickly realised that the relationships among these indicators could be complex and even challenging. As to reform, although conceptual reference to a price system internalising all costs and advantages is crucial, recommendations sometimes try other forms of internalisation that would appear to be more realistic, such as standards and regulations.

• The five main causes of loss of biodiversity in France

There are several definitions of biodiversity that refer, on the one hand, to the variety of existing species and the various levels of organization of life and, on the other hand, to functional approaches and the multiplicity of ecosystem services.

The definition used here, as well as by the working group chaired by Bernard Chevassus-au-Louis[1], refers to the entire fabric of life – fauna, flora, and micro- organisms – and deals with two major variables: the diversity of life with its three main levels of organisation and the appreciation of its abundance, which simultaneously determines its importance to mankind and its chances of survival. Therefore remarkable diversity, ordinary diversity, functional diversity, the multiplicity of ecosystem services and landscape diversity are recognised.

Going beyond definitions, understanding and tracking the state of biodiversity imply the ability to monitor it via observatories and, as far as possible, quantifying it, particularly in order to keep the community informed on its evolution.

[1] Centre d'analyse stratégique (2009), Approche économique de la biodiversité et des services liés aux écosystèmes, report of the commission chaired by Bernard Chevassus-au-Louis, 400 p., www.strategie.gouv.fr/content/rapport-biodiversite-%C2%AB-l%E2%80%99approche-economique-de-la-biodiversite-et-des-services-lies-aux-eco.

Research published over the last two decades agrees on the accelerating pace of biodiversity loss and on the existence of five major pressures that are responsible for it:

- destruction and the qualitative deterioration of habitats owing to fragmentation, changes in land use, land development, simplification and the intensification of farming practices;
- overexploitation of renewable natural resources (fishery resources, water, soil and forests);
- pollution (nitrates, pesticides, heat pollution and drug residues);
- climate change, which exerts an influence on all balances but is the object of many other forms of actions and policies;
- invasive alien species.

It is tricky to establish a ranking of these causes, even if the main impact appears to be the result of land development and habitat deterioration. The effects tend to be mutually reinforcing. Climate change would potentially appear to be the major cause, which, of course, depends on both national and international policies. There is also the issue of national policy coordination on invasive alien species, in particular to ensure compliance with WTO rules. Finally, it is clear that although public subsidy mechanisms can apply in an undifferentiated manner to the entire nation, their effects are often distinctly different depending on the environments concerned. Alternatively, public support is often concentrated on land that is particularly rich and/or fragile in terms of biodiversity.

• Public incentives encouraging the destruction or deterioration of natural habitats

Public subsidies can contribute to three types of habitat destruction that raise concern in France: development, partial development and fragmentation.

Land area is said to be developed when it is deprived of its “natural” condition, whether farmland or forest, in order to be built on, covered or converted into garden, sports fields or leisure space. There is a strong development trend (21 000 km² of land have been affected by this trend since 1990), mainly due to discontinuous urban zones and industrial and commercial areas, to the detriment of farmland.

Public incentive packages can contribute to urban sprawl and to the remoteness of centres of activity by influencing individual choice or specific policy determinants to boost economic activity. Incentives for purchasing a primary residence are preferentially provided to new housing, which is less expensive the farther it is from city centres, whilst home improvement does not consume space. The same trend is evident in grants for building new homes as a purchase or rental investment. The low cost of transportation and the reduction in its relative cost, in particular when compared to housing, encourage the choices that lead to urban sprawl. To attract business to their areas and to increase tax receipts, tend to offer businesses lower taxes (the French *“taxe professionnelle”* has now been replaced by the *“contribution économique territoriale”* which is a kind of regional business tax). Levying taxes at the local level gives rise to harmful competitive effects because it drives over-development and overconsumption of space.

Partial development is an intermediate form of development. It can be seen in simplified landscapes and in the intensification of land usage for home-building. Since the early 1950s, the change in land use and the intensification of production systems have led to a

decrease in the heterogeneity and the complexity of agricultural ecosystems. Forest habitats are, on the whole, in good condition.

The working group identified public subsidies that can, under certain conditions, encourage practices that reduce the natural functions of agricultural habitats, notably through incentives to intensify or to maintain intensive farming (aid having an influence on the price of factors of production) and the simplification of landscapes (aid determining whether or not semi-natural elements such as hedgerows, stands of trees, ponds and the choice of crops are maintained). With respect to forest habitats, the outlook for the development of fuelwood and second generation bio-fuels could ultimately increase the proportion of partially-developed forest habitats.

Fragmentation reduces available habitat area and increases the isolation of habitat patches (severing the contacts between populations). It is often associated with the construction of linear transportation infrastructure in land habitats or a dam in water habitats. Some aid contributes to fragmentation, in particular public funds for road, rail or river transportation systems or undercharging for their use. Furthermore, there are several forms of fees for services or for the use of the public domain that do not sufficiently factor in biodiversity costs.

• Public incentives encouraging the overexploitation of renewable natural resources

In France, the overexploitation of three natural resources is deemed to be a source of concern: soil, fishery resources and water.

Several human activities lead to soil overexploitation, which is reflected in depleted carbon stocks. Among the forms of public subsidies that are likely to encourage such activities, the working group of experts identified:

- aid that contributes to changes in land use (ploughing up prairies for annual crops, soil sealing in agricultural areas), in particular by influencing certain land- consuming activities, such as extending developed land (housing, special areas for businesses known in France as "zones d'activités"), transportation infrastructure and other shared amenities (public or private), or by encouraging the development of agro-fuel;
- aid that contributes to the intensification or maintenance of intensive practices that reduce the carbon content of soil (indirect measures encouraging production yield, mechanisation and the use of inputs).

Public incentive packages contribute to increasing overexploitation of the seas and fish stocks. In particular, commercial fishing, threatened with lower catches and competition from European fishing fleets, is facing significant fluctuations in its revenues, which are sliding, and benefits from several state support measures, of which the most significant is the exemption from the domestic consumption tax on petroleum products (TIPP). Furthermore, recreational fishing – which does not benefit from government subsidies – should be subject to increased monitoring (catch monitoring programmes) and disclosure.

Some public subsidies could intensify overexploitation of water resources for different uses and therefore impact the biodiversity of certain water systems:

- household usage is charged at a rate that encourages private operators, who serve 80% of the population, to promote consumption;

- industrial water use strongly decreases but some usage is exempt from tap-in charges;
- the tap-in charge collected by the French Water Agencies is spatially undifferentiated;
- the use of water resources for power generation benefits from several different subsidies or tax credits;
- agriculture usage also benefits from tax rates that provide no incentive or that are non-internalising which can lead to steady consumed volumes despite the reduction in irrigated land. Although support measures for initial investment and for the renewal of infrastructure are generally well thought out, this trend is associated with a block-rate for system services and a tap-in and resource consumption charge with poor incentives.

As the French Economic, Social and Environmental Council notes, most water market participants take "comfortable water conditions" for granted in mainland France, which makes it hard to question the relevance of irrigation systems and so far, has prevented from the introduction of markets for water rights or from the development of better insurance mechanisms. Nevertheless, gradual climate change threatens to cause prolonged dry spells and to disrupt the water systems of the different basins, once again raising these kinds of questions in a near future.

• Public incentives encouraging pollution

Pollution impacts environments as a whole: air, soil and water. Atmospheric pollution refers to a set of elements (aerosols, trace metals, persistent organic products, ions and micro- organisms) whose presence is the result of natural processes (re-suspension of particulate due to wind, foliar emissions, volcanic activity and marine aerosols) and the actions of humans (various industries, automobile traffic, incineration plants and residential heating). The regulation of such pollution has been addressed by several laws and by the international commitments made by France. Public subsidies encouraging emissions mainly concern laws or taxes on industry and transportation that insufficiently internalise costs and that offer little incentive in the areas of fossil fuel and biomass use.

Human-induced diffuse soil contamination by trace metals is mainly associated with airborne contributions (industrial discharge and transportation) and to agricultural spraying (as well as with certain products, such as chlordecone, whose use continued beyond a reasonable time). Polluted sites raise problems whose significance is often magnified by their "orphan" nature and by the difficulty encountered in identifying the source of certain pollutants. The internalisation of costs is highly problematic when there is no extension of liability to certain market participants, and constitutes a de facto subsidy. The polluter pays' principle is in fact often unenforceable. The general tax on polluting activities (in French : *"Taxe générale sur les Activités polluantes"* shortened as TGAP) levied on domestic and related wastes and special industrial wastes, which was designed in order to provide funding, is a weak financial incentive. Moreover, multiple exemptions have been granted.

Finally, water pollution appears to be clearly under-charged. This relates primarily to urban pollution. However, the greatest cause for concern is perhaps nitrates from agricultural sources, which are causing large-scale problems in some rural areas, especially in Brittany. This reflects patently weak internalisation and results in a set of expenditures for households, especially on their water bill. According to the Ministry for Ecology, the costs of nitrogen treatment at water purification plants ranged, in 2003,

between 220 and 510 million euros, to which the additional costs incurred by these services (cleaning catchment points and intake piping clogged by eutrophication, moving catchment points, etc.) must be added. The total expenditures allow 3,000 tons of nitrogen to be treated, i.e. only 0.4% of the excess discharged into aquatic environments.

• Public incentives encouraging the introduction and the spread of invasive alien species

Some human activities have made it easier for some flora and fauna species to avoid natural obstacles and develop themselves in some regions over the world. Species have therefore been introduced into areas far from their original habitat either accidentally or intentionally. Occasionally they establish themselves so well that they severely disrupt entire ecosystems and become invasive alien species. Their impact on biodiversity, health and human activity is very broad and varies in its severity. A biological invasion can be spontaneous, but a set of human activities is very often responsible for the introduction, spread or the invasive character of alien species.

The movement of people and goods, whose volume has grown dramatically with the liberalisation of international trade, increases the potential for the introduction of such species whilst habitat deterioration, pollution or climate change undermines the ability of environments to resist invasion. Some activities introduce accidental risks while other activities raise risks that can be categorised as structural (transportation and tourism) when they do not introduce alien species intentionally or through negligence (new crops, pets). Finally, a species can become invasive because of changes in its environment. Some of these activities benefit from subsidies.

The experts working group identified very few subsidies that directly encourage biological invasion. Such incentives result mainly from the State's failure to act at the regulatory level in the fight against invasive species and against the non-internalisation of environmental costs.

Transportation, ports and airports are heavily subsidised or are under-charged. In particular, international transportation does not pay for its externalities, including those impacting biodiversity (no domestic consumption tax). Reduced Value Added Tax (VAT) rates are also frequently reported (some pest control products, ornamental plants and zoos). External costs arising from invasions are usually not internalised, in particular the cost of transportation via the structure of import duties. However, regulatory inaction would appear to bear most of the responsibility. European Community policy, for example, does not simplify coordinated actions among Member States. Furthermore, its progress is slow in setting up a European strategy for fighting invasive species. Finally, international monitoring is lacking on the whole.

• Recommendations

In light of the scope and complexity of the mission, the report distinguishes between general guidelines defining medium-term goals and suggestions for concrete reforms in the short term. The group's mission was to identify the subsidies that are harmful to biodiversity and to put forward options for reform, not to identify privileged situations for the purpose of budgetary savings. Moreover, all the guidelines and suggestions should, at first glance, not be interpreted as modifying the amount of aid from which a sector or type of activity benefits, but rather as an effort to eliminate or reduce harmful incentives.

This summary presents a range of recommendations from the working group, with a focus on:

- those that are the easiest to implement;
- those that are the most innovative.

They are divided into categories. Only an outline of the proposals is presented here and the reader is encouraged to refer to the Recommendations section of the report[3] for further information.

Recommendation No. 1 – Transparency and reporting

In light of the richness and vulnerability of biodiversity in France and, in particular, in its overseas, public subsidies should be evaluated and their conditionality should (sometimes) be more rigourous.

Adopt a cross-cutting policy on biodiversity.

Recommendation No. 2 – Assessments

Assign the same weight and the same degree of precision to impacts on biodiversity

Grant the same level of importance to impacts on biodiversity as on greenhouse gases emissions in impact studies, environmental assessments of programmes and projects and in impact assessments of draft legislation transmitted by the government to the parliament.

Better integrate biodiversity into socio-economic assessments for infrastructural projects by:

- taking into account the indirect impacts caused by new infrastructure, in particular those driven by increased urbanisation resulting from such infrastructure;
- not reducing the issue of impacts on biodiversity to the issue of protected species, but extending it also to impacts on the functioning of ecosystems;
- reviewing the values used in socio-economic calculations so as to integrate, even if partially, the values of biodiversity. Nevertheless, given the challenges posed by the establishment of reference values for biodiversity, immediately start by strengthening the enforcement of requirements related to avoiding, reducing, and compensating for such impacts.

Recommendation No. 3 – Public Procurement

Use public procurement as a means to reduce incentives harmful to biodiversity.

Recommendation No. 4 – Make taxes and fees more incentive

Initiate a reflexion on how to allow more frequently the executive power to introduce truly incentive eco-taxes under satisfactory legal security conditions as well as in compliance with the Constitution and the general principles of law (especially tax equality).

Change the fees system to better integrate impacts on the environment and on biodiversity.

In addition, make State fees payable by marine aggregate operators depending on the ecological sensitivity of sea beds and marine environments.

Institute a tax extending the fee for occupancy of the marine public domain beyond the 12-mile limit in the exclusive economic zone or the continental shelf.

Since the mine owners, the holders of mining licences and the developers of combustible oil and gas reserves are exempt from fees imposed by municipalities and "departments" for mines beyond the limit of 1 nautical mile from the baseline, a State fee should be created and collected by the State, between 1 and 12 nautical miles inside territorial waters.

Recommendation No. 5 – Land development and urban sprawl

Retain the "Prêt à Taux Zéro+" (PTZ+), a French zero interest loan scheme for new intra-urban housing and/or housing near dedicated public transport lanes (TCSPs).

Deny regional authorities the power to grant a 50% exemption on the development tax on single-family homes built in sparsely-populated areas financed with the help of PTZ+.

Redefine geographic zoning provided for the "Scellier scheme" and other schemes for rental investments in new homes by:

- excluding Zone B2 areas (agglomerations of more than 50,000 residents and less than 250,000 residents);
- reserving this scheme for intra-urban areas and/or for areas closed to public transportation.

Include criteria such as biodiversity impacts and control of urban sprawl when calculating the compensation allocated to local municipalities for expenditures related to establishing or revising their planning documents.

Make it a requirement to cite the distance to the closest rail station or public transportation stop when opening up new urban development zones (French acronym: "U zone") in city planning scheme (French acronym: PLUs), assessing a PLU's environmental impact and marketing new subdivisions.

Eliminate the 50% tax credit on the value per square meter on which the development tax applicable to warehouses and hangars that are not open to the public but operated commercially is calculated, no matter their location.

Make the low density tax (French acronym: VSD) mandatory in logistics zones, warehouses

and hangars. Increase the leasable area tax (French acronym: TASCOM) on businesses

located in peripheral areas
and lower this tax on businesses located in city centres.

Revise the development tax on car parks:

- reduce the difference in tax between car parks integrated into buildings and those that are not;
- revise this tax rate to better internalise biodiversity costs.

Recommendation No. 6 – Transportation

Slow down habitat fragmentation. Reducing public aid for creating new infrastructures in favour of maintaining, requalification and upgrading of the existing transport network would appear to be a solution for mitigating the harmful impacts of public subsidies to transportation.

Better internalise the costs of road infrastructure on biodiversity:

- by making the grant of building permits depending on much stricter mitigation-offsetting measures or by instituting a tax that internalises the harm associated with the construction of infrastructure;
- by charging via tolls for damage to biodiversity arising from the use of highway infrastructure and/or via a percentage of the price of fuel sold at service stations within their site coverage.

Recommendation No. 7 – Water

In the short term, institute a floor rate for each use of water in the gross water intake fee and revise the ceilings rates in order to integrate the recovery of aquatic environment and biodiversity costs in addition to the recovery of water management costs.

In the medium term, institute a net water intake fee or a gross one adjusted by a correcting coefficient. In addition, apply the water intake fee to drainage.

As soon as possible, enact the implementing decree for Article 161 of the Law "Grenelle 2" establishing the rate of water system loss above and beyond which public water supply systems must draw up a draft multiannual programme of water system improvement work.

Revise the fee on non-domestic pollution by:

- targeting the fee on priority hazardous substances from the EU Water Framework Directive (2000/60/EC);
- reviewing rates so that they take into account the costs of priority hazardous substances on the aquatic environment and biodiversity;
- including the heat factor throughout the year;
- making the collection and treatment of wastewater subject to the fee.

Review the limits below which an activity pays the household pollution fee (and not the non-household pollution fee), so that activities making a significant contribution to the discharge of priority hazardous substances will have to pay the fee for non-household pollution.

Make all hydroelectric facilities subject to the barrier fee.

Recommendation No. 8 – Agriculture

Revise the tax structure for farm production factors by lowering social contributions and land taxes, partially offset by an increase in the tax on inputs that are potentially harmful to

biodiversity when they are used excessively or inappropriately (fertiliser, crop treatments and water).

Apply the standard VAT rate to fertilisers and plant health products.

In the longer term, strengthen the recognition of biodiversity in financial support received under the first pillar of the Common Agricultural Policy (CAP): modulation of the amount of Single Payment Entitlements as a function of environmental criteria, in particular criteria related to biodiversity.

In the longer term, strengthen agri-environmental measures derived from the second pillar of the CAP targeted on biodiversity (technical and budgetary strengthening and better recognition of regional approaches).

Recommendation No. 9 – Industry

Include arsenic and selenium in the general tax on polluting activities (TGAP). Experiment true internalising through an "eco-tax" (or a component of the TGAP) on an atmospheric pollutant.

Recommendation No. 10 – Regional Authorities

Include a biodiversity criterion in the calculation of the overall operating grant. A surface structure criterion which would rely on relatively irrefutable data would appear to be the most appropriate.

Recommendation No. 11 – International

On the occasion of the forthcoming G8 and G20 meetings, France could suggest a commitment on the medium-term consisting inrationalising and eliminating subsidies that are harmful to biodiversity along the lines of the commitment on fossil fuel subsidies adopted during the G20 meeting in Pittsburgh in 2009.

Develop debt-for-nature swaps and specifically increase the percentage of Debt Reduction-Development Contracts (*known in French as "Contrats de Désendettement-Développement", or in short* C2D) allocated to biodiversity.

Recommendations

The mission statement asks for proposals for “courses of action for change and reform” of public subsidies in order to reduce or even remove their harmful impact. The working group wanted to set out two types of recommendations. On the one hand, general guidelines which correspond to the requested “courses of action for change”, but which, in certain cases, require more detailed investigation and consultation. On the other hand, more precise and concrete proposals, which henceforth reflect a unanimous position, going beyond the reserve incumbent upon the administrations represented within the group, and which in many cases it appears possible to implement rapidly.

1. General guidelines

TRANSPARENCY AND REPORTING

1. Facilitate the assessment of public subsidies that harm biodiversity

France does not currently have a clear and comprehensive view of public subsidies that are harmful, or even favourable, to biodiversity, whether at the national, regional, departmental or municipal level, and still less in a consolidated manner. The working group was surprised by this finding. It prevents it from setting out comprehensive, overall and finalised recommendations. The recommendations below can therefore only be partial.

In the first place therefore, the working group recommends that the State and regional authorities should equip themselves, as quickly as possible, with the means for keeping account of support that they provide, which has an impact upon biodiversity. This recommendation is still more relevant insofar as it is in line with the decisions adopted by the Parties to the CBD in Nagoya in 2010[1]. It can itself be broken down into four sub-recommendations:

- Put in place, beyond current budgetary nomenclature, a form of cost accounting enabling an inventory of public expenditure as a whole that is harmful to biodiversity. Current budgetary nomenclature only enables partial accounting. Too many budget lines refer to mixed initiatives, comprising aspects that are both favourable and unfavourable to biodiversity.
- In this domain, priority could be given to the overseas mission and public support with regard to the marine environment, because of their specifically rich, fragile and still little-known biodiversity. With its overseas, France bears a special responsibility in the field of world biodiversity. Its marine territory is the second largest in the world after that of the United States.

Its overseas are located in 5 of the 25 biodiversity hotspots (threatened by human activity). Yet, the public subsidies paid in French overseas are clearly higher than the national average in terms of relative value. Many of them generate harmful effects with regard to biodiversity, even while their benefits for the economic and social development of these areas is not

[1] Objective A2 of the action plan and point 7.1. Nagoya decision X/3.

always convincing. Without denying the necessity of specific support for these areas, justified in particular by the constraints of insularity and underdevelopment, the working group considers that in view of the richness and fragility of biodiversity in French overseas, public support for them and the conditions thereof should be assessed with greater rigour. This should apply in particular to the actions undertaken by the French Development Agency (in French "*Agence Française de Développement*", shortened as AFD), which has authority in French overseas, and to the re-examination of certain items of fiscal expenditure.

- Special attention needs to be given to official development assistance (ODA) and in particular to support provided by the AFD. This is justified on several grounds: the richness and fragility of biodiversity in developing countries receiving ODA, the historic role of France in these areas, the scale of projects that are potentially harmful to biodiversity financed within the framework of the ODA (infrastructures, public works, hydraulic industry etc.), increased and urgent requests for reporting in this field at the international level, the technical facilities at the AFD's disposal for the fulfilment of this task, which are comparable to those of a banking institution, democratic awakening or consolidation in numerous recipient countries which, at a time when they are reinforcing their rule of law, could be given greater assistance in the improved management of their natural resources.
- Draw up a consolidated statement of public support that is harmful to biodiversity, combining that of the State and regional authorities. Although this process comes up against methodological problems and presupposes compliance with the constitutional principle of the free administration of regional authorities, it appears essential. The principle of a consolidated statement of this kind could be debated, or even adopted, within the framework of the Conference of local elected representatives. Methodological support could be provided by French public think-tanks such as the CGAAER, the CGEDD and the IGF[1].

2. Improve transparency with regard to public subsidies

Apart from the establishment of means to better identify public subsidies as a whole that harm biodiversity, the working group considers that the State and regional authorities should, in a proactive manner, make all of this data accessible and shed greater light upon its potential impact on biodiversity, while more effectively explaining it to public opinion.

Incentives harmful to biodiversity may be considered, by certain actors or public authorities, as being favourable from an economic, social, industrial or scientific point of view. They may therefore be justified from this viewpoint.

[1] CGAER: Conseil général de l'alimentation, de l'agriculture et des espaces ruraux (General Council for Food, Agriculture and Rural Areas). CGEDD: Conseil général de l'environnement et du développement durable (General Council for the Environment and Sustainable Development). IGF: Inspection générale des Finances (General Inspectorate of Finances).

3. Take biodiversity more effectively into account in environmental and economic assessments for public subsidies

This cannot constitute an obstacle to their being highlighted and evaluated. Some incentives that harm biodiversity may be considered to be favourable to sustainable development. Still more, some incentives considered favourable to the environment may prove to be unfavourable to biodiversity. This is the case, for example, with regard to the construction of certain new railway lines, ports and canals. These infrastructures may be positive from the point of view of greenhouse gases (GHG) but negative from the point of view of biodiversity. It is incumbent upon public authorities to effectively reconcile these sometimes contradictory demands and to arbitrate between these different components of sustainable development and, similarly, of the environment. In any case, the contradictory aspects of these types of incentive should not be concealed.

In recent assessments and current debates, it appeared to the working group that great importance was given to the assessment of public subsidies in terms of GHG emissions – perhaps due to the presence of fewer methodological difficulties – whereas this was not the case with regard to biodiversity. The working group recommends that comparable weight should be given to greenhouse gases and biodiversity in coming environmental and economic assessments.

4. Define reporting procedures

Article 116 of the "New economic regulations Law" (in French: *Lois sur les Nouvelles régulations économiques*, shortened as Loi NRE), amended by article 225 of the Grenelle 2 law, establishes an obligation for companies listed on the stock exchange to publish "information concerning the manner in which the company takes into account the social and environmental consequences of its activity, as well as with regard to its social responsibility undertakings in favour of sustainable development"[1] in their annual reports. The implementing decree of February 20, 2002 of article 116 of the NRE law made very little mention of biodiversity-related aspects. The implementing decree for article 225 of the Grenelle 2 law is currently being drafted. The working group considers it highly desirable for the elements concerning biodiversity that are supposed to appear in the annual reports of listed companies to be specified in this decree or in a subsequent amendment thereof, should the publication process have progressed too far. These elements might include the past, current and planned impact of the company's activities with regard to biodiversity, the amounts devoted to minimisation of this impact and the guarantees put in place for possible future damage to biodiversity etc.

PUBLIC PROCUREMENT

5. Use public procurement as a lever to reduce incentives harmful to biodiversity

Public procurement constitutes a major source of public funds. The working group as a whole considers that, in spite of some recent progress, the situation remains very unsatisfactory in this domain. Considerations of impact upon biodiversity should be increased and more precisely specified in public procurement criteria.

[1] Article 226 of the Grenelle 2 law extends the field of companies subject to this obligation.

Moreover, all things being equal, public procurement does not appear to give clear preference to projects with a lower environmental impact. When it is stated that environmental criteria are taken into account in the award of public procurement contracts, the manner in which this is done remains vague. Indeed, the criteria are either "drowned" in an overall technical rating and do not appear in their own right, or they represent a small percentage of the final rating (in general less than 20%). Furthermore, it is extremely rare for criteria specific to the preservation of biodiversity to explicitly appear in the composition of ratings leading to the award of public procurement contracts. As a general rule, when the environment is explicitly taken into account in the award of a public procurement contract, the GHG component appears to be given too much emphasis as compared with the others, in particular with regard to the biodiversity component. Finally, publication of the final rating and therefore of levels of compliance with the various criteria of which it is composed, and environmental criteria more particularly, would enable greater transparency and therefore greater effectiveness in ensuring that the environment and biodiversity are effectively taken into account in the award of public procurement contracts.

The working group therefore sets out the following proposals:

- a criterion concerning the consideration of biodiversity should appear systematically in the composition of the rating leading to the award of all public procurement contracts;
- the share of criteria relating to the environment and biodiversity should represent at least 25% of ratings leading to the award of public procurement contracts;
- the final rating with regard to this criterion, having led to the award of a public procurement contract, should be made public at least for candidates having answered a call for tenders. The idea is to promote progress among both public contracting authorities in taking the environment and biodiversity into account, and private actors with regard to the environmental quality of the responses that they draw up and the research that they are led to undertake in order to increase their level of competence with regard to issues concerning the environment and biodiversity;
- special attention needs to be given to biodiversity in public procurement with regard to building and civil engineering. Since the consumption of natural spaces appears to be one of the major causes of loss of biodiversity in France, public procurement should ensure that public contracts relating to construction and transport promote projects that are economical in their use of space.

RESEARCH AND IMPACT STUDIES

6. Develop studies on the value of biodiversity, ecosystem services and the cost of inaction

Studies on the value of biodiversity, ecosystem services and the cost of inaction in this respect (which included the total economic cost of maintaining harmful subsidies and their consequences) need to be carried out in order to enable transparency with regard to the impact of public subsidies. This is also necessary to meet the Nagoya commitments[1]. Thus, in June 2011, the United Kingdom produced its National Ecosystem Assessment (NEA) which

[1] Objective A1 of the strategic plan ("By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably") and point 9. b) ii of decision X/3 of the Conference of the Parties ("All Parties provided with adequate financial resources, will have, by 2015: Assessed and/or evaluated the intrinsic value, ecological, genetic, social economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components").

assesses the value of the parks, lakes, forests and fauna of Britain for its economy. Ireland has also recently completed such an exercise.

7. Support research in the economics of biodiversity

Research concerning the economics of biodiversity and the economics of fees and taxes appears to be relatively weak in France, particularly as compared to Anglo-Saxon countries. The working group emphasises the value of developing this research, on which the studies mentioned under the previous point could then be based.

8. Improve and systematise impact assessment

The existing system of impact studies and environmental assessment in France is not satisfactory and leads to underestimation of the role of harmful subsidies.

- It is important for the implementing texts of the Grenelle 2 law, which provides for improvements in the existing system with regard to projects, to appear without delay. The same applies to the draft implementing decrees providing for the extension of environmental assessments to plans and programmes having an impact upon biodiversity.
- Considerations concerning biodiversity appear to play no more than a minimised role in certain environmental assessments, due in particular to a failure to take into account the indirect impact of infrastructures on biodiversity through urbanisation. Similarly, improvement appears possible with regard to the consideration of combined impacts resulting from the implementation of new projects, added to one or more previously completed projects. Moreover, the impact on biodiversity is too often reduced to protected species (subject to control via the recommendations of the French National Council for the Protection of Nature – French acronym: CNPN) as does not really take into account the impact of fragmentation and rupture upon the overall functioning of ecosystems.
- In these impact studies, attempts to value or express impact upon biodiversity in monetary terms appear to be virtually non-existent, while approaches to the offsetting of the negative impact of projects seem to be extremely brief, in the absence of preventing or mitigating such negative impact upon biodiversity. Analysis of the impact studies concerning the most recent large projects shows that neither the project owners nor specialized design firms currently master the methods of assessment of losses to ecosystems services caused by projects, or the offsetting which may be implemented in this regard.

INTERNALISATION AND THE STATUS OF TAXES AND FEES

9. Facilitate the implementation of incentive-based eco-taxes

Until recently, French tax law comprised three principal categories: taxes and duties; fees; and *sui generis* fees. The first of these are covered by law under article 34 of the Constitution. Fees come under the State's power to make regulations. They are highly diverse in nature, but two categories can be distinguished: fees for services rendered and State fees. The fundamental criterion distinguishing taxes from fees is that the latter are directly due in return for the use of a public service or public facility and have to be equivalent to compensation for this use.

In a recommendation of 27 July 1967 and a ruling of 21 November 1973 (*Société des papeteries de Gascogne*), the French Council of State recognised the existence of a third category: *sui generis* fees. Established with regard to the basin fees instituted following the Water Act of 1964, this term distinguished them from taxes on the one hand, and fees for services rendered on the other hand, in particular insofar as these basin fees, which are set by regulations, may have the character of providing an incentive which is incompatible with the status of traditional fees. The existence of these *sui generis* fees therefore facilitated the implementation of "user pays" and "polluter pays" principles.

However, several important changes followed. In its decision of 23 June 1982 the Constitutional Council of France judged that *sui generis* fees came under the category of taxation of all kinds, for which – under the terms of article 34 of the Constitution – the rules of assessment, rates and collection are fixed by law. The Council of State followed this case law in a ruling of 20 December 1985. This change therefore means that the role of fees can no longer be that of providing incentives, with this role being reserved for duties and taxes. Indeed, although all taxation has to comply with the principle of equality of taxation, case law considers that this principle is not absolute. On the one hand, it has to be assessed in view of the taxpayer's situation. On the other hand, exceptions are possible on the grounds of public interest. The Constitutional Council has recently expressly included the environment among the grounds of public interest under which exceptions to this principle are possible[1].

It must be noted that this case law currently provides a framework that considerably limits and restricts the establishment of an incentive and internalisation-based tax system and inhibits public authorities' attempts to accomplish this. The working group considers that the current situation hinders the internalisation of externalities caused to biodiversity, thus allowing harmful virtual public subsidies to continue to exist, and rendering the use of an effective public policy tool both difficult and unpredictable. Reflection needs to be undertaken with regard to the means enabling the executive to institute real incentive-based eco-taxes more frequently, under satisfactory conditions of legal security, as well as in compliance with the Constitution and the general principles of law, and equality of taxation in particular. If need be, this possibility would make a revision of article 34 of the Constitution necessary.

10. Change the fees system in order to enable externalities to be taken into account

Today, the fees system appears obsolete and complex in many respects. From the point of view of biodiversity, it suffers from several shortcomings which lead to the under-pricing of certain natural resources and harm to biodiversity, this under-pricing therefore constituting a form of public incentive that is harmful to biodiversity.

Firstly, the capping rule restricts the possibility of making fees payable by users when the amount thereof is greater than the cost of the service. However, it may be lower than the latter under certain conditions. Although slight price adjustments are therefore possible, they will tend to be unbalanced.
Secondly, certain fees are mixed, and the rules applying to them are thereby complicated, sometimes requiring the intervention of case law in order to be clarified.

[1] In its ruling of December 2000 on the general tax on polluting activities (TGAP), as well as in its ruling of December 2010 concerning the carbon tax, the Constitutional Council expressly considered, in the same terms, that protection of the environment could justify one or several infringements of the principle of equality of taxation. Nevertheless, beyond this recognition of principle, in both cases the Council considered that the terms of establishment of these taxes did not comply with the conditions under which exemptions from the principle of equality of taxation are possible.

Above all, fees do not take negative externalities into account. Where a service user's activities lead to externalities of this kind, it would be in accordance with economic theory to include the costs thereof in the bill presented to users. Fees would thus be a mode of implementation of the polluter pays principle. This appears to be all the more legitimate with regard to private use of public services. In reality, this is possible when the administration providing the service or making the public facility available is also responsible for rectifying the nuisances caused. Thus, it was possible to include the cost of building noise barriers along motorways in the investment amount passed on to users through the payment of tolls.

However, when expenditure undertaken to correct negative externalities is payable by a third-party body, the criterion of due compensation on which the system of fees for services rendered is based means that the corresponding costs cannot be made payable by the user in the form of fees. Similarly, the criterion of due compensation stands in the way of this expenditure being borne by users - by means of fees - when they are not considered to have a sufficiently close relation with the utility, even when it is defrayed by the same body that supplies the service. Thus, in a ruling of 13 of November 1987 (*Syndicat national des transporteurs aériens*), the Council of State judged a decree instituting a fee for the mitigation of nuisances caused by noise levied from certain aerodromes, as a supplement to the landing fee, to be illegal, on the grounds that this noise mitigation principally resulted from the soundproofing of homes and did not represent due compensation for any service provided by this operator to the companies.

Finally, neither positive externalities nor ecosystem services produced are currently included in State fees or fees for services rendered. This issue appears important, on the one hand, since it involves private occupancy of the public domain and, on the other hand, because it probably leads to the under-pricing of State fees and therefore to suboptimal management of public property and global public goods by the State.

State fees are fixed according to the benefit gained therefrom by the occupant (art. L. 2125-3 *et seq*. of the French General Code of Public Property, often shortened as CGPPP). In practice, the conditions of operation and profitability of the occupancy concession (e.g. turnover for restaurants established in the public estate of Versailles and for the Zénith arena at La Villette) may be taken into consideration. Positives externalities are only taken into account if they are considered to be partly reflected in the concession operator's turnover. Neither is any more account taken of external and upstream ecosystem services.

For example, the annual fees paid to the State for occupancy of the public domain by companies holding motorway concessions (art. R. 122-27 of the Highway Management Code), is calculated by means of the following formula: $R = (R1 + R2) \times 0.3$ where $R1 = V \times 1{,}000 \times L$ and $R2 = 0.015 \times T$[1]. This formula is not therefore linked to the profitability of a given section of motorway. It takes no account of any externalities caused to the public domain, either by the simple existence of a motorway (waterproofing of soils, effects of fragmentation due to the enclosure of land-takes, splitting up of landscapes etc.), or by its use (noise, effects of atmospheric pollutants on surrounding vegetation and build-up of pollutants in neighbouring soils etc.). Neither does it take any account of the ecological and environmental quality of the public domain that provides the motorway's land-take. The fee will be the same regardless of whether the ecosystem hosting the motorway is rich or poor, rare or common, fragile or robust, endangered or otherwise. Neither does the formula take into account the environmental quality of the public domain, in terms of providing an

[1] V being the rental value of 1 metre of a motorway route as fixed by art. 1501 of the General Tax Code (CGI), L corresponding to the number of kilometres of motorway routes operated by the concession holder at 31 December the year preceding the payment, and T representing the turnover made by the company in its activity as a motorway concession holder in the national public domain.

immediate visual environment, as opposed to its role as the physical host of motorway axes of communication, the visual attractiveness of which (this applies to public forests, such as the forest of Fontainebleau, through which motorways pass) may constitute an amenity or pleasure for travellers, enhancing their journey and even promoting their choice of this route and therefore the concession holder's income.

Moreover, in this instance, the fixed rental value appears low with regard to additional land pertaining to motorways (areas comprising artificial surfaces for rest areas, services, parking and access ways and enlarged tollgate zones): it amounts to 0.61 euros per square metre as compared with 4.85 euros per linear metre for roadways, including interchanges and slip roads. These appurtenances are zones of development and sealed soils which host commercial activities, where the prices charged are all the higher as consumers constitute a captive client base inside them. Simple good management of the State domain would presuppose a revaluation of this rental value. An additional increase could be justified by taking into account the externalities caused by these appurtenances (land development, sealed soils, run-off from waterproof surfaces, leaching of pollution into the soil etc.). Similar observations can be made with regard to other fees: for occupation of the maritime public domain, the public domain on rivers and river tolls etc.

Furthermore, the connection between this fee and the tax payable by motorway concession holders, instituted more recently and codified in art. 302 bis ZB of the General Tax Code (French acronym: CGI) remains vague. This tax is payable according to the number of kilometres travelled by users (7.32 euros per 1,000 km). Its basis does not appear to be very far removed from that of the fee, the company's turnover being partly dependent upon the number of kilometres travelled, and the latter being determined in part by the number of kilometres included in the concession. Nevertheless, if one remains within the bounds of current tax law and the distinction that it makes between taxes and fees, although it appears difficult to promote adjustable incentives which take externalities into account by means of the rate of fees, the opposite applies to taxes. It is therefore difficult to understand the construction of this tax and the very perfunctory character thereof, since incentive-based or even internalisation-based elements could be included within it. Such elements would not be aimed at taking the harm caused by the construction of a motorway into account. This has already been done and should have been included upstream in order to be minimised according to the three watchwords: "avoid, reduce, offset". They could rather be aimed at taking motorway use into account (the effects upon surrounding biodiversity of atmospheric pollutants, noise, light pollution and the run-off of pollutants deposited by traffic on road surfaces).

The working group considers that the law on fees has become obsolete and unsuitable and could be amended in the manner set out below.

First:

- capping rules should be revised in order to enable better adjustment;
- the prices of State fees appear to be extremely varied and often undervalued. It would be worthwhile to revise them;
- the State should be better informed of the ecosystem services provided by the natural areas that it owns and measure the value thereof more effectively;
- there is no justification for fact that negative externalities can only be included in fees if the administration providing the service is also responsible for rectifying the nuisances caused, a situation which resembles a virtual legal fiction or a theory of administrative jurisdictional separation. In any case, as far as the national level is concerned, the State and its administration are involved, and rule of the universality of public finance

should take precedence. A similar line of reasoning can be applied to each of the levels of regional authorities.

Second:

- the impossibility of charging negative externalities to those responsible for them, even in cases of private occupation of the public domain, in itself constitutes an argument in favour of reform of the system. On the one hand, this impossibility impedes the State's management of its domain, to the benefit of the general interest. On the other hand, given this impossibility, the State cannot remain indifferent and powerless in view of the scale of the expansion of these externalities, both in economic theory and in the realities of environmental problems;

- as far as biodiversity is concerned, ecosystem services, or services rendered by ecosystems, formalised in 2005 by the Millennium Ecosystem Assessment (MEA), constitute one of the most important conceptual breakthroughs of recent years. Properly considered, this concept is very close to that of a service rendered with regard to the use of a public service or public facility, justifying the payment of a fee to the State in due compensation. In the latter case, the State receives payment for the use of a public service, public facility or the public domain. In the first case, nature provides a large number of ecosystem services, without which life on earth and the very functioning of economies would be impossible. Economists endeavour to quantify the services and find means of remuneration for them. Yet, thanks to the public domain (maritime and river public domain, public forests, land allocated to the Coastal Protection Agency, etc.), the State possesses natural areas which provide ecosystem services. Admittedly, this observation should not lead to purely and simply equating natural heritage with the public domain, in the first place because other, broader legal definitions may apply (article L. 110-1 of the Environmental Code defines areas, sites, resources and species as a "common heritage of the Nation", which cannot but recall the idea of "public goods"), and because these services are not rendered by the owners or managers of the public domain, but indeed by the biodiversity itself. Nonetheless, the fact remains that payment is only demanded for a small part of the services rendered by the ecosystems held by the State. Apart from ecosystem services arising from the very existence of these natural areas, certain ecosystem services arise from State action. For example, the existence of mountain forests, the management thereof by the French National Forests Office (*Office National des Forêts*, shortened as ONF) and mountain terrain restoration operations (French acronym: RTM), upstream from EDF dams (EDF is the major French electricity provider), protect drainage basins from erosion and therefore limit the silting up of dams and incurred costs. These forests also play a role in the prevention of avalanches and landslides, which similarly remains unremunerated. For this reason, would it not be desirable, both from the point of view of effective management by the State of its domain, to the benefit of the general interest and public finances, and from the point of view of valuation of ecosystems and their functionalities, for the State to collect remuneration for some of the ecosystem services that it currently provides free of charge?

Remuneration for these ecosystem services would also make it possible to assign both a flux value (annual flux of ecosystem services rendered) and a stock value (capitalised values) to these ecosystems. Their valuation would thereby be increased, which would make destruction and damage of these habitats more difficult. It would thus make it possible to speed up the necessary value transfers mentioned above. In other terms, should the State refrain from playing an innovative and experimental role in the current movement towards payments for services rendered by ecosystems? This would require no more than the extension to ecosystems of remunerations for services rendered. Since this is not

currently permitted by the laws on fees, the legal means for implementing such an extension remain to be found. New prospects are perhaps opened by one recent example of case law[1]. In this affair, the Council of State considered that fees could exceed the cost price of services, and take their economic value for their beneficiaries into account. On the one hand, this case law weakens the charge-capping rules.

On the other hand, taking the line of reasoning begun above still further, it could eventually open up the possibility of the economic value of ecosystem services rendered being taken into account, by means of fees for services rendered.

VAT ON INTERMEDIATE CONSUMPTION

11. Revise the reduced VAT rates for certain products with a high impact upon biodiversity

Article 54 of the Grenelle 1 law states that France will support the EU plan for the establishment of a reduced VAT rate for products with a low impact upon biodiversity. Reduced VAT rates can be analysed as fiscal expenditure. Generally speaking, Eurostat data shows that France makes use thereof more often than neighbouring EU countries. The working group considers that it would be consistent with article 54 of the Grenelle 1 law for reduced VAT rates that benefit certain products with a high impact upon biodiversity (inputs, water etc.) to be revised and, if necessary, increased to the normal rate.

RURALITY

12. Slow the development of unbuilt rural land

In France, in most cases traditional uses of unbuilt rural land generate negative net profit in real terms, or not profit at all. Apart from its inherent disadvantages, this situation is a cause of concern from the point of view of biodiversity, since it encourages the owners of this kind of property to change the status thereof through development, in an attempt to generate positive real returns. At the very least, all aids providing incentives for such development should be assessed and reviewed, with a view to reducing them. At the same time, a reduction of the burdens upon unbuilt rural land would make it possible to reduce, if only marginally, the profitability gap as compared with built land and would therefore limit this incentive that promotes land development.

13. Revise the tax structure for farm production factors

Historically, the European Common Agricultural Policy (CAP) was constructed with the aim in particular of establishing a self-sufficient internal market. In order to function effectively and with healthy and well-balanced competition rules, an internal market presupposes levels and structures of costs which gradually converge, without necessarily being identical. However, the differences between these levels and structures currently still appear to be too great from one Member State to another. This situation has become more marked due to the successive enlargements of the EU. Generally speaking, France might therefore support the relative harmonisation initiatives initiated by the European Commission.

[1] Conseil d'État (Council of State), 16 July 2007, Syndicat national de défense de l'exercice libéral de la médecine à l'hôpital ; www.conseil-État.fr/cde/fr/selection-de-decisions-du-conseil-d- État/analyse-nos-293229293254-syndicat-national.html.

Several factors are put forward to explain the lower competitiveness of French agriculture as compared with some of its European competitors: diverse production structures, occasional non-optimal positioning in relation to demand, small size of agri-food industries and therefore inadequate R&D investment and the large number of professional organisations which does not allow economies of scale to be fully put into use etc. It does not fall within the working group's remit to examine these factors or to assess their order of importance. On the other hand, at least one of them deserves attention with regard to this inquiry. The structure of agricultural costs in France currently appears unfavourable both to the competitiveness of the sector and to biodiversity. The competitiveness gap between French agriculture and other EU countries is, in fact, also partly attributable to higher labour costs and social security contributions than those in neighbouring countries. Conversely, taxation on inputs appears to be lower in France.

In the agricultural sector, France has the lowest legal working time (35 hours as compared to 40 in Germany, Spain, Poland and Romania, 39 in Italy, 38 in the Netherlands, etc.), the highest employer's social security contributions in relation to gross wages (41.55% as compared to 18.34% in the Netherlands, 23% in Germany, 21.25 % in Spain, 19.8% in Poland etc.), the highest legal minimum hourly wage (8.27 euros as compared with 3.20 in Spain, 1.66 in Poland, 0.66 in Romania, between 4.46 and 6.39 in Germany and 8.13 in the Netherlands), and the highest average wage (more than 12 euros as compared with between 6 and 9 in Germany, less than 6 in Spain, Greece and Portugal, and less than 3 euros for the new Member States)[1]. Conversely, taxes on agricultural fuel had been reduced to a greater extent in France than in Germany (representing a fiscal expenditure of 1.26 billion and 450 million euros respectively)[2]. The situation is more subtle with regard to real estate costs. In 2010, France had the third highest real estate costs as compared to value of production among EU Member States: 2.23%, whereas it is below 1% in 16 Member States[3]. For example, in Germany, the total product of the equivalent of the French tax on unbuilt land (TFNB) amounted to 354 million euros in 2008, whereas it was almost four times higher in France (1.32 billion euros). However, both purchase and rental prices for agricultural land in France are among the lowest in Europe. This situation, partly attributable to the status of leases, leads to three consequences with mutually contradictory results. It limits the burden of real estate costs for agriculture (the consequence in terms of biodiversity is dependent upon the type of farming and therefore may be positive, neutral or negative). It renders the construction of buildings, housing and other facilities on agricultural land cheaper and therefore more profitable (harmful consequences for biodiversity). It contributes to the very low profitability of leased unbuilt rural land, which constitutes an incentive for changing its assigned use (land development), in order to gain higher returns (harmful consequences for biodiversity).

Since a framework is provided by the EU for a part of the tax system with regard to inputs (VAT, minimum rates of duties on energy), any reforms in this field have to be made within an EU framework, without disadvantaging French agriculture. However, in keeping with current trends, exemption systems for inputs in France will probably become increasingly difficult to justify in view of the objectives of international, European and national policies in the fields of energy, climate, biodiversity and water, with stricter norms.

[1] Dionis du Séjour J. (2011). Report on behalf of the Commission des Affaires économiques concerning the bill aimed at consolidating the competitiveness of French agriculture in the long term, no. 3198, Assemblée nationale.
[2] Cour des comptes (2011).
[3] Eurostat.

A revision of taxation structures regarding agricultural production factors, with an increase in taxation of inputs that are potentially negative for biodiversity when used in an excessive or inappropriate manner (fertilisers, crop treatment chemicals, water etc.) and a reduction of social security contributions and taxation for unbuilt land, therefore constitutes a possible course of action to be investigated in further detail.

Properly conducted, a revision of this kind, without harming competitiveness if made upon the principle of strict compensation, would have the advantage of encouraging the protection of biodiversity (although at this stage it appears difficult to calculate the gains with regard to biodiversity, and the environment more generally), promoting agricultural employment and possibly limiting the conversion of agricultural land to other non-agricultural uses. It would also be positive from a dynamic point of view through the encouragement of changeovers to practices and systems that are more economical in terms of chemical inputs and water, and more labour-intensive.

14. Prioritise incentive-based eco-taxation

In the field of agriculture, as elsewhere, priority should be given to a real incentive-based system of eco-taxation and not to a returns-oriented budgetary tax system.

Taxation of this kind is aimed at providing incentives for changes in behaviours, practices, systems and use of inputs. It presupposes strict conditions of use: a precisely defined basis, considerable medium-term price elasticity and, if possible, in the short term, substitute products and practices, the possibility of deferring tax expenses upstream or downstream – or even of redistribution of the tax yield within the sector itself –, and progressive introduction accompanied with explanations and education. This type of eco-taxation produces good results: as evidenced by the French general tax on polluting activities (TGAP) with regard to washing powders according to their phosphate content, the Swiss RPLP taxation[1], the Swedish nitrogen oxide (NOx) emission tax and the price-setting of water in Israel etc. The working group recommends that the tax bases and conditions under which this type of tax system could be introduced or increased in the agricultural sector should be immediately identified, with the profession, alongside the reductions in social security contributions mentioned above, subject to acceptability by the EU. Furthermore, an increase in the cost of the use of these products would be likely to stimulate R&D efforts aimed at economising on the inputs subject to these measures.

As far as plant health products are concerned, apart from prohibited substances, a differentiated tax system could, for example, be introduced between two products with equivalent effectiveness but different effects upon biodiversity.

AGRICULTURAL SUPPORT

The Common Agricultural Policy has been undergoing continuous reforms for 20 years (1992, 1999, 2003, 2009, 2013…) following a process which has consisted of gradually breaking the links between support and production (decoupling of the first Pillar supports) and giving priority, by means of targeted, so-called second Pillar[2] measures, to objectives of adaptation to changes (early retirement); protection of the environment, - in particular through agri-environmental measures (AEM) -, standards of Good Agricultural and Environmental Conditions (GAEC); and finally, rural development objectives.

[1] RPLP: HGV fee linked to services (Redevance poids lourds liée aux prestations).
[2] In reality, the second Pillar was only created in 1999 by Agenda 2000.

Since 2003, the second Pillar has been increased by deduction from the first (the so-called modulation process). At the same time, the first Pillar support (Single Payment Scheme or Single Farm Payment – SPS) has been granted on the condition of compliance with regulations and good practices (maintenance of land in "good agricultural and environmental condition"). The 2008 CAP Health Check marks the end of coupled subsidies. Only the premium for maintaining suckler cows remained coupled until 2012. These changes effectively removed most of the incentives that were directly negative in terms of biodiversity, in particular by removing the incentives based on increasing intensity per hectare (intensive margin incentives) resulting from guaranteed prices and direct subsidies coupled to production, as well as direct incentives to turn over meadow land (extensive margin incentives). However, these changes have not been enough. As shown by the French research center on agriculture INRA multidisciplinary scientific assessment report on the subject of agriculture and biodiversity[1], biodiversity in agricultural environments is still declining (diversity of species and diversity between species) whether at the world level, in Europe, or in France. In light of this observation, three non-exclusive possible courses of action could be explored with farmers.

15. Consolidate the consideration of biodiversity in the first Pillar support

The budget devoted to agri-environmental measures (AEM) only allows their implementation by a limited number of farmers. Increasing the extent to which environmental constraints are taken into account within the first Pillar might constitute an alternative. For example, adjustment of the SPS rates might be considered according to environmental criteria, and biodiversity in particular, as put forward in the 2013-2020 CAP proposals. The effects of adjustment of this kind in terms of reallocation should be studied beforehand.

16. Consolidate the second Pillar targeted measures on biodiversity

The measures taken within the framework of the second Pillar could also be consolidated. This could include:

- "technical" consolidation for the same budget: improving the effectiveness of agri-environmental measures for the same budget, in particular, by improving the location of areas under contract and increasing the rate of establishment of contracts in sensitive zones;
- "budgetary" consolidation, which - within the framework of agricultural budgets that, at best, remained the same -, can only be effected through deduction from the first Pillar in order to increase the amount of the second, and more specifically to increase the amount for biodiversity-targeted agri-environmental measures;
- consolidation of the "regional approach" : the regional level has a strong impact upon biodiversity[2]. Landscape heterogeneity (composition of the countryside in terms of semi-natural elements and crop diversity) and connectivity between elements of the landscape are two important dimensions to be taken into account in particular in any changes in farming practices.

[1] Le Roux X., Barbault R., Baudry J., Burel F., Doussan I., Garnier E., Herzog F., Lavorel S., Lifran R., Roger-Estrade J., Sarthou J.-P. and Trommetter M. (ed.) (2008), Agriculture and Biodiversity. Benefiting from synergies, Multidisciplinary Scientific Assessment, INRA, 110 p.
[2] Ibid.

As in the preceding proposals, the question of impact upon incomes has to be addressed in advance.

With regard to regional agri-environmental measures, several approaches are possible:

- the creation of a regional agri-environmental measure on biodiversity: in addition to the agri-environmental measures currently targeted at "conservation and effective management of sites within the Natura 2000 network" and "the good condition of water bodies established by the European Water Framework Directive[1]", the return to "good status for biodiversity" could comprise a third priority objective. Specifications could then be established, including practices promoting biodiversity, in particular the inclusion of protein crops in rotations (high-protein peas, field beans, lupins);
- adjustment of regional agri-environmental measure support: in addition to widening the regional agri-environmental measure priority objectives, or independently, adjustment of support could be instituted according to the value of the resources used by farmers[2], in relation to the regional agri-environmental measure reference specifications. The more ambitious the resources implemented, the higher the support would be.

17. Maintain organic production systems

In 2007, almost 12,000 farms were engaged in organic agriculture occupying a surface area representing 2% of the French utilised agricultural area (UAA). The 2012 organic farming plan taken up in the Environment Round Table aims to triple the 2007 land surface areas, increasing them to 6% of French UAA by 2012. The development of organic farming is promoted by several schemes: support for conversion to and/or maintenance of organic farming (financing from the EAFRD[2], the State and, in some cases, local authorities), certification subsidies. However, farms that convert to organic agriculture sometimes return to a conventional system. Prolongation of support for conversion to and/or maintenance of organic farming from 5 to 10 years, or also, that of the eligibility conditions with regard to the duration of farming operations for tax credit and/or exemption from the TFNB French tax on unbuilt land for farmers converting to organic agriculture could help to limit this phenomenon.

However, a prolongation of the required length of time for which farming operations have to be conducted in order to benefit from tax credit, might have a dissuasive effect with regard to conversion to organic agriculture, and thus prove counter-productive. The possible impact should therefore be more thoroughly assessed before the implementation of this measure.

These proposals could also be extended to other biodiversity-friendly productions systems (integrated pest management and integrated production).

[1] FWD : directive-cadre sur l'eau (European Water Framework Directive).
[2] Adjustments are deliberately targeted upon resources implemented and not upon results: it still appeared very difficult, both from a scientific and operational point of view, to measure the effects, all other things being equal, of the implementation of agri-environmental practices upon biodiversity.
(3) EAFRD: European Agricultural Fund for Rural Development.

MARINE BIODIVERSITY

18. New uses of the sea

The marine environment is subject to an expansion of traditional uses of the sea (sea freight, yachting, deep-sea diving etc.) with increasingly powerful technical means, as well as new uses (aquaculture, offshore wind farms, marine current water turbines, wave energy converters, very deep water drilling etc.). The impact of these uses on marine biodiversity is still little-known. Yet they benefit from public subsidies fixed without potential or confirmed negative externalities being taken into account. This is the case with regard to repurchase price rates for electricity produced by offshore wind turbines, tax exemptions for offshore oil exploration and trading vessels etc. In view of the fact that it is more difficult to reform incentives that already exist than it is to establish such aid in a suitable manner at the outset, the working group recommends that impact upon biodiversity should be taken into account at the time of definition of the forms and amounts of incentives granted for these new uses.

19. Other pressures upon fishing stocks not resulting from fishing alone

Fishing stocks are harmed by many causes that are not solely due to fishing (oil spills, pollution from land sources, destruction of coastal spawning beds, etc.). The considerable amounts of public support that are sometimes given to activities responsible for this damage and any absence of full internalisation of this negative impact constitute *de facto* public subsidies that are harmful to marine biodiversity. The reduction of incentives for these land-based activities therefore appears important, not only for marine biodiversity, but also for the economic and social future of fishing.

20. Improve knowledge of the condition of fishing stocks

In the field of maritime fishing, the working group has been able to make several statements of fact:

- the tonnage unloaded in French ports represents about 1% of world tonnage;
- the state of certain fishing stocks remains little-known; this activity is highly regulated by EU rules;
- public subsidies that are harmful to biodiversity amounted to 253 million euros in France in 2008, i.e. more than twice the amount of subsidies favourable to biodiversity;
- the form of French public subsidies tends to encourage modes of fishing without regard to the preservation of seabeds. These types of subsidies appear harmful both to marine biodiversity and to the fishing sector itself;
- foreign experiences of reduction or removal of subsidies harmful to fisheries are perhaps too recent to allow drawing definitive conclusions from such experiences. It appears that, to date, the results thereof are uncertain or inadequate. On the other hand, in combination with the institution of individual transferable quotas, they appear to give good results with regard to the preservation or restoration of fishing stocks. Any attempt to reduce public subsidies that are harmful to maritime fishing can only be praised, if only from a budgetary point of view. However, the working group feels any initiative of this kind, which is not combined with the establishment of individual transferable quotas, would have little result as far as biodiversity is concerned. In a

Communication of 13 July 2011, the European commission proposed a reform of the Common Fisheries Policy (CFP) based, in particular, upon the establishment of national individual transferable quotas ("transferable fishing concessions") and excluding boats of less than 12 m in length, with the exception of vessels equipped with towed gears. Although the precise terms of this proposal are not yet known, the working group wishes to emphasise its value.

On the basis of these considerations, the working group therefore firstly recommends an improvement of knowledge of fisheries resources. Lack of knowledge of stocks is compatible with neither rational fishing, nor healthy management of natural resources, nor with the responsibilities of France as the world's second largest maritime domain. The working group therefore recommends that initiatives should be completed as quickly as possible in order to improve knowledge of the state and dynamics of little-known populations of fish stocks, in the waters of French overseas departments and territories in particular.

21. Progressive reduction of subsidies harmful to biodiversity in the fishing industry

- Firstly, the objective of equalisation of the amounts of favourable and harmful subsidies could be a goal both at the EU level and within each Member State. An objective of this kind would require moderate effort in France.
- A proportion of harmful subsidies are granted for certain practices, without regard to their impact upon marine environments and upon the environment more generally. The working group recommends the continuation of the redirection of this support to subsidies of the same amount within the fishing sector, but towards practices which are environmentally-friendly with regard to the marine environment.
- Exemption from the domestic consumption tax on fuel (in French: *Taxe Intérieure de Consommation sur les produits pétroliers* or TICPE) deserves special attention for several reasons:
  - it constitutes the largest item of public spending in the fishing sector;
  - it contributes to increasing the fuel autonomy of boats and potentially to larger catches;
  - it encourages modes of fishing that offer the least protection for seabeds, such as trawlers, which consume markedly more fuel per fish caught than other fishing methods. Any reduction or capping of the domestic consumption tax exemption would put gill-netting and trap fishing at less of a disadvantage than trawling.

Conversely, any incentive for the conversion of trawling to gillnetting or trap fishing would be beneficial both in terms of biodiversity and CO_2; - it encourages the consumption of fossil energy and emissions of CO_2 and other air pollutants harmful to biodiversity.

The planned revision of directive 2003/96 on excise duties maintains the principle of exemption of fuels intended for ships, while asserting a will to place stronger limitations upon exemption possibilities. France could benefit thereby in order to defend the principle of rebalancing exemptions from domestic consumption tax on fuels in favour of fleets that are less harmful with regard to biodiversity. As far as the agricultural sector is concerned, this type of rebalancing is already present in the draft revision of the directive (reduced rate of domestic consumption tax on the condition of undertakings for the improvement of energy efficiency). In the fishing sector, various different approaches are worth examining: making domestic consumption tax exemptions dependent upon fishing practices that are judged to be less harmful (e.g. "passive" netting/trapping as opposed to "active" trawling methods);

capping the amount of exemptions of which a ship may benefit from or establishing a non-negligible rate of taxation, thus creating incentives for relocation of activities in coastal areas and/or changes in the dimensions of new vessels; using the receipts thus generated in order to finance initiatives for the conversion of fleets to lower-impact fishing methods.

WATER

Water is linked to biodiversity in terms of its quality as well as its quantity. Deterioration of water quality affects aquatic biodiversity. The extraction of excessive amounts of water from rivers causes considerable damage to aquatic environments and endangers the species that live in them.

The current situation calls for several observations:

- water appears to be under-priced for a certain number of uses, which constitutes a de facto subsidy for use of this resource;
- the price-setting principles are far from optimal;
- financing of the water cycle appears to be inadequate or non-existent.

In light of this, it seems desirable to work upon the following courses of reform.

22. The need for changes in water price-setting

There are two different schools with regard to this issue. The first is embodied in the pursuit of the “water pays for water” principle, which proposes an extension of user pays and polluter pays principles. Indeed, certain uses (irrigation, energy, etc.) and certain forms of waste discharge (nitrates in particular) are clearly under-priced. To charge for them in a manner equal to other uses, or according to internalisation-based or incentive-based criteria would lead to more economical use of water and the reduction of waste. However, the scale of the progress to be made (more than 24 billion euros by 2015 for the deadline on good ecological status for bodies coming under the European Water Framework Directive, according to the French court of Auditors (in French *Cour des comptes*) makes it doubtful that the sectors giving rise to high net levels of water consumption and harmful waste will be able to bear the cost alone. Moreover, this course of action would involve internalisation of the environmental costs of water in the price of commodities, and therefore an increase in food prices.

The second line of reasoning, which is advocated by operators in particular, considers that the resources intended to finance protective actions, or even for the restoration of aquatic environments and water bodies, should not be solely derived from the bill paid by users, but more directly from the taxpayer. This second scenario might presuppose a change to the principle of “helping those who clean up pollution or who do not pollute”, while offsetting, in one way or another, the absence or restriction of sewage farming in drinking water supply and catchment basins. However, direct financing of these initiatives through taxation appears uncertain and gives rise to several questions. Firstly, the situation of public finances makes it difficult to implement. Secondly, the measure would go against the polluter pays principle, which is currently the basis of French and European policy in this regard and which has now been constitutionalised. Finally, it would be appropriate to determine in detail to whom the benefit of the planned offsetting would be allocated: the managers of agricultural and forestry areas located in the drainage basins should probably benefit therefrom in priority, to a greater extent than operators and distributors.

Moreover, several elements plead in favour of a different line of reasoning: water continues to represent a very small proportion of household budgets; its price hardly sends consumers incentive-giving signals; it is indeed the result of an ecosystem service which, as such, is not remunerated; wetlands, which are considered to be one of the planet's richest environments, are an Environment Round Table priority with regard to biodiversity etc. For this reason, if water prices provided more of an incentive, the implicit subsidies to wasteful use thereof would be removed.

23. Take the quantitative aspects of the resource more effectively into account

Fees for extraction of water resources are based upon gross extraction and not upon net consumption or extraction. This tax base does not penalise extraction that is not restored and therefore does not give any incentive for economical use thereof. Moreover, adjustments according to use are greater than adjustments linked to the availability of the resource[1]. Fees should be based upon net extraction. Otherwise a fee for net extraction (consumption) needs to be added to the current fee for extraction. In the first case, the rate of fees for net extraction should be higher than the current fees for gross extraction. In any case, certain exemptions from fees for extraction and consumption of water (aquaculture, geothermal energy etc.) should be reassessed and, if necessary, abolished. If they are maintained, the fees for gross extraction should be adjusted at different times according to the resource (seasonality and hydrology) and different uses (domestic, fundamental, recreational) so as to pass the cost thereof on to those who give rise to it, and to tourists in seaside and mountain resorts in particular.

24. Take the qualitative aspects of the resource more effectively into account

As far as the qualitative aspects are concerned, several possible courses of change may be mentioned: the creation of a specific tax on nitrogen fertilisers, widening of the base of the fee for diffuse pollution in order to include nitrogen products therein, and putting in place of a sewage farming rights market. The latest OECD analysis concerning the environmental policies conducted in France recommended, in application of the polluter pays principle, the establishment of a tax on nitrogen fertilisers or a quotas market for farmers. In Denmark, the implementation of nitrogen quotas (combined with a tax on pesticides) made it possible to effectively decouple production from nitrogen, pesticides and phosphorus inputs in the space of around 10 years.

25. The specific case of water pollution from medicines

The reduced rates of VAT on medicines and pharmaceutical products constitute tax spending. The reimbursement of these products by social security and mutual insurance companies constitutes a form of support, justified on health grounds. Nevertheless, the increasing presence of residues from pharmaceutical products in water also harms biodiversity (endocrine disruptors etc.). Paradoxically, human health could in itself be affected thereby. It is incumbent upon the authorities to reconcile these demands, in view of scientific knowledge that is still imperfect on this issue. At this stage, the working group will limit itself to three recommendations.

[1] Nevertheless, adjustment according to use does not reflect extractions made per user category: on the sole basis of extractions, agriculture should contribute at the rate of 18% of the total of fees, whereas at present it barely contributes 2%.

- Research into the effects of pharmaceutical products upon biodiversity should be increased.
- Public authorities have significant power with regard to medical prescriptions by means of the approval or denial of marketing authorisation for medical substances, and thus upon the reimbursement of these products and the rate thereof. Marketing authorisation applications for new medicines should contain impact studies of their effects upon biodiversity.
- Moreover, where two medical substances have similar effects in health terms, different rates of reimbursement and/or VAT could be envisaged in favour of the product with the lowest impact upon biodiversity.

26. Improve the clarity of water bills

Water bills constitute the most common and regular means by which French consumers pay the price of biodiversity. However, investment in water savings appears to be low. Furthermore, consumers are probably unaware that, to a large extent, this involves payment for an ecosystem service. This double paradox is partly explained by low levels of water expenditure in household budgets and lack of knowledge of issues related to water and the sources, stocks, flows, pollution and processing thereof etc., in particular as compared with other environmental questions which receive more media attention. Yet, due to increasing regulatory requirements, the inadequate quality of water in France and the investments necessary in coming years, the price of water will probably increase. For this reason, it appears desirable for the various components of water bills to be shown more clearly, so that everyone is aware of what they are paying for. Furthermore, the water bills sent could easily be accompanied with explanatory information concerning aquatic biodiversity and its links with keeping water in good condition. At both of these levels the initiative needs to come from private operators. If after a certain deadline, water bills do not appear to be detailed enough, the authorities could take up the issue, as they have done with regard to transparency concerning bank charges.

27. Changing water price-setting is not enough

There is no single solution to this difficult issue. In order to reduce summer water shortages, which will probably become increasingly common, the possible creation of a limited number of substitute reservoirs should be combined with, or even made subject to:

- changeover to collective and more economical irrigation techniques;
- changeover to more appropriate farming practices and crops: encouraging, in particular, expansion of the farming of plants that are more economical in terms of water or whose growth phase coincides to a lesser extent with the summer period (sorghum and sunflower as opposed to maize);
- provision of incentives for taking out private insurance against drought risks.

TRANSPORT

28. Include externalities affecting biodiversity in the setting of fuel and fuel oil prices

In the energy and transport fields, the external effects of the use of fuels and fuel oils upon biodiversity appear to be little taken into account, not-internalised, or even little-known, since studies have focused upon other externalities to a greater extent. Generally speaking, externalities caused to biodiversity should be taken into account and reincorporated into price-setting for these products.

29. Slow the fragmentation of habitats

The fragmentation of natural areas constitutes the principal direct impact of infrastructures (apart from impacts arising, in particular, from urbanisation and the development of land in the vicinity of stations and interchanges). It is independent of the land-take and the means of transport. Thus, secondary railway lines will have a smaller land-take than secondary roads, but the fragmentation effect will be moderate in both cases. A high-speed railway line will have a smaller land-take than a motorway, though the effect of fragmentation will be similar as well as high. In both cases, the line of enclosure of the land-take will prevent a proportion of the fauna from crossing, create ecological discontinuities and prevent biological connectivity. For this reason, although the construction of high-speed railways may be a “good thing” from the climate point of view – due to the predominant power source in high-speed trains – this is not the case as far as biodiversity is concerned. From this point of view, most of the 4,000 km of high-speed railway lines announced at the time of the Grenelle de l’Environnement are not favourable to the maintenance of biodiversity. The public share of their financing (State and regional authorities) therefore has to be classed among harmful public subsidies.

As far as biodiversity is concerned, quite apart from cost, the maintenance and updating of existing networks and the reduction of public support for new infrastructures therefore clearly appears to be less harmful.

30. Consolidate the ex-ante assessment of linear infrastructure projects

Ex-ante assessment is proving to be very important. It enables the identification of sensitive ecosystems in danger of being damaged, by fragmentation in particular. It makes it easier to compare variables, so-called low impact routes, and even alternative infrastructures. It is for the most part conducted by means of two types of assessment: impact studies and forward estimation of socioeconomic profitability. Nobody denies the need for and usefulness of these prior assessments. On the contrary, they need to be continuously refined, developed and, if possible, gain in quantification.

In accordance with national and EU law, all infrastructures must be subject to an impact study including their consequences for biodiversity in particular. Projects of this kind and their impact studies are subject to the recommendations of the French Environmental Authority (*Autorité Environnementale*). The same applies to plans and programmes subject to environmental impact assessment. These studies and assessments have to take into account the manner in which impact upon the environment, and upon biodiversity in particular, is to be prevented, reduced and offset where necessary. The working group therefore wishes to emphasise that this procedure, and the recommendations issued by

Environmental Authorities in particular, should be a decisive moment for examination of the possible harmful impact of public subsidies upon biodiversity. This does not yet appear to be sufficiently the case. The public subsidies which each project of this type benefit from should therefore be clearly shown in the application sent to the Environmental Authority, setting out their form, their certain or uncertain nature, and the possibilities for going beyond them. In order to assess these aspects more effectively, the Environmental Authority could, insofar as necessary, have staff specialized in the analysis of these subsidies placed at its disposal.

31. Take biodiversity issues more effectively into account in the ex-ante assessment of linear infrastructure projects

The mitigation hierarchy, or avoid, reduce, compensate principle (included in French law as early as in the 1976 Law on nature conservation) has been implemented in an uneven manner. It is almost always impossible to completely avoid the impact of infrastructures and facilities upon biodiversity. On the other hand, great progress has been made in techniques for reducing these impacts since the 1980s, and project owners and contracting authorities have increased their efforts in this domain. Compensation, for its part, remains in its infancy. In the absence of a sufficiently precise methodological and legal framework and recognised equivalence between units of measure of biodiversity, as well as reliable assessment of ecosystem services damaged or proposed for compensation, assessment is in most cases limited to the analysis of the species or, at best, the habitats affected, without addressing the essential question of the functioning of ecosystems.

This observation leads to a comparison between the two methods of handling the ex-ante assessment of projects, with regard to consideration of environmental issues, and biodiversity issues in particular:

- impact studies, which describe the justifications for the project in view of its possible variants and the assessment, on an issue by issue basis, of the project's foreseeable impacts and the means that will be dedicated to avoiding, reducing and compensating them;

- socio-economic assessment (for transport infrastructures in particular, on the basis of the French so-called "Boiteux II" official governmental report), which is aimed at incorporating all of the project's updated costs and benefits into a single economic value (updated net balance, internal profitability rate etc.), whether with regard to monetary values (expenses and investment and operation income, upon which economic figures can be placed) or "ascribed values", intended to internalise external costs and benefits: time gained or lost, negative environmental and social impact etc.

These two methods cannot be merged or substituted for one another, due to their different objectives: the first is not aimed at judging the project's overall suitability, but at enlightening decision-makers, and the public, in as full and reliable a manner as possible with regard to environmental issues. The second, on the contrary, is aimed at incorporating the whole of the economic, ecological and social elements concerning the project into a single figure-based criterion, in order to decide upon its appropriateness and ranking as compared with competing projects. The latter approach, which is more comprehensive, obviously raises questions on the one hand with regard to the exhaustiveness with which ascribed values involving all of the project's environmental and social externalities are taken into account and, on the other hand, with regard to governance of the set-up: indeed, the weighting factors actually introduced between the ascribed values (e.g. the relative weight given to the time value, or the CO_2 emissions value) amounts to inducing implicit policy choices behind the simple selection of calculation parameters.

The working group observes that the ascribed values resulting from the "Boiteux II" report and used by public authorities for conducting socio-economic assessments of infrastructures do not in fact take externalities linked to biodiversity into account, nor do they take any account of those linked to the soil, water and the countryside[1].

Moreover, a certain number of other values deserve to be revised in order to take the research conducted over the last decade into account, and in particular that of the European Commission. French values appear lower than those used by other OECD countries. They place great emphasis on time savings as a criterion, to the point of submerging the others.

The recent report from the *Centre d'Analyse Stratégique*, drafted under the chairmanship of Christian Gollier, concerning the consideration of risks in the calculation of public investments, demonstrated the need to revise the discount rate currently used in social economic calculations, in order to make it compatible with taking the risks linked to each project into account[2].

In any case, in the face of this situation, the working group recommends, in accordance with the desired objectives set out in the Boiteux Report, as well as those of the Gollier Report, that an exercise of restoring the coherence of the values used in socioeconomic calculations should be undertaken in order to incorporate biodiversity values, even if only partially. This revision needs to take the research undertaken into account[3], including the Handbook on Estimation of External Costs in the Transport Sector, Swiss research and that directed by Bernard Chevassus-au-Louis conducted by the Strategic Analysis Centre.

Following the undertaking by the French President, made at the time of his speech before the Grenelle de l'Environnement of October 2007, according to which "In all public decisions, the cost in terms of biodiversity shall be taken into account", the working group emphasises the need to extend this exercise by proposing biodiversity values for the various different ecosystems present in France.

However, it is neither necessary nor reasonable to await the availability of reference values for the whole of French biodiversity in order to take biodiversity values into account in assessing each project's externalities. In practice, this would be an idle task. From a methodological point of view, it appears possible to simplify the work, to begin with, by limiting it to the major types of ecosystem and applying value transfers. Ecosystem assessment will subsequently make progress in due time, both in terms of precision and with regard to the scope covered. The working group therefore hopes that biodiversity will henceforth be incorporated into prospective socio-economic assessments of infrastructures, in order to reduce the systematic bias that currently results from the complete absence thereof in the presentation of supposedly comprehensive socio-economic assessments.

As a result of the considerations set out above, the working group considers that there is no reason to choose between either environmental or economic assessment. These two types of assessment pursue different objectives: ensuring the absence of net biodiversity loss ("no net loss"), in the case of environmental assessment, and giving biodiversity a status

[1] Commissariat général du Plan (2001), Transports : choix des investissements et coûts des nuisances (Transport: choice of investments and cost of nuisance), report of the working group chaired by Marcel Boiteux, rapporteur-general: Luc Baumstark, Paris, La Documentation française; http://lesrapports.ladocumentationfrancaise.fr/cgi- bin/brp/telestats.cgi?brp_ref=014000434&brp_file=0000.pdf.

[2] Centre d'analyse stratégique (2011), Le calcul du risque dans les investissements publics (The calculation of risk in public investment), report of the group chaired by Christian Gollier, rapporteur-general: Luc Baumstark, Paris, La Documentation française; www.strategie.gouv.fr/system/files/rapport_36_diffusion_0.pdf.

[3] Commissariat général du Plan (2001), Transports : choix des investissements et coûts des nuisances (Transport: choice of investments and cost of nuisance), report of the working group chaired by Marcel Boiteux, rapporteur-general: Luc Baumstark, Paris, La Documentation française; http://lesrapports.ladocumentationfrancaise.fr/cgi- bin/brp/telestats.cgi?brp_ref=014000434&brp_file=0000.pdf.

and weight similar to that of other socio-economic criteria in the case of socio-economic assessment. In their respective fields, neither of these approaches is currently fully operational with regard to biodiversity. Progress therefore needs to be made in both the economic assessment of biodiversity, through the proposal of ascribed values, and in the perfection of prevention, mitigation and offsetting techniques.

32. Internalise negative impacts linked to the construction of infrastructures

In concrete terms and very generally speaking, infrastructures have two kinds of negative impacts on biodiversity: first, negative impacts during the construction stage, and second, during the use stage.

The creation of linear infrastructures leads to land development, soil sealing and the fragmentation of natural areas. These types of negative impacts are created by the project owners, and not by users. Non-internalisation thereof constitutes a problem for biodiversity. It may be analysed as a *de facto* subsidy. From the point of view of biodiversity, incentives for project owners to minimise this initial impact would be desirable. A system purely based on offsetting or taxation of external effects would therefore be counterproductive. The taking into account of negative impact upon biodiversity needs to comply with the mitigation hierarchy, which is based on sound principles, it being preferable to avoid negative impact rather than put it right. With this end in view, the way in which a negative impact upon biodiversity is taken into account by project owners, whether involving an offsetting system or a tax, in the first place needs to provide incentives for prevention and reduction, rather than offsetting or full and final payment of a tax. Where taxes are used, the latter should be based more upon incentives than upon internalisation.

The working group therefore considers that extremely careful attention should be given to the impact of linear infrastructures planned or in the course of construction. In particular, the construction of new motorways should only be authorised on the condition of full internalisation of their external effects upon biodiversity, either in the form of combined mitigation-offsetting, or in the form of a tax, or even through an appropriate combination of both of these means.

33. Internalise negative impacts linked to the use of infrastructures

As far as the motorways currently in service are concerned, the fact that they do not internalise the whole of their major impact upon biodiversity constitutes a *de facto* subsidy, in accordance with the findings of this report. In the spirit of the *Grenelle de l'Environnement* and in view of the establishment of the "green and blue infrastructure", the working group considers that these externalities could be partly reduced by means of improvement of the permeability of existing motorways.

Negative impacts arising from use is caused to flora and fauna and neighbouring habitats by pollutants and noise given off by vehicles, to aquatic environments due to run-off of these pollutants deposited upon waterproof surfaces, in addition to the negative impact of direct collisions with insects and other fauna. The working group considers that, since these types of negative impact are caused by users, their cost could be borne by the latter. Especially since the intensity thereof varies according to the type of motorisation and therefore the user's choice of means of transport.

In view of the fact that, in France, negative externalities affecting biodiversity caused by road traffic are not taken into account, either in the axle tax, or in the future heavy goods vehicles (HGV) fee linked to services (RPLP), nor in the taxation of fuels, the working group recommends that the authorities should study means that would enable this negative impact to be taken into account without delay.

Apart from taking harm to biodiversity into account in fuel externalities, two possible courses of reform may be mentioned in this field:

- the effects of motor pollutants are greater in terms of health and harm to built heritage and smaller in terms of intra-urban than in terms of interurban biodiversity. Conversely, pollutants from traffic on major interurban axes, such as motorways, which to a greater extent cross less densely populated and less built-up rural areas, have less impact with regard to health and built heritage, but greater impact as far as biodiversity is concerned. Yet, studies show that motorways are the infrastructures that lead to the greatest biodiversity losses by far[1]. For this reason, it would not be illogical for taxation of fuel distributed by motorway service stations (which, moreover, directly contribute to land development) to be slightly increased, in order to take into account the specific impact of the use of this type of infrastructure upon biodiversity. The revenues from this additional taxation could be assigned to a fund for the restoration of ecological continuities broken by existing motorways, thus facilitating the establishment of the “green and blue infrastructure”;
- the consideration of biodiversity in tolls or tax discs: a biodiversity component could be instilled in motorway tolls and tunnels. Ideally, it should be adjusted according to vehicle type, level of harmfulness for biodiversity in the area traversed, as well as emissions and motorisation. Indeed, the external costs of soil and water pollution, for example, vary considerably according to mode of transport and type of vehicle. The Swiss study gives values in euro centimes for the year 2000 of 0.06 for light vehicles, 1.07 for buses, 1.05 for HGVs, 0.29 for passenger trains and 1.02 for freight trains. Furthermore, if a new annual vehicle tax disc were to be instituted, it would be logical for it to be differentiated according to the vehicle’s emissions of pollutants, without being limited to CO_2 and including pollutants that are harmful to biodiversity. None of these possible courses of reform are perfect. The first is limited to toll motorways and tunnels. The second would be concerned with ownership of vehicles rather than their use. However, they would make it possible to develop these instruments and make progress in taking these externalities into account. From a purely technical point of view, incorporation of a biodiversity component in motorway toll prices, corresponding to use, does not appear to pose any insuperable difficulties. However, it should probably be uniform, at least initially, both because of the inadequacy of data concerning the differential impact of atmospheric pollutants upon biodiversity in areas through which motorways pass, and in order to avoid overly cumbersome management.

As far as HGVs are concerned, this type of pricing, which takes a proportion of external costs into account, will soon become possible. Indeed, at the EU level, the Eurovignette Directive has recently been revised in order to include the three externalities of noise, air pollution and road congestion in the taxation of heavy goods vehicle traffic. Biodiversity does not appear in these three externalities. However, the working group welcomes this revision and hopes that the amended directive will come into force in France as soon as possible.

[1] According to the INFRAS-IWW study of 2004, the cost of biodiversity losses according to the geographical length of infrastructures brought into service is in a ratio of 1:25 between railways and motorways, 1:10 for A roads and motorways, and 1:16 for secondary roads and motorways; www.uic.org/cdrom/2005/external_costs_env/docs/UIC-pressrelease-extcosts_fr.pdf.

The working group also hopes that the HGV ecotax instituted by the Grenelle 1 Act will be rapidly implemented. The rates thereof should be revised as soon as the Eurovignette Directive comes into force, in order to enable internalisation of the three types of external costs henceforth taken into account by the latter.

However, the Eurovignette Directive still lags behind, both with regard to article 11 of the Directive, which envisaged that all of the external costs would eventually be taken into account, and as compared to the Swiss heavy traffic levy (RPLP), the rates of which successfully take into account the externalities for agriculture, forestry, soils, water, biodiversity and landscapes. Since values for these externalities have been put forward by the Handbook on Estimation of External Costs in the Transport Sector, the working group recommends that France should support the commencement of work upon a new revision of the Directive making it possible for them to be included, without delay. Moreover, it recalls that although Member States cannot independently establish rates including the latter externalities for heavy vehicles, they are able to do so for other types of vehicles.

URBAN SPRAWL AND LAND DEVELOPMENT

34. General principles

The rate of development of spaces and urban sprawl constitutes one of the most obvious causes of the loss of French biodiversity. The working group unanimously considers this rate to be unsustainable. Numerous public subsidies have facilitated and continue to encourage these trends. Several recommendations for specific and concrete reforms, many of which appear possible in the short-term, are given below in the second part. In the medium-term, several possible courses of reform deserve to be examined in greater detail:

- in social housing, redirection of incentives from residential construction subsidies to housing benefit could prove less harmful to biodiversity;
- far-reaching sociological transformations, such as the increase in life expectancy, the variable form of family units (single-parent/reconstituted families), as well as changes in economic organisation (distance working, self-employment etc.) have major impacts upon the typology of useful housing. These transformations call for greater flexibility in housing in order to enable its adaptation at minimal cost to different personal and professional life paths, which are less and less uniform. Modular housing could, amongst others, provide a solution to this need. By “modular” the working group means housing in which certain parts can be rearranged or made independent, thanks to provision having been made for setups of this kind at the design stage. It may also involve accommodation that can be extended by the purchase of an additional room, either on the same level, or on a lower or higher floor. This constitutes a possible course of action, in proportions that remain to be assessed, for economising space since accommodation that is adaptable to the requirements of its occupants at minimal cost will thereby offer considerably longer periods of use. This tends towards a denser and more mixed and functional urban planning, and may even facilitate urban redevelopment, thus giving concrete form to the “city within the city” concept, which is likely to limit land development in natural and agricultural areas. The working group therefore considers that modular housing could be encouraged in at least three ways:

  - firstly, with regard to research, in particular within the framework of the investment programme resulting from the “*Grand Emprunt*” future investments loan [launched by

the French State on the financial markets in 2010] and devoted to the city of the future;

- by considering possible amendments of the Urban Planning Code making it possible, in due time and if necessary, to facilitate the establishment of modular housing in certain places;

- by targeting a certain number of fiscal incentives for this type of housing and, in particular, by encouraging co-ownership of properties, whose owners agree to adopt rules providing for and organising the modular nature of the accommodation;

- the construction of new individual housing in zones of urban sprawl tends to be more profitable in terms of real estate development than urban renewal or increases in urban density through the construction of new intra-urban housing, in city centres in particular. This applies all the more insofar as a non-negligible part of the major collective costs of urban sprawl are not borne either by real estate developers or by homebuyers. A reduction of this cost differential would be desirable. However, in the medium-term, the working group considers that the possibility should be examined of making planning permission for building in urbanisation zones (French acronym: "*Zone AU*") dependent upon prior construction on wasteland within the urban area concerned or, at least, upon a simultaneous undertaking on the part of developers involving the construction of new intra-urban accommodation or urban renewal.

35. Taxation of public property

A major part of land development results from action by the State and regional authorities. Yet, generally speaking, public property is little subject to taxation[1]:

- properties belonging to the State, regions, departments, municipalities, public establishments for cooperation between local authorities, mixed syndicates and local authority associations, public highways and port authorities are exempt from the tax on built real estate (in French: *taxe foncière sur les propriétés bâties*, shortened as TFB);
- buildings assigned to a public service or public utility, particularly those directed by the State, local authorities and groupings thereof, public institutions and mutual insurance companies etc. are exempted from the TDCAUE (French departmental tax for the financing of architecture, urban planning and environmental consultancies), the TDENS (French departmental tax for sensitive natural areas) and the TLE (French tax for the financing of local facilities) (which have been grouped together in planning and development tax the *taxe d'aménagement* since 2012);
- services and bodies of the State, regions, departments, municipalities (and groupings thereof) and their State-run businesses that do not have the status of being legal entities are exempted from the CET territorial economic contribution for their activities presenting an essentially cultural, educational, health, social, sports or artistic character, as are large maritime ports, port authorities, ports managed by regional authorities, public institutions and semi-public companies (in French: *sociétés d'économie mixte*);

[1] TFB: tax on built real estate (taxe sur le foncier bâti); TDCAUE: departmental tax for the financing of architecture, urban planning and environmental consultancies (taxe départementale pour le financement des conseils d'architecture d'urbanisme et de l'environnement); TDENS: departmental tax for sensitive natural areas (taxe départementale des espaces naturels sensibles); TLE: tax for the financing of local facilities (taxe locale d'équipement); CET: territorial economic contribution (cotisation économique territoriale); TFNB: tax on unbuilt land (taxe sur le foncier non bâti).

- public ways, (national, departmental and municipal roads, including public squares used for fairs and markets etc.) are exempt from the TFNB tax on unbuilt land, whereas land occupied by railways is subject to this tax. This exemption constitutes a disguised form of subsidies for roads as compared with railways: It reduces their cost, in spite of their external with regard to biodiversity (waterproofing, separation effect, collision with animal species, effects of air pollutants on surrounding plants, etc.).

From the point of view of public finances, it appears counter-intuitive for the State, and regional authorities, to pay taxes assessed on bases that it pays to itself. Nevertheless, from the economic and environmental point of view, it leads to reducing the cost of these facilities, which are sometimes factors of urban sprawl, which hardly provides any incentive to the State and regional authorities to ensure the economical and rational use of space in accordance with the finite character thereof, its increasing rarity, the hierarchy of conflicts of use to which it gives rise, the French General Review of Public Policies (French acronym: RGPP), the issue of the State setting an example and the spirit of the Environmental Round Table. Moreover, the State and regional authorities cannot completely exempt themselves from constraints that they impose in this regard upon businesses and households. Insofar as several of the aforementioned facilities appear, in principle, to be liable to pay certain taxes mentioned above, but have the benefit of a *de facto* exemption, by virtue of regulatory doctrine (e.g. the TFB for port authorities, administrative Court of Appeal, Douai, 20 December 2001). The working group has not found a completely satisfactory solution to this question, but it wants to draw public authorities' attention to its increasing importance in the context of scarcity of space.

Several possible courses of action are to be explored: making sure that public and collective facilities set an example with regard to urban density, if necessary by creating excess occupancy rates (French acronym: COS[1]) in their favour, rewarding or penalising administrations according to their decisions regarding the areas of establishment of new administrative premises and facilities open to the public according to distance in relation to dedicated public transport lanes (French acronym: TCSP[2]) and city centres etc.

36. Include a biodiversity criterion in the calculation of overall operating budget allocations

The introduction of a biodiversity criterion in overall operating budget allocations (French acronym: DGF) would be aimed at acknowledging, for the authorities as a whole, and not only for the local community concerned, the contribution of methods of use and management of space that preserve biodiversity. Indeed the authorities concerned agree to make choices in their territory environmental and social benefits of which are felt far beyond their administrative limits, but which place limits, amongst others, upon their urbanisation possibilities. This is not a question of financing the implementation of an environmental policy or supporting new skills transfers, which would not fall within the scope of DGF budget allocations.

Adjustment of DGF allocations by means of a criterion connected to the protection of biodiversity would avoid the creation from nothing of a specific new scheme juxtaposed over existing measures and thus further complicating the mechanisms for the transfer of finance from the State to local and regional authorities.

The working group judges that the introduction of a biodiversity criterion into DGF allocations would be highly desirable:

[1] COS: occupancy rate (coefficient d'occupation des sols).
[2] TCSP: dedicated public transport lanes (transports en commun en site propre).

- at this stage, a criterion based upon surface area, which can be based upon data whose reliability is little open to doubt, would be the most appropriate;
- in order to be sufficiently sound and avoid calling into question the assessment base of the allocation, this surface area criterion should be based upon clearly identified spaces, who surface area is known at the level of the beneficiary local authorities. The data needs to be homogeneous throughout the territory, updated annually, of reliability that is little open to doubt and passed on by a benchmark public institution;
- the beneficiary local authorities should be involved in the definition and management of these areas;
- the selected criterion needs to be particularly simple to implement and easily adopted by the authorities involved, in order to avoid rendering the method of calculation too complex.

A clear choice needs to be made between approaches based on compensation as opposed to incentives and protection as opposed to ordinary biodiversity. If the aim is to compensate the contribution made to the community as a whole by authorities having agreed to invest in protection and encourage them to undertake new initiatives of this kind, the criterion should be the proportion of the local territory classed as protected surface area. If the aim is to encourage control of urban sprawl, greater density of urban areas and the preservation of ordinary biodiversity, the selected criterion should be the proportion of undeveloped land in the surface area of the territory concerned. Of course, these criteria could only be implemented in rural municipalities.

A combination of these two criteria would in theory be possible. However, the working group does not recommend an option of this kind, which appears too complex to implement and would probably lead to excessively diluted financial weighting.

Moreover, the working group was very interested in exploring the proposal made by the *Assemblée des communautés de France* (a French association of local authorities) consisting in recognising transfers linked to the preservation of biodiversity in tax consolidation rates for inter-municipal groupings. This constitutes a possible course of action to be looked into in greater detail[1].

Finally, the working group is aware of the difficulty of a reform of the DGF budget allocation system, in the current context of skills transfers and public deficit. If, for one reason or another, new skills transfers and/or revenues from taxation were to be introduced in the coming years, the working group recommends that, in accordance with the principle of incorporation of the environment into public policy, the question of the inclusion of a

[1] "Indeed, the objective is to encourage the undertaking of work conducted, within an EU framework, by municipalities in favour of biodiversity. Generally speaking, associations of municipalities and agglomeration communities may provide financial support to member municipalities by means of an allocation (the DSC community solidarity allocation (dotation de solidarité communautaire), which communities may establish when they are under the single business rates (TPU) system). They are entered in the books as repayment expenditure and reduce their "tax consolidation rate" (CIF) and therefore the amount of their DGF overall operating budget allocations. Indeed, the CIF comprises 30% in the determination of the basic allocation for communities and 70% of the equalisation allocation (these two allocations constitute the DGF budget allocation for communities). The idea being to avoid penalising communities making allocations to their municipalities, which undertake to make expenditure favourable to biodiversity and therefore to extract this recurrent expenditure relating to the maintenance of biodiversity from the calculation of the CIF tax consolidation rate (contrary to what is permitted by cost-sharing contributions). There are therefore two possible scenarios: a. Establishing biodiversity as one of the criteria of the DSC community solidarity allocation not taken into account in the repayment expenditure; b. Authorising and establishing a new community- municipality financial relationship, which would then take its place alongside the DSC, the community allocations and cost-sharing contributions."

biodiversity component should be established upstream of a possible future reform of this kind.

Additional guidelines

The working group wishes to set out "additional" proposals, which are thus qualified and detached since they do not properly speaking constitute possible courses of amendment of harmful incentives. Nevertheless, consensus having been reached with regard to these measures, the working group considered it useful to bring them to the attention of public authorities.

37. Biodiversity indicators

As far as biodiversity is concerned, the indicators appear inadequate and hardly satisfactory. This applies equally for quantitative and qualitative indicators, intraspecific, interspecific, rarity, abundance and critical threshold indicators, and even more so to valorisation indicators. The working group wishes to emphasise the need to make progress at this level. However, it also wishes to emphasise the need to disseminate a greater quantity of simpler indicators (such as the STOC[1] indicators and those concerning easily identifiable and keystone species) among biodiversity users and the general public. They cannot be expected to master the indicators used by scientists. Greater awareness and more effective consideration of the impact of the various tourist, industrial, skilled trades, agricultural and transport activities therefore requires the establishment of indicators that are simple to understand, interpret and measure.

38. Biodiversity and official development assistance (ODA)

Subject to the necessary methodological precautions, for the reasons recalled above, the share of biodiversity in ODA (considered by the working group as public subsidies which therefore come within the field of this report) amounted to 2% in 2008 and 1.2% in 2009. These figures raised several questions which the working group wishes to emphasise.

Between 2008 and 2009, the amount allocated to biodiversity reduced by almost 30%, principally due to the 50% reduction in loans granted by the French Development Agency (French acronym: AFD). However, the exact proportion of ODA allocated to biodiversity is difficult to determine precisely and appears to be somewhat overestimated. Indeed, all "Rio 2 marker" projects (the conservation of biodiversity is the main objective of the project) and "Rio 1 marker" projects (significant contribution to biodiversity) are taken into account. However, the financing involved in marker 2 projects is not always 100% devoted to biodiversity. Moreover, marker 1 projects may only devote a small part to biodiversity and sometimes constitute projects that are harmful to biodiversity. Yet, marker 1 projects are clearly predominant in French bilateral ODA: 145.28 million euros as compared with 29 million for marker 2 projects in 2009.

Admittedly, these figures do not take into account multilateral ODA, which passes through various different international and European institutions and funds. Yet, some of them finance initiatives whose (principal or secondary) objective is to protect biodiversity. By way of example, France is the fifth largest contributor to the Global Environment Facility (GEF), which devotes a third of its funds to biodiversity. However, the shares of French multilateral

[1] STOC: French programme for monitoring common breeding birds over time (suivi temporel des oiseaux communs).

ODA that are favourable or unfavourable to biodiversity do not appear to be identified with any greater precision.

Whatever the field considered, the share of biodiversity in ODA appears to be very small. Even if one takes a broad definition (including the GEF and EU instruments therein), it remains 10 times smaller than the share devoted to the fight against climate change (12% in 2009 and 10% in 2008) whereas, for international scientists, these two threats to global public goods are of equivalent importance. This share appears to be out of proportion to the value of ecosystem services rendered by biodiversity. This value is even greater for developing countries, since biodiversity has been described as the "GDP of the poor". Devoting ODA to biodiversity therefore makes it possible to protect and manage it both as a public good and as an economic and social resource, damage to which firstly harms the most disadvantaged groups.

Furthermore, a major proportion of world biodiversity is located in French-speaking developing countries, which receive French ODA, and with which France has special relations. At the present time, these countries are undergoing demographic and economic growth which heightens the pressure on their natural resources.

The working group was pleased to note the commitments in this regard made by the Secretary of State for Ecology on 18 October 2010 at the Nagoya conference. It approves and supports these undertakings. However, it is concerned to note that these commitments do not appear to have been confirmed at the interministerial level, in particular at the stage of validation of State undertakings presented on 19 May 2011 at the time of the launch of the 2011-2020 National Strategy for Biodiversity (French acronym: SNB).

In ODA undertakings (apart from the French Global Environment Facility – shortened as FFEM – but including French overseas), the share devoted to biodiversity (markers 1 and 2) progressed by between 0.4% and 3.2% over the last decade. It appears not to have increased recently, nor since the *Grenelle de l'Environnement*, falling from 3.2% in 2006 to 1% in 2007, 3% in 2008, 1.6% in 2009 and 1.4% in 2010. Moreover, in 2009, marker 1 projects represented (84.2) 102.7 million euros as compared to 8.6 million for marker 2 projects. In 2010, International Year of Biodiversity, the amount of ODA expenditure committed in this regard (85.4 million euros) and the proportion of specifically dedicated projects (less than 10% of biodiversity commitments) confirmed a stagnation, or even a decline.

The working group therefore considers that the effects of French ODA upon biodiversity, whether positive or negative, need to be measured in greater detail. Several possible courses of action should be explored:

- making progress in accounting methods for financing devoted to biodiversity provided by ODA, using a weighting system according to type of projects with a significant contribution to biodiversity (marker 1);
- extending this new methodology to FFEM and other sources of ODA;
- developing a similar methodology for ODA financing that is partly harmful to biodiversity;
- including multilateral ODA devoted to biodiversity. The OECD plans to extend the application of the Rio Markers to international institutions as a whole. The working group recommends that, as a minimum, the Rio Markers should be applied to French contributions to each fund and institution, according to the objectives and types of initiative financed by the Fund and institution;
- a presentation of this kind should be submitted to Parliament on an annual basis.

Furthermore, within the framework of reinforced cooperation and ODA with these countries, the share allocated to biodiversity should be considerably increased in view of the services rendered by ecosystems, to the poorest population groups in particular. Several approaches exist: changes within the structure of ODA itself, debt reduction and development contracts, establishment of environmental conditions for COFACE (the French export credit agency) guarantees and ODA commitments etc. For the reasons outlined above, the working group considers that the share of ODA commitments devoted to biodiversity should progressively increase over the current decade, in order to reach the same level as that devoted to climate change.

39. Taxation of capital gains from the sale of unbuilt land

The public authorities plan to reform taxation of capital gains from the sale of unbuilt land.

There are currently four taxes which may be applicable to capital gains arising from transfer of building land: the tax on real estate capital gains (French acronym: PVI); the fixed-rate tax on the sale of unbuilt real estate that has acquired building land status (French acronym: TFTC) (article 1529 of the General Tax Code [French acronym: CGI]); the real estate development tax (French acronym: TVI) applicable outside of the Île-de-France region (article 1531 of the CGI); and finally the so-called "LMA tax" ["Agricultural Modernisation Act tax"] or agricultural spaces anti-consumption tax (article 1605 *nonies* of the CGI). The TFNB tax on unbuilt land and, depending on the case, the tax on transfers for valuable consideration or the tax on transfers without consideration, VAT, notaries' fees and the "Grand Paris" tax and, where applicable, compensation for non-renewal of business tenancies, land improvement (fertiliser) compensation etc., in any case, need to be added to the above taxes. The objectives of certain taxes appear contradictory: The LMA agricultural spaces anti-consumption tax is overtly intended to encourage the preservation of agricultural land by providing for tax allowances for length of occupation. The PVI tax on real estate capital gains also encourages the preservation of land, since it also makes provision for a tax allowance for length of occupation. The TFTC fixed-rate tax on the sale of unbuilt real estate that has acquired building land status and the TVI real estate development tax are rather aimed at the sharing of capital gains made by owners and the financing of public facilities.

The working group wishes to draw the attention of the authorities to the risks of the current bill. The latter consists of the abolition of the annual tax allowance of 10% after the fifth year of occupation provided for the determination of real estate capital gains and the abolition of the tax allowance for length of occupation provided for by the LMA agricultural spaces anti-consumption tax, as well as exemption from the tax on the transfer of land that has acquired building land status. The bill also provides for further increase in the rental value of land located in urbanisation zones ("*Zone AU*") and urban zones ("*Zone U*") for the determination of the TFNB tax on unbuilt land (article 1396 of the General Tax Code).

This bill calls for a number of observations. It is allegedly justified by the absence of building land. Although all are agreed in acknowledging that the annual number of new buildings is insufficient in certain areas of France, there is no consensus as to the causes of this phenomenon. Several factors are mentioned. For a large number of actors, including among property market professionals, shortage of building land does not appear to be the principal limiting factor. Insofar as it is a factor, it only has a very localised impact. For this reason, to take action concerning a possible phenomenon of a very localised nature by means of national taxation, that is applicable even in rural areas where demand for building land is lacking, hardly appears appropriate.

If this reform were to be adopted as it currently stands, it could lead to an acceleration of urban sprawl and construction on outlying plots of land. Yet, consensus within the working group has clearly identified urban sprawl as being uncontrolled in France (unlike in other countries) and one of the major factors of loss of biodiversity. Although 75,000 hectares are developed in France every year, this rate could be tripled next year, if one estimates that each municipality currently has 5 hectares of building land. It would be increased sixfold on the assumption that each municipality possesses 10 hectares of building land.

A reform of this kind would accelerate consumption of agricultural land and considerably increase the fragility of peri-urban farming, which often uses land that is classed within urbanisation zones (AU) but subject to a rural lease. Yet, this is very often high value-added farming, located on very good soil and coming within short, low-carbon distribution circuits. A considerable number of these farms would be unable to survive.

A reform of this kind would be contrary to the “green belt” policies conducted by certain cities. It would considerably complicate the establishment of the “green and blue infrastructure” green infrastructure (TVB), a major objective of the *Grenelle de l’Environnement* with regard to biodiversity.

It would go against the development of urban density established as a major objective in the Grenelle laws, by encouraging the urbanisation of outlying plots of land not served by public transport.

It would also be contrary to the reform of urban planning taxes introduced in 2010. Through the institution of a payment for insufficient density (VSD) and the possibility of increasing the future development tax in certain areas, the latter reform is intended to promote inner urban densification. The working group approves and supports the reform of 2010 as being likely to contribute to densification and the slowing of urban sprawl. However, the payment for insufficient density and the increase in development tax are optional. National taxation on real estate capital gains will take priority over the simple local possibility of establishing payments for insufficient density. This is the case insofar as this reform will make land in outlying agricultural areas available at a much lower cost than in urban areas whose density is to be increased.

A reform of this kind would only be worthwhile if limited to wasteland.

For all of these reasons, the working group considers this reform to be harmful to biodiversity, Peri-urban agriculture, the “green and blue infrastructure” green infrastructure (TVB) and urban densification, and contrary to the spirit of the Grenelle laws and the fiscal reforms introduced in 2010.

40. Encourage the staggering of holiday periods

“The staggering of holiday periods”, which has been increasing in France in recent years, still remains relatively uncommon. This leads to seaside and skii resorts, marinas, sewage treatment plants and other facilities on developed land which are only used for three to five months per year. Any incentive for greater staggering of holiday periods would therefore enable better rates of use of these facilities and lower levels of land development. It would also enable the extension of certain seasonal jobs. This requires the development of alternative tourism (mountains in summer, nature tourism) and new practices (time sharing) as well as the seasonal adjustment of certain taxes (tourist tax, maritime passages tax, tax on works of art, car parks, tolls and import duties etc.).

41. Compensation for damage caused by game

In France, compensation for damage caused by game is granted to farmers but not to foresters. It is henceforth organised by the departmental hunters' federations. It is therefore by no means certain that this compensation can be considered a public subsidy strictly speaking. Nevertheless, the hunters' federations are legal entities under private law entrusted with fulfilling a public service and, as such, liable to be inspected by Regional Audit Chambers. The poor functioning of the current system with regard to damage caused by game, and by wild boar in particular, is likely to lead to damage to biodiversity. The balance between farming, forestry and hunting has been lost in numerous places. Growth in the wild boar population may occur at the expense of competing species. Excessive population density may encourage the development of epizootic diseases etc. Many hunters' associations have decided to institute a short-term system of financing by means of the purchase of bracelets and/or fixed-rate payments per hectare of forest. This system does not appear likely to resolve the problem. It should probably be reformed, in order to ensure that wild boar populations returned to levels compatible with the load-bearing capacity of the ecosystems. The planting of attractive crops in forest enclaves or plots located at the edges of woods and forests, leads game to visit these crops located in the immediate vicinity of shelter without any risk. Conversely, the presence of open spaces between forest habitats and attractive crops limits the damage. Compensation for game damage could therefore be prohibited with regard to the planting of highly attractive crops in forest enclaves, or less than 100 metres from woods and forests.

42. Payments for Ecosystem Services (PES) in the farming sector

In view of French and European budgetary constraints, incentives originating from these budgets will not be sufficient to support the conversion of production systems to systems that are favourable to biodiversity. Use of the market according to a logic of payment for ecosystem services may therefore constitute a solution. Three possible courses for reflection are possible.

- The bidding system: ecosystems services are "sold" within the framework of tenders according to the same principle as public procurement contracts. When farmers wish to "sell" the ecosystem services of their land, they make an offer to a public or private operator. Generally speaking, the offer is handed over in a sealed envelope. It states the price of the service that the farmer hopes to obtain in return for their investment with regard to biodiversity. The operator then chooses the best offers (the less costly per unit of benefit obtained) and establishes a contractual relationship. Pilot experiments have been conducted in the state of Victoria in Australia (Bush Tender followed by Gippsland) and, to a lesser extent, in the United Kingdom and Germany.
- The definition of a catalogue of crops classed according to their impact upon biodiversity: this catalogue would be used as the basis for classification of plots of land offered in the contract. However, this application is to be interpreted with care since the impact of a farm upon biodiversity is not to be solely inferred from the crops put in place, but also from the production system and technical procedures. The catalogue could, moreover, be used as a reference for the adaptation of Single Farm Payments (SPS) (e.g. point system according to selected crops).
- Trial application of a foreign example of Payments for Ecosystem Services in France: an interesting example of bidding for ecosystem services being studied in greater

detail in the case of France. That of the pilot scheme of Gippsland in Australia, in particular, has received very positive assessments[1].

The working group is aware of the practical difficulties of implementation of these mechanisms. It nevertheless considers that there is no reason to refrain from studying them in greater depth.

2 – Proposals

TPRANSPARENCY AND REPORTING

1. Reinforce the priority that should be given to the protection of biodiversity

The G20 held in Pittsburgh in 2009 made a medium-term commitment to streamline and eliminate subsidies for inefficient fossil fuels. France, which is chairing the G8 and G20 in 2011 could launch a similar initiative for subsidies that are harmful to biodiversity at the G20 summit in Cannes at the end of the year 2011. This would confirm the action plan adopted at Nagoya in 2010, but at the level of Heads of State.

2. Establish a cross-cutting policy document with regard to biodiversity

A document of this kind already exists in the field of the fight against climate change. The production of an equivalent for biodiversity would demonstrate the great importance that the Government accords to this issue, by emphasising the interministerial character of the corresponding policy. This would make it possible to identify instances of financing in favour of biodiversity – or to the detriment thereof – within the programmes of the various different ministries.

This approach seems both necessary and cumbersome. Moreover, it has become urgent due to the compromise made at Nagoya between the European Union and other developed countries, on the one hand, and the countries of the global South on the other hand. Indeed, one of the difficult points of discussion was the strategy of mobilisation of resources for the Convention on Biological Diversity (CBD). On this point, the draft decision was rejected by the countries of the South. The compromise finally reached provides that the Parties' contributions concerning innovative indicators and financing mechanisms, and methodological elements in particular, shall be passed on to the Secretariat of the CBD by 30 June 2011. The CBD will pass on the guidelines for the use of indicators and the drawing up of reference reports to the Parties for the adoption of figured objectives at the COP 11 conference in October 2012, if it has been possible to reach agreement beforehand with regard to the methodology of these reference reports. The schedule is therefore particularly tight. Especially since intra-European consultation will be needed in order for the EU to present a unified position. Yet, the 15 indicators passed on to the CBD on 30 of June 2011 concern, in particular, the monitoring of financial flows devoted to biodiversity. It is therefore urgent to identify them more effectively. One of them is specifically concerned with financial flows arising from the reform of subsidies harmful to biodiversity and redirected in favour of the latter (Decision X3 point 7.13 of COP 10).

[1] 1 million hectares of wild flora located on private land of which 60% is endangered. 51 offers were made of which 33 were accepted, representing a total payment to the amount of $800,000.

This cross-cutting policy document would, in particular, include a presentation of transverse policy for financial investment devoted to biodiversity by the State and the principal programs contributing thereto, the fiscal expenditure involved, the overall strategy for improvement of the performance of transverse policy followed by objectives and performance indicators selected according to strategic fields.

However, in order to be comprehensive and correspond to the decisions adopted at Nagoya and the recommendations made in this report, this cross-cutting policy document cannot merely comprise these elements alone. The working group considers that it also needs to contain a presentation of the principal programmes that hinder this cross-cutting policy, of any fiscal expenditure that is prejudicial thereto and a presentation of the directions, objectives and performance indicators in order to reduce or render them compatible with the transverse biodiversity policy.

Furthermore, the working group suggests the streamlining and standardisation of documents that already exist.

3. Impact studies for parliamentary bills

The organic law of 15 April 2009 obliges the government to accompany bills with an impact study. The environmental impact considered appears be mainly focused upon GHG, impact upon biodiversity being sometimes minimised or even omitted. The working group considers that there is a need for this organic law to be strictly applied and for impact upon biodiversity to be studied to the same extent as impact with regard to GHG.

In the special case of budgets, the law also provides that measures concerning State resources which affect the budget balance (contained in the first part of the finance act), provisions concerning the tax base, the rate and methods of collection of all kinds of taxation not affecting the budget balance and taxation directly affecting the year's budgetary expenditure (contained in the second part) shall be subject to a preliminary assessment submitted to Parliament at the same time as the budget bill. A new budgetary "blue paper" (French technical term to refer to a document writter for the project of Budget Finance Bill) entitled "Preliminary Assessments of the Articles of the Finance Act" was thus, for the first time, appended to the 2010 budget. However, one can only note that within the 501 pages of the budgetary blue paper accompanying the 2011 Budget Bill, the word biodiversity only appears on four occasions. The working group thus considers it necessary for the question of impact upon biodiversity to be posed systematically in the analysis of environmental impact in each of the provisions examined within the framework of the preliminary assessment.

OFFICIAL DEVELOPMENT ASSISTANCE

4. Developing debt-for-nature swaps, in particular within the framework of debt reduction development contracts (C2D)

A debt-for-nature swap is a mechanism providing for the renegotiation, conversion or cancellation of all or part of a developing country's debt by a creditor or an institution which has redeemed it. In exchange, the debtor country undertakes to finance the conservation of biodiversity, to an amount determined by the parties. This tool enables developing countries to relieve their exterior debt burden while preserving their ecosystems, from which the poorest population groups draw a large part of their resources.

There are two categories of negotiable debt: public and commercial. Commercial debts are the result of a loan or contract between a commercial bank or company and the debtor government. In preparation for a debt-for-nature swap, the debt is redeemed on a secondary market by an intermediary from the conservation sector, for example. Public debts are negotiated bilaterally between borrower governments and creditor governments or development agencies. The debt is restructured with the debtor country, negotiation may concern rate of interest, the repayment schedule and the amount of the principal as well as the percentage of the debt that may be subject to conversion.

Unlike the United States, Scandinavian countries, Switzerland and Germany, France has made little use of debt-for-nature swaps.

Debt reduction-development contracts (French acronym: C2D) constitute the French bilateral approach to debt relief entered into within the framework of official development assistance. This approach comes in addition to the Multilateral Debt Relief Initiative for Heavily Indebted Poor Countries (HIPC initiative).

The beneficiaries of these contracts (heavily indebted poor countries - HIPC) continue to honour their debt but, once their repayments are registered, France pays the corresponding sum back to them, to be allocated to programmes selected by common agreement. Biodiversity is eligible.

C2Ds have already been signed with Cameroon (2nd C2D), Ghana, Mozambique, Madagascar and Mauritania, and more recently with Congo (2011 Annual performance project "Official Development Assistance").

Countries eligible for C2Ds include Uganda, Mozambique, Tanzania, Mauritania, Bolivia, Nicaragua, Ghana, Madagascar, Honduras, Rwanda, Cameroon, Somalia, Malawi, Guinea, Democratic Republic of the Congo, Ivory Coast, Burundi, Congo, Sudan, Liberia, Myanmar and Sierra Leone. Virtually all of these are countries with both exceptional and endangered biodiversity.

The working group suggests that France should increase the proportion of Debt Reduction and Development Contracts allocated to biodiversity. In the near future, several countries will be presenting projects of this kind which could be aided in this manner (Ivory Coast, Cameroon, etc.).

MARINE BIODIVERSITY

5. Revise French annual registration and navigation duties

Recreational boats of below a certain size were exempted from the French annual registration and navigation duty (*Droit annuel de francisation et de navigation* – French acronym: DAFN) in 2005, even when their motor power was above the limit. This constitutes tax spending in favour of boats that consume more fuel and give rise to more emissions of CO_2 and other air pollutants. They also cause harm to biodiversity, on the one hand, since they are much noisier and, on the other hand, because they are often small draft vessels. They can therefore enter coves that are inaccessible to yachts and come in very close to land, islands and islets, and may even land. Yet, the months of April, May, June, July and August, which are especially popular for watersports, are months of reproduction, upon which the breeding of fauna, including protected fauna, depends. During this period, it has the greatest need for peace and quiet. The European Commission is mindful to this issue of disturbance of fauna. The repeated disputes between France and the EU with regard to

hunting, since the 1980s, following the Birds Directive of 1979, did not concern hunting itself but the fact that the hunting of water birds in France took place between the end of July and August, dates considered by the Commission to be periods of reproduction upon which the bird species mentioned in the appendices to the Birds Directive depend. This approach was reinforced by the Habitats Directive.

Moreover, at a time when France is designating maritime Natura 2000 sites and creating Marine Protected Areas, it would be paradoxical for this type of boat to remain exempt from DAFN annual registration and navigation duties.

It would therefore be appropriate to extend liability for this tax to "recreational boats" of less than 7 m and "motorised maritime vehicles" (water scooters etc.), On the basis of the sole criterion of real power of mechanical propulsion, according to a progressive rate and abandoning the criterion of hull length[1].

6. Revise the fees for occupation of the maritime public domain

The State collects fees for occupation of the maritime public domain (coastal soil, subsoil and territorial waters) for any private occupation or use of the public domain (beaches, submarine communications cables etc.), in accordance with articles L. 2125-1 *et seq*. of the French General Code of Public Property. Generally speaking, the fees are fixed by the departmental director of tax services (on the instructions of Service France Domaine). This results in great heterogeneity in the modes of determining these fees. Indeed, the directors may draw upon the national tables at their disposal for other situations, or proceed on a fixed rate basis according to the nature of the plot in operation, or decide to use the surface area of subcontracted plots as a tax base (rate per square metre) etc. moreover, in all cases, the impact of the activity subject to the fee for occupancy does not appear to have any influence upon the rate charged.

These fees could be modified:

- by standardising the field of application and modes of determination of the fees;
- by fixing rates according to turnover and reassessing them according to inflation. It is therefore considered here that occupants profit from the positive externalities of the public domain, which appear in part in their turnover;
- by adjusting rates according to the more less harmful character for marine and coastal biodiversity and/or the zone occupied, which would make the fee more incentive-based;
- by reallocating a part of these fees to marine environment research, protection and restoration initiatives.

7. Institute a form of taxation beyond the zone of 12 nautical miles

The maritime public domain extends to a limit of 12 nautical miles[2]. No fees may be collected beyond these 12 miles in the exclusive economic zone (EEZ) or on the continental shelf, since this no longer therefore comes within the public domain. Because of disturbances caused to marine ecosystems by this type of activity, which seems set to expand in these zones in the future, and the increasing assertion of States' rights over EEZs

[1] On 7 July 2011 the French President announced the "greening" of the DAFN annual registration and navigation duties, in particular "through the extension of the tax base thereof to all recreational boats equipped with high-powered, and therefore more polluting motors".
[2] One nautical mile = 1,852 m.

and/or continental shelves, it would be logical to institute a form of taxation extending these fees to activities conducted in this area, and to the extractive industries in particular.

8. Extraction of aggregates at sea

The extraction of aggregates at sea leads to impact of various kinds upon biodiversity (turbidity, reduction of growth, deposits of fine particles, drawing up of organisms living on the seabed, disturbance of benthic fauna, spawning beds and breeding grounds associated with sandy sea bottoms etc.). The rate of this fee is not uniform, since it is fixed by the departmental director of tax services. These extracted aggregates are also subject to the TGAP general tax on polluting activities according to the net weight of the pieces of stone/gravel, but at a uniform rate. This uniformity means that the tax is hardly incentive-based and has been criticised by the *Conseil général des Mines* ("General Council for Mining") and the French General Secretariat for the Sea[1] in particular.

The working group wishes to make several recommendations in this regard:

- public procurement, which constitutes a form of subsidy and gives rise to a major proportion of consumption, should do more to promote the use of aggregates produced by the recycling of used aggregates and dredging products;
- private excavation of marine aggregates is conducted in public areas and should, as such, remain subject to a fee. This fee should be adjusted according to the ecological sensitivity of the environment and seabeds upon which the activity has an impact;
- tax incentives do not appear to be appropriate for certain strategic spawning grounds for which it should be possible to enact a statutory prohibition;
- otherwise, this fee could be fixed in relation to the market value of the materials extracted and take into account the regulatory costs for the authority of the territory where the extractive activity is conducted, which are greater than those for land-based activities (policing of navigation and mines, resources management etc.).

Moreover, it does not come within the working group's remit to expressly give an opinion upon the allocation of the State fees payable by aggregate extraction operators. Nevertheless, allocation to port authorities, when the extractive activity is located in the district of a port authority, appears questionable in its view. Allocation to Marine Protected Areas or to the French Coastal Protection Agency (Conservatoire du littoral) might be envisaged, but presents the disadvantage of making the budget of public institutions dependent upon protection of the biodiversity of resources drawn from activities that disturb this biodiversity. Since France possesses the second largest maritime domain, its knowledge of which is limited, allocation for research into Marine biodiversity, including that of seabeds, appears preferable.

9. Extraction of fossil fuels at sea

Holders of mining concessions and mining permits and prospectors of combustible oil and gas deposits are exempt from fees imposed by municipalities and departments for mines (French General Tax Code art. 1519 and 1587) when the deposits are located more than one nautical mile from the baseline defined by the Act of 24 of December 1971 concerning the boundaries of French territorial waters.

[1] Secrétariat général de la Mer [General Secretariat for the Sea] (2006), Extraction de granulats marins, Document d'orientation pour une politique nationale [Extraction of marine aggreates, Policy paper for national policy], Version 3.0, 1 June, 83 p.

This tax spending reduces the cost of extraction of fossil fuels in a very sensitive environment. At a time when deep sea offshore extraction is becoming profitable with the rise in oil prices, and France is taking up offshore prospection once again (French Guiana), creating Marine Protected Areas and designating maritime Natura 2000 sites, it appears difficult to justify the maintenance of this tax spending. The holders of these concessions should be subject to State fees between 1 and 12 nautical miles and to taxation beyond 12 nautical miles. Furthermore, their permits for extraction and even prospection should be subject to verification that they have adequate reserves for facing up to all kinds of accidents and oil spills.

WATER

Assessment of the status of French water bodies is leading to the ascertainment of their overall unsatisfactory and inadequate condition in relation to the norms fixed at the EU level as well as at the national level[1]:

- with regard to the state of surface waters:
  - 53% are in an ecological status judged to be medium to bad (38% medium, 11% poor and 4% bad);
  - 21% do not have good chemical status and 34% have indeterminate chemical status;
  - the status of heavily modified water bodies and artificial (man-made) and semi-artificial water bodies[2] gives particular cause for concern: 61% of them are judged to have medium to bad ecological status, 24% do not have good chemical status;
  - almost 36% of surface water bodies are subject to exemptions from the objective of achieving good ecological status by 2015 and around 17% from the objective of good chemical status.
- with regard to the status of groundwater:
  - 9% do not have good quantitative status;
  - 41% do not have good chemical status;
  - almost 2% of groundwater are subject to exemptions from the objective of achieving good ecological status by 2015 and around 36% from the objective of good chemical status.

This situation gives cause for concern since it renders the objective of achieving good ecological status for water bodies by 2015 very uncertain. In application of the principle of recovery of the cost of services linked to water use, as defined by the European Water Framework Directive and article L. 210-1 of the French Environmental Code[3], the working group recommends a revision of the structure of taxation of uses of water and, in particular, of the fee for extraction and the fee for pollution.

It also proposes adjustments for other measures that may affect the quantitative and/or qualitative status of bodies of water.

[1] ONEMA [the French National Agency for Water and Aquatic Environments], 2010. La reconquête du bon état des eaux et des milieux aquatiques : de l'état des eaux en 2009 aux objectifs 2015, (Restoring the good status of water and aquatic environments: from the status of water in 2009 to the 2015 objectives) 4 p.
[2] Heavily modified water bodies and artificial (man-made) and semi-artificial water bodies represent 7% of surface water bodies.
[3] Act no. 2004-338 of 21 April 2004, www.legifrance.gouv.fr/affichTexte.do;jsessionid=89EFE858640C97C5633F35FD3D4FD232.tpdjo09v_1?cidTexte=JORFTEXT000000418424&dateTexte=20110831.

Fees for extraction

The fee for extraction (article L. 213-10-9 of the French Environmental Code) is based upon gross extraction and not upon net extraction (equivalent to the volume extracted minus the volume restored). It thus encourages uses which restore little water, as compared to those that restore a considerable proportion of the volume extracted. Eventually, it would be desirable for a fee upon net extraction or upon gross extraction corrected by a restoration ratio, which needs to be studied in detail, to be established (see General guidelines).

In the short-term, a reform of a technical order of the current extraction fee appears to be both easy and fully-justified. The working group recommends the following reforms.

10. Establish a minimum price for each type of water use

The rate of the fee cannot currently be greater than the maximum limits set out under article L. 213-10-9 of the French Environmental Code, which are adjusted according to the use[1] and the availability of the resource[2]. Yet, in reality the rates applied by French Water Agencies vary considerably and rarely reach the maximum limits. For example, in 2010:

- for non-gravity fed irrigation, the French Water Agencies adjusted their rates within the very wide range of between 7% and 100% of the maximum rate;
- overall, gravity-fed irrigation is closer to the maximum rate than non-gravity fed irrigation, but the range remains wide (from 27% to 100% of the maximum rate);
- very wide ranges of application of rates (from 6% to 100% of the maximum rate) for drinking water supply;
- generally speaking, water supply for channels is taxed in the same way as for gravity-fed networks;
- wastewater used for industrial cooling shows the greatest variations in the rates applied (from 2% to 100% of the maximum rate);
- the rates applied for other economic uses of water (i.e. industry, excluding agriculture and cooling) are similar to those for cooling, while being slightly higher;
- for hydroelectric industry, the rates are between 17% and 56% of the maximum rate (85% in the case of lockage water).

The European Water Framework Directive principle of contributions from water users appropriate to recovery of the costs of services linked to use of water, while respecting social, environmental and economic criteria in particular (see article 9 of the aforementioned directive) certainly deserves to be taken into account more effectively, in particular by reducing the range of rates applied for each use. From this point of view, the working group proposes, as envisaged in the draft framing of the Xth French Water Agencies programme for the 2012 Budget Bill, the establishment of a minimum rate for each use.

[1] The various different uses listed are: non gravity-fed irrigation, gravity fed irrigation, drinking water supply, supply of a channel, industrial cooling, other economic uses, hydroelectric installation, hydroelectric lockage installations.

[2] A water distribution zone is characterised by a chronic lack of water resources in relation to needs. The rate of the fee is low when the resource is located outside of water distribution zones. It is costly when it is in a water distribution zone (high rate).

11. Revise the level of maximum rates

The rates of fees are determined by the French Water Agencies in such a manner as to ensure recovery of the financial costs of use of water services (investments, maintenance and operational costs, administrative costs etc.) and not environmental costs (including costs with regard to biodiversity).

The environmental costs include all of the costs of damage to the environment resulting from bad ecological and/or chemical and/or quantitative status of the body of water, its qualitative and quantitative status being intrinsically linked. According to the report of the WATECO[1] working group for the European Commission, environmental costs may be assessed directly (economic value of changes in groundwater levels) and/or indirectly (cost of curative and/or preventive measures for compliance with the objective of good status for water bodies). The assessment of the environmental costs of services linked to water use has given rise to numerous studies, some of which have been undertaken by French Water Agencies. The working group therefore proposes a revision of the level of maximum rates ensuring that the average cost of water use services is taken into account for the category of user concerned, as well as the costs of water use for biodiversity.

12. Take drainage surface areas into account

Wetland areas constitute environments that are very rich in biodiversity, and their preservation is among the *Grenelle de l'Environnement* priorities. By drying them out, drainage can cause considerable reduction in their biodiversity. Moreover, drainage is a form of water consumption and should be taxed like other types of extraction. It would there for the legitimate for the public extraction fee to also be applied to drainage activities. However, implementation of the fee raises difficulties of measurement. A fixed-rate tax per hectare drained might therefore be considered. The application of a fee for drainage extraction presupposes the existence of precise data concerning the surface areas drained. The working group therefore considers that there is a need, on the one hand, for detailed knowledge of the areas drained at the appropriate level and, on the other hand, for drainage to be liable to fees for extraction.

Fees for pollution

Good chemical status of water is assessed on the basis of the concentration of 33 priority substances and groups of substances identified in Annex X of the European Water Framework Directive, including 13 priority hazardous substances or groups of substances. The European Water Framework Directive states that "Pollution through the discharge, emission or loss of priority hazardous substances must cease or be phased out."

The phasing out objective is to be reached by November 2021 for the 11 priority hazardous substances or groups of substances identified in Annex X of the European Water Framework Directive: brominated diphenylethers, cadmium, chloroalkanes, hexachlorobenzene, hexachlorobutadiene, hexachlorocyclohexane, mercury, nonylphenols, pentachlorobenzene and polycyclic aromatic hydrocarbons (PAHs) as well as tributyltin compounds. The adoption of the "daughter directive" introduced two new hazardous substances into Annex X, anthracene and endosulfan, which are due to be eliminated at the end of 2028.

[1] WATECO (2003), Economics and the Environment: The implementation challenge of the European Water Framework Directive, Guidance document n° 1, 247 p.

Furthermore, "cocktail effects" should not be overlooked. Although the levels of concentration may not be high, the cumulative effect of the hazards of each substance within the same effluent may considerably increase the number of sites and activities having a potential impact upon the environment.

The working group wishes to make two principal recommendations concerning fees for water pollution. The first is of a general order while the second is more technical.

13. Target the European objectives for good status of water bodies

It sometimes remains costly for communities that do not have wastewater treatment plants or which need to make major investments in order to bring them into line with the norms, to pay the full rate of pollution fees (0.5 euro/m^3), rather than invest in an infrastructure whose operational costs alone, excluding depreciation, are twice that of the fee. This situation could partly explain France's lateness with regard to application of European Directive no. 91/271/EEC concerning urban waste-water treatment. It is therefore clear that the fees for domestic pollution do not provide an incentive.

The French Water Agencies should further adapt their fees (progressive rates) and make their incentives (graduated rates, conditionality) to regional authorities dependent upon water good status objectives, compliance with a work schedule and real water treatment performance.

14. Internalise the costs of water use

Although, generally speaking, a smaller number of pollutant substances is to be observed coming out of urban water treatment plants than from industrial waste, assessments[1] show that waste from certain water treatment plants contains priority substances and priority hazardous substances that are potentially toxic for the aquatic environment.

The European Water Framework Directive considers that services connected with water use (extraction, storage, treatment and distribution, followed by collection and treatment of wastewater before its return to the aquatic environment) constitute a part of water use liable to have a considerable impact upon the resource and that they should, therefore contribute to the recovery of their inherent costs. Yet public and private water management bodies are not subject to a fee for water pollution. They collect the fee from users and pay it back to French Water Agencies. This scheme enables the organisation of a "pooling" of wastewater clean-up costs, but not for environmental costs when effluent from water treatment plants is not of sufficient quality, all of the water users being responsible. The pollution fee is therefore fixed at a lower rate than the externalities produced by water use, which can be analysed as a de facto subsidy. The three following proposals are aimed at correcting this shortcoming.

a) Due to its method of calculation, the "pollution" fee is not designed to encourage water managers (wastewater treatment services) to improve the quality of waste discharged into the environment with a view to compliance with the good status objective for water. In this case incentives are provided by other channels (subsidies and regulatory action).

[1] *Action de recherche et de réduction des rejets de substances dangereuses dans l'eau* (*Actions 3RSDE*) (*Research and reduction action for discharges and of hazardous substances into water*) initiated in 2002 by the circular of 4 February 2002 and circular DGPR 1/2009, www.eco-et-mat.com/etudes/3rsde-action-de-recherche-et-de-reduction-des-rejets-de-substances-dangereuses-dans-l-eau--synthese-de-l-action-regionale-er-1039.php.

The question of making regional authorities' water purification plants subject to a pollution fee, on the same basis as for industrial facilities, deserves to be examined in order to supplement the incentives provided by aid for dealing with waste. The working group therefore recommends that wastewater collection and treatment activities should be subject to a polluter pays fee. In this case, the fee could be inversely proportional to the effectiveness of the water treatment plant with regard to each of the priority hazardous substances as compared to a reference water treatment plant.

b) The fee for water pollution of non-domestic origin is calculated according to the pollutant waste produced by the activity liable for taxation. The French decree of 21 December 2007 concerning the modes of establishment of fees for water pollution sets out 11 elements constituting waste pollution[1] on the basis of which the fee is calculated. Among these elements, three concern eco-toxic waste: toxic metals (Metox)[2], inhibitors[3], halogenated compounds which can be adsorbed to activated carbon.

Certain hazardous substances are taken into account, such as cadmium and mercury, which are among the Metox toxic metals mentioned in the calculation of the fee. Others may be found in overall pollutant levels as in the measurement of absorbable organic halogens. The fee does not therefore target any incentive for the elimination of these priority pollutants, whereas the European Water Framework Directive demands their elimination within twenty years.

The working group proposes several possible courses for improving this situation and ensuring more effective compliance with the good chemical status obligation for bodies of water, set out in the European Water Framework Directive:

- the putting in place of a fee targeted upon the 13 priority hazardous substances and groups of substances. This type of fee would make it possible to establish a follow-up mechanism and an incentive for the elimination of the specific pollutants;
- with regard to the elements already included in the calculation of the fee, verification of whether the rates applied indeed take into account the costs of both treatment and biodiversity, adapting them if necessary. For this purpose, several studies concerning costs linked to bad status of water bodies have been conducted by French Water Agencies (in particular the "costs-benefits" catalogues of the *Agence de l'Eau Seine Normandie*) and research institutes (the French Geological Survey (French acronym: BRGM[4]) in particular) as well as the European research programmes (the AQUAMONEY project in particular);
- the cumulative effects upon the environment, when several substances are present in the same discharge, need to be studied with a view to included them in the calculation of the fee;
- the working group considers it essential for priority hazardous substances to be more clearly set out, with their respective fee rates, among the substances mentioned within the framework of calculation of the fee for non-domestic pollution.

[1] These 11 elements are: suspended solids, suspended solids, chemical oxygen demand, biochemical oxygen demand, reduced nitrogen, oxidised nitrogen, phosphorus, Metox toxic metals, Metox toxic metals discharged into groundwater bodies, acute toxicity, discharge of acute toxicity in groundwater, halogenated compounds which can be adsorbed to activated carbon, halogenated compounds which can be adsorbed to activated carbon discharged into groundwater, salts, heat (except in winter), heat discharged into the sea (except in winter).

[2] The Metox toxic metals are established as the sum of discharges of various different heavy metals, weighted by their respective toxicity (arsenic, cadmium, chrome, copper, mercury, nickel, lead, zinc) (article R. 213-48-3 of the Environmental Code).

[3] Inhibitors enable the measurement of the acute toxicity of waste for micro-crustaceans (*Daphnia*).

[4] BRGM (2005), *Développement d'un cadre méthodologique pour évaluer le coût d'atteinte du bon état des masses d'eau du Bassin Rhin-Meuse*, (Development of a methodological framework for assessing the cost of achieving good status of water bodies in the Rhine-Meuse river basin) 142 p.

c) The fee for pollution of domestic origin applies, in particular, in addition to registered drinking water service users, to person whose activities lead to discharge of elements pollution at lower levels than the thresholds fixed[1] for activities subject to the fee for pollution of non-domestic origin. This is the case for toxic pollutants such as chlorinated solvents, heavy metals, organic micro-pollutants originating from mechanics, garages, washing of vehicles, metal processing etc. Domestic waste may also contain substances of this kind.

The thresholds for payment of the non-domestic pollution fee appear to have been set too high for certain substances. The working group considers that these thresholds could be revised in order to ensure that these activities, which are currently subject to the domestic pollution fee and which make a considerable contribution to discharges of priority substances and priority hazardous substances, are in future subject to the pollution fee.

Moreover, it would be appropriate to identify the priorities in terms of geographical initiatives and then encourage managers to reinforce monitoring of discharges of domestic waste into the networks, or to undertake initiatives to inform domestic users and recover toxic products. A simple procedure for the assessment of waste should be studied beforehand in order to avoid increases in the costs of administration and control.

Other measures that may affect the quantitative and/or qualitative status of water bodies

15. The financing of reservoirs on high ground

The establishment of storage facilities constitutes eligible expenditure within the framework of measure 125 mechanism B of the French rural development plan (PDRH) “support for alternative and collective reservoirs on high ground”.

The CGAER (French “General Council for Agriculture, Food and Rural Areas”) and IGE (French “General Inspectorate for the Environment”) mission of 2007[2] suggests the maintenance of a minimum contribution from irrigators for the financing of initial investments[3]. In recommends never descending below 25% for reservoirs on high ground and alternative reservoirs. The same mission’s suggestion to more strictly control methods of validation of environmental accounting for reservoirs on high ground and alternative reservoirs appears legitimate. The same applies to the will to specify the definitions of “on high ground” and “alternative” used according to their mode of supply:

- by collection of flows from a primary drainage basin (whether or not feeding a river) for “reservoirs on high ground”,
- by winter pumping from the environment (rivers, lakes or groundwater), in the case of “alternative reservoirs”.

[1] Thresholds established for each of the 11 constituent elements of waste pollution.
[2] CGAAER and IGE (2007), *Préconisations pour la mise en œuvre du plan national de gestion de la rareté de l’eau* (Recommendations for the implementation of the national plan for the management of water scarcity), 118 p., http://portail.documentation.developpement-durable.gouv.fr/documents/cgedd/006225-01_rapport.pdf.
[3] “A significant contribution on the part of irrigators to the financing of investments (whether manifested in a direct contribution or through a fee including a share of depreciation costs) should be systematically maintained and this contribution should be calculated upon a legitimate basis, so that its rationale remains economic if only partially (due to benefits arising from the investment upon which a figure cannot be placed); indeed, this rationale disappears if the investment is free for irrigators (or if its cost is not sufficiently passed on in operational costs)”; CGAAER and IGE (2007), op. cit., p. 47.
(3) Source: www.senat.fr/rap/l08-552-1/l08-552-188.html.

The working group supports these recommendations and hopes that they will be applied without delay.

16. Water losses from drinking water networks

According to article 161 of the Grenelle 2 law, when levels of water loss from drinking water networks prove greater than a rate fixed by decree, according to the characteristics of the service and resources, the public water distribution services draw up an action plan, if necessary including long-term planning of a programme of network improvement work. The same article adds that, in case of failure to draw up a plan of this kind, the rate of the fee paid by the distributors for extraction from water resources will be doubled.

The difference between the volume of water extracted and processed (6 billion m^3 in 2004) and the volume actually consumed (4.45 billion m^3) amounts to 1.6 billion m^3. This figure represents firefighting and consumption for network maintenance but, above all, also includes network leaks. The latter were estimated to represent 1.3 billion m^3 in 2004, that is to say more than one fifth volume distributed[1]. The rate of water losses, which is currently 21%, needs to be reduced in the short-term to 15%, in order to bring France into line with other European Union countries with networks of similar length. Losses of between 5 and 10% might be targeted in high-density urbanisation zones. At a constant level of use, this objective for reduction of losses by one third would enable a reduction of extractions from the natural environment of almost 400 million m^3.

The fact that, to date, the implementing decree for article 161 of the Grenelle 2 law has not appeared prevents the incentive provided for by this article from coming into play. As long as the decree has not been published, the rate of water losses from networks cannot be fixed according to the characteristics of the service of the resource, action plans, – if necessary including work for improvement of the network –, cannot be drawn up by the public water distribution services, and the doubling of the fee on extraction for distributors cannot be instituted, a measure which would provide a considerable incentive.

The working group therefore hopes that a decree establishing the level of network water losses beyond which public water distribution services have to draw up long-term-programmes of network improvement work will be published without delay, and that in any case this measure shall be included in the priority Grenelle 2 law implementing decrees.

17. Impact of water use on energy production

Generally speaking, the world trend is for full costs, and therefore externalities, to be reflected in energy. This trend is particularly strong in the case of fossil fuels. If it materialises in the case of the latter energies, there is a risk of compromise in favour of other energies to the detriment of the environmental impact that they may cause, including with regard to biodiversity. It is therefore necessary for simultaneous progress to be made in the case of these types of energy.

a) Hydroelectric power has various different kinds of impact upon biodiversity, in particular:

- creation of obstacles to the movement of aquatic fauna;
- creation of obstacles to sediment transport;

[1] Source: www.senat.fr/rap/l08-552-1/l08-552-188.html.

- changes to distribution patterns of rises in water level: mini-floods may constitute valuable zones for spawning beds and feeding, whereas lockage water (sudden changes in flow rate) disturb ecosystems and fauna[1];
- reduction in the rate of flow of certain river sections between extraction and return;
- evaporation of water stopped in reservoirs (absence of restitution to the initial aquatic environment).

At the present time, these types of impact are not effectively internalised. In order to take the first three types into account, the fee for obstacles should therefore apply to hydroelectric installations. It is payable by any person possessing facilities constituting an unbroken obstacle across both banks of a river. The owners of structures that are part of hydroelectric installations subject to fees for extraction from water resources, are exempted from the fee for obstacles on rivers. The creation of obstacles and extraction of water constitute two different kinds of impact upon biodiversity. They are therefore respectively subject to different and specific fees. Since hydroelectricity leads to two types of impact, there is scarcely any reason to exempt it from the obstacle fee. Furthermore, only installations using more than 1,000,000 m³ per year to drive their turbines are subject to the extraction fee. Small installations are thus subject neither to the extraction fee nor to the obstacle fee. The working group therefore considers that hydroelectric installations as a whole should be subject to the obstacle fee. Small installations whose contribution to evaporation is only small would remain exempted from the extraction fee, in order to take their specific nature into account.

b) Power stations beside rivers have three types of impact upon biodiversity:

- net water extraction (high evaporation levels);
- increases in the temperature of water used for cooling power stations;
- reduction in the rate of flow of certain river sections between extraction and return.

As far as the second point is concerned, the heat of the water discharged is among the constituent elements of pollution taken into account in the calculation of the fee for non-domestic pollution. However, this parameter is excluded from the fee for the months from January to March[2]. Their does not appear to be any scientific reason, in terms of impact upon biodiversity, for this exception. Furthermore, the effects of climate change upon average water temperatures, in summer and winter alike, render this exception increasingly questionable. The working group therefore considers it necessary for the heat element to be included in the pollution fee throughout the year.

A combination of factors now makes this series of reforms both possible and necessary. Re-establishment of the ecological continuity of rivers forms a part of Good Ecological Status with regard to bodies, according to the Water Framework Directive, which France needs to achieve by 2015. The establishment of “green and blue infrastructure” also requires improvement of the ecological connectivity of rivers. A favourable timescale is provided by the renewal of hydroelectric concessions and the recent re-launch of French hydroelectricity within the framework of the renewable energy objectives to be achieved by 2020 pursuant to the European Union climate and energy package. Within the framework of climate change adaptation scenarios, operators of hydroelectric power stations already have to make provision for repeated episodes of drought and/or heatwaves and anticipate the

[1] The current hydroelectric fee is increased in case of operation by means of lockage water.
[2] Circular of 24/10/08 concerning the modes of calculation of the fee collected by Water Agencies for discharge of heat in rivers and the sea.

consequences thereof in terms of water extraction and temperature. Incentive-based taxation could help them in this regard.

18. Water Agency subsidies

Certain operations financed by the French Water Agencies appear harmful to biodiversity and not connected to their principal duties and the intentions of the legislature of 1964 (drinking water distribution, production of cooling towers etc.). It would be worthwhile to assess this financing and, if necessary, revise it. The French Water Agencies also finance corrective initiatives to a greater extent than preventive initiatives (detection of the resource, changes in farming practices etc.). Yet, certain corrective measures can be analysed as clean-up subsidies, which are therefore contrary to the polluter pays principle.

Although the working group in no case proposes the abolition of the subsidies, it considers that the French Water Agencies should finance preventive initiatives to a much greater extent, or even in priority.

INFRASTRUCTURES

19. Reducing impacts upon biodiversity

The “1% landscape and development” (in French : “1% paysage et développement”) incentive policy applies to motorways and concerns “routes” listed by the State. This scheme is managed by the local offices of the French ministry of the environment, spatial planning and housing, which put in place this partnership-based policy involving the State, local authorities, socio-economic actors and, in the case of motorway concessions, the company holding the concession.

According to the terms of the circular of March 2005, the objective of the “1% landscape and development” policy is to encourage local authorities that neighbour motorways to valorise the landscapes and territories that they cross, in order to make them a factor of economic development and tourism. The objective is to support projects promoting the value of territories, located outside of the motorway area but within the corresponding visibility zone, in terms of their economy and landscape. In the case of motorway concessions, 50% of the 1% countryside policy is financed by the company holding the concession. For their part, the local authorities pay at least 20%. Eligibility for 1% countryside initiatives proposed by contributing concession holders or local authorities is subject to State decision. Typical initiatives are concerned with landscape development and enhancement operations. The preservation of biodiversity is not currently included in observed recurrent initiatives, without any clear decision having been made with regard to the eligibility thereof. Moreover, in the past, some of the initiatives financed were marginally harmful to biodiversity. The working group considers that the “1% landscape and development” policy could, without any additional cost for the State:

- on the one hand, incorporate an obligation to avoid harm to biodiversity in all initiatives eligible for the 1% scheme (“passive” approach),
- on the other hand, make initiatives for the preservation of biodiversity explicitly eligible for the 1% scheme (“active” approach).

This adaptation would be in line with the establishment of the “green and blue infrastructrure” and the recent adoption of the new National Strategy for Biodiversity (SNB). The 1% scheme could be renamed “1% landscape, biodiversity and development” policy. Its

objective would thus be to enhance the value of the countryside and biodiversity of the territories crossed, in order to make them a factor of sustainable development and tourism.

20. Local airport taxes

Article 1518 A of the French General Tax Code (French acronym: CGI) provides for a reduction of one third in the amount of the rental values used for the establishment of local airport taxes. The tax on business property (French acronym: CFE) corresponds to the share of the local business tax (*contribution économique territoriale*, French acronym: CET, previously the *taxe professionnelle*) assessed on the basis of land rental value. Airports take up large land surface areas, occupied both by their buildings properly speaking and by landing strips, which lead to waterproof sealing of the soils concerned.

Furthermore, the associated development of land (car parks, road access etc.) needs to be taken into account. From the point of view of biodiversity, the reduction of one third is therefore scarcely justified. It leads to a reduction in the cost of development of the land. The working group proposes the abolition of this reduction in land rental value.

21. Dismantling of infrastructures and facilities

Article 90 of the Grenelle 2 law of 12 July 2010 provides that “operators of installations producing electricity from mechanical wind energy or, in case of default, their parent companies, are responsible for dismantling them and restoring the site in a good environmental condition, as soon as the operations are brought to an end, whatever the reason for ending the activity”.

The working group suggests that a similar provision should be adopted for all infrastructures and established facilities that have a limited lifespan (ski lifts etc.). This should concern both electrical energy production plans, whatever the technology used, and light transport infrastructures intended for special and seasonal use, such as mountain ski lifts.

PRIMARY SECTOR

22. Reinforce cross-compliance within the tax system applicable to forests: capital transfer tax

Article 793 of the French General Tax Code exempts woods and forests from capital transfer tax, free of charge, with regard to three quarters of their value, subject to certain conditions of sustainable management and reforesting.

The primary effect of the measure, an incentive for sustainable management of forests, is positive. On the other hand, parts of the content of this measure are potentially harmful, with regard to commitments for the reforesting of wasteland, moors and pastoral land, areas which are rich in biodiversity. Changes to the conditions of eligibility for exemption from capital transfer tax free of charge might thus be considered, by removing the reforesting obligation with regard to wasteland, moors and pastoral land, or even by accompanying it with an obligation not to reforest land presenting special ecological interest.

23. Reinforce cross-compliance within the tax system applicable to forests: property tax on unbuilt land

Article 1359 of the French General Tax Code provides for exemption from property tax for unbuilt land and land planted with forest. It was amended in 2001 in order to more effectively adapt the tax system to economic and biological realities. The following are thus exempted from property tax on unbuilt land:

- plots of land sown, planted or replanted with forest, for the first half of the production cycle (10 years for poplar groves, 30 years for conifers and 50 years for trees other than conifers);
- high forest land or mixed coppice and high forest land, other than poplar groves that have undergone natural generation;
- wooded land that has presented a recognised state of varied coppicing with balanced regeneration for 15 years (of up to 25% of the amount of the tax).

The primary effect of this measure, which provides an incentive for the conservation of forest land and sustainable management of forests, is positive. Nevertheless, it may give rise to certain indirect harmful effects upon biodiversity if it is applied to areas that are rich in biodiversity before afforestation, the open character of which is desirable to maintain, such as wetlands, an *Grenelle de l'Environnement* priority. Furthermore, in general, wetlands are not conducive to poplar cultivation.

A proposal could therefore be put forward to exclude wetlands, and even other open sensitive environments, from the measure.

24. Reinforce cross-compliance within the tax system applicable to forests: afforestation support for agricultural land

The forest surface area in France has been constantly growing for several decades. It currently covers more than 25% of the territory. Conversely, the Utilised Agricultural Area (UAA) has been rapidly diminishing, giving rise to fears, in the medium-term, of a risk of shortage of agricultural properties in the face of competition for land use. The afforestation of certain plots of agricultural land may be justified on economic (poor quality land) or environmental (phytoremediation of polluted land) grounds, or even for reasons of biodiversity in certain cases. On the other hand, the afforestation of certain open spaces, including certain areas of extensive agriculture, may lead to decline in biodiversity and environmental wealth. In this context, afforestation subsidies for farmland should be strictly reserved to those areas alone in which afforestation provides real value-added in terms of biodiversity (or phytoremediation). Meadows could also be expressly excluded from eligibility for such subsidies.

25. Apply the standard VAT rate to fertilisers and plant health products

Fertilisers and plant health products have the benefit of a reduced VAT rate of 5.5% (French General Tax Code, art. 278 bis). Within the EU, France is the country that applies the lowest rate to these products (see General guideline no. 13). This concerns fertilisers, sulphur, copper sulphate and filings used for the production of copper sulphate, as well as cupreous products containing at least 10% copper and pest control chemicals, on the condition of their having received official approval or authorisation.

Herbicides, fungicides and insecticides have a direct impact upon the wild species targeted, as well as upon wild species linked to the targets via the food chain. Furthermore, pesticides can reach habitats very far removed from the zone in which they are applied through wash-out. They lead to the contamination of both surface and groundwater. In addition, at the time of treatment, part of the chemicals does not reach a target and is dispersed in the environment: in year (at the time of spraying chemicals on to leaves, 30 to 50% of the product does not reach his target and is dispersed in the air) and the soil (at the time of spraying on to leaves, losses into the soil may reach from 10% to 70%). This measure does not therefore have any basis at the environmental level and goes against the *Grenelle de l'Environnement* objectives aimed at limiting the use of fertilisers and pesticides. It also contradicts the polluter pays principle. It is therefore proposed to exclude products and fertilisers for agricultural use from the field of application of the reduced VAT rate.

The cost of this fiscal measure estimated to be 43 million euros for the year 2008. This cost is assessed on the basis of final and equivalent consumption alone (principally households, local and regional authorities and farmers at the fixed rate).

A standard VAT rate for fertilisers and pest control products would make it possible to re-establish a price signal aimed at households and local authorities, which are the principal beneficiaries of this measure (66% of the amount expended), whose reduced rate encourages the use of pesticides under conditions which are in general proportionally more hazardous (excessive quantities, waterproof surfaces, close to dwellings etc.).

On the other hand, the re-establishment of a standard VAT rate upon farmers' intermediate consumption of fertilisers and pesticides has no impact upon their production costs. Farmers subject to the simplified VAT system subsequently recover VAT that they pay on the purchase of their products. Raising the rate of VAT upon agricultural inputs would not therefore lead to any accounting consequences upon their operating profits. For farmers having opted for a fixed-rate reimbursement (1.6% of farmers), that is to say a fixed percentage applied to business income for the purposes of VAT refunds, the effect of raising VAT would also be neutral, on the condition that this fixed-rate is raised accordingly. Failing this, farmers who previously opted for the fixed-rate reimbursement could move to the simplified VAT system, in which they indeed recover their VAT, although admittedly at the price of additional administrative formalities. That being said, special arrangements could be considered for farmers (increasing the fixed reimbursement rate, liquidity support etc.).

AIR POLLUTION

26. More effective internalisation of biodiversity costs

A veritable internalisation-based eco-tax (or a component of the TGAP general tax on polluting activities) could be tested on an air pollutant. This would presuppose very high levels and repayment to those liable for the tax, according to an allocation key to be defined, as well as close consultation with the latter. For this purpose, two foreign examples may be referred to concerning SO_2 and nitrogen oxide (NOx) in Sweden[1]:

[1] Since 1 January 2008, the rate of the Swedish tax has been 50,000 SEK per tonne of NOx emissions, that is to say around 5,400 euros per tonne of NOx emissions (rate of exchange used: 1 euro = 9.20 Swedish krona). The TGAP pollutant emission for nitrogen oxides (NOx) has increased from 53.60 euros per tonne of NOx emissions in 2010, to 107.20 euros in 2011 and 160.80 euros in 2012.

27. Extend the TGAP to certain heavy metals

Emissions of heavy metals, primarily of industrial origins, are not taken into account in the calculation of the TGAP tax on pollutant emissions. Yet, these pollutants may just as directly affect organisms, or change their conditions of life by disturbing their habitats, to the same extent as other pollutants that are already regulated. The International Technical Centre For Studies on Atmospheric Pollution (CITEPA) observed that heavy metal emissions fell considerably over the 1999-2008 period. However, selenium emissions were distinguished by their slower rate of reduction.

Above all, selenium bioaccumulation occurs among aquatic invertebrates and fish. This element can also be found in aquatic birds, plants and soils. Numerous studies show the toxicity of selenium for marine organisms, mammals and birds according to the mode of exposure (presence in the environment or in food)[1].

Furthermore, although arsenic emissions have considerably dropped since 1990, they fell less than other heavy metals measured by the CITEPA and continue to give cause for concern with regard to biodiversity. Indeed, arsenic is persistent and particularly liable to bioaccumulation among marine organisms. It is highly toxic for algae, invertebrates and fish. It is also toxic for terrestrial organisms, as shown by tests upon redworm (*Eisenia fetida*), upland cotton (*Gossypium hirsutum*), and soil microorganisms[2].

These two substances thus lead to harmful effects upon biodiversity, in particular for marine biodiversity, for which France has a special responsibility in its capacity as holder of the second largest marine domain, which it has made a priority since the *Grenelle de l'Environnement* and the *Grenelle de la Mer* [a national public consultation on sea policy carried out by the French government after the national consultation on the environment, known as *Grenelle de l'environnement*]. Yet, emissions of these substances are falling less quickly than other pollutants. The working group therefore considers that arsenic and selenium should be introduced into the TGAP tax on polluting activities.

LAND DEVELOPMENT

Urban sprawl is a recent phenomenon in France. Various different mechanisms supporting badly or inadequately targeted public policies have contributed to its expansion. This is the case with regard to the various different support schemes for rental investment, sometimes implemented in areas lacking in demand, the "Zero Interest Loan" (French acronym: PTZ) which presupposed properties which were inexpensive and therefore located in outlying districts, the Malthusian occupancy rate (French acronym: COS) and payments for exceeding local travel plans (French acronym: PLD), certain kinds of compensation paid to farmers in case of change of use of agricultural land, the introduction of tax exemptions for property in French overseas departments and territories, certain exemptions from the tax for the financing of local facilities (French acronym: TLE), from the departmental tax for sensitive natural areas (French acronym: TDENS), from the departmental tax for the financing of architecture, urban planning and environmental consultancies (French acronym: TDCAUE), the tax on built land (French acronym: TFB) and business tax as well as the tax on business property (French acronym: CFE), etc.[3] To varying degrees, all of these

[1] INERIS (2009), *Sélénium et ses composés* (*Selenium and its compounds*), INERIS -DRC- 08-83451-01269A.doc, 121 p.
[2] INERIS (2010), *Arsenic et ses dérivés inorganiques (Arsenic and its inorganic derivatives)*, INERIS- DRC-09-103112-11453A, 124 p.
[3] See Appendix 4, *Abbreviations and acronyms*, p. 319.

mechanisms constituted subsidies or incentives for urbanisation of a sprawling and scattered kind.

Conversely, the working group welcomes the reform of the taxation on urban planning introduced in December 2010. It considers it to be broadly favourable to biodiversity.

Nevertheless, it regrets that the payments for insufficient density remain optional[1]. As such, they may only rarely be implemented and therefore hardly provide an incentive for increasing density.

With a view to slowing urban sprawl, the working group therefore recommends:

28. Retain the PTZ+ for new intra-urban housing and/or housing near dedicated public transport lanes (TCSPs).

29. Redefine geographic zoning provided for the "Scellier scheme" and other schemes for rental investments in new homes by reserving this scheme for intra-urban areas and/or for areas closed to public transportation

Whatever their tax bracket margin, taxpayers who purchase homes that are new or in a future state of completion, between 1 January 2009 and 31 December 2012, have the benefit of an income tax reduction, on the condition that they undertake to rent it unfurnished, for use as a principal residence, for a minimum period of nine years (article 199z of the General Tax Code). The maximum limits of rents depend upon the geographical zone within which the property is located (zones A, A bis, B1 and B2)[2].

The tax reduction is equivalent to a certain percentage of the cost price of the home or homes, within a limit of 300,000 euros. After two years of 25% tax reduction in 2009 and 2010, the rates were lowered to 13% for the year 2011 and 9% in 2012. Moreover, it is possible to benefit from a tax reduction at a rate increased by 9 percentage points by investing in properties granted the official Low-Energy Building (French acronym: BBC) label (tax reduction amount increased by 9 points).

For (BBC and social) application of the Scellier Act, France's towns and municipality are divided into five zones according to supply and demand for housing. The planned tax reduction is no longer granted for housing located in communities classed as being in geographical zones not characterised by imbalance between supply and demand for housing (zone C), except in case of special dispensation from the Housing Ministry. The zones eligible for the Scellier 2001 scheme are zones A and A Bis (Paris and the Paris Metropolitan Area as well as the French Rivera and municipality close to the Swiss border),

[1] Muncipialities and public establishments for cooperation between local authorities, with authority with regard to local urban planning policy and land-use planning policy may, through consultation, institute a minimum density level within which persons granted express or tacit planning permission, or the person responsible for the building in case of construction without planning permission or infringement of obligations resulting from the planning permission (articles L. 331-36 and L. 331-36 of the Urban Planning Code), are liable to payments for insufficient density. Municipalities and intercommunal groupings can, under certain conditions, grant exemptions from payments for insufficient density, in particular, for premises for use in industry and skilled trades and associated activities, storage depots and warehouses not open to the public and subject to commercial use (article L. 331-9 of the Urban Planning Code).

[2] For the application of this Act, France's towns and municipalities are divided into five zones according to supply and demand for housing: A, A bis, B1, B2 and C. "A" zones are the areas with the greatest shortage of supply and strongest demand for housing. "C" zones, which have the greatest supply and the least demand, are excluded from the scheme.

B1 (large urban areas as well as the municipalities of Brittany's islands, Corsica and French overseas departments and territories as a whole) and B2 (medium-sized cities).

30. Deny regional authorities the power to grant a 50% exemption on the development tax on single-family homes built in sparsely-populated areas financed with the help of PTZ+

31. Revise or eliminate certain exemptions from the fee for rescue archaeology

A certain number of projects and excavations are exempt from this fee. This fiscal expenditure does not appear to be directly unfavourable to biodiversity. Nevertheless, it leads to a reduction in the cost of development and activities leading to sealing of the soil and harm to soil biodiversity. Amongst current exemptions, the following could be revised or eliminated:

- the building of homes for themselves by natural persons;
- the building of accommodation for rental use and sheltered housing in the same category, built or adapted with financial support from the State (art. L. 351-2 and L. 472 of the Building and Housing Code).

32. Revise the annual tax on vacant housing and the council tax on vacant housing

A certain number of items of fiscal expenditure appear to be indirectly favourable to underuse of existing housing stock and therefore encourage, without this always being necessary, consumption of rural space due to urbanisation. This is the case for the annual tax on vacant housing (French acronym: TLV) and the council tax on vacant housing (French acronym: THLV and even the TFB taxes. However, the conditions are restrictive and exclude accommodation that can only be rendered inhabitable by undertaking major work. As a practical rule, the fiscal administration acknowledges that this condition is met on presentation of an estimate for work for an amount greater than 25% of the market value of the property. Insofar as renovation expenditure is deductible from income from real estate, this threshold is surprising, and could be increased. This measure would not call for any legislative amendments and could be implemented by simple administrative directions.

The working group suggests:

- an extension of the annual tax on vacant housing beyond the 8 urban areas of more than 200,000 inhabitants already designated, so as to make it applicable to all urban areas of more than 200,000 inhabitants, or even all areas of rental pressure[1];
- an increase in the minimum rate of the tax. The rate is currently fixed at 10% for the first year of imposition, 12.5% for the second year and 15% as from the third year. It could be raised to 15% for the first year, 20% for the second and 25% from the third year;

[1] Out of the 29 urban areas of more than 200,000 inhabitants on French national territory, eight are concerned by the TLV tax on vacant housing: Paris, Lille, Bordeaux, Toulouse, Lyon, Montpellier, Cannes and Nice.

- an increase in the threshold for the price of renovation work beyond which homes can be exempted from the TLV tax on vacant housing, by increasing it from 25% to 40% of the property's market value;

- the penalisation of owners and renovation companies that mutually arrange estimates of convenience, giving figures for the cost of work of an amount that is intentionally greater than the threshold, making it possible to avoid the TLV tax.

33. Planning documents

All types of land-use on national territory are organised by planning documents or, failing this, by the terms of national planning regulations. In peri-urban zones, where most harm to biodiversity caused by land development is taking place, planning documents drawn up by communities and intercommunal groupings are the rule. Very schematically speaking, rationally-managed planning is complicated and sometimes costly in political terms and it tends to be easier to open up new building zones for urbanisation in agricultural and natural areas. As a result, communities opening up new areas for residential construction may have a high proportion of vacant spaces in their building zones[1]. The drawing up of planning documents involves the assistance of local authorities in addition to specific public subsidies. Yet, the allocation criteria for public subsidies (compensation by the State by means of general decentralisation allocations and/or in the form of making decentralised State services available free of charge) are made proportional to the expenditure laid out for the completion of the documents[2], and take neither impact upon biodiversity into account nor initiatives with regard to increase in urban density and control of urban sprawl.

The working group therefore considers that this constitutes public expenditure that is potentially favourable to urban sprawl and harmful to biodiversity. Moreover, this mechanism is contrary to the spirit of the *Grenelle de l'Environnement* and to the provisions of the Grenelle laws with regard to urban planning. It therefore considers that:

- an official letter (in French "circulaire" to prefects and to the Departments for Territorial Planning (DDT) in French departments by the minister responsible for urban planning should clearly recall the conditions for making decentralised State services available, i.e. that they cannot be made available within the framework, not only of the law, but also of the general directions of public urban planning policy, as amended since the Grenelle laws and their accompanying texts;

- compensation by the State (through general decentralisation allocations – French acronym: DGD and/or by making services available) needs to be adjusted according to criteria of impact upon biodiversity and initiatives for controlling urban sprawl, in particular:

  - the level of density of building zones that have already been defined, as measured, for example, by the ratio of "built plots to the total number of plots in the building zones of the municipality (by type of zone)"[3]. This criterion may be taken

[1] Dumas E., Geniaux G., Napoléone C., Bartoli C. and Cezanne-Bert P. (2005), *Identification qualitative des espaces disponibles pour l'urbanisation nouvelle (Qualitative identification of available spaces for new urbanisation),* Report of the Conseil régional Provence Alpes Côte d'Azur / Association CESSA, Marseille, 280 p.

[2] Article L. 121-7 of the Urban Planning Code provides that the expenditure laid out by municipalities or their associations for studies and the drawing up of planning documents are subject to compensation by the State: in the case of expenditure linked to the drawing up of planning documents, the compensation is effected by means of general decentralisation allocation on the basis of an assessment of the average costs of categories of expenditure; in the case of drawing up, modification and revision of planning documents, the services of the decentralised departments of the State can, insofar as necessary, be placed at the disposal of communities and groupings of municipalities free of charge. Moreover, numerous councils of French departments and regional councils have also made provision for subsidies for municipalities or their associations.

[3] The land registry services have the information needed for these types of indicator.

into account in order to focus State assistance upon local authorities that actually have shortages in terms of absolute supply of building land and in order to avoid local consensus from increasing the number of insufficiently dense residential zones for the purposes of income from rent rather than urban planning.

- density levels of future building zones. This level of density is often specified in the regulations[1].

Moreover, the working group suggests that the departmental arbitration committees for questions of urban planning should be called upon to give a ruling concerning adjustment of the subsidy criteria and scales of the urban planning general decentralisation allocation (DGD Urbanisme), according to the impact indicators of urban planning documents on biodiversity (indicators to be supplied by the departments of the State).

34. Make it mandatory to state the distance to the nearest public transportation station

Making it compulsory to state the distance of the nearest public transportation (French acronym:TCSP) station at the time of opening new urban zones (*Zones U*) under local town plans (French acronym: PLU), in PLU environmental assessments and at the time of the marketing of new plots of land. A measure of this kind would make it possible to measure urban sprawl and its overall cost and consequences more effectively, both by municipalities, households and property developers.

35. Promote research into dense and mixed urban planning that is economical in its use of space

Redirect part of the budgets of public bodies working on urban planning such as the CERTU [French National Research Centre on Networks, Transport and Urban Planning], the CSTB [French Scientific and Technical Centre for Building] and so on, and research programmes into urban planning financed by public funds towards research into dense and mixed urban planning that is economical in its use of space.

Slow down other types of land development. L and development does not merely consist of urban sprawl alone. In 2009, land covered with artificial surfaces and consolidated land represented 2.3 million hectares, that is to say 4.2% of the territory and almost half of the developed surface area[2]. The road networks represented 1.2 million hectares, i.e. almost half of the covered and consolidated surface areas. The surfaces of car parks not incorporated in buildings constitute most of the remainder of the land artificially covered and consolidated. According to the results of the Teruti-Lucas enquiry, land covered with artificial surfaces or consolidated increased by 49,000 hectares per year between 2006 and 2009, that is to say almost 60% of the increase in land development. This very rapid growth is encouraged by inexpensive unbuilt land, lack of internalisation of the external costs of land development and, in some cases, implicit fiscal expenditure and subsidies. The rate of land development being one of the principal causes of loss of biodiversity in France, the working group considers it necessary to address certain incentives that facilitate it. By way of example, it suggests three possible courses of reform.

[1] Generally speaking, the number of homes expected in each zone is assessed by the prescribers.
[2] *Enquête Teruti-Lucas* (Agreste-Ministère de l'Agriculture).

36. Application of the development tax to car parks

The new development tax instituted in 2010 is applicable to the surface areas of indoor car parks (incorporated in buildings). It applies for an average value of 9,240 euros per parking space (10,240 euros in the Île-de-France region). An allowance of 50% in particular applies to principal homes up to a threshold of 100 m^2, and to larger surface areas on an optional basis. This allowance constitutes fiscal expenditure which reduces the cost of possessing a vehicle and indirectly facilitates urban sprawl. When one considers that collective car parks incorporated into buildings, for which the space taken up by access routes and utilities leads to the doubling of the average surface area per parking space (around 25 m^2), the tax is applied on a value of between 16,500 and 18,700 euros per parking space (in Île-de-France).

Development tax is also applicable to car park spaces not included in the surface areas of buildings. The fixed rate value at which the tax is applied is set at 2,000 euros per parking space, a value which may be increased up to 5,000 euros.

The value at which the tax applies is therefore between 2 and 8 times higher for indoor parking spaces than for parking spaces not incorporated into buildings. The main aspects justifying the adoption of a development tax on parking spaces – traffic generated, the need for investments in access routes and utilities, land development, incentives for the use of alternative transport etc. – are not only justified by a difference of this kind between indoor and outdoor car parks. As far as the land development is concerned, indoor car parks could even be considered less harmful since they enable multi-storey development or the construction of an upper floor in individual residences.

It therefore appears logical to reduce the taxation gap between these two types of car parks. The development tax could be automatically applied for a fixed-rate value of 5,000 euros for all parking spaces and 10,000 euros for collective (commercial) parking spaces, in order to take into account the space taken up by access routes and utilities.

Moreover, using the reference values for ecosystem services provided by overall biodiversity put forward by the Chevassus-au-Louis report[1], parking spaces would correspond to a minimum updated value of 32,000 euros per hectare, while the development tax would amount to 16,000 euros per hectare in the case of an individual car park and 8,000 euros in the case of a collective car park[2]. Admittedly, the principal justification for development tax is not the offsetting of loss of ecosystem services (ordinary biodiversity), but rather that of contributing to the financing of development.

However, this result pleads in favour of an increase in the reference value for outdoor car park surface areas. A similar line of reasoning could be applied to the components of the development tax corresponding to the former TDENS, TDCAUE and TLE taxes.

37. Zones of logistics, commercial, small business and warehouse activity

Zones of logistics, commercial, small business and warehouse activity present a certain number of clearly identified characteristics that are objectively unfavourable to biodiversity:

[1] Centre d'analyse stratégique (2009), *L'approche économique de la biodiversité et des services liés aux écosystèmes* (The economic approach to biodiversity and services related to eco systems), report of the commission chaired by Bernard Chevassus-au-Louis, Paris, La Documentation française, 399 p.; www.strategie.gouv.fr/content/rapport-biodiversite-%C2%AB-l%E2%80%99approche-economique-de-la-biodiversite-et-des-services-lies-aux-eco.

[2] In the scenario of a rate of development tax of 1% applied at a fixed-rate value of 2,000 euros per parking space.

high levels of consumption of space, low effective land occupancy rate (French acronym: COS), excess capacity, lack of current investment in density increase, externalities caused by these zones being established outside of towns and therefore not served by TCSPs, etc. The working group therefore considers that the following measures would be appropriate:

- for the determination of the assessment base for the development tax, eliminate the 50% tax credit on the value per square meter for warehouses and hangars that are not open to the public but operated commercially, and indoor car parking areas that are commercially operated;

- to make the low density tax (French acronym: VSD) mandatory and even an increase – which is currently optional – of the new development tax for zones of commercial, logistics and warehouse activity etc.

Municipalities and public establishments for cooperation between local authorities with authority with regard to local urban planning policy and land-use planning policy may, through consultation, institute a minimum density level within which persons granted express or tacit planning permission, or the person responsible for the building in case of construction without planning permission or infringing obligations resulting from the planning permission (articles L. 331-36 and L. 331-36 of the French Urban Planning Code), are liable to payments for insufficient density. For each sector, the minimum density cannot be less than half of or greater than three quarters of the maximum density authorised by the rules set out in the local town plan.

The payment is equal to half of the value of the land multiplied by the ratio between the surface area lacking in order for the building to reach the minimum density threshold, and the building surface area resulting from application of the minimum density threshold. The low density tax cannot in any case be greater than 25% of the value of the land.

Municipalities and intercommunal groupings can, under certain conditions, grant exemptions from low density tax, in particular, for premises for use in industry and small businesses and associated activities, storage depots and warehouses not open to the public and commercially operated and indoor car parking areas that are commercially operated (article L. 331-9 of the French Urban Planning Code).

- reform the leasable area tax (French acronym:TASCOM). The tax schedule for the latter is currently fixed according to turnover with a distinction made between businesses that also engage in fuel retail (higher rate) and those that do not. Provisions are made for reductions in the rate of taxation for professions whose exercise requires very high sales surface areas. The tax is increased by 30% for businesses with surface areas of greater than 5,000 m^2 and ex-tax turnovers of more than 3,000 euros/m^2/per year. The geographical uniformity of this tax schedule is to the advantage of businesses located in peripheral areas, where real estate is less expensive, and does not therefore provide any incentive for taking into account the external costs generated by sites of this kind. The working group suggests a marked increase in the tax for businesses located in peripheral areas and a reduction for businesses located in city centres, in order to make it into an incentive-based tool, promoting mixed urban development and limitation of urban sprawl. It also suggests that the tax should be made progressive according to the number of square metres occupied, beyond a certain threshold.

- the tax on unused commercial land adopted in the amending finance act for 2006 (article 126) should actually be applied. It is intended to fight against the

existence, in town centres, of commercial wasteland, which sometimes results either from speculative operations or from the negligence of certain owners, and to promote the re-use of plots of land for housing, trade and any other activities. As such, it is therefore favourable to urban densification and economical use of natural areas.

This tax is payable for property assessed according to its rental value, with the exception of industrial buildings and land not appearing in the assets of an industrial or commercial company, which have ceased to be devoted to activities coming within the field of business tax for at least five years at 1 January of the year of imposition and which have remained unoccupied for the same period. The tax is not payable in cases where the fact that the property is not operated is independent of the taxpayer's will (e.g. in case of fire).

It scarcely appears to have been applied. In the first place, in order to understand the reasons for this situation, it would be appropriate to take a detailed inventory of the location and surface area of pieces of unused commercial land and to consolidate this data, which does not appear to be available at the national level. In the second place, the possibility could be considered of making the tax compulsory, revising the rates thereof, and reducing the period of inactivity and vacancy of properties from five to three years.

38. Fee for the creation of office space in Île-de-France

A certain number of harmful items of fiscal expenditure linked to the fee for the creation of office space in the Île-de-France region: exemptions for offices with a surface area of less than 1,000 m^2, 65% reduction for commercial premises and 85% reduction for storage premises. Similarly, storage premises, exhibition centres and premises principally used for conferences are exempt from the annual tax on offices in Île-de-France. It would be worthwhile reviewing these exemptions and allowances, in particular those concerned with storage premises, which constitutes a very profitable activity that is heavy in its consumption of space and which has increased at a very fast rate in Île-de-France in recent years. Furthermore, the rates are very low, in particular for parking and storage premises surface areas. Finally, their zoning in three geographical circles means that they become progressively lower the further one moves into the rural part of Île-de-France. This constitutes a de facto incentive for the consumption of rural real estate.

ADDITIONAL RECOMMENDATIONS

As in the case of the general guidelines, the working group wishes to set out "additional" proposals, which are also qualified and detached, since they do not properly speaking constitute possible courses of amendment of harmful incentives. Nevertheless, having reached a consensus concerning these measures, some of which it appears possible to bring into concrete application in the short or medium-term, the group considers it useful to bring them to the attention of the originator.

39. Consumption of public funds allocated to projects in favour of biodiversity

Although, strictly speaking, this does not come within the report's scope of enquiry, the working group noted with regret that non-negligible amounts of public subsidies favourable to biodiversity and available in France remained unused. This is the case of certain European Structural Funds and the LIFE-Nature fund. This does not appear to be a new situation.

By way of example, the overall LIFE+ budget for 2007-2013 amounts to around 2 billion euros. Projects under “Nature & Biodiversity” (component I) may be presented for territories on land and at sea as well as in French overseas departments (but not in overseas territories). In 2011, 267 million euros were allocated to the projects accepted as a whole, of which France was allocated around 27 million euros. Half of this budget was allocated to LIFE component 1 projects, that is to say “Nature and Biodiversity”. In 2009, France ranked 5th in terms of the number of projects submitted (23 projects presented) but was far behind Italy (168 projects submitted) and Spain (126 projects submitted).

The following table shows the number of projects accepted in relation to the number of projects presented.

Year	Component I Nature and biodiversity	Component II Environment	Component III Information /
2007	2/7	5/14	1/4
2008	5/10	8/13	0/7
2009	3/4	9/15	0/4

Projects in the “environment” category are the most frequently submitted. The average subsidy amount requested for LIFE+ 2010 projects amounted to 1,425,000 euros. Co-financing would appear to be the principal obstacle to the establishment of LIFE projects. The financing for projects under the “Nature and Biodiversity” component comes, for the most part, from public funds (public institutions, and to a lesser extent regional natural parks [French acronym: PNR]). France requested that European co-financing be brought to 75% for this component. The Commission suggests the possibility of co-financing at this level for small projects alone.

The working group wishes to make several observations and recommendations:

- in view of the number of potential national public co-financing bodies in the field of biodiversity, whether national (French Water Agencies, national parks, the ONEMA, Marine Protected Areas Agency, the Coastal Protection Agency), the ONCFS [French national office for hunting and wild fauna], ONF [French National Forests Office], etc.) and infra-national (regions, departments, municipalities, regional natural parks, etc.), and the financial means at their disposal, the fact that France has not managed to co-finance a sum of 27 million euros appears difficult to understand;
- the priority granted to wetlands, “green and blue infrastructure” (TVB) green infrastructures and the marine environment by the *Grenelle de l’Environnement* should provide a strong incentive to the French Water Agencies, - which have the means at their disposal to co-finance these LIFE funds-, to do so in a much more active manner;
- the same applies to the French Development Agency, with authority in French overseas departments, which are very rich in endangered biodiversity and eligible for the LIFE funds;
- the accession of Mayotte to the status of a French department henceforth renders it eligible for LIFE funds. The island’s importance in the field of biodiversity should lead the authorities to facilitate the submission of LIFE projects there.
- beyond this, France might plead for the eligibility of overseas territories for LIFE funds insofar as these constitute the areas with the richest biodiversity, not only in France but also at the European level.

In any case, the current situation might justify a joint mission of the two public think-tanks of the ministry of agriculture and the ministry of ecology (i.e. the CGAER and the CGEDD in order to improve understanding of the reasons for this underuse and propose means for putting it right.

40. Monitoring indicators for land development

In the field of land development, the working group believes it necessary to establish "positive indicators", and no longer negative indicators alone, as has been done in the United Kingdom (e.g. indicators of building density, of the annual proportion of buildings constructed on previously urbanised land, etc.) or indicative objectives for reduction of the quantity of hectares developed per year, as in Germany.

41. Use of the existing building stock

Although it may seem far removed from the initial subject of its enquiry, the working group wishes to emphasise the existence of a certain number of factors that indirectly work in favour of the land development and which merit greater consideration.

Without calling into question the existence of a considerable need with regard to housing matters in France, the working group observes that the supply of housing does not always correspond to demand and that a certain number of homes remain unoccupied. More effective use of the existing building stock could contribute to slowing land development, if only marginally, in areas where it appears least necessary. In this respect the following could be indirectly favourable to biodiversity, in particular in areas where the supply of housing is insufficient:

- the creation of an annual tax upon offices and vacant business, storage and exhibition premises (beyond a certain deadline) in zones with pressure upon residential properties. Owners would thus be prompted to occupy, sell or modernise these premises and the construction of new real estate business capacity for speculative purposes would be discouraged;

- conversely, the granting of tax benefits for the conversion of certain professional premises into housing, for example exemption from transfer capital gains tax at the time of sale of professional premises for the purposes of conversion into rental accommodation, or exemption from future development tax for alterations when planning permission has been granted and such tax is due, as well as 5-year exemptions from the tax on built land (French acronym: TFB) and the application of a 5.5% rate of VAT etc. (Nevertheless, a reform of this kind would need to take into account mixed business/accommodation urban planning objectives, which are a condition of urban densification in themselves);

- a reduction in the tax on transfers for valuable consideration or residential properties, in such a manner as to facilitate mobility and reduce the time for which accommodation remains vacant. This fluidity would also be favourable to the labour market.

42. Payment for exceeding the legal density limit

The French Act concerning Social Solidarity and Urban Renewal (French acronym: SRU) of 30 December 2000 abrogated the system of payments for exceeding the legal density limit (replacing it with a contribution to the financing of new routes and networks). However, municipalities that instituted the payment for exceeding the legal density limit before 1 January 2000 may maintain it, unless they decide to bring it to an end by explicit abrogation

or by introducing the contribution for the creation of new routes and networks. The working group considers that the payment for exceeding the legal density limit is henceforth anachronistic and contradicts the low density tax, the Grenelle laws and the general trend towards densification. It therefore recommends its abolition at the national level.

43. Classification of unbuilt land

The classification of unbuilt land into 13 different groups implemented by the ministerial direction of 31 December 1908 no longer corresponds to current realities and concerns. It needs to be reformed on several points.

- Peatlands should be removed from category 7 “quarries, slate quarries, sand quarries and peatlands” so as to be exempted. They cannot be exempted as long as they appear in this category. Several important factors plead in favour of this exemption: it was perhaps possible to regard peatlands as being similar to the other components of this category in the 19th century and at the beginning of the 20th century, when peat was still extracted. This is no longer the case today. They constitute an environment with a great wealth of biodiversity. There remain around 20,000 hectares of peatlands in France. Their protection has long been a priority objective in France, in Europe and internationally. This objective was reasserted within the framework of the *Grenelle de l’Environnement*. Peatlands store and filter large quantities of water. They function as one of the world’s most effective carbon sinks.

The Act of 23 February 2005 codified by article 1395D of the French General Tax Code provided for the possibility of a 50% exemption from the TFNB tax on unbuilt land for wetland meadows classified under categories 2 (meadows) and 6 (moors) of the direction. Due to their classification under category 7, this measure cannot be applied to peatlands. Still further, the same Act made provision for the possibility of exempting Natura 2000 sites classed under categories 1 (land), 2, 3 (orchards), 5 (woods), 6 and 8 (lakes and ponds) from the whole of the TFNB. Once again, peatlands, of which many are nevertheless designated Natura 2000 sites, cannot benefit from this measure as they are classed under category 7.

The classification of peatlands in the same category as land that is still of an extractive nature constitutes an administrative, economic, fiscal and ecological aberration. Thus, when the 2010 budget created a tax to supplement the TFNB (art. 77, CGI 1519), it created it, quite naturally from an administrative point of view, for categories 7, 9, 10, 12 and 13, that is to say for land considered to not to be agricultural or forestry land, but more pleasant or productive than other categories. Peatlands, still included in category 7, were thereby *ipso facto* made liable for this additional tax and the fiscal pressure upon them increased.

- Beyond this, this direction divides wetlands into five principal categories (1, 2, 6, 7 and 8). The protection of wetlands having been repeatedly set up as a priority, for decades, by the authorities, and strongly reasserted at the time of the Grenelle de l’Environnement, the grouping together of wetlands into two or three categories would probably be likely to make initiatives intended to protect them easier.
- For the calculation of the property tax on unbuilt land, the rental value of unbuilt land established according to the income from this land results from rates fixed according to the nature of the crops and land, in accordance with the rules of the ministerial direction of 31 December 1908. The classification of uncultivated or manifestly underused land in the category of a municipality's best arable land until it is farmed (CGI, art. 1509), results in encouraging the farming of this land and may thus constitute an incentive for impoverishment of the biodiversity of certain plots. This measure could be abolished.

44. Agricultural tenancies and maintenance of biodiversity

Deterioration of the ecological quality and agronomic value of soils is a question that gives cause for concern from both the environmental and economic points of view. In 2006, the European Commission adopted a strategy in favour of the protection of soils (COM(2006)231 final) and a proposal for a framework directive for the protection of soils (COM(2006) 232 final). The working group suggests that an indicator of soil organic carbon content – a good index of the organic matter content of soils[1] and therefore of biodiversity – should appear in the inventory and statement of the condition of the property appended to leases between lessees and lessors, at the time of entering into new leases.

The topographical elements could also be shown in this inventory and statement of the condition of the property. This will make it possible to have historical references, which are important in this regard since the maintenance of these topographical elements is a part of the GAEC conditions upon which the payment of a part of CAP subsidies depends.

45. Tourist taxes

Tourist taxes pose several problems in relation to biodiversity. Tourism can, in certain cases, lead to harmful effects upon biodiversity. The current rate of the tax and the methods for setting it do not internalise this damage. Conversely, biodiversity in the form of natural heritage is a factor of attractiveness for tourism and, as such, of positive externalities. Yet, neither are the rate of the tax nor the methods for setting it fixed in accordance with the level of these externalities. Moreover, the proceeds from the tax should be allocated to expenditure aimed at encouraging tourism in the municipality and/or the management of its natural areas (art. L. 2333-26 of the French General Code of Local and Regional Authorities). Preservation of a rich natural heritage in good condition is obviously one of the most important factors in the attractiveness of an area for tourism. Yet proceeds from the tax appear to be very seldom allocated to the management of what is, nonetheless, a natural tourism infrastructure. Furthermore, the rate of the tax is set by the municipal or community council within the limits of a tax schedule which has not been reassessed since 2002.

For this reason, the working group recommends:

- that the tax schedule should be reassessed with regard to that set almost ten years ago;
- a revision of the mode of institution of a tourist tax for initiatives in favour of the protection and management of natural areas for the purposes of tourism, making It mandatory (article L. 2333-26 of the French General Code of Local and Regional Authorities);
- that the allocation of proceeds from the tourist tax to natural areas should be increased, which only appears to be immediately possible through increased awareness on the part of regional authorities of the connection between a rich natural heritage and attractiveness for tourism;
- that reflection should be undertaken with regard to the possibilities for making tourist taxes more internalisation and incentive-based;

[1] Organic carbon content was selected in the list of indicators debated in the consultations for the 2011-2020 National Strategy for Biodiversity (SNB) under “proportion of cantons in Metropolitan France where the organic carbon content (proper assessment of organic matter content) of the upper layer of agricultural soils is increasing”.

- that spatial and temporal adjustment of tourist taxes should be undertaken or tested. Indeed, the tourist trade is more prominent in certain environments whose biodiversity is fragile during certain periods (reproduction). An adjustment enabling higher levels at these places and times would not therefore be illogical. Similarly, the concentration of the holiday period within a timescale of 2 or 3 months sometimes leads to excess tourist facilities. A tourist tax that is low or fixed at zero in the low season, and increased in the high season could contribute to a certain staggering of holidays and better management of certain externalities connected with seasonal variations and peaks of activity. However, the difficulties of such an adjustment should not be overlooked. In order to lead to real results, relatively large variations in tax rates and strong elasticity would be required. This would be partly in contradiction with the desire to base tax proceeds upon tourist flows. The staggering of holiday periods is not possible for everyone. Nevertheless, in the face of the recent and future development of mass tourism and the increasing pressure that it exerts upon biodiversity, the working group believes that the use of incentives of this kind will eventually be necessary.

46. Development tax

The TDENS departmental tax for sensitive natural areas will be converted into a component of the development tax in 2012. This component will remain optional, at the department's discretion. In practice, virtually all French departments have instituted this tax. Those that have not done so are, for the most part, rural departments (Aube, Haute-Garonne, Haute-Marne, Lozère and Yonne). Since it is an optional tax whose proceeds are allocated and managed by the departments, it does not appear appropriate for the State to impose its being brought into general use. On the other hand, the working group wishes to draw attention to the situation of Paris, both a municipality and a department, which has not instituted this tax. This exception, on the part of the capital city, may be criticised. Admittedly, on the one hand, the volume of buildings authorised in inner Paris is limited in terms of the number of square metres and, on the other hand, its biodiversity is low. However, since the tax is based upon the building cost, a Parisian TDENS could produce non-negligible proceeds. Above all, a major part of the new buildings authorised in Paris correspond to offices, registered offices and shops. By not collecting TDENS on these buildings, Paris reduces their cost. Yet, apart from biodiversity, a constant concern of French territorial planning policy is to encourage the establishment of businesses in the provinces and to discourage it in Paris. The absence of TDENS in Paris contributes to a contrary phenomenon, rendering the building of offices and registered offices in the provinces more expensive in relative terms. The inclusion of the TDENS in the development tax provides an "administrative opportunity" to institute it in the department of the capital city. However, only Paris can of course make this political decision. The non-existence of a TDENS may perhaps have been justified until now both by the special status of Paris and by the small proportion of natural areas. However, on the one hand, Paris' status does not prevent the institution of the tax. On the other hand, it appears possible for the proceeds from the tax to be allocated in several different ways. "Urban Nature" is attracting increasing attention. The successive reforms of the TDENS have widened its potential field of allocation. It would also be possible, as is done in other departments of the Île-de-France regional, to allocate all or part of its proceeds to the Île-de-France Region Agency for Green Spaces (*Agence des espaces verts de la région Île-de-France*), which manages spaces to the advantage of Parisians in priority. Finally, allocation or at least a partial allocation might be considered to the Coastal Protection Agency, which acquires land visited annually by 30 million visitors, including a considerable proportion of Parisians (although this option would probably presuppose a legislative amendment).

47. Create a fund for assistance in the drafting and implementation of PLUs that show greater respect for biodiversity

The working group suggests the creation of a fund for subsidisation of the excess costs inherent in the elaboration and implementation of municipal and inter-municipal local town plans (French acronym: PLUs), when the latter meet criteria involving sustainable development, the fight against urban sprawl and the quest for optimal use of space.

Chapter 1

Definitions, methods and limits

In accordance with articles 26 and 48 of the Grenelle 1[1] law and its mission statement, the working group set itself the objective of identifying budgetary, extra-budgetary or fiscal public subsidies, with a negative impact on biodiversity, evaluating them and proposing avenues for reform.

This chapter is intended to specify the methodological approach of the working group. It explains the scope adopted to define biodiversity harmful subsidies. It then describes how the group proceeded to list the incentives and make proposals for reform. Lastly, it sets out to demonstrate the complexity of the relationships between a public incentive and the state of biodiversity.

1 • Definitions

The concept of biodiversity harmful to subsidies may have various meanings. The approach chosen here is intended to be educational: it aims to accompany readers, starting with the most common intuition concerning what we call "public incentive" and leading them in three stages towards a more economical and conceptually more complete meaning. The theoretical, then empirical, insights proposed are accompanied by concrete examples, most often taken from the environmental field.

1.1. First definition: a public incentive is a financial transfer from the State or regional authorities to a private agent

At the international level, based on the doctrines of the WTO[2], we can define public incentive as a financial transfer of public origin (State, regional authorities, public institutions, legal entities governed by private law financed by public funds, etc.,) which confers an advantage to the beneficiary.

In France, the legal doctrine uses this first definition, using at least three of the following elements to qualify a public incentive[3]:

- the nature of the financier: public entity (state, regional authorities, public institutions, public-interest groups) or legal entities established under private law related to a

[1] The Grenelle 1 Law stipulates, in its articles, that the government shall "assess, based on an audit, tax measures unfavourable to biodiversity and propose new systems for gradually moving towards taxation better adapted to environmental issues", and more generally "shall present to Parliament an assessment of the environmental impact of public subsidies of a budgetary or fiscal character. These incentives will be gradually reviewed to make sure that they do not encourage harm to the environment".

[2] "Specific subsidies", according to the meaning of the agreement on subsidies and compensatory measures attached to the GATT agreement in Marrakesh in 1994, are defined as "financial contributions, allocated by the public authorities or by any public organisation under the territorial responsibility of a state, which confer a benefit".
They are known as "specific" because only subsidies specifically granted to a company, a production branch or a group of companies or branches are covered by this agreement.

[3] Adapted from: *Conseil d'orientation pour l'emploi* (Council on policy for employment) (2006), report to the Prime Minister relative to public subsidies, 186 p.

public entity by an organic link (administrative associations), asset management (public companies, semi-public companies) or functional (public-service management), or European structural funds and international organisations;

- the existence of a beneficiary (to distinguish a subsidy from a general non-targeted political measure);
- the characterisation of the donor/beneficiary relationship: accounting impact of the transfer, selfless (or without equivalent counterpart), direct or indirect benefits.

In accordance with these concepts (international and legal), we may mention that the modernisation audit board[1] qualifies public incentive as "a transfer of wealth from a public financier (or a private financier receiving public funds) to a beneficiary, motivated by a public policy objective and subject to compliance with explicit conditions". The categories of beneficiaries chosen here may be either companies or households or the public entities themselves.

Note that the financial transfer that constitutes public incentive may be either an actual transfer from the public entity to the beneficiary (a subsidy in the usual sense) or a waiver of a reverse transfer from the beneficiary to the public entity (a tax exemption, for example, or a tax expenditure). Furthermore, the direct beneficiary of the aid is not necessarily the final beneficiary, as aid to a producer may ultimately indirectly benefit the consumer.

Such a definition can already cover quite a broad spectrum of arrangements and financial instruments – direct budgetary subsidies, tax exemption, tax credit, tax deduction, accelerated depreciation, purchase prices, support to prices or income, debt discharge or write-off, grant of guarantee, stake in capital, loan at non-market conditions, repayable advance, discount on sale price,… – which we may summarily group in the nomenclature proposed by the European Union (see the following framed section and table). Other classification criteria may be proposed (budgetary / non-budgetary, consumption/production, direct/indirect, etc.)[2].

[1] Mission d'audit de modernisation (Modernisation audit board) IGF-IGAS-IGA (2007), *Rapport sur les aides publiques aux entreprises* (Report on public subsidies to companies).
[2] See, for example, UNEP (2008) or IEEP et al. (2007).

The nomenclature of the European Union relative to State incentives (public incentive)

Categories	Budgetary incentive	Tax
Group A: Aid fully transferred to the beneficiary	Subsidy Allowance Interest subsidy obtained directly by the beneficiary Public order	Tax credit Tax deduction, exemptions, Reduction in social-security contributions Measures equivalent to a subsidy Reduced rate Tax relief
Group B: Equity investment	Equity investment in all its forms (including debt conversion)	
Group C: Interest saved by the beneficiary during the provision of transferred capital	Reduced-interest loan, Equity loan, Repayable advance	Tax deferral
Group D: Guarantees	Guarantees: amount covered by guarantee schemes; resulting losses, allowance deductions	

Source: adapted from the European Commission[1]

Some examples of public subsidies

Direct subsidy: the example of agriculture and fishing

Most direct incentives to farmers are organised under the Common Agricultural Policy. The price-support instruments originally put in place have been gradually replaced by an increase in direct incentives to farmers. These aids are of different types: firstly, the single payment entitlement (main aid in terms of amount paid, independent of the production activity), aid related to products (allowance for the maintenance of a herd of dairy cattle, sheep compensation allowance, etc.,) or aid in favour of rural development (compensation for natural disadvantages, agri-environmental measures, etc.). Likewise, as part of the fisheries policy, there are aids to fleet modernisation, aids to port infrastructure facilities, compensation measures related to geographical disadvantages (insularity) or environmental hazards (death of oysters), etc.

Tax reduction: "Scellier" rental investment

To support rental investment, the "Scellier" scheme, in force since 2009, allows taxpayers to benefit from a 20% tax reduction if they buy a new housing unit and undertake to rent it unfurnished, for use as a principal residence for a minimum period of nine years. Thus, under these conditions, an investment of 300,000 euros would provide total tax reduction of 60,000 euros, namely 6,666 euros per year for nine years.

[1] In particular, see the report from the European Commission on state aid to the manufacturing sector, COM 1998, 18 September 1998. The report also mentions two other types of aid, material and legal aid, which we will not discuss here.

Reduced interest rate: zero + rate loan

Since 1 January 2011, the State has established a “zero +” rate loan to support households that wish to become owners. This instrument merges the previous arrangements of the zero-rate loan, the "Pass foncier" and the tax credit on loan interest. The zero + rate loan is a loan for which the interest is paid by the State, without any administration fee, for the purchase of a first main residence (reserved for persons who have not been owners of their main residence for at least two years). The cost of the public aid associated with this arrangement corresponds to the updated value of the differences between the monthly payments for a zero-rate loan and the monthly payments that would have been due under a normal loan.

Accelerated depreciation

To encourage the development of a business sector or the renewal of production facilities, public aid may consist of allowing accelerated depreciation of productive investment. In doing so, the costs are reduced over the first years of the investment cycle, years during which the financial position of the new business is potentially fragile or the return on investment still uncertain. In correlation, the taxable basis for corporate tax is reduced by the same amount, which negatively affects the income from this tax during the current year. This arrangement was, for example, put in place in Canada to benefit companies undertaking the exploitation of tar sands in Alberta. In France, such an arrangement existed until 2011 for equipment intended to save energy and equipment for producing renewable energy purchased by companies, and for equipment intended to purify industrial water or reduce atmospheric pollution: this equipment could benefit from exceptional depreciation over twelve months from its commissioning.

Mileage scale for travel expenses deductible from taxable income

To make it simpler for taxpayers deducting professional expenses for their real amounts, each year, the tax administration publishes a mileage scale that uses the mileage travelled for professional reasons and the fiscal rating of the vehicle used to easily assess the professional travel expenses made, as well as a flat-rate scale for fuel expenses to determine the fuel expenses that can be deducted. These scales are highly favourable to the owners of vehicles of high fiscal ratings, which consume relatively more fuel and therefore emit more greenhouse gases or other atmospheric pollutants. As an example, for the same distance travelled of 40 km per day, a person using a low-pollution vehicle (3 HP) is reimbursed 2,671 euros per year in application of the mileage scale. This reimbursement stands at 4,028 euros if the vehicle used is situated at the threshold for triggering the penalty and at 4,823 euros in the case of a highly polluting vehicle (16 HP). The "excess cost" of the travel caused by using high-fuel-consumption vehicles is thus financed by the public, although these vehicles are acquired and used partly for personal preference.

Furthermore, these journeys, due to the additional CO^2 emissions that they cause (compared to lower-pollution vehicles for the same distance), are sources of additional social costs, which the public has even less reason to finance.

1.2. Second definition: a public aid is a government action likely to provide benefit in terms of income or cost

This definition does not exclusively refer to financial transfers. It is used in particular by the OECD, where subsidies are defined as the “result of a government action that confers an advantage on consumers or producers, in order to supplement their income or lower their costs”provides an advantage to consumers or producers, with the aim of increasing their income or reducing their costs" and do not necessarily come only from the public authorities.

Thus, production quotas may constitute a subsidy, in cases where demand is high. This is because the price of quotas increases because supply is limited by the number of quotas,

which improves the profitability of production. The transfer no longer comes from the public authority, but is from consumers to producers.

Price-support measures for producers are another form of such transfers. Thus, purchase prices for electricity produced from photovoltaic panels involve a transfer from consumers to producers: consumers pay for the production of solar energy through a deduction from their electricity bills via the contribution for the public electricity service.

But in these two examples, it is indeed a public policy that is at the origin of this benefit or support to a category.

Lastly, we may consider that the non-application (or partial application) of the regulations (particularly European) by the State, due to the costs that this avoids (standards compliance investments, for example), constitutes a de facto benefit to the players who escape paying them.

Speaking of “benefits” conferred by government action necessarily implies a reference in relation to which the benefit is defined. The reference may relate to a national or international framework. At the international level, in the debate on fossil-fuel subsidies, for example, the G20 proposed using the price of oil on world markets as a reference price. At the national level, in the case of tax expenditures, the definition is based on general principles of French tax law and their dispensation character. As we see, the reference implies a normative position on which there is no general consensus.

1.3. Third definition: an economically, public aid is defined as the difference between the price observed and the marginal social cost of production, meaning the cost that includes harm to society

The economic analysis proposes another perspective, introducing the concept of efficiency. The current discussion on tax loopholes is, in a certain way, based on this concept: in the current context of a massive deficit in the public accounts, the government is examining tax expenditures to re-examine those which prove to be of low efficiency.

In the United States, a recent debate on tax expenditures thus tried to clarify the possible meanings: tax reductions and other reductions, defined differently to the usual general case, and structural distortions caused by taxation. Indeed, in certain cases, we cannot simply define the usual general case, for example in savings taxation. Differentiated taxation of savings must thus more naturally be seen with regard to the distortions caused in capital allocation compared to a situation without differentiation.

In an "optimal" economy (perfect and complete markets, possible to transfer resources without cost), the price of an asset corresponds to its marginal production cost. We thus identify a subsidy (preferred term for public aid in the economic literature, but synonymous here) to consumers when the price is below this marginal production cost, and a subsidy to producers when the price is greater. In this context, a subsidy may be defined as a government action that moves the market price away from this "optimal" price and it may be quantified as the difference between this "subsidised" price and this optimal price.

We are rarely in this optimal economic world due to numerous market imperfections (externalities, firms in monopoly or oligopoly situations, asymmetric information, etc.). In this imperfect world, the price seen in the market does not internalise the cost of environmental damages for society and for biodiversity: this price is no longer optimal and it may be legitimate for the state to intervene through taxes or transfers to correct the aforementioned market imperfections (typically, by taxing negative externalities). The

"optimal" price is therefore equal to the marginal social cost of production, representing the marginal production cost increased by the optimal internalising tax. A parallel set of arguments may be used to establish that neither does the market price include the value of services provided by biodiversity (ideally, in this case, the producers of positive externalities in biodiversity should be paid for the services thus provided).

From a strict economic point of view, qualifying and quantifying an inefficient subsidy (as distinct from a subsidy that is justified by economic theory) would therefore require being able to take a position in relation to this optimal price, including optimal taxation and transfers.

It should nevertheless be noted that, in certain cases, even a subsidy considered efficient from an economic point of view may be harmful from the point of view of biodiversity. This would be the case, for example, of a subsidy causing negative externalities for biodiversity, compensated by positive externalities in social or economic matters. There may even be subsidies that are harmful to biodiversity but efficient, not only from the point of view of economic theory, but also from the overall environmental point of view if damages to biodiversity are compensated by positive externalities in other environmental areas (certain rail investments, for example).

These considerations therefore firstly invite a broader definition of the previous definition of aid to take into account "implicit subsidies" resulting from failures to internalise externalities in the taxation system in force (or the absence of ownership rights in the case of fishery or forestry resources, for example), in accordance with the recommendations of the latest TEEB[1] report.

This acceptance, which seems the most legitimate, leads to very practical and useful consequences, which we can illustrate through tax expenditures concerning the consumption of fossil fuels, which are therefore tax expenditures potentially harmful for the climate. Thus, concerning the internal consumption tax on fossil fuels, the simplest approach, as explained in points 1 and 2 above, would consist of identifying all tax expenditures as a harmful subsidy and assessing the amounts of these subsidies as the difference between the reduced rate granted and the standard tax rate, multiplied by the quantity consumed at the reduced rate[2]. This approach nevertheless poses several problems.

Firstly, within the same national tax system, for example, we would qualify a reduced tax rate on diesel consumption as a harmful subsidy, without, at the same time, identifying subsidies to the consumption of heating oil or coal in the case of low standard taxation for these sources of energy, even though the environmental damage is significantly higher in terms of CO^2 emissions caused (see the framed section below).What is worse, this method does not allow sound international comparisons.

A reduced rate could thus be qualified as a subsidy to fossil fuels in country A having a high standard rate of energy taxes, even though in country B, the standard tax at a rate lower than the reduced rate granted by country A would not present any subsidy to fossil fuels. Implicitly, it is therefore the question of the optimal tax rate which is raised, and the associated marginal social harm, which is the only relevant reference from the economic point of view for identifying and quantifying the distortion caused by the subsidy. The economic approach in terms of marginal social cost can therefore avoid the pitfalls of using the other approaches, as long as these economic quantities can be calculated.

[1] TEEB (2009), The Economics of Ecosystems and Biodiversity for Policy Makers, third report, 48 p.
[2] In fact, this method is used for estimating the tax expenditures presented in Voies et Moyens, tome 2, attached to the annual finance bill.

Tax expenditures, harmful subsidies and externalities in matters of the Domestic Consumption Tax (DCT)

The domestic consumption tax on oil products (DCT) is the main tax on oil products (petrol, diesel and fuel oil) used as fuels or for heating. Natural gas is not subject to the DCT but to a similar tax known as the domestic consumption tax on natural gas (DCTNG). Likewise, coal, lignite and coke used as fuel is subject to a domestic consumption tax (DCT).

To simplify, let us assume that a single negative externality caused by the consumption of these energies is emissions of CO_2 (and their consequences for global warming). The current levels of taxation for the CO_2 content of these different fuels is very uneven, going from 264 euros per tonne of CO_2 for high-octane unleaded petrol to less than 6 euros for heating oil, gas or coal[1].

Within the standard analysis of tax expenditures, any exemption or reduction of DCT on diesel fuels (benefiting, for example, taxis and road haulage contractors) could be considered as a public aid that is harmful in terms of global warming. On the other hand, in this context, the standard tax on gas or coal would not be considered as public aid harmful to the climate, even though the taxation of the CO_2 content of these sources of energy is far below the value the shadow price of €32/t CO_2 adopted in the report by the Quinet commission[2].

Likewise, the reduced rate of DCT applicable to domestic heating oil (instead of the normal diesel taxation rate), which "off road" uses benefit from, indeed constitutes a tax expenditure, but its character as a harmful public aid must be assessed according to external costs (including those other than CO_2 emissions) generated by these uses, which may be less than those generated by road uses in matters of congestion or local pollution, for example.

Secondly, the level of reference to be considered is difficult to assess because externalities are not necessarily taxed with the appropriate instrument and certain arrangements may compensate the under-pricing of other instruments. Typically, in the case of transport, we can simplify things by saying that the external costs of road congestion, local pollution and wear on infrastructure should be priced via adaptable road tolls based on mileage and that the greenhouse effect caused by greenhouse gas emissions should be internalised by a tax on fuel consumption (such as the DCT). This is not generally the case in practice and assessments of road traffic compare external costs and the total income from pricing instruments.

In spite of these difficulties in defining the appropriate reference, we may consider that, for fossil fuels, for which the environmental damage and the associated pricing have been broadly documented, the reference to optimal taxation may be operational. This approach is also common concerning the pricing of infrastructure and traffic, where an assessment of complete costs including environmental damage may be established[3].

Concerning the internalisation of damages to biodiversity, determining an optimal reference price (that would therefore include the price of external costs affecting biodiversity) against

[1] ADEME-MEDDTL (2009), Éléments d'analyse sur la contribution Climat-Énergie (Elements in the analysis of the climate-energy contribution), June, http://temis.documentation.equipement.gouv.fr/documents/Temis/0061/Temis-0061773/17309.pdf.

[2] Centre d'analyse stratégique (2009), *La Valeur tutélaire du carbone* (The shadow price of carbon), report from the commission chaired by Alain Quinet, Paris, La Documentation française, 420 p.

[3] " *La tarification, un instrument économique pour des transports durables* " (Pricing, an economic instrument for sustainable transport), La Revue du CGDD, November 2009, and Handbook on Estimation of External Costs in the Transport Sector, European Commission (2008).

which an inefficient subsidy can be identified and assessed is more difficult: measuring marginal harm/benefits for biodiversity is complex and quantifying it in terms of money (and therefore pricing it) runs up against certain methodological obstacles[1]. It is nevertheless towards this method that we must try to move if, according to the recommendations of TEEB and the OECD, we want to evaluate biodiversity at its true value and encourage the true assessment of costs. Several recent works have proposed values for certain ecosystems or species (TEEB, Handbook on Estimation of External Costs in the Transport Sector, report from the federal office for the regional development of the Swiss Confederation, CAS report 2009[2], etc.), in relation to which it is gradually becoming possible to quantify harm and calculate internalising prices and therefore, possibly, the differences between existing prices and pricing corresponding to internalising the harm. The Centre d'Analyse Stratégique, in several reports, has distributed a large number of "shadow prices" which act as quantified guides for determining environmental costs/benefits in terms of money. The Chevassus-au-Louis report thus proposed an approximation[3] of the monetary value of ecosystem services provided by temperate French forests estimated at €970/ha/year, and about 600 euros/ha/year for services provided by permanent meadows.

2 • Methodological elements

This part shows how we can, in an operational manner, move towards the best solution, which consists of gauging public subsidies in relation to the internalisation of positive/negative externalities for biodiversity by economic agents (third definition). After having explained the main methodological frameworks existing at the international level, we present the methodology adapted by the working group, stressing the points of attachment with the previous frameworks.

2.1. Pre-existing methodological frameworks

Other than the recommendations made in international texts, part of the literature from international organisations proposes methodologies to reform biodiversity harmful subsidies. The methodologies recommended by the OECD, the European Commission and the TEEB have been adopted.

The methodological framework of the OECD

In order to help governments identify and, if appropriate, modify or abolish environmentally harmful subsidies, the OECD has developed three qualitative analysis models since the end of the 1990s. The first, called "quick scan", which dates from 1998, can highlight the absence of a direct and automatic link between the financial amount of the subsidy and the extent of impact on the environment[4]. While theoretically seductive, this model nevertheless remains difficult to use because quantifying the impact associated with each link is very often difficult or impossible due to lack of data.

[1] This point is examined in depth in chapter 5 of the report from the Centre d'analyse stratégique (2009), *Approche économique de la biodiversité et des services liés aux écosystèmes* (2009), report from the working group chaired by Bernard Chevassus-au-Louis, Paris, La Documentation française, 400 p.
[2] Centre d'analyse stratégique (2009), *La Valeur tutélaire du carbone*, op. cit.
[3] With concern for methodological prudence, these approximations are minimum value because not all of the components of value in these two environments were able to be evaluated.
[4] OECD (1998), Improving the Environment Through Reducing Subsidies, OECD, Paris.

Then, in 2005[1], the OECD developed the "checklist" method, which is simpler and more practical. It lets governments determine whether abolishing a subsidy will have positive effects on the environment, given the economic, social and environmental context. It is nevertheless limited in that it does not examine the social consequences that the abolition of certain subsidies may have.

In order to deal with this shortcoming, in 2007[2] the OECD developed a final integrated model (the "integrated assessment framework") which broadens the analysis from a sustainable development perspective, taking into account in particular the necessary choices to be made between the environmental dimensions and the economic and social dimensions.

The methodological framework of the TEEB

The TEEB report of 2009 intended for political decision-makers[3] notes that it is important not to limit tax reform to identifying and abolishing measures harmful to the environment. It advises focusing reform on subsidies that do not, or no longer, reach their objectives, or at least those which are not the most suitable. The study must therefore be carried out in terms of what is appropriate for public spending.

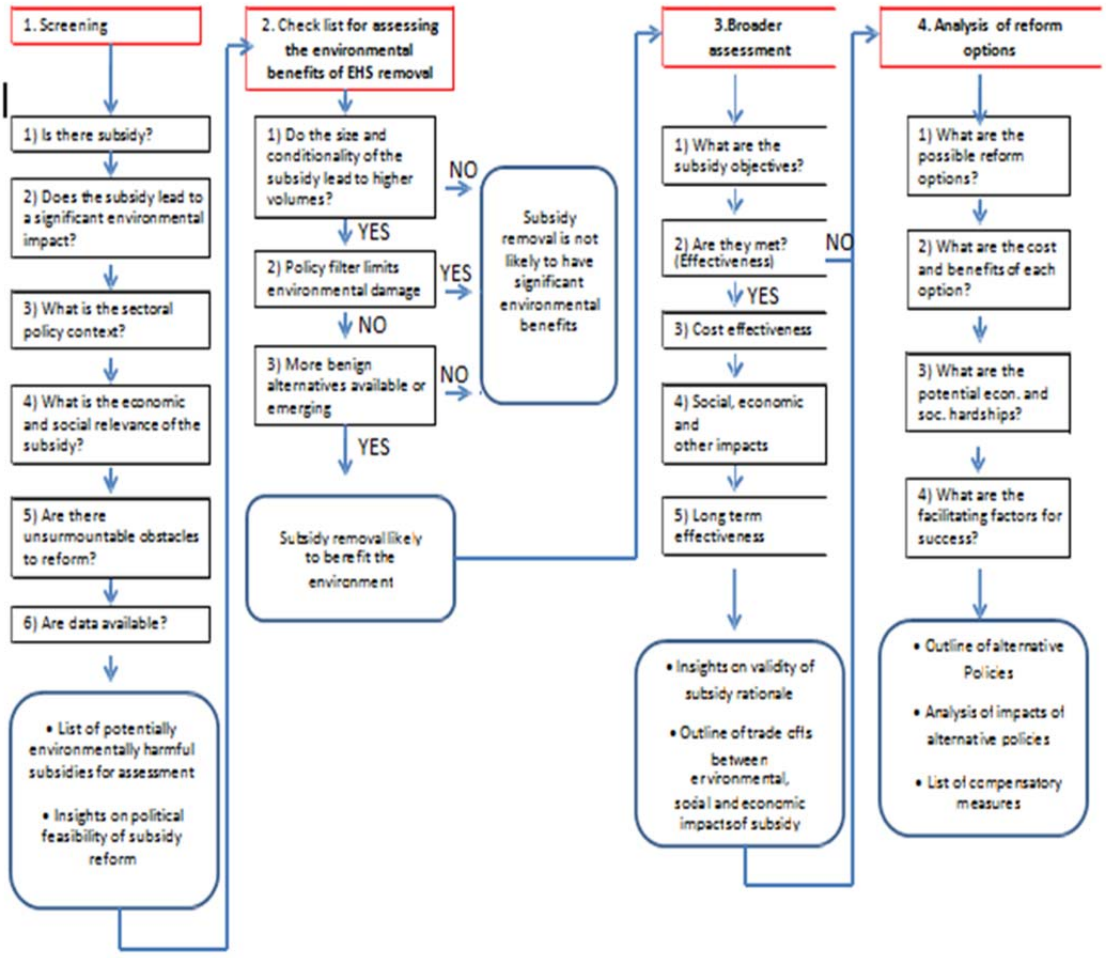
The TEEB report considers that public subsidies to the fishing, then agriculture, then water sectors should be reformed first, and lastly those of transport and energy. For this, it recommends establishing plans for reforming or abolishing subsidies by 2020. The funds thus released could be used in the same sectors, but for biodiversity conservation and the commercial development of services provided by the ecosystems.

The methodological framework of the European Commission

In 2009[4], the European commission tried to make the OECD's methods more operational by preparing a new analysis table summarising the lessons of the three models described above, a new table which remains nevertheless very complicated to use (see the following figure). It also recommends that the Member States prepare "identity sheets" for subsidies that are harmful to biodiversity, a key stage in any attempt to modify or abolish them.

[1] OECD (2005), Environmentally Harmful Subsidies: Challenges for reform, OECD, Paris.
[2] OECD (2007), Subsidy Reform and Sustainable Development: Political economy aspects, OECD, Paris.
[3] TEEB (2009), The Economics of Ecosystems and Biodiversity for National and International Policy Makers – Summary: Responding to the value of Nature.
[4] IEEP (2009), Environmentally Harmful Subsidies (EHS): Identification and assessment, Study contract 07.0307/2008/514349/ETU/G, 190 p.

Analysis Table



Source: IEEP, 2009

2.2. Choice of a simplified method stressing the causality relations between public subsidies and biodiversity

The methodology chosen by the working group is mainly inspired by the report from the European commission. It includes three main stages.

1) Inventory of potential biodiversity harmful subsidies

(equivalent to stage 1 "Screening": Is there subsidy?)

The inventory consists of listing the public subsidies that do not, or do not sufficiently, lead to internalisation by the economic agents of the costs/benefits to biodiversity (third definition). The scope chosen is therefore not limited to subsidies and tax expenditures, but is broadened to include non-internalising taxes, price and income support policies, etc.

The aids are identified from the budgetary appendix to the budget bill for 2010[1]. This appendix is broken down per mission and summarises the credits and expenditures required for 2010. When necessary, this appendix was supplemented by the general tax code, the customs code and other budgetary documents.

2) Demonstration of the cause/effect link between public aid and the state of biodiversity

(inspired by stage 1 "Screening": Does the subsidy lead to a significant environmental impact? and stage 2 "Check list for assessing the environmental benefits of EHS removal": Policy filter limits environmental damage)

It has been established that the aids listed in 1) are potentially harmful to biodiversity when they directly or indirectly influence at least one of the major causes of loss of biodiversity: the destruction/deterioration of habitats, the over-exploitation of natural resources, the pollution of environments, the dissemination of invasive aline species and climate change (see chapter 2).

The layout of the report by major cause of the loss of biodiversity was also chosen to make the link between an aid and biodiversity explicit for readers. This type of layout also has the advantage of determining a quantification relative to the impact of aids coming from different sectors on biodiversity. Indeed, certain aids are minimal in terms of financing, but their reform may be crucial for safeguarding biodiversity when they act on sensitive areas. Focusing on the major causes allows examination of how the various tax measures in question act and also to try to address their price elasticity.

3) Reconfiguration of public subsidies identified as harmful to biodiversity

To reconfigure a public aid identified as harmful to biodiversity, the process consists of trying to move towards the optimal level of prices that internalise all of the negative externalities affecting biodiversity. The monetary values of the externalities mentioned in the literature may be used for this purpose (amongst others, the work of the Centre d'Analyse Stratégique giving shadow prices, particularly the Chevassus-au-Louis report, the Handbook on Estimation of External Costs in the Transport Sector, the Swiss work on the heavy-goods vehicle charge related to services, the studies by SETRA, etc.). Where appropriate, the use

[1] Budgetary appendix to the finance bill specified by article 51-5 of the organic law dated 1 August 2001 relative to the Finance Acts (LOLF).

of the standard and the regulations may be envisaged if it seems difficult or impractical to determine an internalising price.

3 • Attempt to characterise a causality link between public incentives and biodiversity

To define the harmful character of an aid in terms of biodiversity, the link between cause and effect between this aid and the pressure or pressures that it causes on biodiversity via the behaviour of the agents that it favours[1] must be analysed. In particular, there is not always an unequivocal link between the amount of public aid (however it is quantified) and the extent of its negative effects on biodiversity. A harmful public aid of a high amount that affects a poor natural environment of a very common type may be less negative than a subsidy of a low amount affecting a rare or threatened ecosystem. Furthermore, to assess its harmful character, an examination must be made of the connection between the public aid in question and other regulatory or economic mechanisms dedicated specifically to limiting the negative environmental effects that it causes (for example, the implementation of corrective actions taken in application of the avoid/reduce/compensate principle, for programmes or projects subject to impact studies).

This section presents the methodology adopted by the working group for characterising the impact of a public aid on biodiversity. The intention was to define a methodology that could be generalised as much as possible and which was also operational.

The general framework used is the Driver-Pressure-State-Impact-Reponse (DPSIR) from the OECD, which is summarised in the following paragraphs (3.1.). It consists of describing, if possible quantitatively, the cause/effect relationships between indicators of pressure and impact. This section then offers several examples of indicators (3.2.), then tries to provide a "system" view of all of the indicators (3.3.). See blue highlight 2 pages below

3.1. A general analysis framework based on the DPSIR model

The link between cause and effect depends primarily on the extent of changes to the behaviour of economic agents following a price variation (caused by the aid) and secondly, the extent of the impact of this behaviour on biodiversity. In technical terms, the key parameters are therefore the price-elasticity of production/consumption behaviour and the abilities of the ecosystems concerned to respond, these being according to their characteristics (resilience, rarity and biological abundance).

To clarify and attempt to quantify these cause/effect mechanisms, we can refer to the Driver-Pressure-State-Impact-Reponse methodological framework developed by the OECD in 1993[2] (in the form of Pressure-State-Reponse) and then used by the European environmental agency to establish its environmental indicators. The DPSIR proposes completing five types of indicators[3]:

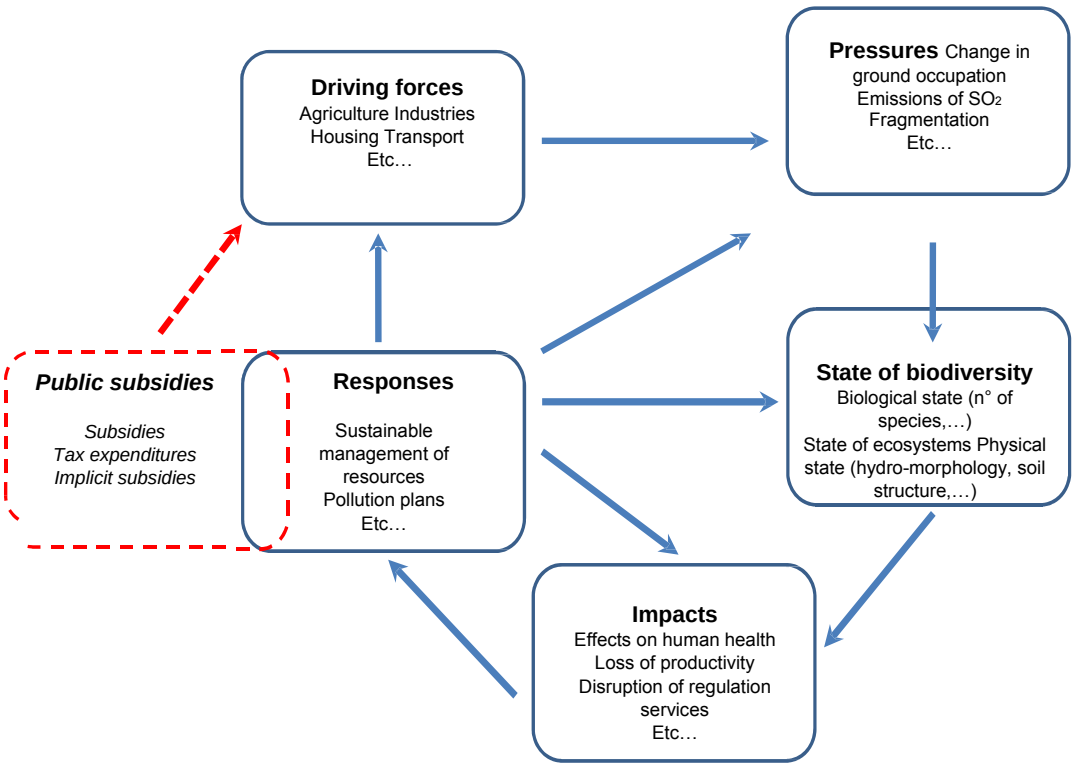
- indicators of driving force (or indicators of pressure factors): they describe the social, demographic and economic developments of society, and changes to way of life, levels of consumption and production. We can distinguish the primary driving forces

[1] Or, at the same time, the benefit in terms of biodiversity that the community would receive from eliminating this harmful public aid.
[2] OECD (1993), OECD Core set of Indicators for Environmental Performance Reviews: A synthesis report by the Group on the State of the Environment. Environment Monographs, n° 83, 39 p.
[3] Smet E. and Weterings R. (1999), Environmental indicators: Typology and overview, Technical Report for the European Environment Agency, n° 25, 19 p.

that will cause a chain of consequences for consumption and production, such as, for example, demographic growth or the development of new requirements. These are therefore the variations in consumption and production that will exert a pressure on biodiversity;

- indicators of pressure: they measure the pressures that directly affect biodiversity coming from the anthropic system (for example, emission of pollutants);
- state indicators: they measure the conditions of the state of biodiversity;
- impact indicators: they measure the effects of changing the state of biodiversity on anthropic activities and processes;
- response indicators: they assess the actions for preserving biodiversity in response to a variation in one or more impact indicators.

The following figure illustrates the cause and effect relationships between these indicators.



Public subsidies act, all other things being equal, on the level of driving force indicators. For example, the driving force indicators for the fishing activity are, in particular, amplified by aids to investment (fleet modernisation subsidy), which reduce the costs of renewing the fleet and encourage growth in the capacity of the fleet, or, by tax exemptions on fuels that significantly reduces the cost of high-fuel-consumption techniques (such as trawling) and consequently encourage this type of practice in relation to others that use less fuel.

To analyse the causal link between public subsidies and the state of biodiversity, the levels of the driving force, pressure and state indicators are sufficient. It may nevertheless be advantageous to look at the response indicators, to observe (and, if possible, measure) the results of certain actions in favour of biodiversity.

Also, it is just as important to provide data to the indicators as to examine the interactions that exist between them (symbolised by the arrows in the context of DPSIR). To do this, a pragmatic solution consists of:

- providing data to the three categories of indicators (driving forces, pressures and state) as well as possible from a quantitative point of view or, failing this, qualitatively;
- completing the causal links between the driving force indicators and the pressure indicators, and the pressure and "state of biodiversity" indicators. If data is lacking, these relationships may be characterised qualitatively from scientific opinions and appraisal reports.

To simplify matters, only the driving forces that directly influence the level of pressure indicators are explained here. The direct and indirect driving forces are nevertheless properly considered in the rest of the report.

Generally, data must be provided to the indicators at the finest regional level possible, to properly take into account the different response capacities of ecosystems.

The two following sections present the general approach adopted by the working group to check the existence of a causal link between a public aid and the state of biodiversity. Indicators are first proposed as examples in 3.2, then the method in 3.3.

3.2. Examples of indicators

In order to illustrate this approach more tangibly, several indicators of driving force, pressure, state of biodiversity and response are suggested here. They were chosen by the working group so as to best represent some of the types of driving forces, pressure, state and response. As far as possible, the indicators were selected according to whether or not an operational database exists.

The driving force indicators

These indicators must reflect the level of intensity of anthropic activity. They may be expressed, for example, in tonnes of manufactured product, by value added, or by number of persons using a service. The following table gives several examples of indicators. Some are used in this study.

Types of driving force	Examples of indicators of driving force (or of pressure factors)	Name of the existing database
Road transport	UVP* expressed by day or by hour. This indicator takes into account the greatest impact of certain vehicles, particularly heavy goods vehicles	
	Number of km of roads built per year	
Fishing	Relative size of the fishing fleet per "business line"[1]	SIH-Usages* (Ifremer)
Agriculture	Ratio (UTA/ha)*	Agreste (EAA)
	Ratio (production value/m^3 of water)	Water agencies Agreste (RICA)
	Agri-environmental indicators broken down into three topics: • use of inputs (farms with high, medium and low consumption of inputs in hectares) • use of land (SAU*, STH*, arable land, permanent crops in hectares) • management of farms (training level of farmers, equipment for storing stock breeding effluent) These indicators can take into account the diversity of agricultural practices	Eurostat, RICA
Recreational activities	Number of visitors per year or number of people practising (example with recreational fishing)	Departmental tourism committee SIH-Usages* for recreational fishing
	Turnover	INSEE
	Hectares allocated to recreational activities	Agreste (Teruti-Lucas)
Housing	Share of new buildings in built surfaces or Share of the surface developed per habitable square metre	
	Density	
	Number of new houses per hectare	

(*) UVP: private vehicle unit; UTA: agricultural unit of work; SIH: fisheries information system; SAU: usable agricultural surface area; STH: surface area still under grass.

Data must be fed to the driving force indicators at the finest regional configuration possible, to be able to observe any superimposition between a zone of sensitive biodiversity and a driving force that could generate pressure harmful to biodiversity.

[1] The "business line" is a way of describing the fishing activity. It is based on the machinery used and the species targeted. The business lines that seem to have a particularly negative impact on biodiversity are those associated with the use of bottom trawls and drag nets for protected habitats; those associated with bottom nets, long lines and bottom trawls for protected species.

The pressure indicators

The four following tables present indicators by main types of pressure on biodiversity, namely: deterioration/destruction of habitat; over-exploitation of renewable natural resources; pollution (including greenhouse gas emissions); the introduction of invasive alien species.

The indicators are, as far as possible, related to the tonne of manufactured product, the point of GDP or added value or to individual persons (consumers or producers). For example, to measure the pressure exerted by road transport in terms of pollution, a good indicator is the quantity of NOx emitted per private vehicle (UVP) and per year.

These ratios must nevertheless be constructed with care so as not to introduce bias during interpretation. This is because a ratio such as the quantity of inputs related to the tonne of product produced in agriculture will favour intensive high-yield production systems. In this case, it is more appropriate to relate the use of inputs to labour (unit of human work, UTH).

Examples of indicators for characterising the deterioration and destruction of habitats

Types of pressure	Examples of pressure indicators (or determinants of the state of biodiversity)	Name of the existing database
Fragmentation	Effective rate of coverage	
	Permeability of the infrastructure (width, fence, traffic density) Density of the road network compared to the surface area or population or: Number of zones of + than X 000 ha not traversed by impenetrable infrastructure (more than X vehicles per day)	
	Fragmentation of natural areas	SOeS*
Development	Surface area developed annually	Corine Land Cover (SOeS) Teruti-Lucas (Agreste)
	Share of the SAU* developed annually	Teruti-Lucas (Agreste)
	Share of surface areas developed within the whole of the territory	Corine Land Cover (SOeS) Teruti-Lucas (Agreste)
	Length of coastline developed per year	Corine Land Cover (SOeS) Teruti-Lucas (Agreste)
Partial development	Surface areas of marine habitat trawled and/or dragged per year	Ifremer
	Indicators of intensification or abandonment of practices for managing agricultural habitats (agro-ecosystems) and forestry habitats	?
	Effects of the overflow of anthropised zones into natural habitats (environmental pollution, increase in human traffic, induced light pollution,…)	?
	Annual change to the diversity of types of occupation of land that is not very developed at the local level	To be constructed from Corine Land Cover (SOeS) and Teruti-Lucas (Agreste)
	Hectares drained	Agreste
	Irrigable surface area	Agreste

(*) SAU: usable agricultural surface area; SOeS: Statistics and observation service (ministry of sustainable development)

Examples of indicators for characterising the level of over-exploitation of renewable natural resources

Types of pressure	Examples of pressure indicators (or determinants of the state of biodiversity)	Name of the existing database
Fishing	Annual harvesting level per species; Number of marine mammals and protected species accidentally caught; Surface areas trawled annually; marine trophic[1] index per year	SIH*-Ifremer resource, FAO*
Water	Ratio (annual level of abstraction of fresh water per sector/renewable annual fresh water resources)	ONEMA*, French Water agencies, Eurostat
	Water footprint (an international standard ISO 14046 currently being created): shows, per country, the quantity of water necessary to production and consumption	www.footprintnetwork.org/fr/index.php/GFN/
Soils	Annual change in the organic carbon content of the soil	Earth analysis database (BD-AT)
	Annual change to surface areas still under grass	Annual agricultural statistics (Agreste) Corine Land Cover (SOeS)*
Forests	Level of annual harvesting by type of forest	ONF*

(*) SIH: fisheries information system; FAO: Food and Agriculture Organisation of the United Nations; INF: National forestry inventory; ONEMA: National bureau for water and aquatic environments; SOeS: Statistics and observation service (ministry of sustainable development)

Examples of indicators to characterise pollution (emissions of greenhouse gases included)

Types of pressure	Examples of pressure indicators (or determinants of the state of biodiversity)	Name of the existing database
Water	Quantities rejected annually of the main pollutants into water bodies.	
	Annual average concentrations of main pollutants in water bodies	ONEMA*, French Water agencies
	Overall nitrogen balance of farming (contributions-exports)	Chambers of agriculture
Air	Change to the atmospheric emissions of the main pollutants per year	IREP* Citepa database
	Annual average concentrations of main atmospheric pollutions in the ambient air	AASQA*
Soil	Annual concentrations of pollutants in soils	BD-AT (agricultural pollutants) BASOL (polluted sites and soils)
Climatic change	Change in annual emissions of CO_2 and other greenhouse gases	Pégase (SOeS)*

(*) ONEMA: National bureau for water and aquatic environments; IREP: French register of polluting emissions; AASQA: Approved associations for monitoring air quality; SOeS: Statistics and observation service (ministry of sustainable development).

[1] The marine trophic index measures the average trophic level of fish catch landings.

Examples of indicators to characterise invasive species

Types of pressure	Examples of pressure indicators (or determinants of the state of biodiversity)	Name of the existing database
Voluntary introduction for economic purposes	Number of species amongst the "100 of the worst" listed in DAISIE	www.europe-aliens.org
	Hectares under "new" crops (e.g.: elephant grass)	
Voluntary introduction for recreational purposes	Number of new pets	
Voluntary introduction	Intensity of intercontinental commercial trade	
	Intensity of long-distance tourism	

Indicators of the state of biodiversity

According to the Chevassus-au-Louis report (CAS, 2009), indicators of the state of biodiversity must:

- provide a picture, from a necessarily-limited number of easily-observable entities, of a much larger whole that is still largely unknown;
- describe the different levels of organisation of biodiversity (genetic, specific and ecological) based on metrics that are specific to each level and boundless;
- go beyond the inventory of entities to take into account the importance of the interactions between them, whether this is in the short term as a basis for the services of ecosystems or in the long term as a driver of the adaptation of life;
- perceive and measure, at the human scale, any changes to this biodiversity.

The following table presents examples of indicators for this report (most proposed in the national biodiversity strategy, SNB - Stratégie nationale pour la biodiversité).

Criteria for the state of biodiversity	Examples of state indicators	Name of the existing database
Abundance and distribution of selected species	Development of the abundance of common birds	STOC* programme
	River fish index	ONEMA*
	Development of the abundance of marine fish caught	Ifremer
Threatened species	Changes to species on the French red list of the UICN*	UICN*
	Conservation status of species of community interest	
Ordinary biodiversity	Conservation statuts of habitats of community interest	
	Communities specialisation index (abundance of specialist species / abundance of generalist species)	
	Organic carbon content of soil	Earth analysis database (BD-AT)
	Ecological state of fresh water bodies	Water information system (Sandre)
	Ecological state of marine and transition water bodies	Water information system (Sandre)
	Foliar deficit index	European network for monitoring forest damage
	Above ground forest biomass Underground forest biomass	IFN*

(*) STOC: Temporal monitoring of common birds; ONEMA: National bureau for water and aquatic environments; UICN: International union for nature conservation; IFN: National forestry inventory.

For French overseas territories, the SNB proposes appropriate indicators such as abundance and distribution of selected species (STOC programme in French overseas departments and territories, protected birds, marine turtles, whales, vascular plants) the surface area and composition of forest regions, the surface area of wetlands and the surface area of coral reefs.

Response indicators

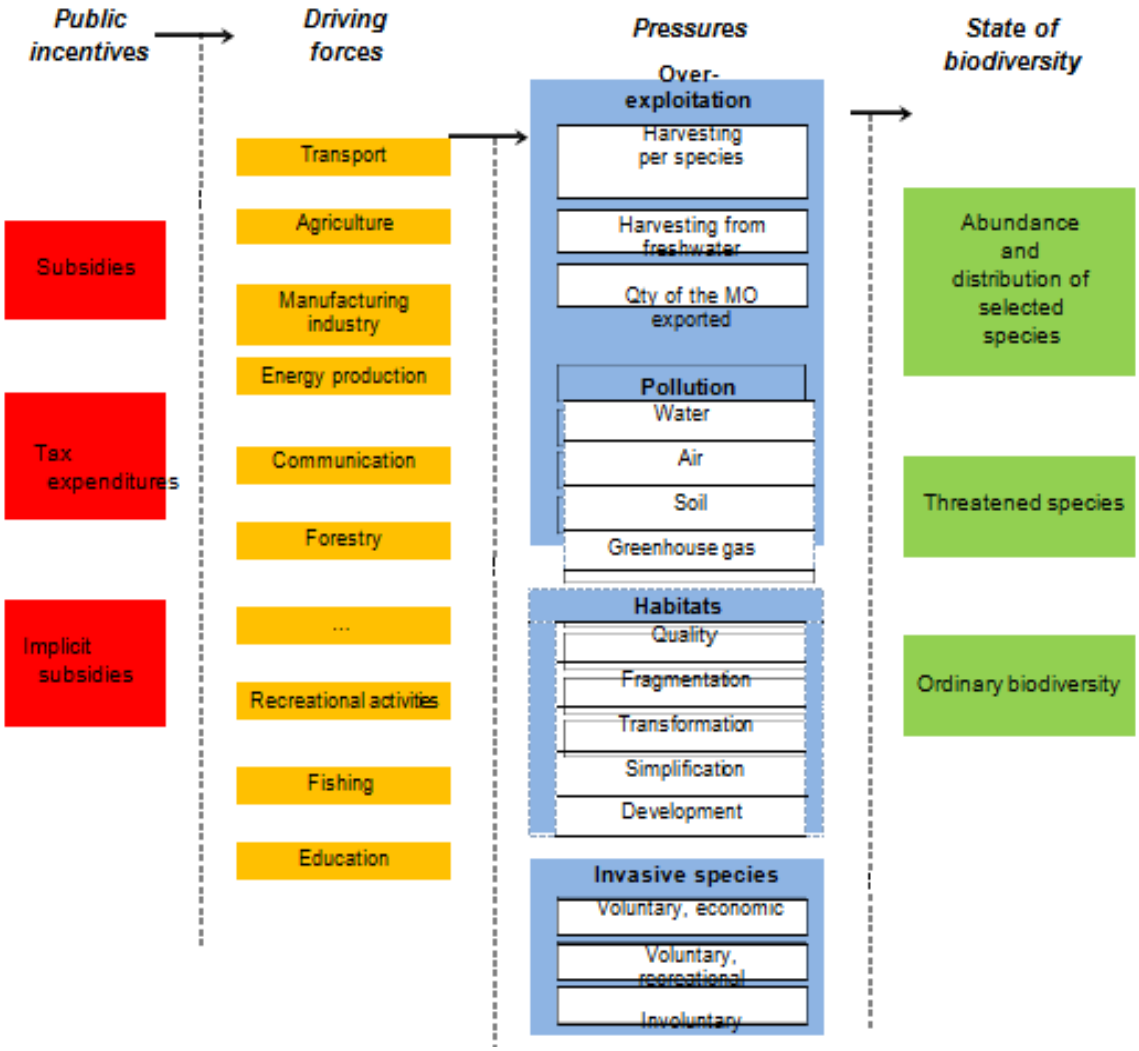
These indicators must describe the responses of individuals (or groups of individuals) and the public authorities for anticipating, compensating or improving the state of biodiversity or for adapting to this new condition. The responses may manifest themselves at the level of the driving forces (reduction in the level of production, for example), and/or the relationship between a driving force and the pressure (use of a de-pollution technology). They may also act directly on the state of biodiversity (restoration of polluted soils, such as by phytoremediation).

The responses applied to driving forces have particularly attracted the attention of the working group, because they make the positive behaviour of certain economic sectors visible. It is difficult to adopt the same approach as previously and isolate the types of responses because they are so diverse and dependent on the sector in question. It is

nevertheless possible to cite several examples of indicators, such as the share of new buildings on land that is already developed, or the density of new buildings[1].

Summary of indicators

The following figure gives an overall view of the "boxes of indicators" for the driving forces, the pressures and the state of biodiversity proposed for this study.



The path between the indicators may be illustrated by the example of the national transport infrastructure plan (SNIT) established by the "Grenelle 1" Law. This measure proposes a list of actions to improve networks and a list of "development projects" relating to new rail, river and road infrastructure. According to the overall assessment of the SNIT's feasibility study (CGDD, 2011)[2], the public share (state and regional authorities) in funding and developing the networks would be greater than 76% for a total of about 170 billion euros.

[1] The British government already uses this type of indicator in its sustainable development strategy; Defra (2009), Sustainable development indicators in your pocket 2009: An update of the UK Government strategy indicators, 163 p.
[2] CGDD (2011), Rapport d'évaluation globale de l'avant-projet consolidé de Schéma national des infrastructures de transport (Overall assessment report of the consolidated feasibility study for the national transport infrastructure plan), Commissioner-General for Sustainable Development, 61 p.

The objective is to be able to observe, all other things being equal, the impact of this system, which is largely financed by the public authorities, on the state of biodiversity via the following indicators for driving force, pressure and state:

- Driving force indicators:
  - number of kilometres of transport infrastructure built per year: will the application of the SNIT increase the length of roads, railways,…?
  - number of private vehicles per day in UVP: will the development of transport infrastructure, following the application of the SNIT, increase the level of road traffic?
  - level of congestion: will the additional infrastructure reduce the level of congestion?
  - number of new buildings per year[1]: will the new infrastructure generate new zones of housing or activity?
- Pressure indicators:
  - permeability of infrastructure: will the development of traffic expressed as numbers of UVP and the changes made to certain infrastructure influence the permeability of infrastructure?
  - average annual concentration of NOx and other atmospheric pollutants in the ambient air: will the level of congestion have an effect on the quality of the ambient air?
  - annual emissions of greenhouse gases and atmospheric pollutants: will the development of traffic change emissions of greenhouse gases and atmospheric pollutants?
  - surface area developed annually: will the roads and new buildings extend the developed area, i.e. urban sprawl?
  - SAU developed annually: will the developed areas substitute for agricultural areas?
- Indicators on the state of biodiversity:
  - change to the abundance of common birds, i.e. STOC index: will the increase in pollution and/or the increase in the developed area reduce the abundance of common birds in the zone in question?
  - conservation status of habitats, if the construction zone is located in a zone of community interest: will the increase in pollution and/or the increase in the developed areas, or the increase in fragmentation, influence the conservation status of habitats?

[1] At the driving force stage, we specify whether or not new buildings will be constructed, then, at the pressure stage, we specify whether the new buildings are in town centres or whether they produce urban sprawl. It is a question of knowing how the SNIT modifies the origins and destinations of journeys, via location of housing, jobs, etc.

- changes to the species on the UICN's French red list: will the permeability of infrastructure or harm to their specific habitats reduce the rates of survival of certain species on the red list?

3.3. A complex system of causality relationships

Theoretically, once the indicators have been identified and completed, the relationships between these indicators must be known in order to measure the validity of any causal links between a public aid and the state of biodiversity.

After having presented the general principle of characterisation of links, this section will try to describe, as synthetically as possible, the system of relationships between the different types of indicators.

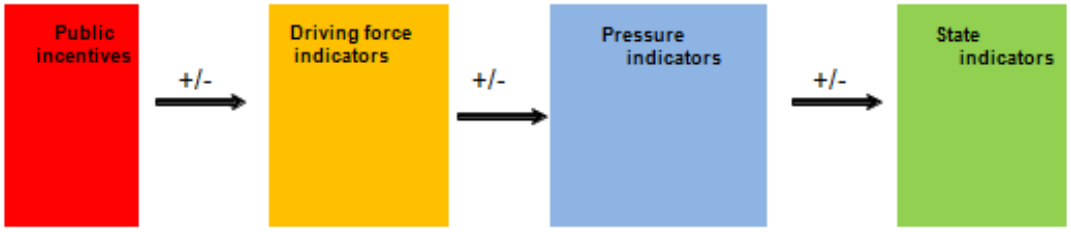
General principle

The aim here is to define a guideline for finding out whether or not there is a link between a public aid and the state of biodiversity from indicators such as those previously proposed.

The links between indicators are simply standardised by a positive or negative sign:

- negative to mean that the upstream indicator reduces the downstream indicator;
- positive to indicate that the upstream indicator increases the downstream indicator.

The following plan illustrates this principle.



All of the difficulty is in the ability to isolate a relationship between two indicators, all other things being equal. This is because changes to an indicator depend on a large number of parameters, some of which may be amongst the indicators selected. These parameters each have their own impact, positive or negative, on the indicator, which needs explaining. Distinguishing a relationship in a system of relationships, as here, is therefore not easy.

Also, according to the availability of information, three cases are possible:

- the relationships have been studied several times and a quantitative relationship (elasticity) can be established. It is then sufficient to observe the level of the upstream indicator to deduce that of the downstream indicators;
- the relationships are known through case studies or according to experts and the direction of the relationship (positive or negative) is the subject of consensus. It is then possible to deduce the changes to the downstream indicators from that of the upstream indicator;

- no data exists and it is therefore impossible to draw any conclusions concerning changes to the indicators.

The approach is therefore limited, in the best case, to characterising the direction of the relationship (increase or reduction). The magnitude of the relationship, i.e. the amplitude of the effect, is very rarely specified as the cause and effect relationships are most often insufficiently documented.

In application of this principle to the aforementioned example of the SNIT, even if the data cannot currently be confirmed, the following relationships may be put forward for the development of natural habitats:

- the implementation of the SNIT should see the number of kilometres of built transport infrastructure increase (relationship between public aid and driving force indicator);
- this new infrastructure could represent between 150 km² and 300 km² of additional developed surface area in total compared to the current situation, as the developments or improvements to existing infrastructure have not been taken into account (DGITM, 2010[1]), as well as the effect caused on urbanisation, which could be significantly greater[2] (relationship between driving force indicator and pressure indicator);
- the Natura 2000 zones could be concerned for 12% of the infrastructure projects (DGITM, 2010) and their conservation status could deteriorate (relationship between pressure indicator and biodiversity state indicators).

… and in the case of climate change:

- the new transport infrastructure should produce an increase in traffic (relationship between public aid and driving force indicator);
- according to the SNIT's feasibility study, the increase in traffic should be compensated by the drop in unit emissions of greenhouse gases due to technical progress, with slight additional progress being due to the specific effect of SNIT. The SNIT finally shows an almost-stable or very slight drop in greenhouse gas emissions by 2025 (environmental authority, 2011[3]). The environmental authority nevertheless has reservations about this assessment, particularly because it does not take into account emissions during the construction-site phase of project implementation[4], because the prediction models used for these assessments do not appear to be valid for assessing the overall effects of a network with overall modification of origins and destinations and because the SNIT's feasibility study forecasts cannot assess whether the capacity for traffic absorption (travellers and freight) by the rail network, after SNIT, is sufficient to allow a much stronger modal transfer in order to more clearly contribute to the objective of a 20% reduction in emissions of greenhouse gases by 2020 (relationship between driving force indicator and pressure indicator);

[1] DGITM (2010), Avant-projet de Schéma national des infrastructures de transport soumis à concertation (Feasibility study from the national transport infrastructure plan subject to consultation), 9 July, 178 p.
[2] The impact caused on residential, industrial or tertiary urbanisation (business zones near network nodes, impact of changes to logistics, etc.), are probably the main source of impact on biodiversity, through the intermediary of development of land and the disruption of habitat. The SNIT does not provide any assessment.
[3] Autorité environnementale (2011), Avis délibéré de l'Autorité environnementale sur l'avant-projet de Schéma national des infrastructures de transport (SNIT) (considered opinion of the environmental authority on the feasibility study by the national transport infrastructure plan (SNIT)), n° Ae: 2010-32, 20 p.
[4] For example, an increase in emissions was highlighted by the carbon-footprint study for the Rhine-Rhône high-speed train line, due to the increase in emissions during the construction-site phase (reference: www.bilan-carbone-lgvrr.fr/).

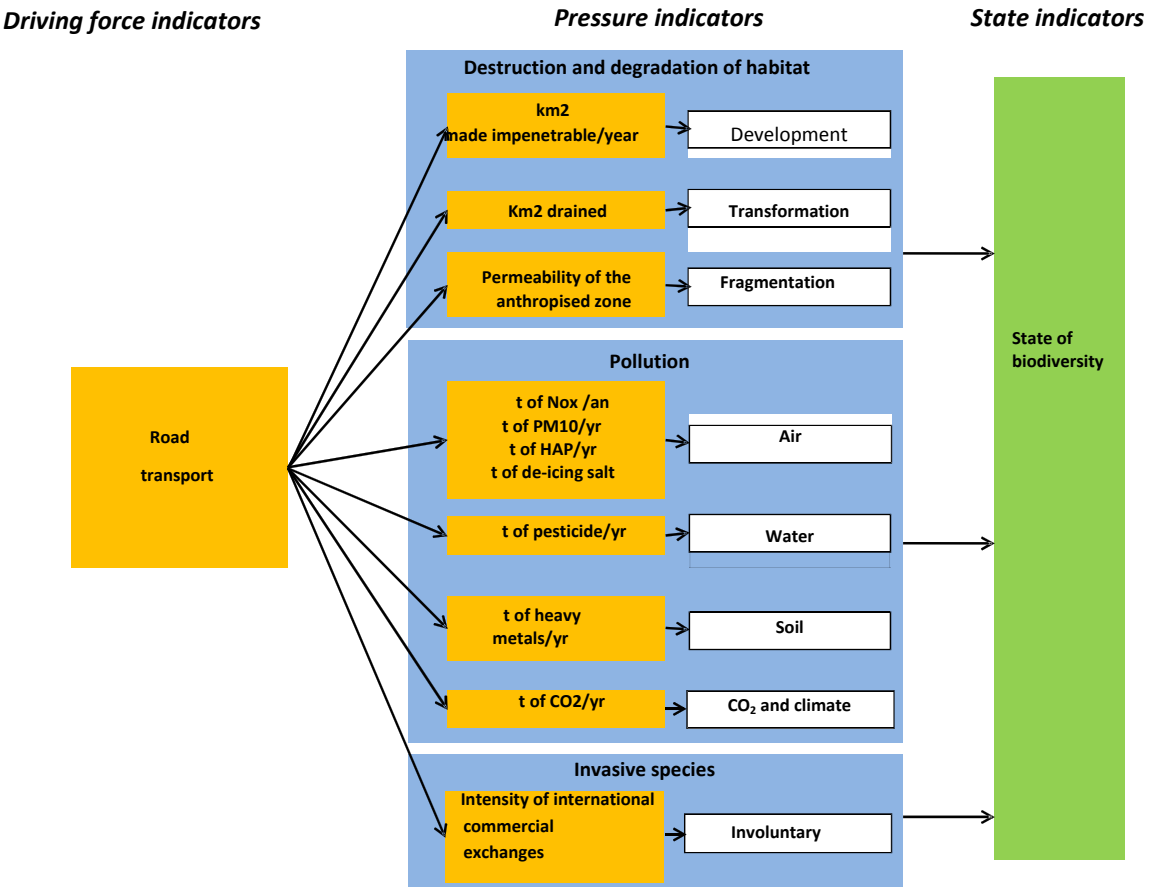
- as the emissions of greenhouse gases are stable over the period, we do not predict any effect on the biodiversity state indicators (relationship between the pressure indicator and the biodiversity state indicators).

The relationships between driving force indicators and pressure indicators

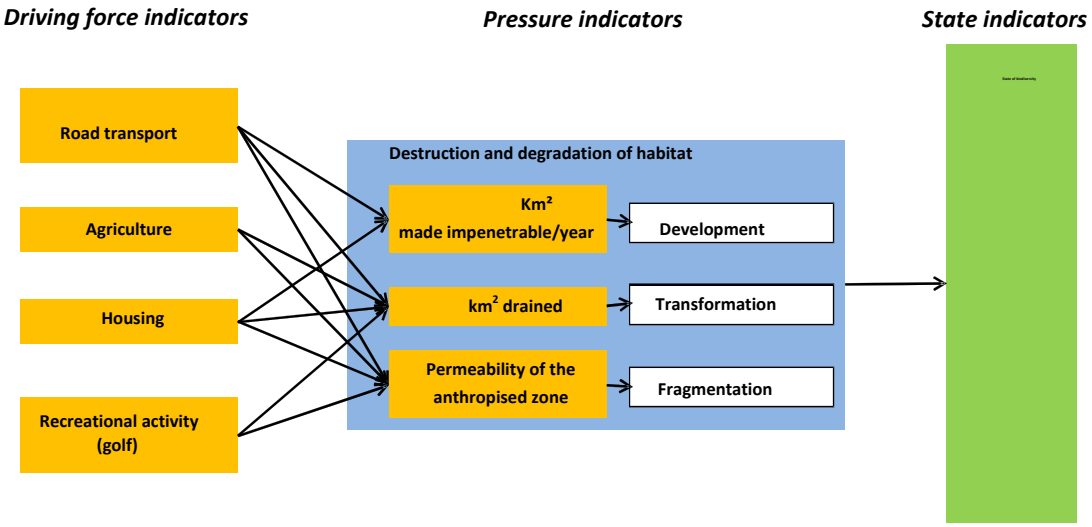
According to Smet and Weterings (1999)[1], the relationship between the level of a driving force and the level of a pressure depends on the ability of the anthropic activity to reduce its effects upon ecosystems and biodiversity. In other words, the more the construction of transport infrastructure takes into account restrictions on the fragmentation of habitats, emission of polluting substances, etc., the less it will increase the level of pressure indicators.

Also, a driving force may influence several pressure indicators (see the figure below in the case of road transport)…

[1] Smet E. and Weterings R. (1999), Environmental indicators: Typology and overview, op. cit.


Driving force indicators
Pressure indicators
State indicators
Road transport
Destruction and degradation of habitat
km2 made impenetrable/year
Development
Km2 drained
Transformation
Permeability of the anthropised zone
Fragmentation
Pollution
t of Nox /an
t of PM10/yr
t of HAP/yr
t of de-icing salt
Air
t of pesticide/yr
Water
t of heavy metals/yr
Soil
t of CO2/yr
CO2 and climate
Invasive species
Intensity of international commercial exchanges
Involuntary
State of biodiversity

… and a pressure indicator may be dependent on several driving forces (see the following figure for the destruction and deterioration of habitats).



Lastly, a driving force may have indirect effects. For example, the construction of a road may lead to the development of new commercial, industrial and recreational activities which will themselves constitute new driving forces.

The relationships between pressure and state indicators

According to the availability of information, the relationship between a pressure indicator and a state indicator may be characterised by one or more of the following criteria:

- possibility of a return to a good state of biodiversity (concept of reversibility);
- shape of the relationship (linear relationship, relationship of the "threshold effect" type, etc.);
- temporality of the relationship (important effects during the construction site phase, for example);
- geographical situation of the relationship (the impacts are highly dependent on the characteristics of the environment).

Pressure may also produce indirect effects. This is the case of the fragmentation into plots of the farms located alongside a new road, which will entail a land regrouping operation. This operation will in turn increase the deterioration of habitats.

Lastly, there are interactions between pressures. This is the case of climate change concerning the development of certain invasive species, or of development on the run-off of stocks of pollutants present on roads. Other interesting examples:

- the transformation of habitats by draining can produce significant effects on the water cycle (the drainage can, in particular, disrupt the supply to the water table and can also accelerate the pollution of rivers);
- invasive species can deteriorate the quality of habitats.

The relationships between public subsidies and driving force indicators

We can distinguish three main types of relationships:

- aid with a non-environmental objective, which encourages the development of an anthropic activity that can in itself increase the level of one or more driving forces or, on the contrary, reduce one or more driving forces (for example, certain types of agriculture, such as mixed farming), or even have a mixed effect;
- aid with an environmental objective, but which does not take biodiversity into account. It may then have a neutral effect on the driving forces or indirectly increase a driving force (example of aids to ground photovoltaic electricity production);
- aid to a biodiversity objective that will encourage virtuous practices. This aid will then reduce the level of driving forces.

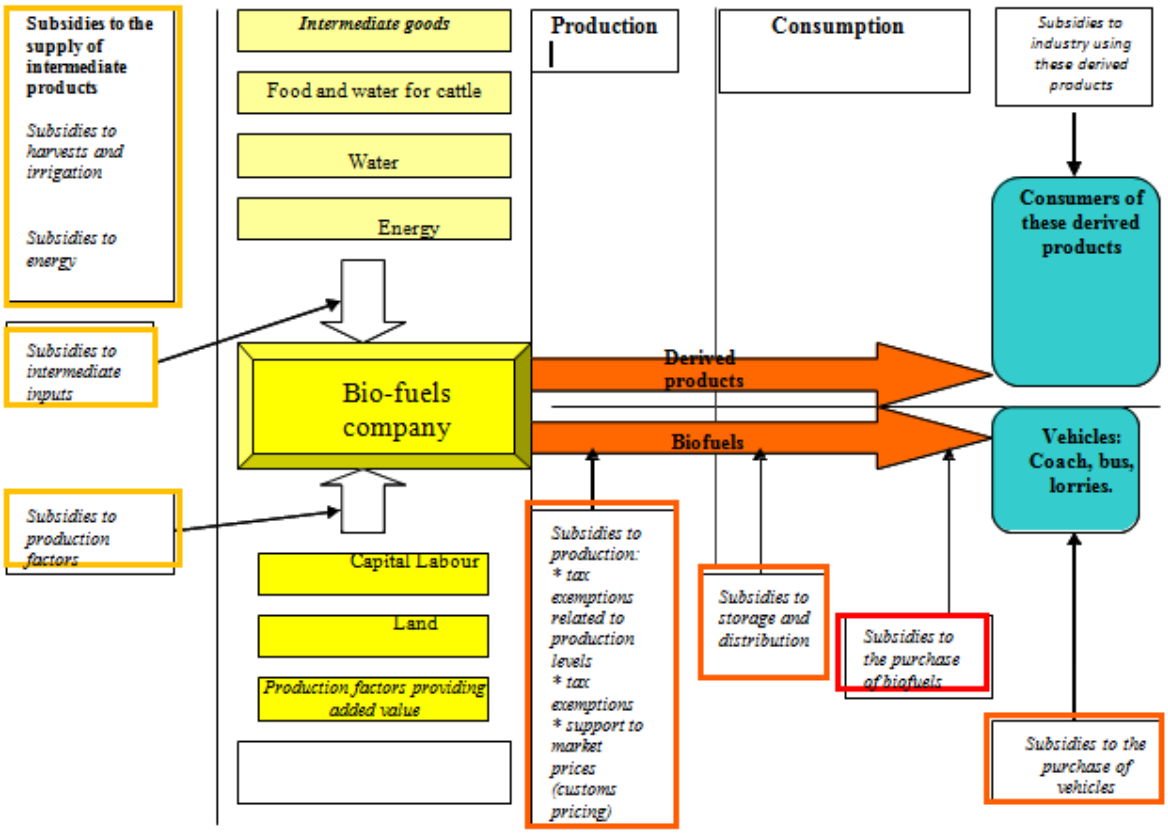
When a public aid acts on several driving forces which, themselves, can influence several pressures and finally the state of biodiversity or, when several aids are implemented simultaneously and act on several driving forces, with each of these relationships able to be positive or negative, the result of all of these impacts on biodiversity is difficult to anticipate. The interpretation of a combination of relationships requires knowing the magnitude of the relationships and the interactions between driving forces, pressures and biodiversity. As there is either little or no such information, the relationships between an aid and biodiversity are analysed individually.

The geographical scope of application of an aid also adds an interesting classification dimension. It allows differentiation of the aids associated with a driving force acting upon:

- a fragile or rare environment (such as the Crau or the Camargue);
- or a relatively poor environment (example of the Beauce).

The effect of an aid on driving forces also depends on the technical, bio-physical and economic conditions of the region in which the agent located by the arrangement is situated. It is, of course, difficult to control all of these parameters. However, as an example, although the Beauce has a certain interest for biodiversity with threatened species (such as the little bustard), generally, the diversity of species in the Camargue is greater and the effects of an aid applied to the Beauce are considered as less harmful to biodiversity than the same aid applied in the Camargue, all other things being equal.

Furthermore, an aid acting on a determinant of a driving force, i.e., an indirect aid, is taken into account in the same way as an aid that is directly assigned to a driving force. The following figure illustrates the diversity of aids that are more or less direct and which can influence the consumption of agricultural fuel per inhabitant.



Source: Presentation, OECD Workshop on estimating support to Fossil Fuels, Paris, 18-19 November, 2010

We can see in this example that a single aid is applied directly to the consumption of agricultural fuels (subsidies to the purchase of agricultural fuels, in the red framed section) while there are numerous indirect aids: subsidies for the purchase of appropriate vehicles, subsidies for storage and distribution, subsidies to production, subsidies to production factors and to intermediate inputs and subsidies on the supply of intermediate products.

Lastly, attention must be paid to the impact of any substitutions generated by an aid arrangement. Coming back to the example of bio-fuels, moving from maize to sugar beet for ethanol production would probably have a low effect on biodiversity, while the transition from Amazonian forest to sugar cane has a major impact.

4 • The accepted approach

Finally, the process of analysing public aids unfavourable to biodiversity adopted in this report is based on the following operational principles:

- examine all types of public aids (direct budget subsidies, tax expenditures, price and income support policies, advantageous financial conditions, etc.);
- engaged both at the national level and at the subnational and supranational (European and international) levels, even if it is more difficult to make proposals at the supranational level;
- determine, case-by-case, and by open debate within the group, the harmful character of public aid in matters of biodiversity by comparison with a situation where there is no public aid, taking into account the effect of the aid on the behaviour of players and ultimately on biodiversity as it is shown by the analysis carried out as part of the DPSIR model;
- to reconfigure a public aid that will have been identified as harmful to biodiversity, keep, as a conceptual reference point, the optimal level of prices that internalise all of the negative externalities affecting biodiversity, in view of possible recommendations. For this, we will rely, among other things, on the past work of the Centre d'Analyse Stratégique giving shadow prices, particularly concerning biodiversity (Chevassus-au-Louis report), the Handbook on Estimation of External Costs in the Transport Sector, the Swiss work on the heavy-goods vehicle charge related to services, the studies by SETRA, etc.;
- where applicable, use of the standard and the regulation may be envisaged if the establishment of an internalising price appears difficult or impractical.

Chapter 2

The five main drivers of biodiversity loss in France

The factors in the decline of biodiversity are usually grouped into five main categories: destruction and deterioration of habitats, overexploitation of natural resources, pollution, invasive alien species and climate change. These five categories are internationally recognised. They have also been refered during the French conference on biodiversity in Chamonix in 2010, as well as in the French national strategy for biodiversity of 2011 and the Global Biodiversity Outlook published by UNEP. The main characteristics are presented here after a brief reminder of the concept of biodiversity and an appraisal of the French situation.

1 • An exceptional but threatened natural capital

This part first considers the concept of biodiversity as well as the organisations involved in the monitoring and assessment of biodiversity in France. It then describes the diversity of habitats and species living on the French territory and provides an assessment of their conservation status.

1.1. Biodiversity from singular to plural: what is it?

Three major stages have marked the development of the concept of biodiversity if we consider the study of the diversity of life as the beginnings of the concept.

Although the study of the diversity of life appeared in antiquity, it was only from the eighteenth century that the discipline really took off with the classification system of Linnaeus. During the folowing century, scientific milestones such as the theory of evolution, then the appearance of genetics and finally ecology marked the development of a hereditary concept of biodiversity as a support to evolution (Le Roux et al., 2008[1]).

The second stage occurred in the second half of the twentieth century, with the synthetic theory of evolution, the development of scientific ecology and, in the 1980s, when the term "biodiversity" appeared and was popularised at the Rio Earth Summit in 1992. The concept of biodiversity was then defined as a set of three levels of organisation of life[2]:

- ecological diversity (or diversity of ecosystems);
- species diversity (diversity of species or inter-specific);
- genetic diversity (diversity within species, or intra-specific diversity).

[1] Le Roux X., Barbault R., Baudry J., Burel F., Doussan I., Garnier E., Herzog F., Lavorel S., Lifran R., Roger-Estrade J., Sarthou J.-P., Trommetter M. (éd.) (2008), Agriculture and Biodiversity: Benefiting from synergies, *Collective scientific expert report INRA*, 114 p.

[2] This definition is used in the convention on biological diversity or Rio Convention signed in 1992: " The variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems." *(article 2 of the Convention on Biological Diversity)*.

The present decade constitutes a third stage in the evolution of the concept, with the development of functional ecology and, at the same time, an utilitarian conception in which biodiversity is the support to ecosystem services. The report by the Millennium Ecosystem Assessment of 2005 (MEA, 2005)[1] promotes this approach and proposes four categories of ecosystem services depending on the state of biodiversity:

- supply services (food, fresh water, medicines derived from plants, etc.);
- regulation services (filtration of pollutants by wetlands, regulation of the climate through carbon storage and the hydrological cycle, pollination and protection against natural disasters, etc.);
- cultural services (recreational activities, spiritual and aesthetic values, education, etc.);
- support services (formation of soil, photosynthesis and nutrients cycle).

The TEEB report on the economics of ecosystems and biodiversity[2] is also inspired by this, seeing the value of biodiversity essentially from the economic translation of services provided by ecosystems.

The working group thus defined biodiversity as the diversity of species (fauna, flora, fungi and micro-organisms), their genes, ecosystems and their interactions, particularly between species.

Within biodiversity, the working group distinguishes two components: one, qualified as "remarkable", corresponding to entities (genes, species, habitats and landscapes) to which society has assigned as having an intrinsic value, even if it is difficult to quantify, justifying the collective desire to preserve it; the other, qualified as "general" (or "ordinary"), does not have any intrinsic value identified as such but, through abundance and numerous interactions between its entities, contributes, to various degrees, to the functioning of ecosystems and the production of services that our societies find there.

The contributions of biodiversity to human life and well-being of humans, also known as "ecosystem services" are essential to social life and economic activities, through the supply of food, fuel and building materials; air and water purification; the stabilisation and mitigation of the planet's climate; the moderation of flooding and droughts; the generation of soil and the renewal of its fertility; the maintenance of genetic resources that contribute to the variable selection of crops and breeding animals, producing substances that are usable, in particular medicines, and provide recreational aesthetic and cultural benefits (Millennium Ecosystem Assessment, 2005[3]).

Ecosystem services mainly result from interactions between living organisms. These interactions shape environments and physical, chemical and biological flows within ecosystems. Air or water purification, carbon storage and soil fertility are all services resulting from the interaction of organisms with their environment. Each type of ecosystem (forest, wetlands, meadows, coral, etc.) corresponds to different functions and services, which themselves dependent on the condition of the ecosystem, the pressures that affects exerted on it and also the use that humans make of it[4].

[1] – Assessment of ecosystems for the millennium (2005), Millennium Ecosystem Assessment, General Synthesis *Report, Island Press*, Washington D.C.
[2] TEEB (2010), The economy of ecosystems and biodiversity: Inclusion of the economics of nature. A summary of the approach, *conclusions and recommendations of the TEEB*.
[3] Millennium Ecosystem Assessment (2005), Ecosystems and Human Well-being: Biodiversity Synthesis, *World Resources Institute*, Washington, DC, 86 p.
[4] *Ibidem*.

Two major variables can be used to assess biodiversity: abundance and variability. Abundance directly determines the quantity of services produced for humans (in a stock of fish, it is more the abundance that matters rather than the genetic or specific diversity) and its probability to be maintained. In the current biodiversity crisis, as well as extinction, it is increasing shortages in natural resources pose a considerable problem. Variability is a major factor that influences the potential of biodiversity to adapt and therefore survive.

The importance of biodiversity is therefore not just that of protected or rare species, in other words "remarkable biodiversity", the elements of which are often well identified. It is also necessary to maintain the "ordinary biodiversity", which corresponds to the activity of organisms that do not have as such any particular perceived value, but which, through their abundance and their numerous interactions, contribute to various degrees (sometimes in an essential way even when their role is not recognised) to the functioning of ecosystems and the production of ecosystem services[1].

1.2. The large variety of organisations involved in biodiversity monitoring and assessment

Biodiversity is monitored through two approaches: observatories and inventories.

The Observatories are numerous and present at different levels on the territory. The following table shows the biodiversity observatories in France according to UICN[2].

[1] Centre d'Analyse Stratégique (2009), *L'approche économique de la biodiversité et des services liés aux écosystèmes* (The economic approach to biodiversity and services related to ecosystems), report by the working group chaired by Bernard Chevassus-au-Louis, Paris, La Documentation française, 400 p. This report shows, for several ecosystems present on the national territory, how it is possible to estimate the monetary value of a certain number of their services, and the limits to this type of assessment.

[2] De Clap F. and Moral V. (2010), Biodiversité & Collectivités : Panorama de l'implication des collectivités territoriales pour la préservation de la biodiversité en France métropolitaine (Biodiversity & local authorities: Overview of the involvement of regional authorities in the preservation of biodiversity in mainland France), *French committee of the UICN*, Paris.

Scale	Title	Operation
Europe	European biodiversity observatory	Implementation planned during the plenary session on 17 and 18 June 2009 of the Committee of the Regions of Europe This observatory will receive data from observatories at national, regional and other subnational levels[1]
France	National biodiversity observatory	Implementation specified in article 25 of the conclusions of the Grenelle de l'Environment[2] It will play a fundamental role in numerous initiatives concerning inventories and databases, particularly the incorporation of the future information system on nature and landscapes (French acronym: SINP) It will also allow the production of biodiversity indicators at the national level developed as part of the national biodiversity strategy (Popy, 2009[3])
France	Écoscope	Together with the national observatory, the French foundation for research on biodiversity (French acronym: FRB) tries to coordinate observation systems, via the "écoscope", in order to make progress in research in this field, and to provide biodiversity knowledge
Region	Regional observatory	This type of observatory can be initiated by regional authorities (observatories in different French regions: Bourgogne, Haute-Normandie, Poitou-Charentes, Rhône-Alpes, Île-de-France), by decentralized State authorities - the DIREN/DREAL (observatory on wild fauna in Aquitaine), by associations between DIREN and regional councils (regional observatory of the natural heritage in Bretagne). These observatories are designed as regional relays for the
Department	Departmental observatory	Several departments already have an observatory of this type (Seine-Saint-Denis, Gironde, Haute Savoie, Seine et Marne, Isère)
Local authorities	Municipal and inter-municipal observatory	There are still few observatories of this type

Inventories and information systems targeted at the monitoring of the state of biodiversity (fauna, flora and habitats) are mostly initiatives from French environmental NGOs (FNE, LPO, SFEPM, OPIE etc.)[5], conservatories of natural areas and national botanical conservatories. The French national office for hunting and wild fauna (ONCFS) and the French national office for forests (ONF) also carry out their own inventories. French research

[1] Opinion from the committee of the regions on " *Un nouvel élan pour enrayer la diminution de la biodiversité* " (New momentum to check the reduction in biodiversity), 80th plenary session, 17-18 June 2009, p. 12.
[2] Law n° 2009-967 dated 3 August 2009 on programming relative to the implementation of the Grenelle Environment Round Table, open day of 5 August 2009: this article proposes "setting up a national biodiversity observatory providing up-to-date information to the public".
[3] Popy S. (2009), *Projet d'Observatoire régional de la biodiversité en Languedoc-Roussillon : synthèse sur les observatoires existants* (Project for a regional biodiversity observatory in Languedoc-Roussillon: synthesis covering existing observatories), CEMAGREF, March, p. 8 and 30.
[4] MEEDDAT (2009), *Compte rendu de la réunion des administrateurs secondaires de l'Inventaire des dispositifs de collecte Nature et Paysage du 26 janvier* (Report of the meeting of the secondary administrators of the inventory of Nature and Landscape collection systems, dated 26 January), p. 3.
[5] FNE: France Nature Environnement; LPO: League for the protection of birds; SFEPM: French society for the study and protection of mammals; *OPIE: Office for eco-entomological information*.

organisations, such as the CNRS, INRA and museums, are also developing monitoring systems.

With the aim of coordinating these inventory efforts, the ministry in charge of ecology has decided to implement the information system on nature and landscapes (French acronym: SINP)[1]. This system aims at promoting "synergy between actors in the production, management, processing, commercial development and dissemination of data on nature and landscapes".

The identification of “hot-spots” of biodiversity (such as the French ZNIEFF)[2] and the UICN's red lists of the most threatened species, are established based on these inventories.

1.3. A very rich natural heritage

Mainland France is in four of the eleven European bio-geographical zones[3] (Atlantic, Continental, Mediterranean and Alpine), which makes it one of the most diverse countries of the European Union in terms of ecosystems. More than 75% of the types of natural habitats identified as priority in Europe are in on the mainland France. Furthermore, the territory hosts 40% of the European flora. Mediterranean habitats are particularly important because of the diversity of plant species (13,000 endemic species). The entire mainland is also remarkable for the diversity of its landscapes and the historical relationships between humans and nature (UICN, 2005).

The French overseas are located in eight large bio-geographical regions in austral, antarctic, equatorial, tropical and sub-boreal zones. They also possess 55,000 km² of coral reefs and lagoons, equivalent to nearly 10% of reefs worldwide (SNB, 2009).

Biodiversity in the French Antilles (Guadeloupe, Martinique, Saint-Barthélemy and Saint-Martin) is one of the greatest in the Caribbean islands. The bay of *Grand Cul-de-sac Marin* was designated as a Ramsar wetland in 1993 and part of Guadeloupe has been designated as a biosphere reserve since 1992. Although human occupation is not recent, local and regional terrestrial endemism is still very high in the vascular plants (1,863 indigenous species – 13% of the regional endemism), fungi and the animal kingdom, particularly amongst reptiles (30% of local endemism) and bats (30% to 40% of regional endemism). There are also 17 species of whales and 3 of tortoises (UICN, 2010[4]).

Knowledge of the fauna and flora of French Guiana is still very incomplete. Today, 5,120 species of higher plants have been identified (endemism: 3.5%), 480 species of fresh-water fish (endemism: 35% to 40%), 100 species of bats and the endemism is between 5% and 10% for the other groups of vertebrates. French Guiana also includes a large site for the reproduction of marine birds (the island of *Grand Connétable*). Marine biodiversity is also very high there: 650 species of algae, 450 of molluscs, 146 of crustaceans, 5 species of whales and the American manatee, and sites where 5 species of turtles lay their eggs.

[1] Source: circular dated 11 June 2007 relative to the publication and implementation of the protocol for the information system on nature and landscapes (*French acronym: SINP*) – Official bulletin from the ministry of ecology, development and sustainable management.
[2] ZNIEFF: *Zone naturelle d'intérêt écologique faunistique et floristique* (Natural zone of ecological, fauna and flora interest).
[3] European bio-geographical zones: Atlantic, Continental, Alpine, Boreal, Mediterranean, Arctic, Macaronesian, Steppe, Pannonian, Anatolian and North-sea littoral.
[4] UICN (2010), *Biodiversité de la francophonie : richesse et vulnérabilité* (Biodiversity in French-speaking countries: wealth and vulnerability), 273 p.

Lastly, the level of terrestrial endemism in Reunion Island is very high (34% of flowering plants, 47% of beetles, 33% of butterflies and 20% of birds). However, it is lower in the marine environment (10% of molluscs and fish).

1.4. An incomplete but yet globally pessimistic health assessment

Worldwide biodiversity has decreased over the last few decades. The species extinction rate is nevertheless difficult to estimate. Methods for assessing change and the figures are constantly revised. At the worldwide level and during the last 100 years, the Millennium Ecosystem Assessment estimates that at global level and during the las 100 years human activities have accelerated the rate of species disappearance by more than 1,000 times the natural extinction rate[1]. Recently, Stephen Hubbell and Fangliang He[2] published an article in the scientific magazine Nature questioning the methods for measuring the species extinction rate. They assessed an extinction rate that was no more than half of that announced by the experts.

The loss of biodiversity is nevertheless very tangible. Butcher et al. (2010)[3] state, in the Science magazine, that indicators on the state of biodiversity are continuing to move downwards without the rate really slowing, while the indicators of pressure on biodiversity (particularly consumption and over-exploitation of resources, invasive species, nitrate pollution and climate change) are moving upwards. They state that even though we are seeing some successes in conservation, these remain local and that the rate of loss of biodiversity does not seem to be slowing.

Biodiversity present on the French territory is undergoing the same phenomenon of loss. Its state of conservation status is now available through various systems:

- assessment pursuant to article 17 of the Habitats directive on the conservation status of habitats and species of community interest[4] ;
- the IUCN's red list of threatened species;
- the information system on nature and landscapes[5] run by the ministry in charge of ecology (in the process of being set up in all regions of French territory)

The first assessment report in accordance with article 17 of the Habitats directive carried out by Bensettiti and Trouvilliez (2009)[6] covers the period 2001-2006. The assessment covers the entire mainland territory and is not limited to Natura 2000[7] sites. According to its first

[1] Millennium Ecosystem Assessment (2005), Ecosystem and Human Well-being: Biodiversity Synthesis, World resource Institute, Washington D.C., 86 p.
[2] He F. and Hubbell S. P. (2011), "Species–area relationships always overestimate extinction rates from habitat loss", Nature, 473, p. 368-371.
[3] Butchart S. H. M., Walpole M., Collen B., van Strien A., Scharlemann J. P., Almond R. E., Baillie J. E., Bomhard B., Brown C., Bruno J., Carpenter K. E., Carr G. M., Chanson J., Chenery A. M., Csirke J., Davidson N. C., Dentener F., Foster M., Galli A., Galloway J. N., Genovesi P., Gregory R. D., Hockings M., Kapos V., Lamarque J. F., Leverington F., Loh J., McGeoch M. A., McRae L., Minasyan A., Hernández M., Oldfield T. E., Pauly D., Quader S., Revenga C., Sauer J. R., Skolnik B., Spear D., Stanwell-Smith D., Stuart S. N., Symes A., Tierney M., Tyrrell T. D., Vié J. C. and Watson R. (2010), "Global biodiversity: Indicators of recent declines", Science, 328, p. 1164-1168.
[4] The "Habitats" directive requires member states to produce a report, every six years, on the assessment of the conservation status of their biodiversity (article 17 of directive 92/43/CEE).
[5] www.naturefrance.fr/sinp.
[6] Bensettiti F. and Trouvilliez J. (2009), *Rapport synthétique des résultats de la France sur l'état de conservation des habitats et des espèces conformément à l'article 17 de la directive Habitats* (Summary report of the results of France on the conservation status of habitats and species in accordance with article 17 of the Habitats directive), report SPN 2009/12, MNHN-DEGB-SPN, Paris, 48 p.
[7] The assessment does not take into account the species under the "Birds" directive.

assessment, France has a total of 131 habitats and 290 species to protect (excluding bird species). More than three quarters of habitats are in an unfavourable state of conservation status (inadequate or bad) and only 17% are in a favourable state.

The habitats in bad condition are essentially in the Atlantic and Continental regions. The Grasslands and meadows are in a bad state and peat bogs are in a very unfavourable situation.

Most of the littoral, marine and coastal habitats are in a bad state of conservation status or in an inadequate status on both the Atlantic and Mediterranean coasts. This is mainly due to reduced ranges, reductions in surface areas and the damage to the functioning of these habitats. Forest habitats are generally in a relatively good state of conservation status. The best-preserved habitats are in the Alpine area.

Concerning the state of conservation of species, still according to the report from Bensettiti and Trouvilliez, more than half of the assessments of species to be protected have concluded that there is an unfavourable conservation status (bad: 33%; inadequate: 21%) against 20% in a favourable state. The large share of "unknown" states (25%) especially concerns marine species, bats and invertebrates (CGDD, 2010)[1]. The worst results are in the Atlantic and continental regions, both for fauna and flora. Furthermore, 32% of alpine flora and 28% of Mediterranean fauna are in a good conservation status.

More precisely, amongst the vertebrates, the amphibians are the most threatened group (55% of "bad" assessments). Amongst invertebrates, the situation appears very unfavourable for crustaceans and molluscs. Amongst insects, butterflies and especially dragonflies are the groups that are weakest (respectively 31% and 48% of "bad" assessments). Fish are also very affected, with two thirds of unfavourable assessments. Lastly, terrestrial mammals, other than bats, are in the most favourable conservation status (52% of assessments).

The red list of threatened species was established in 2007 by the French committee of the UICN in cooperation with the national natural history museum. It aims at "establishing an objective assessment of the degree of threats to species at the scale of the national or regional territory[2]".

The first list developed in 2008 contained 762 threatened species, including amphibians, reptiles, marine and terrestrial mammals and breeding birds. The second list issued a year later was broadened to orchids and freshwater fish and showed a total of 778 threatened species (see table below for threatened species on the mainland). The overseas territories have 87% of the threatened species.

[1] Source: CGDD-SOeS (2010), « *La biodiversité remarquable en France : résultats de la première évaluation des habitats et espèces d'intérêt communautaire* » (Remarkable biodiversity in France: results of the first assessment of habitats and species of community interest), Le Point Sur, n° 48, April.
[2] UICN France and MNHN (2009), *La Liste rouge des espèces menacées en France – Contexte, enjeux et démarche d'élaboration* (The red list of threatened species in France – Context, issues and preparation process), p. 2.

Mainland	Number of species listed by UICN	Number of threatened species
Reptiles	37	7
Amphibians	34	7
Mammals	119	11 (10 continental species and 1 marine)
Orchids	160	27 (+ 36 at the point of being threatened)
Freshwater fish	69	15
Nesting birds	277	73
Overwintering birds	60	8
Transiting birds	52	7

Source: IUCN red list

According to the IUCN, the decline in the populations of breeding birds is particularly worrying. More than one in four species are threatened. This proportion is much higher than at global level, where 12% of bird species are threatened with extinction. For terrestrial birds, this decline is explained by the intensification in agricultural practices, urbanisation and the drainage of wetlands. Marine birds are, on the other hand, more sensitive to pollution due to hydrocarbons and the reduction in food resources related to climate change.

Also, only one habitat out of six and one species out of five considered of community interest present in France are in a favourable conservation status[1].

Overseas, a certain number of species are threatened, still according to the IUCN's red list (2010). In the French Antilles, 4 plant species and 8 vertebrate species have become extinct, and 38 species of plants, 6 of vertebrates, 1 mollusc species and 260 to 270 vascular plants are threatened. Forests located above 600 m in altitude are still well preserved in Martinique and Guadeloupe. On the other hand, they are regressing below this altitude and particularly in Guadeloupe. In French Guiana, amongst the species listed, 114 plants, 8 mammals and 2 reptile species are threatened. On Reunion Island, 12 plant species and 22 endemic animal species have become extinct. Ninety-eight plants and 28 animal species are in danger, including the black petrel, which is in critical danger of extinction.

2 • The destruction and deterioration of habitats: a predominant and multi-faceted impact

Throughout the world, the modification of habitats is the primary cause of biodiversity loss.

Species do not all react in the same way to changes in their habitats. This depends on their "ecological plasticity". From this point of view, we should differentiate (Ramade, 1993; Paillât and Butet, 1994):

- specialist species: those that require a particular habitat. These species generally perceive their host environments in a very subtle manner and are highly sensitive to its quality and to its slightest variation or deterioration to it;

[1] European commission (2008), *The economy of ecosystems and biodiversity*.

- generalist species: these do not have a precise ecological requirement and perceive their host environments in a less complex manner. They are consequently less sensitive to changes in their habitats.

Artificialisation, partial artificialisation and fragmentation are forms of destruction/deterioration of habitats that are particularly worrying in France.

2.1. Artificialisation

Here, artificialised areas designate land that has been built upon for housing (flats, houses) or for commercial use (offices, factories, etc.), land that has been covered or stabilised (roads, railways, parking areas, roundabouts, etc.), and other areas that have not been built upon but significantly shaped by human activity (construction sites, quarries, mines, landfills, etc.). This category also includes cultivated "green" spaces (urban green spaces, sports and leisure facilities, etc.). These artificialised areas can therefore be located outside urban areas, at the edges of smaller towns or even villages, at the interface of infrastructure networks or in the middle of the countryside (diffuse urbanisation process).

The extension of these artificialised areas causes a loss of natural habitat and often a loss of "resources" when they occur at the expense of the richest soils[1]. Also, this artificialisation, when waterproofing the coverage of land (housing, bitumen, etc.), amplifies phenomena of run-off processes, thus increasing levels of high water, the risks of flooding and erosive intensity; it is generally irreversible. Furthermore, because of travels and therefore additional CO_2 emissions and other pollutants they induce, the extension of diffuse urbanisation and the peripheral location of business and commercial zones, also have a harmful indirect effect on biodiversity[2].

2.2. Partial artificialisation

This corresponds to a reduction in specific or intra-specific diversity or in the abundance of certain components of the habitat under the effect of various factors (pollution, species introduction, production system mode, etc.). Thus, since the beginning of the 1950s, changes in landuse and modification of farming practices towards greater intensification have led to a reduction in the heterogeneity and complexity of agricultural and forest ecosystems. Of course, this type of modification of habitats is not without consequence for biodiversity (Le Roux et al., 2008[3]).

2.3. Fragmentation

The development of linear transport networks with large footprints has led to the fragmentation of habitats and the partitioning of the natural environments. Fragmentation may be defined as the dual phenomenon of the reduction of the surface area of the available habitat (total and average surface area of the fragments of habitats) and the increase in the isolation of fragments (reduction in the connection between populations) (SETRA, 2000). It

[1] More than a third of agricultural land developed between 2000 and 2006 in mainland France consists of soil with the best agronomic potential; source: CGDD-SOeS (2011), *"L'artificialisation des sols s'opère aux dépens des terres agricoles*" (The development of land is taking place at the expense of agricultural land), Le Point Sur, n° 75.
[2] CGDD (2009), « *Dépenses de carburant automobile des ménages : relations avec la zone de résidence et impacts redistributifs potentiels d'une fiscalité incitative* » (Household automobile fuel expenses: relationships with the zone of residence and potential redistributive impacts of incentive taxation), Études et documents, June.
[3] Le Roux X. et al. (2008), *Agriculture et biodiversité. Valoriser les synergies* (Agriculture and biodiversity. Promote synergies), op. cit.

may be terrestrial, isolating a sub-part of a forest ecosystem by the passage of a road, or aquatic, cutting a river between its upstream and downstream by the construction of a dam.

3 • Overexploitation of renewable natural resources: an alarming situation for some of them

The problem of the overexploitation of common resources has given rise to a wealth of literature in biology and economics. Warming (1911)[1] then Gordon (1957)[2] were the first to study overexploitation due to non-limitation of the access to fishing resources. Then Garret Hardin popularised the concept through his article published in 1968 in the Science magazine, "The tragedy of the commons"[3]. In this paper, he illustrated the problem of "the tragedy of the commons" in which "each user of a common resource, if only taking care of his own interests, will try to use the resources so as to maximise his individual gain. […]. The combination of individual interests therefore leads to over-exploitation and degradation of the resource"[4].

Overexploitation of natural resources includes the exploitation of living resources (fish, fisheries resources, possibly forest exploitation and the illegal trade in species) and non-living resources (extraction of water, soil and ore). It is an overall problem, which concerns fishery, agricultural, forestry and medicinal resources. In France, the main victims of overexploitation are fishery resources, the soil (organic carbon in the soil), fresh water, coral and tropical fish. Only the first three are covered in this report.

3.1. Fisheries resources

It is possible to distinguish at least three forms of overexploitation of fishery resources[5]:

- the overexploitation of juveniles *"occurs when the younger fish that become available to the fishing ground (the juveniles) are captured before they can reach a reasonable size"*;
- the overexploitation of reproducers takes place *when "the parental stock is reduced, through fishing, to a dimension that is so low that it can no longer produce enough young fish to ensure its renewal"*;
- the overexploitation at the level of the ecosystem corresponds to "*the transformation of a relatively mature and efficient system into an immature (or stressed) system*". This is particularly the case when the future of a species is threatened when another species that it depends upon is harvested.

In France, three quarters of catches take place in the North-East Atlantic. In this zone, the state of the fish stock is highly variable from one species to another. In 2006, it was quite good for the pelagic species but much less so for species living on the seabed or near to it. In the Western English Channel and the bay of Biscay, 20% of stocks were in a critical state (CGDD, 2010).

[1] Warming J. (1911), "On the rent of fishing grounds", History of Political Economy, 15, p. 391-396.
[2] Gordon H. (1957), "The economic theory of a common property resource: The fishery", Journal of Political Economic, 62, p. 124-142.
[3] Hardin G. (1968), "The tragedy of the commons". Science, 162, p. 1243-1248.
[4] Halland G. and Sene H. (2010), « Elinor Ostrom et la gouvernance économique », (Elinor Ostrom and economic governance), Revue d'économie politique, 2010/3, vol. 120, p. 441-452.
[5] www.fao.org/docrep/003/X6845F/X6845F07.htm.

The situation of stocks overseas is less critical than it is off the mainland, apart from the cod of Saint-Pierre et Miquelon[1]. Certain pelagic species are also widely exploited, such as the bigeye tuna and the yellowfin tuna. These species live far from the coasts in international zones and are therefore subject to capture from boats of different nationalities (D'Aboville, 2007)[2]. According to Gardes and Salvat (2008)[3], the state of French coral reefs is relatively satisfactory. Certain practices can nevertheless constitute a threat, such as fishing with dynamite or collecting fish for ornamental aquariums.

3.2. Soils

Overexploitation of soils results in a reduction in organic matter, which plays numerous roles in biodiversity. Organic matter is a source of nutrient and energy, and elements essential for the development of plants and organisms living in the soils. It also allows better circulation of water in the soil and makes it available for micro-fauna in the soil and for the roots of plants. It also has an important role in the physical structure of the soil (improves the cohesion of soils and prevents erosion), for what happens to pollutants (influences the retention and degradation of pesticides, heavy metals, etc.), and in many other areas (chemical properties of the soil, carbon storage, etc.).

In 2006, the European commission adopted a Thematic Strategy for Soil Protection (COM(2006)231 final) and proposed a project for a framework directive on the protection of soils (COM(2006) 232 final). Even though it is still not yet adopted, this is a serious intent to prepare a policy to protect and manage soils at the European Union level.

3.3. Fresh water

Freshwater habitats cover less than 1% of the earth's surface and yet they host more than 25% of all vertebrates described, more than 126,000 animal species and nearly 2,600 macrophyte plants. Fresh water ecosystems provide numerous goods and services, such as food, water and building materials and they control floods and erosion (UICN, 2008)[4].

Massive abstraction of fresh water can have a significant impact on the biodiversity of these environments.

4 • Pollution: a pressure that affects the environment as a whole

According to the European directive 2008/1/EC dated 15 January 2008 relative to the integrated prevention and reduction of pollution, pollution is defined as "*the direct or indirect introduction, as a result of human activity, of substances, vibrations, heat or noise into the air, water or land which may be harmful to human health or the quality of the environment result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environement*".

[1] The overexploitation of stocks of cod led Canada to set an acceptable rate of capture, part of which was assigned to the French archipelago, but is fished by vessels under the Canadian flag and landed at St-Pierre to be prepared and processed (D'Aboville, 2007 – unofficial translation).
[2] Conseil économique et social (2007), *La pêche et l'aquaculture en Outre-mer* (Fishing and aquaculture in French overseas territories), report presented by Gérard d'Aboville, 188 p.
[3] Gardes L. and Salvat B. (2008), « *Récifs coralliens de l'Outre-mer français. Suivi et état des lieux* » (Coral reefs in French overseas territories. Monitoring and appraisal), Revue d'écologie (Ecology magazine) (Terre et Vie), vol. 63, 1-2, 200 p.
[4] UICN (2008), « *Biodiversité des eaux douces : une ressources cachée et menacée* » (Biodiversity of fresh water: a hidden and threatened resource), 2 p.

The various environmental compartments (aquatic, atmospheric and soil) interact between each other. Thus, pollutants deposited in one environment can be disseminated to all the other environments. Water, for example, receives pollution brought by channels that are both various (leaching of substances spread on permeable soil, run-off from soils with an impermeable cover and atmospheric fallout) as well as specific. Also, underground water contributes to surface water and conversely (a wetland is dependent on underground water). Lastly, soil pollution can cause exposure of underground water for soluble substances and of air for volatile substances (Vindimian and Parfait, 2009)[1]. Generally, the atmosphere transports and disseminates pollutants. The sea is the final destination. Soils and the rivers are intermediate environments, which can sometimes accumulate pollutants.

The effects of pollutants (heavy metals, pesticides, endocrine disruptors,…) on biodiversity still remain difficult to measure with precision. Most of the studies are done at the scale of individuals, in the laboratory, and are used above all to characterise the effects on survival of individuals, which are observed quickly over a duration of about 90 days (which is known as "acute" toxicity). Diffuse effects (acceleration of senescence, increase in deferred mortality) and fertility and trans-generational effects (Diethylstilbestrol) are most often not studied. Lastly, the interactions are still not much seen in the laboratory.

The effects on the populations, communities and ecosystems are studied with correlative methods, from data collected by the biodiversity observatories. The probable effects remain to be quantified in most cases.

At the scale of ecosystems, it is nevertheless possible to suggest two main effects:

- loss of diversity when sensitive species and genotypes are replaced by those that are resistant, as the latter are usually less frequent (hence a reduction in diversity);
- reduction in the intensity of the associated ecosystemic functions or services, when all species and/or genotypes of the group in question are affected (for example, storing carbon by vegetation).

The absence of an observatory on the effects of pollutants on biodiversity means that these effects cannot be put in hierarchical order. Also, products that are highly toxic but have very limited diffusion may have an overall effect that is lower than low-toxicity products that have very wide spatial and/or temporal diffusion.

The pollution of environments is not limited to chemical pollution. Other forms of pollution may affect the ecosystems but will not be dealt with in this report, notably:

Light pollution: ecological light pollution applies to artificial light that degrades the alternation between day and night (nycthemeral rhythm) in the ecosystems (Longcore et Rich, 2004). Nearly 20% of the surface of the globe may be considered as harmed by light pollution (Cinzano et al., 2001). Light pollution *"very significantly affects the biology of animals by modifying the natural cycle of light and darkness during the day. It also affects migration behaviour, inter-specific competition activities, prey-predator relationships and harms their physiologies. Much less "media publicity" was given to the consequences for plants"* (Siblet, 2008).

Marine sound pollution: the current state of knowledge of the impact of sound pollution on marine life is still very incomplete. Models simulating the effect of sound disruption on

[1] Vindimian É. and Parfait G. (2009), *« Réduire les pollutions et les impacts sur la biodiversité »* (Reducing pollution and impact on biodiversity), outline note for the "pollutions" workshop, French conference for biodiversity, 10-12 may 2010, Chamonix, 28 p.

population parameters, such as demographic rates, are still only just beginning to appear. A first report from OSPAR (2009) on this subject underlines "the need to distinguish between the effects due to short-duration exposure but with intense sound levels, which may, in the worst cases, cause lesions or death, and the effects due to more moderate exposure to generally-continuous background noise, which may influence the long-term quality of habitats and consequently have greater effects on the animal populations".

Terrestrial sound pollution: studies are even rarer concerning the effects of sound pollution on terrestrial biodiversity. In the magazine Proceedings of the Royal Society B German researchers published the results of their study on the negative impact of traffic noise on the predatory abilities of bats.

Lastly, neither will the risks of future pollution be dealt with in this report, namely:

Nanoparticles: the production and use of nanomaterials is increasing. The discharge of nanoparticles into the environment raises new questions. The results of the first studies, although they are highly contradictory, show that the toxicity of these particles and what becomes of them is predominantly attributable to the physicochemical properties related to their surfaces. Their tiny size also gives them a great capacity for diffusion, and particularly to pass through membranes and natural barriers. These particles can therefore penetrate living organisms and cause specific toxic reactions (inflammation, oxidising stress and possibly genetic harm).

Also, it is precisely the surface reactivity of these materials that is sought, and industrial processes tend to maximise it. Furthermore, they can be functionalised at the surface for particular functions.

The consideration of the risks of environmental contamination throughout the life cycle of these products, in solid materials likely to be broken down, or in powdered forms, is therefore a highly topical question.

Genetically modified organisms (GMO): at a level other than the species, diversity also includes that of the genome. The arrival of organisms whose genomes have been modified introduces a new danger due to the natural mixing of genes (notably through non-reproductive processes, such as via soil bacteria for plants). There is, from this point of view, an essential difference between this and selection as historically practised: domestic selection, copying natural processes, sorts from within a pool of existing genes and favours one part only (the reintegration within natural populations of the varieties thus obtained re-diversifies the gene system), while genetic engineering incorporates a new gene in the organism's genome (the related risk is that this gene may be diffused into the surrounding biocenosis).

Pollution through the production of shale gas: three licences for shale gas exploration were granted in 2010 in France, then withdrawn on 3 October 2011[1].

Other than the large quantities of water necessary to fracturing the rock, and bringing equipment to the site, this activity produces a pollution risk at three levels, at least (CAS, 2011):

- contamination of water tables penetrated by the boreholes. This is because "*although the mixture injected underground is composed of 98% or 99% of water and sand, apparently neutral for the environment, the remaining 1% to 2% contains acids and gelling agents that are potentially dangerous for humans and the environment*";

[1] Decision by the ecology minister, Nathalie Kosciusko-Morizet, announced on 3 October 2011.

- the fluids brought back to the surface (20% to 80% of those injected) and treated are loaded with the products of the reaction between the injected components, the gas and the rock;
- the propagation of fluids along the cracks (natural or resulting from fracking the rock).

5 • Invasive alien species: a poorly-known but increasing factor of biodiversity loss

Plant and animal species on earth have evolved over several billion years. The oceans, seas, mountain chains, deserts or even wide rivers have, according to climatic variations, movements of the earth's crust, variations in the level of the oceans or specific events, created or eliminated physical barriers to the movement of species. Over the millennia, this has contributed to the differentiation of species, to communities, to the great diversity of our planet and to the development of communities of animals and plants, in varied ranges of distribution, from the narrowest endemism to the greatest ubiquity.

Due to human influence of man, however, physical obstacles which had separated populations or allowed the development of distinct fauna and flora in various regions, have been crossed. The distances keeping species and ecosystems from influencing each other have been eliminated. Thus, some species have, accidentally or intentionally, been brought into zones located at hundreds or even thousands of kilometres from the original habitat. From the end of the nineteenth century, the number of introductions increased significantly.

There is no consensus on the rate of invasive alien species introduced in France, as the figures are highly dependent on the nomenclature of the species chosen. It is sometimes estimated that 10% of introduced species survive, and 1% may become invasive. The DAISIE database (Delivering Alien Invasive Species Inventories for Europe) lists the species introduced to Europe, with data from a network of experts spread across the continent. According to this database, 1,919 continental species (aquatic or terrestrial) were introduced to mainland France, two thirds of which being plants. Amongst these species, 111 are considered as invasive according to the national inventory of the natural heritage, two thirds being plants (CGDD, 2010). In the marine environment, 113 species were introduced on the coasts of the English Channel, North Sea and the Atlantic, and 83 in the Mediterranean. These are mainly crustaceans and molluscs in the first case and red algae in the second. Amongst these introduced species, 9 are considered as invasive (CGDD, 2010). The rate of invasive species in the introduced species within introduced species finally stands at about 5% for both terrestrial and marine environments.

The effects of these alien species are highly diverse and their intensity is variable, depending on the situation. The effects may be delayed: for example, *Ocinebrellus inornatus* ("Japanese oyster drill"), which was probably introduced in the 1970s, became invasive at the end of the 1990s and has affected shellfish farming ever since. More generally, species that have undergone "acclimatisation" over the last century are a reservoir of potential delayed invasive species. Domestic species that were introduced and then escaped (feral species) can also become invasive in natural environments.

In many cases, these alien species adapt poorly to their new environment and disappear quickly. However, some survive, establish themselves and reproduce. Sometimes, these new arrivals establish themselves so well that they cease to be a biological curiosity and start to evolve in the region. This success can be accompanied by the extinction of local species (competition, predation, illnesses, habitat change, etc.).

Generally, alien species influence biodiversity:

- by coming into competition with the indigenous organisms for food and habitat: this is the case, for example of the red-eared terrapin (*Trachemys scripta*) that is threatening the European pond terrapin (*Emys orbicularis*) through competition in the South of France, or the American signal crayfish (*Pacifastacus leniusculus*) that is taking the place of the European crayfish (*Astacus spp.*), by direct competition, as well as by being a healthy carrier of crayfish plague, or the harlequin ladybird (*Harmonia axydiris*) imported into Europe to fight against aphids and which became established in the wild and is threatening other species of ladybirds by competition and predation. Amongst the invasive plants, the sour fig (*Carpobrotus edulis*) has established very dense populations that are competing with the indigenous flora, particularly in the South of France and on the West Coast. Furthermore, invasive species contribute to a potential loss of specific biodiversity through increased commonality and homogenisation of biodiversity, with loss of resilience;
- by changing the structures of ecosystems: invasive plants may cause significant change in the composition, structure and functioning of ecosystems by modifying the luminosity, the rate of oxygen in water, the chemistry of soils, the nutrient element cycle, the fire regime, interactions between plants and animals, etc. A single species can degrade the functioning of the ecosystem. Exotic aquatic plants invading freshwater environments, such as the water hyacinth (*Eichhornia crassipes*) in tropical zones or water primroses (*Ludwigia peploides and L. grandiflora*) in mainland France limit the penetration of light into the water, reducing the rate of dissolved oxygen and can lead to eutrophication of the environment and an overall disruption of aquatic ecosystems;
- by cross-breeding with indigenous species: the ruddy duck (*Oxyura jamaicensis*) and the Sika deer (*Cervus nippon*), for example, are capable of breeding with indigenous species, producing hybrids that threaten local indigenous species with extinction;
- by direct lethality: for example, the pine wilt nematode, *Bursaphelenchus xylophilus*, is a small worm, of North-American origin, which attacks conifers, mainly pines. It infests the resin canals of trees and then breeds, thus blocking the circulation of sap. This causes rapid wilting, resulting in the death of the infested tree in an average of 60 days;
- by interference with reproduction mechanisms: for example, by disrupting pollination due to competition with local bee species.

These alien species (meaning allochthonous or non-indigenous) whose introduction by man (intentional or by chance), establishment and propagation threaten ecosystems, habitats or indigenous species, with negative ecological and/or economic and/or health consequences, are known as "invasive alien species" or IAS, sometimes also called "invasive species". These expressions are synonymous and the species covered are characterised by the following criteria:

- allochthonous;
- introduced;
- naturalised (expansionist);
- cause harmful disruption to wild biodiversity.

In the present report, these species are called “invasive alien species”, or IAS following the European vocabulary, which is generally accepted.

6 • Climate change: direct effects and indirect effects via other pressures

Concentration of greenhouse gases has increased since the pre-industrial era, mainly through the increase in emissions of CO_2 emissions coming from burning fossil fuels and land use changes.

The Intergovernmental Panel on Climate Change (IPCC) predicts an increase in the average temperature of the earth by 1.4°C to 5.8°C by the end of the twenty-first century with, generally, a more noticeable increase on land than at sea and a higher temperature in the high latitudes than in the tropics. Sea levels should rise by between 0.09 m and 0.88 m. Precipitations should be greater in the high latitudes and in the equatorial zones and should reduce in the sub-tropical zones, with violent rainfall events.

These manifestations of climate change will have, still according to the IPCC, the following consequences for biodiversity (IPPC, 2002[1]):

- numerous species having their habitats displaced towards the poles. The Species will nevertheless be affected at different rates by climate change. They will migrate across fragmented landscapes and the ecosystems dominated by persistent species will probably be slow in showing evidence of changes. Thus, it is expected that the composition of ecosystems will be modified, given that the species that constitute an ecosystem are unlikely to evolve at the same speed. The most rapid changes should take place in ecosystems that are already in the process of change due to non-climatic disruptions of natural or anthropic origin;
- the existing ecosystems could be altered by new species. The ecosystem replacement characteristics (speed of replacement, what is replaced by what) depend on changes in frequency, intensity, extent and the location of climate changes;
- the impact of sea-level rise on coastal ecosystems (mangrove, algae, coastal wetlands, etc.) will vary regionally and depend on the process of erosion by the sea and processes of deposits coming from the land. For example, mangroves located in low coastal zones where deposits of sediments are high and erosion processes are weak should not be particularly affected by the rise in the sea-level rise;
- the risk of extinction will increase for species that are already vulnerable: species with a tight climatic range or great restrictions on habitat or for which the population is weak are typically the most vulnerable (such as endemic mountain species, biota restricted to an island, etc.);
- when a significant disruption to the ecosystem occurs, there should be a net loss of productivity of ecosystems, at least during the transition period. However, in most cases, loss of biodiversity in extensive and varied ecosystems should not necessarily imply an overall drop in biodiversity, because there is a certain degree of redundancy in this type of ecosystem, i.e., the contribution of one species to the productivity of the ecosystem is compensated by another species. It should be noted that knowledge on this subject is very incomplete.

According to the SNB (2009), the direct effects already observed relate to changes in the physiology of individuals, their behaviour (settlement versus migration), the diversity and abundance of species, their geographical distribution (terrestrial species changing altitude

[1] IPPC (2002), "Climate Change and Biodiversity", IPPC Technical paper V, 86 p.

and moving northwards)[1], the structure of communities (generalist species sometimes prevailing over specialists), phenology (asynchronous prey and predator cycles) and the relative surface area occupied by the different natural environments (SNB, 2009).

The indirect effects result from the influence of climate change on other pressure factors on biodiversity, which they superimpose.

For example, climate changes could favour the development of species that become invasive because they are more competitive under the new conditions.

Other indirect effects, such as those resulting from measures put in place in different business sectors (energy, forestry, agriculture, etc.) to adapt to climate change should also not be forgotten, for example, the impact of windmills on certain species.

[1] According to the CGDD (2010), climatic warming could, in future, lead to changes in the distribution areas of numerous bird species, some of which may disappear from mainland France by moving northwards, while others could appear from the south.

Chapter 3

Public incentives encouraging the destruction or deterioration of natural habitats

This chapter will successively examine public subsidies that promote the extension of developed, partially developed and/or fragmented spaces.

1 • Artificialisation of habitats

1.1. An accelerating process

artificialisation is a radical form of change landuse. It is usually irreversible. It is associated with the construction of transport infrastructure, urbanisation work (housing and zones of industrial and commercial activity) and the setting-up of agricultural greenhouses.

In France, there are two tools for observing the occupation of land through which it is possible to measure changes to artificialised areas: the *European tool Corine Land Cover* used by the ministry in charge of ecology and *Teruti-Lucas* used by the ministry of agriculture. These two databases do not refer to the same nomenclature of land use (the nomenclature used by *Teruti-Lucas* is finer) and the sampling methods are different (*Corine Land Cover* uses satellite images over the entire territory, while *Teruti-Lucas* uses observation around a grid of points covering the territory).

According to *Corine Land Cover*, between 1990 and 2006, the share of land area developed in mainland France went from 4.6% to 5.1%, which corresponds to a loss of 281,354 ha in 16 years, including 122,949 ha over the period 2000-2006 (see the following table).

Occupation of land in 1990, 2000 and 2006 according to Corine Land Cover[1]

Mainland France (*Corine Land Cover*)	1990	2000	2006
Total surface area (not including seas, oceans and estuaries) (thousands of ha)	54,927	54,927	54,927
Total surface area developed (thousands of ha)	2,538	2,661	2,819
Share of developed land in the total land area	4.6%	4.8%	5.1%
Share of continuous urban fabric in the developed surface area	1.8%	1.8%	1.6%
Share of discontinuous urban fabric in the developed surface area	76.0%	74.5%	74.3%
Share of industrial and commercial zones in the developed surface area	10.8%	11.8%	12.1%
Share of road and rail networks and associated spaces* in the developed surface area	1.0%	1.4%	1.6%
Share of port zones in the developed surface area	0.4%	0.4%	0.4%
Share of airports in the developed surface area	1.7%	1.7%	1.6%
Share of places of materials extraction in the developed surface	3.0%	3.2%	3.1%
Share of landfill sites in the developed surface area	0.3%	0.3%	0.3%
Share of construction sites in the developed surface area	0.6%	0.5%	0.3%
Share of urban green spaces in the developed surface area	0.8%	0.7%	0.9%
Share of sports and leisure facilities in the developed surface area	3.6%	3.8%	3.9%
Total	100%	100%	100%

(*) The item "road and rail networks and associated areas" used in CLC corresponds to motorways, railways and ancillary areas of a minimum width of 100 metres.

The artificialised areas are higher according to the *Teruti* and *Teruti-Lucas* nomenclature. They represented 7% of the area of mainland France in 1993 (beginning of the Teruti inventory) and 9.4% in 2008.

[1] We see in this table that CLC does not consider industrial and commercial zones as part of the urban fabric.

Changes to artificialised areas between 1993 and 2008 according to Teruti then Teruti-Lucas

Mainland	1993	1995	2000	2006*	2007	2008
Total surface area (thousands of ha)	54,919	54,919	54,919	54,919	54,919	54,919
Artificialised areas (thousands of ha)	3,869	4,009	4,301	4,996	5,064	5,145
Share of developed land in the total land area	7.0%	7.3%	7.8%	9.1%	9.2%	9.4%
Share of Urbanised Developed Area (UAA) in the total area	51.4%	51.2%	50.7%	50.2%	50.1%	50.0%
Share of forests in the total area	27.6%	27.8%	28.1%	28.3%	28.3%	28.3%
Share of other types of land occupation in the total area	14.0%	13.8%	13.4%	12.3%	12.3%	12.3%
Total	100%	100%	100%	100%	100%	100%
Share of areas dedicated to industrial activities in the developed surface area	nc	nc	nc	5.6%	5.6%	5.5%
Share of surface areas dedicated to road networks in the developed areas	nc	nc	nc	22.3%	22.0%	22.1%
Share of areas dedicated to public services in the developed areas	nc	nc	nc	8.4%	8.4%	8.4%
Share of areas dedicated to sports and leisure in the developed areas	nc	nc	nc	15.9%	15.8%	15.5%
Share of areas dedicated to housing in the developed areas (individual and collective)	nc	nc	nc	44.3%	44.9%	44.9%
Share in other areas	nc	nc	nc	3.5%	3.3%	3.7%
Total	nc	nc	nc	100%	100%	100%
Share of built land in the developed surface area	24.8%	24.6%	24.6%	15.5%	15.9%	15.8%
Share of covered or stabilised land in the developed surface area	40.2%	39.9%	39.2%	43.2%	44.0%	44.4%
Share of other developed spaces in the developed surface area	35.0%	35.5%	36.2%	41.3%	40.1%	39.8%
Total	100%	100%	100%	100%	100%	100%

(*) The annual French Teruti survey was adapted to the European Lucas specifications in 2005. The data collection methodology therefore changed from this date.

The two surveys show an acceleration in the artificialisation process:

- between about 16,000 ha and 20,000 ha developed per year over the periods 1990-2000 then 2000-2006 according to CLC;
- between about 60,000 ha and 75,000 ha developed over the periods 1993-2000 then 2006-2008 according to Teruti-Lucas.

According to the Teruti-Lucas survey, it is covered land that is increasing fastest. Agricultural surface area is diminishing. Only wooded areas, however, seem to be remaining steady.

According to CLC, the continuous urban fabric only represents 1.6% of artificialised areas. Conversely, discontinuous urban fabric, which consumes much more space, represents three quarters of the artificialised areas.

A study from CGDD in 2010[1] assesses the progression of urban sprawl (i.e. discontinuous urban fabric) at 5,600 ha/yr. According to this same study, industrial and commercial zones are continuing to expand in all regions (+ 3,800 ha/yr), as is transport infrastructure (+ 1,300 ha/yr)[2], which represents the greatest relative increase (related to their surface area) (+19%). Zones where materials are extracted are also clearly up (+ 1,200 ha/yr), as over the period 1990-2000.

According to these three different sources, using different methods and classifications, it is the other artificialised areas (i.e. non-built artificialised areas) which have increased the most over the last few decades.

The rest of this section is devoted to public incentive favouring, firstly, urban sprawl, then development in rural zones and development through extractive activities. A separate section is reserved for public incentive related to development in French overseas territories. Lastly, the areas dedicated to transport networks will be dealt with in the section "Public subsidies promoting the fragmentation of habitats".

1.2. Urban sprawl: what is it?

Urban sprawl is characterised by urban zones of low density at the edges of towns and cities, with historic town centres sometimes becoming depopulated at the same time. Typically, the land becomes urbanised gradually around built-up areas: we therefore see, around town centres and their near suburbs, a mosaic of discontinuous housing estates and surrounded cultivated fields. Since 1999, we have seen, probably through proactive local development policies, certain town centres undergoing a renewal, but the increase in the surrounding urban fringes remains strong. Thus, the average annual population change between 1999 and 2006 is 1.3% for the urban fringe, against 0.5% for urban centres and 0.7% for rural areas (source: INSEE - French National Institute for Statistics and Economic Research, General Population Census).

Certain basic trends remain: human pressure is still growing on coastal zones, which have had a rate of development 2.7 times greater than the average in mainland France (source: *Le 4 pages de l'Ifen* - French Institute for the Environment n° 120; October 2007); a portion of the territory along a line running from the Meuse to the Landes (the "empty diagonal")[3] remains characterised by very low densities, less than 30 inhabitants/km^2, even though rural spaces are now increasing at the same rate as the whole of the territory (+0.7% per year). The resumption in demographic growth in rural zones is nevertheless not consistent and is the result of an extension of urban fringes.

[1] CGDD (2010), *L'environnement en France, Service de l'observation et des statistiques* (The environment in France, Statistics observation service), Collection Références, general commission for sustainable development.
[2] It should be noted that the Teruti-Lucas survey assesses the areas dedicated to road networks at more than 20% of the artificialized areas, while, for the CLC, the road and rail networks only represent about 1.5%. As the observation scale of Teruti-Lucas was much finer than that of CLC, the areas dedicated to road networks are better distinguished.
[3] The "empty diagonal" is the portion of France on a line between the South West and the North East, which groups the least densely populated departments.

New zones of urbanisation are clearly emerging, along transport infrastructure and borders. Urban development is taking place around villages, near places served by motorways or in the middle of the countryside (urbanisation). It is "*the multi-polar town as an archipelago structure, where urban pieces spread out amongst the rural*"[1].

The traditionally-identified factors influencing urban sprawl are individual preferences (price per m^2, living environment, transport,…) as well as urban planning policies.

1.3. Public subsidies related to individual determinants of urban sprawl

For a household, the main motivation for moving to an urban fringe remains the cost of housing, which reduces, as distance from town centres increases, under the dual effect of the lower price of land and lower construction costs.

Town centres are still too expensive for many households: however 44% of urban fringe owners would like to live in the urban zone. It is nevertheless likely that, in their decision, households underestimated the transport budget necessary in the urban fringe, and therefore the overall cost of housing at the periphery, as fuel costs represent only 27% of the budget for a car.

Although optimisation of the number of m^2 takes clear precedence over the enjoyment of a garden, the search for a more natural environment is the second reason for moving to the urban fringe. Thus, 85% of inhabitants classified as in the urban fringe zone consider that they live in the countryside. Rural areas continue to attract those living in urban environments (27% of them say that they would like to move to the countryside in the near future) and the town continues to repel rural dwellers (only 8% of them would like to live in a town). Furthermore, in the order of social perceptions, ownership of a detached house has tended to remain the dominant model until now.

These elements are, or were, supported by the following subsidies:

♦ **The various incentives to the acquisition of housing**

Incentives to the acquisition of land contribute to urban sprawl when it encourages the construction of new houses, particularly when these incentives are not targeted between the urban and the urban fringe. Support to the purchase of property during 2011 was valued at 4.7 billion euros.

A. Incentives to the acquisition of the main home

Incentives to the acquisition of new property that are not targeted according to the location of the property (urban/urban fringe) contribute to development of the territory and urban sprawl.

a) The social housing loan (French acronym: *PAS – prêt d'accession sociale*) is intended for households whose incomes are below resource limits lower than those applied to the new zero-rate loan, who purchase or improve a home or have one built, in order to live in it as their main residence. The PAS is distributed by lending institutions that are members of the

[1] CERTU (2000), *La Forme des villes. Caractériser l´étalement urbain et réfléchir à de nouvelles modalités d´actions* (The shape of towns. Characterising urban sprawl and reflecting on new types of actions), Lyon, 178 p.

social housing loan guarantee scheme. This scheme compensates lending institutions for any losses that they may incur if their borrowers become insolvent.

b) The social loan for rental-purchase (French acronym: PSLA - *prêt social de location-accession*) is dedicated to the financing of rental-purchase transactions. Households benefiting from this scheme can become owners of a new home after a reduced-rent rental phase, during which they can measure their ability to repay. Guarantees covering repurchase of the home and rehousing are also provided to households to protect them against personal accident.

c) The zero + rate loan (French acronym : PTZ+ *prêt à taux zéro* +)
The PTZ (*code de la construction et de l'habitation* - housing and building code, article L. 31-10-1; CGI, article 244 sub-paragraph 4 J and 244 sub-paragraph 4 V) is a loan for which the interest is paid by the state for the purchase of a first main residence (reserved for persons who have not been owners of their main residence for at least two years). The amount of the loan and the conditions for repayment take into account the level of income, the size of the household, the geographical location of the home, its type (new or existing) and its energy performance.

The zoning of the PTZ+, defined by the ordinance dated 29 April 2009 modified relative to the classification of municipalities per zone applicable to certain housing aids, is a geographical division according to market prices, not according to the imperatives concerning the occupation of areas and urban sprawl.

So, for the 100,000 PTZ+ existing in the first quarter of 2011:

- 40% were granted in zone A (Paris and the greater Paris area as well as the Côte d'azur and the municipalities close to the Swiss frontier) and B1 (large urban areas as well as all municipalities in Corsica and on the islands off Bretagne and overseas), against 34% in 2010 with the former scheme;
- 20% were granted in zone B2 (medium-sized towns), a percentage almost identical to that of PTZ in 2010 (20.3%);
- 40% were granted in zone C (the remainder of the national territory) (45.7% in 2010).

Furthermore, the magnitude of the variation in the amount of the PTZ+, according to whether the home is new or existing, has the effect of funding a large share of the construction of detached houses located in urban fringe sectors.

Furthermore, the variation in the amount of the PTZ according to the energy performance encourages the acquisition of new homes and consequently their construction, to the detriment of renovation: yet renovation does not cause loss of natural spaces.

The cost of the PTZ+ is estimated at 920 million euros in 2010 and 1,060 million euros in 2011.

B) Incentives to the construction of new homes

a) The reduction in income tax in favour of rental investment (the "Scellier scheme")

Private individuals who acquire new homes intended for rental between 1 January 2009 and 31 December 2012 may benefit from tax reductions spread over nine years. These homes must be located in municipalities classified in geographical zones A, B1, B2 (zone C subject

to approval). The tax reduction is calculated on the purchase price of the home within the limit of 300,000 multiplied by a rate of 13% (22% for low-energy-consumption homes). When the rental is granted under rental conditions that are more restrictive for tenants who satisfy resource conditions, the owners benefit from additional advantages: a specific deduction of 30% for property income and an additional tax reduction when this home remains rented beyond nine years. Housing units located in a rural revitalisation zone benefit from an additional deduction of 26% for property income.

Prior schemes (Robien, Borloo) participated, to a certain extent, in urban sprawl by increasing the construction of new homes in certain geographical zones, so that the supply of housing was greater than the demand (which led to the exclusion of zone C from these schemes).

This type of scheme should be concentrated in intra-urban areas and in zones close to rapid-transit public transport systems.

b) The reform of taxation on urban development

In matters of urban development, the costs of facilities are generally spread over the entire population and not only over the population that benefits directly from them. Furthermore, not taking into account the full infrastructure costs reduces the cost of housing. The demand for these housing units is thus greater, hence excessive sprawl. Modifying the system for financing collective facilities with the aim of fully recovering their cost from those who generate it would correct this malfunction.

The reform of urban-planning taxes, specified in article 28 of the amending finance act for 2010 (act n° 2010-1658 dated 29 December 2010), which came into force on 1 March 2012, partly meets this objective.

The scheme is composed of two taxes that complement each other:

- the development tax (taxe d'aménagement) that has the objectives of simplification and yield, and can finance the public facilities made necessary by urbanisation;
- the contribution for sub-density (versement pour sous-densité), which has the objective of fighting urban sprawl and encourages the economical use of space.

The development tax substitutes for the local facilities tax (French acronym: TLE – *taxe locale d'équipement*), the departmental tax on natural and sensitive areas (French acronym: TDENS - *taxe départementale des espaces naturels et sensibles*), the departmental tax for financing the architecture, urbanism and environment councils (French acronym: TDCAUE - *taxe départementale pour le financement des conseils d'architecture, d'urbanisme et de l'environnement*), the tax that is complementary to the TLE in the Paris region and the overall development programme (French acronym: PAE - *programme d'aménagement d'ensemble*). It is due for "development and construction operations, reconstruction and enlargement of buildings, facilities or developments of any kind subject to an authorisation regime".

The following are exempt:

- buildings intended for public service or public utility;
- premises for housing and accommodation benefiting from a subsidised social-integration rental loan;
- operational surface areas of agricultural buildings that constitute non-taxed gross floor area under the current arrangement;

- developments prohibited by the risk-prevention plans;
- the identical reconstruction of a building destroyed less than ten years ago;
- buildings for which the surface area is less than 5 m^2, to simplify and reduce the cost of managing the tax.

Also, the regional authorities, as far as they are concerned, may fully or partially exempt social housing benefiting from the reduced rate of VAT.

Concerning the surface areas for buildings for use as main homes which do not automatically benefit from the 50% allowance (namely: surface areas greater than 100 m^2), the regional authorities may exempt them up to 50% if they are financed with the aid of a zero-rate loan.

The authorities may also, if they wish, totally or partially exempt industrial buildings, retail shops of a surface area of less than 400 m^2 with the aim of retaining local shops, as well as renovation authorised on buildings classified as historical monuments or recorded on the supplementary inventory.

The tax base is constituted by the construction surface area, to which a fixed amount is applied per square metre (660 euros and 748 euros in the Paris area).

The construction surface area is calculated within the building's walls and therefore does not penalise insulation[1].

The rates are fixed by the municipalities or public establishments for cooperation between local authorities (French acronym: EPCI - *établissements publics de coopération intercommunale*) within a range of between 1% and 5%, according to the developments to be carried out and depending on the sectors within their territories[2].

The municipalities may thus define sectors within the zones specified in the local urban development plan (French acronym: PLU - *plan local d'urbanisme*) and vary the rates per sector according to the cost of public facilities driven by urbanisation in the sector. For example: in a zone where all of the facilities are already completed and where the municipality wishes to intensify urbanisation, it may be fixed at a rate of 1%. Conversely, in another peripheral zone where the facilities are not completed, it may establish a higher rate. In certain cases, when it is necessary to create significant public facilities, the municipalities may fix a rate of development tax up to 20%.

The contribution for sub-density (French acronym: VSD - *versement pour sous-densité*) is established to provide a tool to moderate urban sprawl. It allows municipalities or EPCI to decide to establish a minimum density threshold below which a payment for sub-density is due by the beneficiaries of building permits. But this arrangement is optional. The minimum threshold for density is determined by sectors of the territory within the municipality or the EPCI within urban zones U or zones to be urbanised AU.

[1] The outright value of photovoltaic panels on the ground is set at 10 euros. This amount is low but the principle of taxation has been determined. It also taxes wind turbines higher than 12 metres: 3,000 euros per wind turbine. Parking areas not included in the construction surface area are also taxed. The outright value is fixed at 2,000 euros per place and this value can be increased up to 5,000 euros. It is a simplified way of taxing activities that make land impermeable.

[2] The departmental share of the development tax finances the policy on the protection of "sensitive natural areas" (previously known as the TDENS) and "expenses for the CAUE (conseils d'architecture, d'urbanisme et de l'environnement - architecture, urbanism and environment councils)". The rate is set by the general council within the limit of 2.5%. It also determines the rates of distribution between the ENS and the CAUE.

The amount of the VSD "*is equal to the product of half of the value of the land by the ratio between the surface area lacking for construction to reach the minimum density threshold and the construction surface area resulting from the application of the minimum density threshold*". For example, a person has land of 1,000 m² with a value of 200,000 euros, on which the density threshold has been set by the commune at 0.5, namely 500 m². This person builds a house of 300 m². He/she must therefore pay the VSD = (200,000/2) x (200/500) = 40,000 euros, which is a strong deterrent.

c) The taxation of empty homes

A high proportion of vacant homes may lead to the construction of new homes, particularly in periods of housing shortage in certain urban zones under pressure. In consequence, the low application of taxation for vacant homes does not act as an encouragement for increasing the rate of occupation of these homes and can contribute to the construction of new homes.

Vacant homes are subject to:

- the annual tax on vacant homes (CGI- general tax code, article 232) for which the tax take is paid for the benefit of the national housing agency (Agence nationale de l'habitat);

- a housing tax on vacant homes was established by article 47 of the law 2006-872 dated 13 July 2006. This tax is not applicable in municipalities on the territory in which the annual tax on vacant homes specified by article 232 of the general tax code is applicable.

The annual tax on vacant homes applies to homes within municipalities belonging to continuous zones of urbanisation of more than 200,000 inhabitants where there is a marked imbalance between supply and demand for homes, to the detriment of persons with modest incomes and disadvantaged persons. The list of municipalities in which the tax applies was set by ordinance 98-1249 dated 29 December 1998. Homes subject to the tax are those vacant over two consecutive years to 1 January of the year of taxation. These are therefore homes that are not subject to the housing tax.

Only habitable housing units, meaning those that are closed, covered and fitted with the minimum elements of convenience (electrical installation, running water and sanitary equipment) come within the field of application of the tax. Not subject to the tax on vacant homes are those housing units which can only be made habitable following significant renovation[1] and for which the expense would necessarily fall to the owners (work intended to stabilise walls, roof frameworks and roofs, floors or interior corridors; work to install or fully renovate basic equipment for sanitary purposes, heating, electricity, running water and all windows and external doors). The extent of the renovation is assessed by the production of quotations. As a practical rule, the tax administration accepts that this condition is fulfilled when the amount of renovation necessary to make the housing units habitable exceeds 25% of the actual market value of the housing unit.

The tax is not due when the housing unit is vacant due to a cause outside the control of the lessor. The following in particular are excluded from the field of application of the tax:

- housing intended to shortly disappear or undergo work under urban-planning, renovation or demolition operations (in this respect, a notice period of one year may be accepted);

[1] Constitutional council in its decision of 29 July 1998.

- or housing units put up for lease or sale at the market price that do not find a tenant or a buyer.

The tax base is composed of the rental value of the housing unit used for the housing tax.

The rate is fixed at 10% the first year when the housing unit becomes taxable, at 12.5% the second year and at 15% from the third year.

The housing tax on homes that have been vacant for more than five years may be applied by the municipalities, providing that the annual tax on vacant homes is not applicable on their territory.

Only homes that are habitable, defined according to the same conditions as the tax on vacant homes, may be subject to the housing tax on homes vacant for more than five years.

Vacancy is also assessed under the same conditions as for the tax on vacant homes.

The basis of the tax consists of the rental value of the home according to the procedures used for a second home.

Members of Parliament have ascertained a drop in the collection of the housing tax on vacant homes[1]. For example, over the last three years, the town of Béziers has seen a drop in income and the number of those liable for the housing tax on vacant homes: income from it went from 257,000 euros in 2008 to 128,000 euros in 2009 and 75,000 euros in 2010. This tax relief at the expense of the town reduced the overall tax income for 2010 by 62,000 euros, as the number of those liable to pay dropped from 397 in 2008 to 136 in 2010. This situation is explained by the fact that tax relief can be obtained upon presentation of quotations for work of an amount greater than 25% of the market value of the property, and thanks to certain exceptional tax reliefs pronounced by the administration.

This convenient regulation, which allows tax exemption on vacant homes and exemption from housing tax, providing that the amount of work necessary to make the housing unit habitable exceeds 25% of the market value of the housing unit, diverts these arrangements from the intended purpose, which is to encourage the owners of habitable and vacant homes to rent them.

The drop in transport costs plays an essential role in the process of urban sprawl

The low and decreasing cost of transport allows households to accept greater distance from town centres (assumed to concentrate most jobs), in order to benefit from more spacious homes. The costs of transport, understood in the wider sense as the sum of the direct monetary cost (car, fuel and maintenance) and the cost of transport time, have considerably diminished since the mid-20th-century[2]: the cost of cars has dropped significantly, encouraging the increase in the rates of car ownership, and the development and improvements to infrastructure, particularly the road network, have significantly increased the speed of journeys. Urban sprawl is thus characterised by the combination of the increase in distances travelled for daily journeys and intensive use of private cars, which increases the emissions of atmospheric pollutants. Other than its specific effect on the consumption of natural spaces, urban sprawl causes two indirect effects on biodiversity: it contributes to increasing the fragmentation of natural spaces and the effects of atmospheric pollution on flora and fauna.

[1] *Question orale sans débat n° 1241S* (Oral question without debate n° 1241S) from Senator Raymond Couderc (Hérault-UMP) published in the Official Journal of the Senate on 10 March 2011, p. 568.
[2] Source : www.developpement-durable.gouv.fr/Les-determinants-de-l-etalement.html.

The construction of a new high-speed railway or motorway may also be accompanied by new urban developments near areas that are served and near stations.

Certain theoretical models show that the construction of a new road from an urban centre causes depopulation of the centre and an increase in urban sprawl along the new highway. Certain researchers think that this link between the development of infrastructure and new human settlement constitutes the application of "Zahari's conjecture", which explains that the time spent daily in transport for the inhabitants of an urban zone has hardly varied over time (it is approximately one hour). Thus, time saved by improving public transport networks results in an increase in the distance travelled, and therefore in urban sprawl. We therefore obtain a paradoxical situation: public subsidies to the improvement of transport contribute strongly to the consumption of space: an example of a "social/environmental" conflict.

Generally, all measures that lead to under-pricing interurban transport in total[1] therefore increase urban sprawl (also see the chapter on pollution and the following paragraph devoted to the fragmentation of the region).

1.5. Public subsidies related to the economic activities of urban sprawl

Economic activities also consume space, particularly at the urban fringe, to the detriment of agricultural land.

The regional economic contribution

As the regional economic contribution (contribution économique territoriale) (formerly the business tax – taxe professionnelle) is generally lower outside town centres, communities at the urban fringes tend to attract companies. This policy usually results in the creation of business zones at the fringe, of low-density construction, established on agricultural land or natural spaces where the price of land per square metre is less expensive than in urban zones.

This policy has the effect of displacing business and commercial centres from the town centres to the periphery, which also results in increased travel. It also arouses competition between municipalities, particularly between communes, to attract these activities which consume land.

The business property tax (French acronym: CFE - cotisation foncière des entreprises) is due by all persons exercising a non-salaried professional activity.

Its rate is set by local authorities, which sometimes have a policy of competition between each other to attract companies to their regions.

Certain activities are exempt, either by law (the craft trades, agricultural activities and public authorities for certain activities, including ports), or optionally according to the decision of local authorities, according to their place of establishment:

- zones of rural regeneration;
- business clusters;
- sensitive urban zones;

[1] « La tarification, un instrument économique pour des transports durables » (Pricing, an economic instrument for sustainable transport), La Revue du CGDD, November 2009.

- urban customs-free zones;
- employment pools to be regenerated.

Depending on where companies are located, these exemptions usually contribute to urban sprawl.

The tax on commercial areas

The tax on commercial areas (French acronym: TASCOM - *taxe sur les surfaces commerciales*) is due by establishments with retail commercial sales areas exceeding 400 m^2 and for which annual turnover is at least equal to 460,000 euros. The amount of the tax is determined according to the turnover, excluding taxes, of the establishment during the previous calendar year. The scale of the tax is fixed as follows (per m^2 of sales area):

- 5.74 euros per m^2 for establishments whose turnover per m^2 is less than or equal to 3,000 euros ;
- for establishments whose turnover per m^2 is greater than 3,000 euros but less than or equal to 12,000 euros, the rate of the tax is given by the following formula: €5.74 + [0.00315 x (CA per m^2 – 3 000)];
- 34.12 euros per m^2 for establishments with a turnover per m^2 superior 12,000 euros.

The rate is increased for retail businesses selling fuel.

Rate reductions are provided:

- 30% in favour of professions whose businesses require abnormally large sales areas (exclusive sale of furniture, automobiles, agricultural machinery and construction materials);
- 20% for establishments whose retail surface area is between 400 m^2 and 600 m^2, when annual turnover per m^2 is no greater than 3,800 euros.

On the other hand, the amount of the tax is increased by 30% for establishments with surface areas greater than 5,000 m^2 and for whom annual turnover, excluding taxes, is greater than 3,000 euros per m^2.

Since 1 January 2011, income from the Tascom has been assigned to local authorities in the regions in which the taxable establishments are located.

These local authorities may apply, to the amount of the tax, a multiplying coefficient of between 0.8 and 1.2 from the tax due in 2012.

This tax therefore applies indiscriminately according to the location of the commercial surface area. While admittedly adjusting, in the absolute, in relation to the extension of the surface area, it corrects neither the differential cost of land nor the impact of the establishment on biodiversity.

The tax for office creation and the annual tax on offices in the Paris region

Areas used for offices, which are highly profitable and consume much space, are under-taxed and do not internalise their harm to biodiversity through excessive consumption of space.

Tax for creation of offices, research premises or commercial or storage premises in the Paris region (urban planning code - code de l'urbanisme, article L. 520-1)

A tax is payable:

- on the construction in Paris, and in certain municipalities of the Paris region, of premises for use as offices or research premises and their ancillaries; from 1 January 2011, the tax is extended to the creation of commercial and storage premises (law 2010-1658 dated 29 December 2010, art. 31, II);
- on the conversion, into such premises, of premises previously assigned to another usage.

The following are nevertheless exempt from the tax: in industrial establishments, offices that are part of production premises and other offices of a surface area less than 1,000 m^2; research premises, included in industrial establishments; offices used by members of the liberal professions or court and state officials; offices forming part of housing premises; premises of a social character; health premises; premises assigned to a public service or used by the social security or family allowance organisations; premises assigned to associations recognised as being of public utility.

The following are also exempt: conversions by owners or their claimants of premises destroyed by disaster or subject to compulsory purchase for public utility; conversions of premises for use as offices, research premises, commercial premises or storage premises, carried out within urban customs-free zones.

The tax is calculated on the usable surface area, meaning, except where proved to the contrary, on the roofed gross floor area at each floor of the building subject to a fixed deduction of 5%. From 1 January 2011, the amount of the tax varies according to the situation of the premises in zones 1, 2 or 3, for which the delimitation is identical to that used for the annual tax on offices in the Paris region.

Its amount is:

- 344 euros per m^2 in zone 1;
- 214 euros per m^2 in zone 2;
- 86 euros per m^2 in zone 3.

These rates are reduced by 65% for commercial premises and by 85% for storage premises.

The annual tax on offices in the Paris region (general tax code, article 23b)

The tax is due on:

- premises used for offices and their immediate and essential outbuildings intended for the exercise of a business activity (including one of the liberal professions) or used by the state, regional authorities, public institutions, professional organisations or private associations, both profit-making and non-profit-making;
- commercial premises intended for a wholesale or retail commercial activity or the provision of services, together with their adjacent stock rooms and the adjacent places permanently assigned to sales;
- storage premises that are not integrated into a production establishment;
- parking areas of at least 500 m^2 ancillary to these categories of premises.

The following are exempt from the tax:

- premises for use as offices with a surface area less than 100 m^2, commercial premises with a surface area less than 2,500 m^2, storage premises with a surface area less than 5,000 m^2 (in this respect, exhibition grounds and premises mainly for the use of conferences are considered in the same category as storage premises) and parking areas of less than 500 m^2;
- storage premises for agricultural cooperative companies;
- premises for use as offices, commercial premises, storage premises and parking areas located in a zone of urban regeneration or in an urban customs-free zone;
- premises used for production and conversion activities and premises integrated into a farm;
- premises and parking areas belonging to foundations and associations recognised as being of public utility in which they exercise their activities, and premises specially adapted for archiving and for the exercise of research activities or activities of a health, social, educational or cultural character;
- administrative premises and parking areas for teaching institutions of the first and second level (primary schools, secondary schools and upper secondary schools), whether they are public or private under contracts made with the state.

All these exemptions, by reducing the cost of development, are objectively unfavourable to biodiversity.

The amount of the tax is equal to the product of the surface area, expressed in square metres, multiplied by a single rate that varies according to the nature of premises and the geographical situation (zone 1: Paris and the municipalities of Hauts-de-Seine; zone 2: others municipalities of the urban unit of Paris as delimited by decree; zone 3: other municipalities of the Paris region).

Location of buildings	Zone 1	Zone 2	Zone 3
Buildings for office use, normal rate	15.91	9.43	4.51
Buildings for office use, reduced rate	7.88	5.63	4.08
Commercial premises	7.00	3.60	1.80
Storage premises	3.60	1.80	0.90
Parking areas	2.10	1.20	0.60

We can see that, probably for reasons of territorial development, the rates are lowest in the most rural zones. This graduation is unfavourable to biodiversity. Given the numerous exemptions, these low rates and the graduation in force, these taxes do not provide a disincentive to the construction of offices and storage buildings.

The Paris region does not seem threatened by a shortage of business premises. Thus, Immogroup Consulting estimates that "for offices, the excess at one year has been between 1.8 and 2.5 million square metres per year since 2003".

The tax on commercial wasteland (general tax code, article 1530)

The municipalities (or amalgamations of municipalities) may establish an annual tax on commercial wasteland located on their territories. These assets must have no longer been

assigned to an activity coming within the scope of CFE for at least five years and must have remained unoccupied during this period.

This tax covers assets which, by their nature, are liable for the land tax: offices, buildings assigned to commercial activity, parking areas for shopping centres and places of warehousing or storage. However, the tax is not due when the non-use of the assets is outside the control of the taxpayer.

The taxable base consists of the net income used as the basis for the land tax on built property. Its rate is set at 5% during the first year of taxation, 10% the second year and 15% from the third year. These rates may be increased up to twice their amounts.

This tax has not currently been brought into force, yet it could encourage the offer for sale and preferred consumption of land that is already profoundly artificialised.

The tourist tax and additional taxes

Tourism is a driver of activities, some of which require the development of natural areas (additional housing, construction of recreational complexes, shopping centres, etc.) and/or disrupt neighbouring habitats through noise and light. Conversely, a tourist site is even more attractive if it retains its authentic character.

According to the general code for regional authorities (articles L. 2333-26 to L. 2333-46), the following may establish tourist taxes:

- classified resorts;
- municipalities benefiting from the additional grant to municipalities and tourist or spa associations and the specific grant to tourist municipalities;
- mountain municipalities;
- coastal municipalities;
- municipalities making the effort to promote tourism;
- municipalities carrying out actions to protect and manage their natural areas;
- public establishements for cooperation between local authorities when they benefit from the supplementary or special grant mentioned in article L. 5211-24 of the general code covering regional authorities or when they undertake actions to promote tourism or when they perform actions to protect and manage their natural areas.

The municipal council (or deliberating body) may establish, for each type of paid accommodation, either the tourist tax or the fixed-amount tourist tax.

The amount of the tourist tax due is equal to the number of nights spent in the municipality multiplied by the rate fixed by the municipal council.

The amount due for the fixed-amount tourist tax corresponds to the product of the number of days included both in the period of collection of the tax and in the period of opening of the establishment, multiplied by the number of persons who may be accommodated in the establishment (reception capacity) and by the municipal or inter-municipal rate.

The additional tax of 10% may be collected by the departments on the territory of municipalities and public establishments for cooperation between local authorities which

have established the tourist tax or fixed-amount tourist tax at the same time and under the same conditions. It brought in 3 million euros in 2009.

Income from the tourist tax (207 million euros in 2009) is assigned to expenditure intended to promote tourism in the municipality. In the municipalities that have established the tourist tax pursuant to actions to protect and manage their natural areas, the income from the tax may be assigned to expenditure intended to protect and manage natural areas for tourist purposes.

The tax rate is fixed by the municipal or community council within the limits of the scale fixed by decree n° 2002-1549 dated 24 December 2002. It has not been revalued since. The rate of the tourist tax is fixed, for each type and category of accommodation, per person and per overnight stay. It is included between 0.2 and 1.5 euros according to the comfort and level of luxury of the accommodation, per person and per overnight stay.

Thus, the procedures for setting the tourist tax internalise neither the negative impacts of tourist activity on biodiversity, nor the benefits that tourists receive from a preserved natural environment. Indeed, this was not the objective of this tax when it was implemented.

1.6. Public subsidies to development in rural zones

The following incentives reduce the cost of constructing new buildings in agricultural areas and consequently contribute to the development of agricultural habitats:

- exemption from the TFB for rural buildings exclusively and permanently assigned to agricultural use (barns, stables, granaries, cellars, vaults, pressing sheds, etc.) whatever the type of farm;
- exemption from the regional economic contribution (French acronym: CET, the former business tax). The CET includes a part based on property (the CFE, cotisation foncière des entreprises - business property tax) and another part calculated according to the added value created by companies (French acronym: CVAE, *cotisation sur la valeur ajoutée des entreprises*. The CFE is based on the rental value of property liable for the land tax on built properties (factories, commercial premises, etc., or the land tax on non-built property (land, quarries, etc.). The following in particular are exempt from the CFE: large maritime ports and autonomous ports and farmers (articles 1449-1466 of the general tax code);
- exemption from urban planning taxes: the departmental tax for sensitive natural areas (TDENS), the departmental tax for the financing of architecture, urban planning and environmental consultancies (TDCAUE) and the local facilities tax (TLE). The general council may, for example, exempt from the TDENS any craft trade and industrial premises located in municipalities of less than 2,000 inhabitants (article L. 142-2 of the urban planning code);
- exemption of the preventive archaeological tax for excavations for the implementation of agricultural work and work relative to rental housing built or improved with the financial contribution of the state.

Also, when agricultural land is subject to development, a farmer may receive compensation for expropriation according to a scale fixed by prefectural decree in each department.

1.7. Public subsidies favouring quarries and extractive activities

Mineral extractive activities supply the raw materials necessary to creating infrastructure for travel (80%) and for the construction of buildings (20%). This activity has had to satisfy an ever-increasing demand over the last thirty years, resulting in a 20% increase in production, going from 280 million tonnes of ballast in 1970 to 376 million in 2009. The determining factors behind this growth are the increase in requirements for housing and infrastructure, supported by demographic growth, the increase in the size of housing units per inhabitant and increased personal mobility.

The resulting momentum concerning land consumption is an annual net surface area consumed of about 1,200 ha[1], accompanied by a reduction in the number of sites (-14% between 1998 and 2008), which currently stand at 2,700. This net consumption of space is the result of an extension of the areas of quarries, by about 1,700 ha/yr (three quarters of which are to the detriment of agricultural zones), and a reverse movement of a return of worked-out land in a "non-artificialised" state (for about 500 ha/yr), mainly in the form of grass/shrubbery areas, and secondly in the form of agricultural zones or lakes.

On land, quarries have a direct impact on biodiversity because they directly or indirectly destroy habitats and therefore species that live in it[2]. The noises (site equipment and transport vehicles) and the vibrations (blasting) caused by the activity may also be a source of nuisances for species living nearby. Exploitation of a quarry may also have hydro-geological impacts (erosion, modification of flows and the level of watercourses) and affect the functioning of aquatic ecosystems (modification of chemical properties in contact with the air, dissemination and deposit of suspended matter, drying or reduction in water levels). Furthermore, the transport of extracted materials, most often by road (94% of tonnage), indirectly affects biodiversity via emissions of CO_2 that it causes and its contribution to global warming, via atmospheric pollution that it causes, as well as its effects on flora and fauna. On this point, the activity of quarries nevertheless tends to be localised near to places of consumption, as the average distance travelled from the production sites is 20 km to 25 km.

Extraction of ballast at sea, which is still very marginal (2% of annual production), potentially has specific localised impacts but these are unevenly documented (nuisance for certain benthic species and disruption to their ecosystems, temporary effects on water turbidity, re-deposit of fine particles, hydrogeomorphological impact, etc.).

No direct public subsidies favouring or supporting extractive activities have been identified. On the other hand, as the products of extraction are mainly used to meet requirements in terms of constructing transport infrastructure (80%) and buildings (20%), the extractive industry benefits indirectly from public subsidies already identified in both these sectors. On the same principle, the special tax treatment of ports is likely to lower the costs of extraction of ballast at sea (even if the pricing of port services for these materials is considered in the whole of the port's pricing policy).

There is also specific tax treatment to this activity (*French acronym: TGAP*[3] on extraction and state tax for extraction at sea), supplemented by other, more generous, tax instruments (preventive archaeological tax, EPCI[4], land tax, water taxes, etc.). Any consideration as to

[1] Source: Corine Land Cover survey, CGDD calculations.
[2] This paragraph largely relies on the section « *Réduire les impacts sur l'environnement : une priorité* » (Reducing impact on the environment: a priority) taken from the White Paper *Carrières et granulats à l'horizon 2030*, published by the national union of ballast producers in 2011.
[3] TGAP: *taxe générale sur les activités polluantes* (general tax on polluting activities).
[4] ICPE: *installation classée pour la protection de l'environnement* (facility classified for the protection of the environment).

whether the "internalising" character of this specific taxation is sufficient should first take into account the other instruments aiming to prevent or compensate the impact of the activity in terms of biodiversity, all the more so as it was originally more a funding tax than an incentive tax[1].

Indeed, a number of regulatory provisions relative to this activity already aim to limit environmental impacts. Quarries are considered as forming part of the facilities classified for the protection of the environment and, in this respect, the opening and exploitation of a quarry are subject to prefectural authorisation, based on an impact study (particularly environmental) and a study of the dangers. Furthermore, the authorisation to quarry is associated with an obligation to restore the site, simultaneously with operation; the operator is also required to constitute financial guarantees to meet this obligation in case of bankruptcy. Indeed, old and redeveloped quarries can sometimes represent sites that are advantageous in terms of biodiversity[2].

1.8. Public subsidies to urban sprawl in the departments and local authorities overseas

Overseas departments and territories are also affected by urban sprawl.

This sprawl is often a *de facto* pre-existing situation resulting from illegal buildings (which are also more polluting because they are not connected to the sewage network).

This being so, incentives to the purchase of property and the construction of new housing, particularly income tax reductions and deductions concerning rental investments made (general tax code, articles 199 item 11 A and 199 item 11 C, 217 item 11 and 217 item 12) may contribute to urban sprawl when this occurs in zones of non-dense urbanisation.

Also contributing to urban sprawl are incentives to investment (construction) in the industrial, accommodation (holiday villages, campsites,…), catering, tourism (leisure activities: tourist site facilities, marinas,…), personal accommodation, etc., sectors. The same applies to income tax reductions and deductions concerning investments made in the aforementioned sectors (general tax code, articles 199 item 11 B, 217 item 11 and 217 item 12), when they are made in non-dense urbanisation zones.

2 • Partial development of habitats

The public subsidies influencing agricultural and forestry habitats are successively addressed in this part.

2.1. Habitats increasingly simplified and more intensive production systems

Agricultural habitats: the simplification and intensification of production systems is continuing

At the scale of the landscape, three partial development factors are particularly decisive in relation to biodiversity (Le Roux et al., 2008): the intensity of use of agricultural or forestry

[1] In principle, the state tax has more the character of a deduction, by the public authority owning the exploited resource, of the rent generated by the private exploitation of this "rare" resource.
[2] Quarries host overwintering or nesting water birds, maintain threatened populations of amphibians or insects, and shelter certain rare plant species.

production systems, the heterogeneity of the landscape and, to a lesser extent, the connectivity of inhabitants.

Heterogeneity of the landscape and production system acting simultaneously on biodiversity, sometimes in synergy and sometimes in opposition, with the effect of one being able to limit the potential effects of the other. Assessing the relative share of these factors on the state of the biodiversity process in agricultural landscapes is not easy, particularly due to the level of correlation often seen between them. In the majority of cases, there is a strong relationship between the intensification of conventional agriculture and the homogenisation of the landscape, namely the increase in the size of plots and fragmentation of semi-natural elements (Le Roux et al., 2008).

Simplification of agricultural landscapes

Simplification manifests itself by a reduction in semi-natural environments (wooded zones, semi-natural meadows, hedges and edges of fields, bogs, embankments, hollow lanes, etc.) and the establishment of a uniform habitat over vast surface areas. The patchwork of the countryside is disappearing and, with it, the beneficial effects of this type of landscape on biodiversity. This is because a mixed landscape increases the specific wealth of most animal and plant groups and contributes to increasing the abundance of most of them (Le Roux et al., 2008).

The percentages of semi-natural elements in French agricultural landscapes are highly variable. In arable crop-growing regions, they may represent less than 10% of the agricultural surface area. On the other hand, in certain pasture land production regions, they can represent more than half of the territory. At the scale of mainland France, the percentage of the total agricultural area occupied by semi-natural elements is less than 20% in some fifty French departments, a value considered as critical by ecologists, (Le Roux et al., 2008).

Zones of abandoned farmland have only a relative interest in terms of biodiversity. Although they are dominated by semi-natural elements, they may, for example, have a landscape structure that is less complex than hedged farmland, when there is a type of land occupation that is broadly predominant.

Intensification of production systems

In intensive production systems (arable crop systems, for example), the organisation of the landscape conforms to a logic that is focused on production. The search for maximum efficiency in the use of machines (size and shape of plots, route of tracks) and maximum work productivity (plot grouping, minimisation of manoeuvring time) has the effect of leading to grouping and ploughing up meadows, drainage and the removal of hedges.

Most of the studies assessing the impact of intensification of practices on biodiversity show effects that are often positive for the most "extensive" practices and variable effects depending on the practices and groups considered as most "intensive" (Le Roux et al., 2008).

Forest habitats: prospects for intensification and simplification

Forests in good condition overall

Over the last 150 years, the surface area of French forests has increased at a sustained pace, replacing low-productivity agricultural areas, which is not always favourable to biodiversity when the latter host notable ecosystems.

French forests have three specific characteristics compared to other Member States of the European Union:

- they are ecologically particularly rich and diversified, both in terms of species and of silvicultural: 136 species of trees in mainland France and 1,300 different species in the forests of French Guiana;
- the share of private forest represents 75% of the total surface area. Private properties are, on the other hand, very fragmented, with an average surface area of 2.8 ha per owner (MAP, 1994)[1];
- France has a large tropical forest in its overseas departments. This covers a surface of 7.7 million hectares, 98% of which is in French Guiana (source: CGDD Internet site).

From a more qualitative point of view, two thirds of the French forest is composed of broad-leaved trees. The Landes forest are dominated by the maritime pine, while broad-leaved trees are characteristic of the plains and foothills, while coniferous are characteristic of mountain areas. The species contributing most to the total standing volume (the wood, measured on the bark, of living trees for which the diameter at 1.30 m is greater than or equal to 7.5 cm) are the pedunculate oak and the sessile oak for nearly a quarter of the stock, beech (9%), pubescent oak (9%), maritime pine (7%), Scots pine (6%), the chestnut (5%), and the holly oak(5%).

The quality and biodiversity of French forests are satisfactory overall. Certain indicators of sustainable management (French acronym: IGD - indicateurs de gestion durable) of the mainland forest presented in the report from MAP of 2010[2] are relatively good[3], particularly:

- natural regeneration is more developed than artificial regeneration (71% of the total surface area against 29%). Half of the surface area of pines is nevertheless in artificial regeneration mode;
- the forests are mainly semi-natural (87% of the forest surface area) and not very artificial (12% of the total surface under plantation) (see table below).

[1] MAP (1994), *La gestion durable des forêts françaises* (The sustainable management of French forests), 81 p.
[2] MAP (2010), Les indicateurs de gestion durables des forêts françaises métropolitaines (The sustainable management indicators of French mainland forests), 2010 edition, ministry of agriculture and fisheries, 72 p.
[3] The adoption, since 2005, of the international definition of forests and the homogenisation of the conditions for creating the inventory at the national level during transition to the new inventory method, have caused a break in the series concerning the surface area of forest. This break in the surface area causes a break in all the other results. The 2010 results should therefore be considered as a new zero state of indicators constructed from IFN data and it should be borne in mind that all comparisons between 2005 and 2010 results are affected. The state of indicators constructed from IFN data and it should be borne in mind that all comparisons between 2005 and 2010 results are affected.

Degree of naturalness	Type of forests	Surface area (1,000 ha) in 2010	%
Non-disturbed forest		30	<1
Semi-natural forests	Broad-leaved population	9,722	63
	Pines population	2,273	15
	Mixed populations	1,392	9
Total semi-natural forests		13,387	87
Plantations	Broad-leaf species planted	376	2
	Pine species planted	1,496	10
	Mixed species planted	N/A	
Total plantations		1,901	12
Total		15,319	100

Source: IFN, inventory campaigns 2006-2009

Other indicators are less good (Gosselin et al. (2009[1]):

- the forest structure is dominated by the structure of the type "high forest" (nearly 50% of the surface area). The structure "irregular high forest" is not very present (less than 5% of the surface area, dropping more strongly than composite forest, for example);
- the proportion of trees of more than 60 cm in diameter represents between 7% and 11% of the total volume, depending on whether it is pine or broad-leaf;
- the density of deer has been constantly increasing over the last few decades, which may have mixed effects on biodiversity (losses for some groups and increases for others).

Strong increase expected for demand for wood

The prospect of an intensification of harvesting wood biomass from forests to meet the demand for wood energy and/or second-generation biofuels raises questions about the future of forest biodiversity.

According to the reports from Cemagref of 2007[2] and 2009[3] on the state of forest biomass and the options for its exploitation until 2020, it is possible to increase current production of wood while respecting the conditions of sustainable management. It should be noted, however, that state and municipal forests represent a quarter of the national forest area, but alone provide 40% of wood production. The observation of under-exploited private French forests is widely shared, but increasing their production appears difficult.

[1] Gosselin F., Bouget C., Gosselin M., Chauvin C. and Landmann G. (2009), « *L'état et les enjeux de la biodiversité en France* » (The state and issues of biodiversity in France), in Bio2, biomass and forest biodiversity, report produced under the coordination of GIP Ecofor upon request from MEEDDM, July, 221 p.
[2] Vallet P., Levesque C. and Ginisty C. (2007), *Biomasse forestière disponible pour de nouveaux débouchés énergétiques et industriels, Partie 1 : Analyse et synthèse des études existantes recensées au niveau national* (Forest biomass available for new energy and industrial outlets, Part 1: Analysis and synthesis of existing studies listed at the national level), Convention DGFAR/Cemagref n° E19/06, final report, October, 124 p.
[3] Ginisty C., Chevalier H., Vallet P. and Colin A. (2009), *Évaluation des volumes de bois mobilisables à partir des données de l'IFN « nouvelle méthode » : Actualisation 2009 de l'étude « biomasse disponible » de 2007* (Assessment of volumes of wood that is usable from data from the IFN's "new method": 2009 update to the study "available biomass" of 2007), Convention Cemagref/IFN/DGFAR n° E 10/08, final report, 62 p.

2.2. Incentives related to the partial development of agricultural habitats

Incentives that are more or less direct can accelerate the partial development of agricultural habitats. They are presented here by major determining factor in partial development, namely the intensification of practices and the simplification of landscapes.

Incentives favouring the intensity of agricultural production systems

Generally, the intensification of agricultural practices is determined by the price of intermediate consumption (pesticides, fertilisers, fuel, etc.), equipment, land and labour. Public subsidies reducing these various costs are covered in the first section of chapter 4.

Incentives favouring the simplification of the landscape

A landscape composed of numerous natural or semi-natural elements and varied crops is a habitat favourable to maintaining biodiversity. The incentives mentioned below were identified as being able to directly or indirectly influence one of these two characteristics of the landscape.

Incentives influencing semi-natural elements

The following incentives directly determine the choice of farmers concerning whether or not to keep their semi-natural elements:

- incentives from general councils to municipalities, amalgamations of municipalities and farmers for land-regrouping operations. This type of operation leads to a reconfiguration of the landscape and, although the legislation in the matter has changed[1], to the removal of hedges. These incentives can thus directly participate in simplifying the landscape;
- incentives from general councils for drainage operations. These incentives are most often assigned under conditions involving compliance with best drainage practices, which include not draining wetlands of ecological interest.

More indirectly, several incentives can reduce the cost of very large agricultural machinery and accelerate the disappearance of elements of the landscape, as this type of equipment is made easier to use by reducing the number of obstacles on the plot and between the plots:

- incentives to investment (specific deduction for investment, modernisation loans, loans for getting established);
- incentives reducing the cost of use of equipment (exemption or reduced rate of domestic consumption tax on fuels);
- exemption from the vehicle weight tax.

These incentives are covered in greater detail in the first section of chapter 4.

Making unique payments conditional on ecological factors can, in certain cases, generate free-rider effects. Amongst the good agro-environmental conditions (BCAE - bonnes conditions agro-environnementales), the "maintenance of topographical specifics" is a good

[1] The « Loi relative au développement des territoires ruraux » (Law on the development of rural regions) published on 23 February 2005 has replaced land regrouping by a procedure covering the development of agricultural and forest land. When the state and departments give financial support to a land regrouping operation, they must adjust their incentives on the basis of environmental conditions and legal procedures.

example. The stable elements of the landscape located on plots or next to plots on the farm's agricultural area declared in the CAP dossier must represent a total of 3% of the farm's usable agricultural surface area. The 2011 BCAE sheets specify that "if the hedge separates two plots used by two separate farmers, and each controls the part adjoining his/her plot, then the hedge may be counted amongst the topographical specifics for both farmers".

The same hedge can therefore be counted twice to fulfil the conditions necessary to receive the unique payment. We can therefore see a free-rider effect because the payment is the same whether the farmer maintains one or both sides of a hedge. This provision contradicts the agro-environmental measures covering the maintenance of hedges, which distinguish both cases and provide a higher subsidy when the hedge is not shared.

This observation also applies to other elements of the landscape counted as topographical specifics (woods, ponds, etc.), when they are on the edge of the farm even if they are not part of it, which constitutes a free-rider effect.

Incentives influencing the diversity of crops

"Aid coupled with production", so to speak, no longer exists (apart from the incentives covered by article 68[1]). On the other hand, less direct methods of support remain or have been recently established:

- export refunds (111.7 million euros from Europe in 2010[2]) and intervention expenses (storage) (77.6 million euros from Europe in 2010): several agricultural and food-processing products (cereals, sugar, milk and dairy products, eggs, beef, pork, mutton and goats, processed products and certain horticultural products) can benefit from refunds when they are exported to third countries. The intervention expenses are received by the FranceAgriMer organisation responsible for implementing the public storage mechanisms to ensure market balance, particularly cereals. These two arrangements thus guarantee a certain price level for targeted crops and reduce the income risk in comparison to non-targeted crops.

  The surface area of crops associated with incentives to regulate the market may therefore increase at the expense of other crops and reduce the diversity of crop rotation;

- control of the conditions for vegetable production (3 million euros from the state in 2010[3]): Controlling outbreaks of disease and pests consists of not only the mandatory treatment of vegetable production, but also the compensation of producers in case of uprooting ordered as a precautionary measure. The compensation for consequences related to non-rotation, in other words, production systems of low diversity, encourages farmers to continue doing likewise and not to change practices;

- harvest insurance (38.1 million euros from the state in 2010[4]): reintroduces a form of linkage with insurable production. With all other things being equal, the risks of a high

[1] Article 68 was introduced as part of the CAP's health report in 2008. According to this article, the Member States may retain, per sector, 10% of their national budgets intended for direct payments and assign this amount, in the sector concerned, in favour of environmental measures or actions aiming to improve the quality of products and their marketing.

[2] Source: Commission des comptes de l'agriculture de la nation (2010), Les concours publics à l'agriculture en 2010, Public aid to agriculture in 2010), 24 p.

[3] Source: Projets annuels de performance 2010, Mission Agriculture, Pêche, Alimentation, Forêt et Affaires rurales, Programme 206, Action 01 (Annual performance projects 2010, working group on agriculture, fisheries, food, forestry and rural affairs, programme 206, Action 01).

[4] Source: Annual performance projects 2010, working group on agriculture, fisheries, food, forestry and rural affairs, programme 154, Action 12.

variation in income associated with the latter are smaller than for non-insurable crops and cultivated areas could develop in their favour. The public authorities are nevertheless providing incentives to the development of insurance for meadows, which are still not currently insurable, through the Agriculture and Fisheries Modernisation Act (French acronym: LMAP);

- subsidies for local authorities and the "Water agencies" for the construction of retention ponds on high ground: reduces the cost of crops that need water at times when water levels are low, compared to those that do not need it. The area of the latter can therefore drop and the diversity of crop rotation may also be reduced.

There are also actions concerning animal genetics (11.5 million euros from the state in 2010[1]) which include:

- the national technical supervision of the technical institutions;
- the compensation funds for the universal artificial insemination service;
- the evolutionary maintenance of the genetic sequences;
- national index linking;
- the public service duties of the selection organisations;
- the aid to organisations for the selection of rare breeds;
- the national cryogenic bank;
- innovative actions/applied research.

If these actions are implemented without any conditions covering the maintenance of genetic diversity, there is a risk of overall dissemination of dominant genomes. Furthermore, these actions lead to the evolution of breeds outside their traditional ecosystems. Farmers are then led to adapt the management of their farms to the productive specifics of the selected breed (example of the evolution of Roquefort ewes, standardisation and industrialisation of the *Lacaune breed*).

It is nevertheless necessary to comment that this subsidy also allows the maintenance of traditional breeds within the regions.

2.3. Incentives related to the partial development of forest habitats

Incentives related to the energy transition

As part of the energy transition in progress with the 2009 and 2010 Grenelle de l'Environnement, France has undertaken to bring the share of renewable energies in its energy mix to at least 23% by 2020. Wood and agricultural biomass should contribute to more than half of this objective.

French undertakings plan for French consumption of forest biomass to go from 9 MTOE in 2006 to more than 13 MTOE in 2020 (+4 MTOE/year). This intention to increase production is a significant challenge because it assumes a 60% increase in the marketed harvest by 2020, while complying with the other undertakings of the Grenelle de l'Environnement, particularly the preservation of biodiversity.

[1] Source: Annual performance projects 2010, working group on agriculture, fisheries, food, forestry and Rural affairs, programme 154, Action 11.

Public funding is planned to support this transition: the establishment of incentive financial arrangements such as the wood-energy plans (in French: *Plans bois-énergie*), renewable heating fund (in French: Fonds chaleur, managed by the public institution ADEME, since 2009) and, within this, the BCIAT call for proposals (biomass, heat, industry, agricultural and tertiary), as well as the Energy regulatory Commission (French acronym: CRE) calls for tenders.

Considering that in 2011, 80% of the CRE2 and renewable heating funds projects accepted had started and that in 2012, all of the CRE2, heating fund and CRE3 projects had begun, the additional requirements for woodchips could reach between 3.5 and 4.5 million tonnes per year from 2012, although current production is estimated at 300,000 tonnes per year. The maximum requirement for woodchips should be reached in 2014, with the commissioning of the latest facilities in the programme stemming from the third call for tenders and the full-scale functioning of the renewable heat fund.

These public subsidies currently represent a low risk of negative secondary effects on biodiversity and are difficult to measure in advance. In any case, the risk for biodiversity should be included from now on in the terms of these incentives.

Incentives to reforestation

There are incentives to reforestation and the plantation of forest species. Some of them are targeted to forest management and others to plantation.

Exemption from the land tax on non-built properties for land that is planted with trees (general tax code, article 1395: 7 million euros in 2010[1]) for:

- land that is seeded, planted or re-planted with trees, during the first part of the production cycle (10 years for poplars, 30 years for pines, 50 years for trees other than pines);
- wooded land consisting of high forest or composite forest, other than poplars, that were naturally regenerated;
- wooded land consisting of irregular high forest undergoing balanced regeneration for the 15 years that follow the ascertainment of this state (up to a limit of 25% of the amount of the tax).

This exemption may encourage planting trees on natural environments that were richer before afforestation, such as wetlands, moorland, etc. It could also result in a reduction in the optimal age of exploitation, which is harmful for biodiversity. This is because the age of forest ecosystems is an important factor favouring their biological wealth: certain species, for which the colonisation speed is low, are found only in old forest, and, as shown by Liu et al. (1994)[2], animal species are often sensitive to the length of rotation chosen by the forest managers.

Furthermore, this exemption could encourage owners to substitute the cultivated species for species that grow faster, in order to stay within the exemption period for as long as possible and intensify production; this, in time, could tend to reduce the specific and genetic diversity of forests. But these risks should probably not be exaggerated.

[1] *Projets annuels de performance 2011, Mission Agriculture, Pêche, Alimentation, Forêt et Affaires rurales, Programme 149.*

[2] Liu J., Cubbage F. C. and Pulliam H. R. (1994), "Ecological and economic effects of forest landscape structure and rotation length.", Ecological Economics, vol. 10.

Reduction of income tax for investments, forest work and the management of forest plots (general tax code, article 199 item 10 H: 8 million euros in 2010[1]): the concept of forest work covers plantation, reconstitution, renewal, maintenance work (including phytosanitary work), the work of protecting and improving the tree population (pruning, burning, selective thinning and undergrowth clearance), and the work of creating and improving service tracks.

Eligibility for this arrangement is subject to obtaining and applying a sustainable-management document [forestry], which implies compliance with specific rules, both concerning the choice of species and the management of forests, phytosanitary practices or the improvement of tree populations (plantations must be made with the seeds and forest plants compliant with the instructions of regional decrees relative to state incentives to forest investment).

Subsidies from the state and regions for the plantation of forest species: if these subsidies benefit non-native or alien species, they may be harmful, etc.

Partial exemption from transfer taxes for woods and forests (general tax code, article 793: 25 million euros in 2010[2]): amongst the conditions for benefiting from the exemption, waste land and moorland must be able to be re-forested and be intended for forestry, within a period of five years. This condition can also lead to the impoverishment of ecosystems rich in biodiversity.

3 • The fragmentation of habitats

Fragmentation by a linear infrastructure may interrupt the connectivity of habitats, both terrestrial and aquatic, and cause negative effects for biodiversity (section 3.1). Amongst the incentives favouring this type of pressure, public funding of transport infrastructure takes first place (section 3.2). The other public subsidies are presented in section 3.3.

3.1. The decisive role of the connectivity of habitats

The effects of fragmentation on biodiversity can be grouped in three main categories.

Reduction in the total surface of the habitat: the resources necessary for the survival of species are limited by the size of the habitat. Thus, a large habitat divided into several small habitats has an increased linear edge. The "edge effect" manifests itself tangibly by the reduction in the living area of species living in the interior environment. For example, Kaczynska (2009)[3] considers that certain forests, when they are fragmented beyond a network of two thirds of a square kilometre, lose their interior habitats.

Increase in the isolation of fragments: the more the fragments of habitats are isolated, the more mating opportunities are limited. We therefore see a reduction in the genetic variability within local populations (Kaczynska, 2009). Also, the isolation of fragments leads to greater genetic differentiation between local populations. Although a certain degree of isolation can sometimes be favourable, encouraging local adaptation, too much isolation is unfavourable,

[1] *Projets annuels de performance 2011, Mission Agriculture, Pêche, Alimentation, Forêt et Affaires rurales, Programme 149.*
[2] *Projets annuels de performance 2011, Mission Agriculture, Pêche, Alimentation, Forêt et Affaires rurales, Programme 149.*
[3] Kaczynska M. (2009), Impact of transport on biodiversity and nature protection legislation, Workshop on Road Transport, European Investment Bank, 15 May.

particularly due to a significant drop in genetic variability. According to the estimates that we have, we find ourselves tending towards the range of variation where an increase in isolation is disadvantageous (Couvet, 2002).

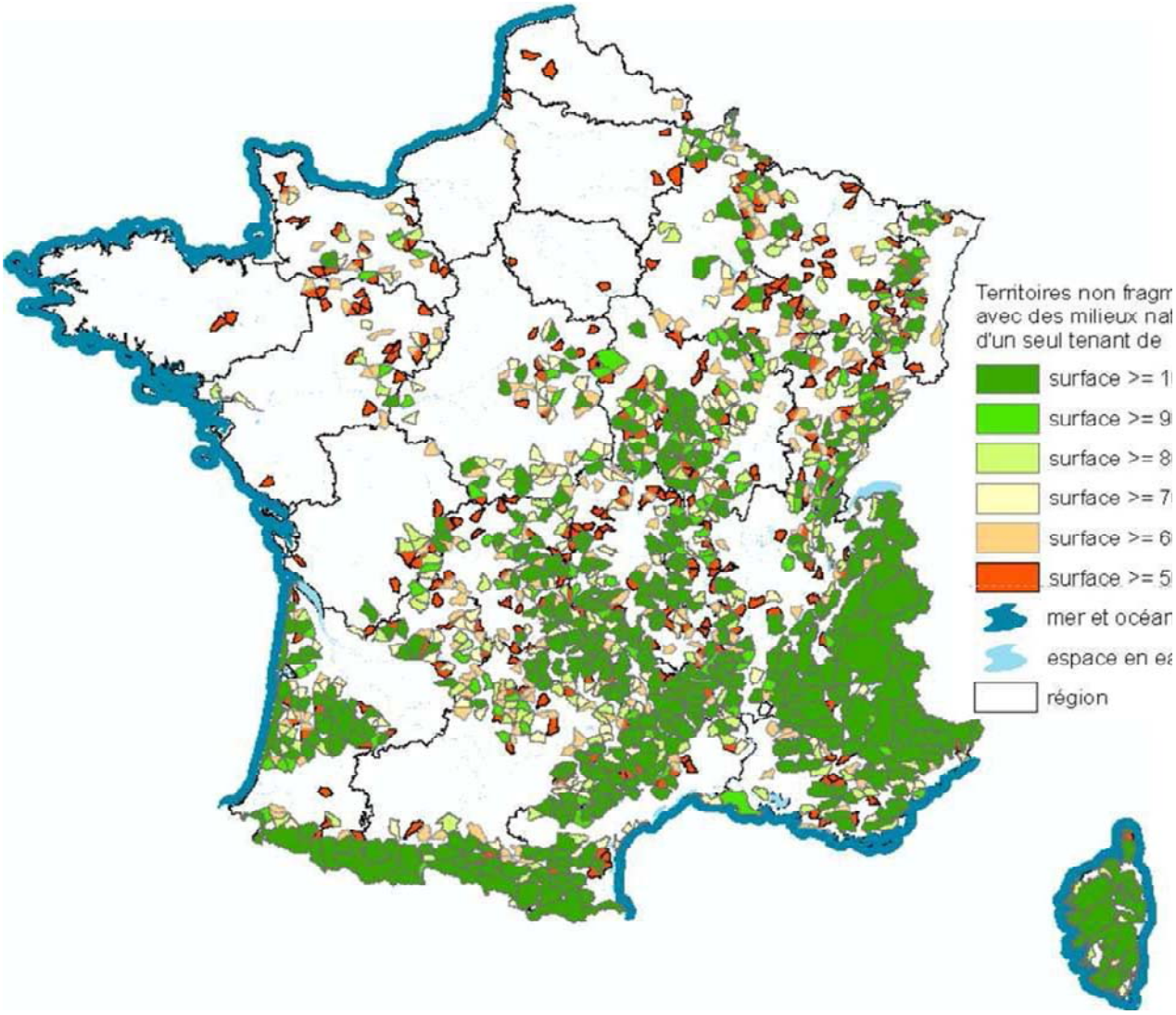
Limitation of the free movement of animals: the free movement of animals depends on the permeability of the barrier, which may be defined as the probability that an organism, when reaching the edge of an element in the landscape, does not cross it (Verboom, 1995)[1]. Permeability depends on the width of the barrier element, the relative mobility and behaviour of animals, and the extent of the contrast between the barrier element and the adjacent environments (Bennet, 1991)[2]. For example, roads that are between 20 m and 30 m wide and that have a traffic between 250 and 5,000 vehicles per day are permeable to voles: 68% successfully return to their original territory (Richardson et al., 1997)[3].

[1] Verboom J. (1995), Dispersal of animals and infrastructure. A model study: summary, Directorate-General for Hydraulic Engineering Division., Delft, The Netherlands, 8 p.
[2] Bennett A. F. (1991), "Roads, road sides and wildlife conservation". Nature Conservations 2: The role of corridors, D. A. Saunders and R. J. Kobbs, Surrey Beatty & Sons ed, Chipping Norton,
Australia, p. 99-117.
[3] Richardson J. H., Shore R. F. and Treweek J. R. (1997), "Are major roads a barrier to small mammals?", Journal of Zoology, London, 243, p. 840-846.

The following two maps show the potential development of the fragmentation of habitats located on the route of the National Transportation Infrastructure Scheme (French acronym: SNIT) feasibility study:

- the first shows the level of fragmentation of habitats in 2000;
- the second shows the routes of the main rail development projects proposed by the SNIT's feasibility study.

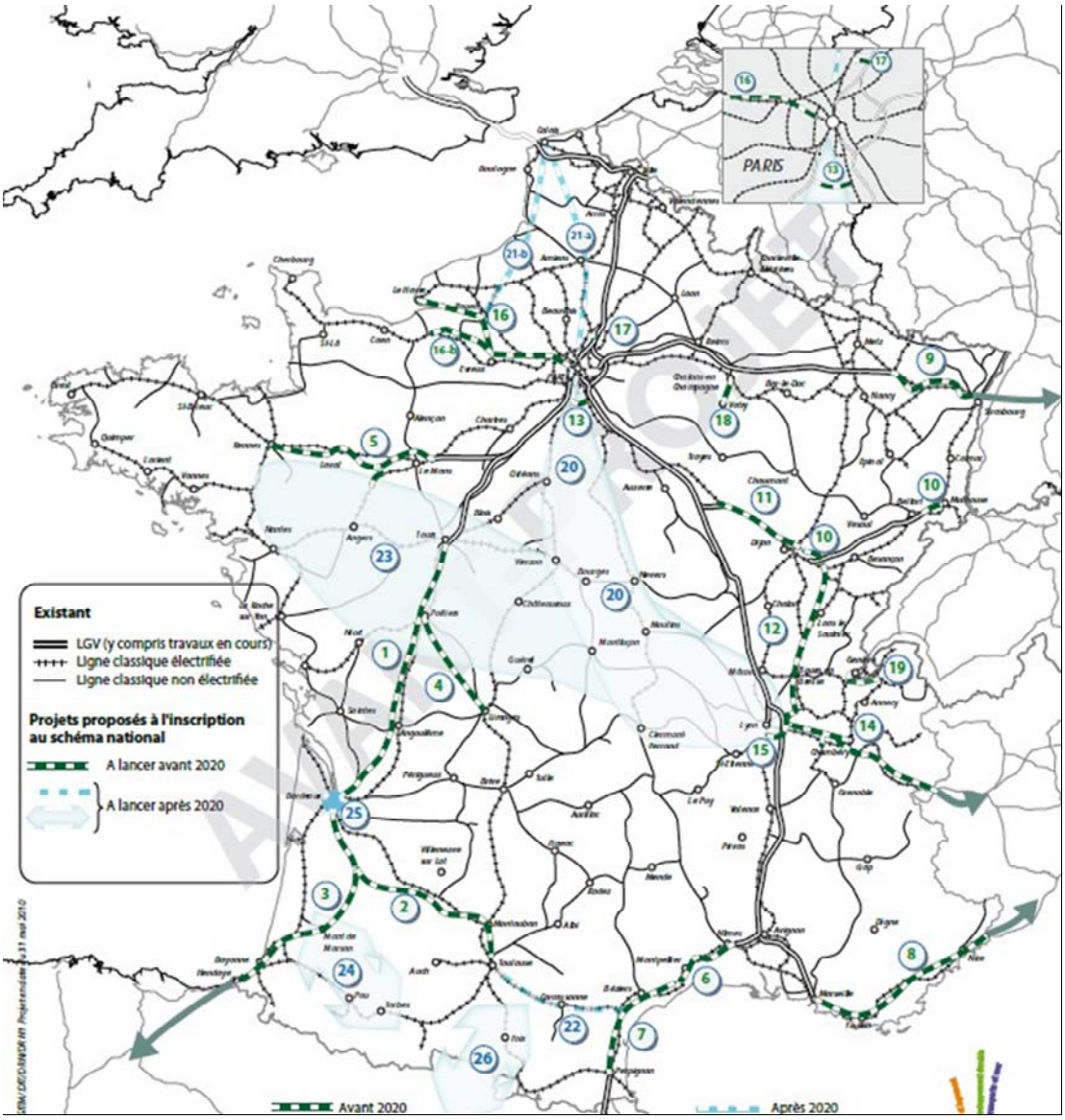
Natural land areas not fragmented in France according to their size (50 km² and more), in 2000



Non-fragmented territories with natural environments in one piece measuring

Surface area >= 100 km^2
Surface area >= 90 km^2
Surface area >= 80 km^2
Surface area >= 70 km^2
Surface area >= 60 km^2
Surface area >= 50 km^2

sea and ocean
area of water
region



Source: TETIS (2007), Appraisal project: Creation of a map of non-fragmented natural land areas, 2 p.

Existing
LGV is the French acronym for high-speed train lines (including ongoing work)
Conventional electrified line
Conventional non-electrified line
Projects nominated for the national plan
To launch before 2020
To launch after 2020

We can see that certain routes in the SNIT's feasibility study pass through regions in which there is currently little fragmentation.

The fragmentation of aquatic habitats is mainly due to the construction of dams. The continuity of watercourses forms part of the "good ecological condition" in the Water Framework Directive. According to the circular dated 25 January 2010 relative to the implementation, by the state and its public institutions, of an action plan for restoring ecological continuity of watercourses, "for 50% of surface water bodies, the channelling of watercourses and obstacles to flow alone constitute a risk that the good condition will not be achieved".

3.2. The significant contribution of public funding to linear transport infrastructure

The transport field is often the market sector were public investment is greatest. This circumstance is explained by the extent of the non-market and non-internalised benefits that transport provides. It has justified the development, with an accuracy and effort for comprehensiveness unknown elsewhere, of broad calculations of profitability, incorporating certain benefits and costs for the community stemming from investments made (Boiteux II report)[1].

To manage its infrastructure networks, the state makes use of external operators, private or public, over which it exercises its control: The French rail network (French acronym: RFF - Réseau ferré de France), the Compagnie Nationale du Rhône, the companies holding concessions on motorways and tunnels, and Voies Navigables de France (French acronym: VNF). It nevertheless directly intervenes in the management of the road network that is not under concession, through the inter-regional roads departments.

The regional authorities also have their own networks and their own operators.

The funding of two transport infrastructure projects of a national scale is essentially dealt with in this part: the national transport infrastructure plan (SNIT) and Greater Paris. Other public subsidies related to linear infrastructure and the problem of inserting the “green and blue infrastructure” and its funding are present at the end of the part.

The SNIT project

Characteristics

The SNIT project "sets state policy in matters of maintenance, modernisation and development of networks coming within its competence" as asted in the Grenelle Law.
The plan for the next 20 to 30 years is in the process of validation and could change significantly downwards following the strong reservations issued by the Assemblée Nationale (see the report from the member of Parliament Hervé Mariton on 18 May 2011)[2].
The figures presented below are therefore provisional and given as a rough guide.

[1] Commissariat général du Plan (2001), Transports : choix des investissements et coûts des nuisances (Transport: choice of investments and costs of nuisances), report from the group chaired by Marcel Boiteux, Paris, La Documentation française.
[2] Mariton H. (2011), Rapport d’information déposé en application de l’article 146 du règlement par la Commission des finances, de l’économie générale et du contrôle budgétaire relatif au SNIT (Information report registered in application of article 146 of the regulation by the finance, general economics and budgetary control commission relative to the SNIT), *Assemblée Nationale*, 24 p.

The lengths of transport infrastructure networks on 1 January 2009

	Length of supplementary networks (SNIT)	
Roads and motorways Length of networks in km on 1 January 2009		
Roads and motorways	11,042	732 (2020)
of which conceded	8,431	
National road network	9,765	
Departmental road network	377,984	
Municipal road network	629,000	
Rail network		
National rail network: total lines operated and open to commercial traffic	29,473	2,411 (2020) + 1,640 (2030)
including high-speed lines	1,881	
Number of level crossings	18,507	
River craft		
All of the navigable network	8,500	350
Whole of the VNF navigable network	6,700	
including the main regional transport infrastructure	4,100	
including the network intended for tourist use	2,600	
Non-VNF navigable network	1,800	

The SNIT deals with the road, rail and river transport modes, as well as ports, aviation and collective urban transport, which is of lesser interest in relation to the fragmentation of habitats. Its first priority is rail.

The rail network represents nearly 30,000 km of roads, with quite contrasting characteristics and uses:

- 27% of the network runs only 10 trains per day;
- 15% of the network is only used by freight trains;
- 51% of the network is electrified but traffic (in trains per km) under electric traction represents 90% of passenger traffic and 85% of freight traffic.

The network of navigable waterways is relatively discontinuous. It is divided between several basins: Seine, North (Escaut), Moselle, Rhine, Rhône, Lower Loire … connected between them, where they are connected, by narrow canals. The region that is served is mainly located in the north-east of France and covers about a quarter of the area of the country.

Impacts on biodiversity

The SNIT's feasibility study contains an environmental assessment[1] of current and future infrastructure on biodiversity, the main lessons of which can be summarised as follows.

[1] The environmental assessment of the plans and programmes is required by directive 2001/42/CE relative to the assessment of the impacts of certain plans and programmes on the environment.

In 2006, the number of non-fragmented natural areas greater than 100 km^2 was estimated at more than 1,100. Ten to twenty of these areas may be directly affected by the rail projects coming under the SNIT (about 210 were already close to the existing network in 2008), and ten to fifteen for road projects (about 110 non-fragmented spaces were already close to the existing road network in 2008). 12% of the Natura 2000 zones may be concerned by the development projects, an additional risk of pressure (i.e., project located at less than 1 km) affecting about 8% of zones because of rail projects and 4% because of road projects. It should be stressed that the indicators above are approximate and only a rough guide.

About biodiversity and natural environments, the SNIT's feasibility study estimates that 5,200 km of new infrastructure will impact the natural environments in various ways:

- 11 % of Natura 2000 sites located at less than 1 km from SNIT's network (excluding post-2020 rail projects);
- 90 % of Natura 2000 sites potentially affected are already affected by other infrastructure in the national network. Cumulative effects could therefore appear;
- 31 species are potentially affected by the SNIT over all sites that justified their designation;
- 4% to 10% of the spaces not fragmented over more than 100 km² are potentially affected;
- 400 km² to 600 km² of natural areas are developed by the footprint of the projects, including between 240 km² and 480 km² of agricultural areas. The plan resulting from the 2003 meeting of the interministerial committee on territorial planning and development (French acronym: CIADT - Comité interministériel d'aménagement et de développement du territoire) specified the consumption of between 35,000 ha and 45,000 ha of these areas.

We may therefore note that, in spite of the Grenelle de l'Environnement, the SNB, and the fact that the TVB and the control of the development of the territory are priorities of the Grenelle Laws, the implementation of SNIT post-Grenelle would lead to the consumption of more natural spaces than those planned by the CIADT before the Grenelle de l'Environnement.

The SNIT's feasibility study also gave rise to environmental assessments from the general commission for sustainable development (French acronym: CGDD) and the Environmental Authority.

The CGDD identifies the following points where attention must be paid:

- the cumulative impact on biodiversity of existing and projected infrastructure: 90% of the Natura 2000 sites affected are already potentially affected by existing national networks and more than thirty notable species are potentially affected in all their main habitats by new infrastructure coming under the SNIT;
- the consumption of space, directly, indirectly and caused by the SNIT, particularly urbanisation and its impacts on the natural and agricultural environments.

The main conclusions of the environmental authority are the following:

- a complete assessment of the impact of this programme assumes that we can determine the cumulative effects with other decisions, particularly those of communities on the networks that they are responsible for, and those of other transport-policy decisions (effects of improved use of existing infrastructure, effects of pricing on modal sharing, etc.);

- the coherence between the SNIT and the TVB is essentially related to the future definition of the national plan for the TVB, and regional plans for ecological coherence (French acronym: SRCE - schémas régionaux de cohérence écologique): it cannot therefore yet be established;
- the analysis of the fragmentation of the areas does not appear sufficient to deal with the question of biodiversity outside the Natura 2000 network. Indeed, the impact on biodiversity caused by changes in the occupation of land, invasive species penetrating along infrastructure, local modifications to topography and the hydrological flow, and the increase in traffic, are not taken into account by the changes to fragmentation;
- the study of the impacts on the Natura 2000 network was done independently, in application of the provisions of directive 92/43/CEE, the "habitats directive". The analysis was conducted on the priority habitats and on certain species considered representative, because they are particularly affected;
- moreover, the re-establishment of ecological continuities on the existing networks is a very important issue that has been omitted. Concerning the re-establishment of ecologically continuity for fauna, the environmental authority observes that it would be more appropriate to favour small vertebrates and not forest ungulates (deer and wild boar), for which the populations are growing very significantly almost everywhere.

It should be noted, also, that the SNIT project does not take into account the development of the existing rail network, part of which, very little used, could be declassified in the years to come.

The impact of the new river infrastructure coming under the SNIT is less developed than that concerning land transport infrastructure. During the public enquiry into the projected canal Seine-Nord Europe, it was stated that in addition to several advantages (reduction in the effects of flooding, securing the supply of potable water to population groups), a canal can also affect a region over the long term and cause serious hydraulic and hydro-geological disorders. It can, in particular, disrupt hydrological and ecological continuity, cause the silting up of numerous watercourses, a reduction in biodiversity through the degradation of the quality of environments and prevent the movement of fish or, on the contrary, the movement of new species, including invasive ones, when there is a change of catchment area. The study on the impacts relative to the hydraulics of the Seine-North Europe canal only covers very few of these impacts.

Assessment of the costs-benefits of the project

The amount of public expenditure and the assessment of costs-benefits presented here are given as a rough guide. In its current configuration, the Assemblée Nationale has serious reservations about the consistency and funding of the SNIT project (Mariton, 2011).

1) Amount of public expenditure

The following table, resulting from the consolidated feasibility study, presents an estimate of the breakdown of expenditure, all modes combined (rail, road, river, airport, port, public transport) between the state, the regional authorities and other contributors. The nature of these other contributors is not specified, but must concern the public institutions above all (RFF, VNF, etc.) and probably the other managers of infrastructure, as well as community funding, and other funding that are less easy to classify (part of the funding that was initially intended to come from the management of infrastructure may ultimately come from a combination of income from tolls and any "rent" paid on public funds). As things stand, the amount of these subsidies "greatly exceeds the funding resources currently called upon, given the very restricted situation with the public finances" (Mariton, 2011). In addition, the

costs of the SNIT do not include all of the environmental externalities. We may therefore expect a significant revision downwards of the ambition of the SNIT and the financial resources devoted to it.

Breakdown of expenses by contributors (millions of euros)

Item	Estimated costs	State share	Regional authorities share	Share of other contributors
Development investments	166,000	55,000	71,000	40,000
Modernisation investments	59,500	25,500	24,500	9,500
Regeneration investments	30,500	3,000	1,500	26,000
Increase in maintenance and operation charges	4,500	2,000	0	2,500
Total	260,500	85,500	97,000	78,000

The following table presents the breakdown of costs between rail, river and road.

Estimated costs*

Item	Rail	River	Road
Development investment	103,000 for 4,051 km by 2030 Representing about 25 M€/km	16,000 for 350 km by 2020 Representing about 46 M€/km	13,000 for 732 km by 2020 Representing about 18 M€/km
Modernisation investments	15,000	2,500	22,000
Regeneration investments	25,000	4,000	1,500
Increase in maintenance and operation charges	2,000	500	2,000
Total	145,000	23,000	38,500

(*) The plan covering investments and actions for which completion is desirable in the next 20 to 30 years, the corresponding expenses were estimated at over a median duration of 25 years. The calculations were made in constant euros.

The programme for new high-speed train lines (French acronym: LGV) to be undertaken before 2020 represents a cost of about 75 billion euros (direct financial investment costs for all players who could be involved in the implementation of the plan (state, infrastructure managers, concession holders, regional authorities, etc.).

The high-speed train lines programme to be undertaken before 2030 is currently at least equal to 28 billion euros.

The programme for new road infrastructure to be undertaken in the timeframe covered by the national plan represents a cost of about 8.4 billion euros.

The programme for new river infrastructure to be undertaken in the timeframe covered by the national plan represents a cost of about 13 billion euros (see table below).

Proposed project	Length in km	Cost in €M excluding tax	Cost in €M/km
Seine-North Europe canal	110	around 4,200	approx 38
Broad beam river delivery Bray-Nogent	30	between 190 and 270	between 6 and 9
Broad beam river delivery Saône Moselle	230	between 9,700 and 13,100	between 42 and 57
Total	370	between 14,090 and 17,570	between 38 and 47

According to the Ministry of Ecology, Sustainable Development, Transportation and Housing, the funding anticipated in 2011 for the Seine-North Europe canal is composed as follows:

- regions Nord-Pas-de-Calais, Picardie, Île-de-France: 510 million euros;
- general councils of the Oise, the Somme, Nord and Pas-de-Calais: 200 million euros;
- large maritime ports of Le Havre, Rouen, Dunkerque, and Ports de Paris: 106 million euros;
- general councils of Île-de-France: expected contribution of around 75 million euros;
- European commission: 333 million euros;
- State: 900 million euros.

2) Balance of costs and benefits

No complete and published socio-economic assessment has currently been made for the SNIT project (the Mariton report states in this regard that "a socio-economic analysis of projects must be carried out"). Partial figures have been produced by the ministry of transport, which summarily compare the advantages of time and comfort for users resulting from the new transport infrastructure against the environmental externalities (greenhouse gas, local pollution and noise only, therefore not biodiversity), the impact in security matters and the costs of investment and operation, to which is added the "opportunity cost" of public funds (French acronym: COFP - coût d'opportunité des fonds publics)[1].

The overall "social net benefit / cost" ratio would be, according to these figures, about 1 (balance between the costs and the value of the benefits):

- the share of the population with direct access to the high-speed network in less than one hour would increase from 53% in 2009 to 77% by the time of the completion of the programme of 2,000 km of lines to be launched before 2020 and to 84% by the time of

[1] The opportunity cost (conventionally taken as 30% of the cost of public funds committed) aims to represent the disruptive effects ("crowding-out") generated in the rest of the economy by the additional deduction of public funds required for the project.

the completion of the additional programme of 2,500 km of lines to be launched after 2020;

- the time of the average overall journey between two regional capitals would be reduced by more than 30 minutes (4 hours and 41 minutes in 2009 – 4 hours and 8 minutes eventually) by the time of the completion of the programme for 2,000 km of high-speed train lines to be launched before 2020.

The CGDD also estimates that the results of these figures should be considered with a certain degree of caution because they are individual valuations that are sometimes old, not consistent, have not been the subject of any second expert opinion and for which the methodological details are not necessarily available. Also, even though overall, the benefits appear to cover the costs according to this analysis, there is great variability between the projects: a third of the projects have an updated benefit that is barely in balance or likely to be negative and an uneven CO_2 footprint.

Also, in a socio-economic evaluation following the Boiteux II framework, the justification for the principle of public subsidies is to internalise the positive externalities (time saving if it is not financed by the toll, positive overall effects of modal changes and effects on regional development, etc.). The inclusion of effects of fragmentation on biodiversity would lead to an evaluation of the cost of the route and/or the facilities that would allow retention of a certain degree of connectivity between habitats compared to a route that does not consider this parameter. Because these costs are not taken into account in the evaluation, this is indeed a subsidy that is harmful to biodiversity.

The costs of the fragmentation of terrestrial habitats have been estimated and may be consulted essentially through two documents:

- the report on the heavy-goods vehicle charge related to Swiss services (French acronym: RPLP - Redevance poids lourds liée aux prestations): evaluates the cost of the fragmentation at 523 million Swiss francs in total for all of the Swiss rail and road networks in 2005. This amount is estimated from the costs of connection structures (to allow the passage of toads, for example), depreciated over 80 years. We would need to know the length of the Swiss network to deduce the amount relative to the French network;
- the Handbook on Estimation of External Costs in the Transport Sector (2008): lists the costs of fragmentation of habitat per kilometre and per year. As in the report on the RPLP, these figures are obtained from the cost of connection facilities (see the following two tables).

Details of the cost per types of facilities in Switzerland
(specific cost factors for different types of infrastructure dedicated to the reduction of habitat fragmentation)

Type of infrastructure	Cost factor (in 1,000 €/y), medium values					
	Motorway	1 class road	2 class road	3 class road	Rail single-lane	Rail multi-lane
Wildlife overpass	66	28	23			18
Wildlife underpass	136	58	48			72
Stream passage for wildlife	150	64	53			72
Passage for stream animals	7.4	4.5	4.5	3.0	4.5	4.5
Small animal passage	3.7	2.2	2.2			2.5

Source: OSD, 2003 (data for the year 2000)

Average costs in Switzerland

Transport mode	Average costs (in 1,000 €/km*y)		
	Habitat loss	Habitat fragmentation	Total
Road total	3.6	7.1	11
Motorways	19	92	110
1st class/national roads	3.2	13	16
2nd class/regional roads	4.2	2.7	6.9
3rd class roads	2.2	1.6	3.9
Railway total	6.0	10	16
Railway single track	3.3	5.6	8.9
Railway multi track	14	23	37

Source: OSD, 2003 (data for the year 2000)

As an example for aquatic fragmentation, the construction of the fish ladder at the Kerousse dam on the Blavet by EDF corresponds to a budget of 466,300 euros. The total amount of subsidies is 105,000 euros, spread between the regional council, the general council and the water agency.

Greater Paris

Characteristics of the project

The automated Metro project prepared by the *Société du Grand Paris* plans to construct a 164 km network in the Paris region, composed of three main lines (SGP, 2010)[11]:

- the "blue" line from Roissy to Orly, 50 km long, including the current metro line 14 in its central part;
- the "green" line from Orly to Saint-Denis-Pleyel via Saclay, Versailles and La Défense, 54 km long, extended as far as Roissy by the Saint-Denis-Roissy section of the blue line;
- the "red" line, 60 km long , from La Défense to Le Bourget via Villejuif, Champs sur Marne and Clichy-Montfermeil.

Impact on biodiversity

In its strategic environmental analysis, the *Société du Grand Paris* identified the sections with a direct impact on biodiversity, agriculture and the landscape. "*The zone of the automated metro network project avoids almost all zones with regional issues, with the exception of the ZPS Natura 2000 site "Sites de Seine-Saint-Denis" (sections B and C)*". The following table indicates the level of importance of the ecological issues for each section of the network.

[1] SGP (2010), Débat public : le dossier du maître d'ouvrage (Public debate: the contracting authority's dossier), Société du Grand Paris, 188 p.

Summary of the issues per section of the Greater Paris automated metro network

Number of section	Location	Technological issues identified
A	From Gonesse to Roissy	Low to medium
B	From Bonneuil-en-France to Livry-Gargan	Medium
C	From Saint-Ouen to Drancy	Medium
D	From Colombes to Villeneuve-la-Garenne	Low
E	From Rueil-Malmaison to Courbevoie	Low
F1	From Chatou to Versailles	Medium to strong
F2	From Suresnes to Ville d'Avray	Medium
G	From Buc to Saclay	Medium to strong
H	From Saclay to Palaiseau	Medium
I	From Massy to Paray-Vieille-Poste	Low
J	From Villejuif to Orly	Very low
K	From Créteil to Vitry-sur-Seine	Low to medium
L	From Villiers-sur-Marne to Créteil	Medium
M	From Livry-Gargan to Noisy-le-Grand	Strong
N	From Boulogne-Billancourt to Bagneux	Low
O	Paris crossing	Very low

Source: SGP, 2010

The environmental authority issued the following opinion concerning the evaluation of the direct impact of the network on biodiversity:

- the extent of the sections that are planned to be buried would avoid significant impact in all sectors with serious issues identified in the appraisal, providing that the temporary impacts in the construction phase are handled properly and that there is a judicious choice in placing the safety and maintenance facilities for the network;
- the analysis of impact on the Natura 2000 sites located near to the network (*"sites de Seine-Saint-Denis"*, *"boucles de la Marne"* and *"massif de Rambouillet et zones humides proches"*) should be the subject of a more complete impact evaluation even for the underground parts of the network, including, in particular, the impact on water and the impact of greater visitor numbers, where applicable.

Concerning the indirect impacts, it strongly recommends that the environmental impacts of the transport network, whether buried or not, on new urbanisation is explicitly examined during the public debate in the zone and outside it (creation of stations outside the urbanised zones, particularly on the agricultural plain of Saclay). It stresses that the concrete procedures for the public authority to control urban sprawl should be explained in particular.

Funding the project

The costs of the project were estimated by the *Société du Grand Paris* based on an entirely subterranean scenario for a route of about 155 km of new lines (including the extension of line 14) according to the options for the route.

The estimated cost is, depending on the options, between 21.4 and 23.5 billion euros for the entire Greater Paris network, including more than 80% for the infrastructure, about 12% for the rolling stock and the rest for the land acquisition.

It was considered that half of the stations could be constructed from the surface, while the other half would have to be built entirely underground.

The funding structure of this project is envisaged as follows:

- the state will provide the *Société du Grand Paris* with a grant of 4 billion euros;
- the investment will be completed by borrowing over a total period of about 40 years;
- the annuities for these loans may be covered by ongoing income based on:
  - the increased value of land, in other words, the excess generated by the development and construction operations around the stations: the regional development contracts will specify how this excess is shared;
  - the economic process triggered by the automated metro network in the region of the capital will generate additional tax revenue, which is planned to be partly assigned to financing this investment;
  - appropriate tax measures would be able to make use of part of the resources generated by these two phenomena, both contributing to fighting land speculation. To this end, the government will ask Parliament to supplement the tax provisions specified under the law relative to Greater Paris, in line with the recommendations of the report from the member of Parliament Gilles Carrez[1], by creating a special "additional facilities" tax in the Paris region, and by assigning additional revenue generated by modernising the local tax on offices.

The following will be added to this income, as soon as the automated metro network is in operation:

- the commercial income provided by the stations, designed as providers of services, in line with the report by the senator Fabienne Keller (2009)[2];
- the state tax paid by the future operator of the transport network on the model of the rail or motorway networks.

A call for tenders to produce the socio-economic assessment of the Greater Paris transport network is in progress. The results of this study are expected at the beginning of 2012.

The project financing mode, based on land revenue, nevertheless suggests a risk of extensive urbanisation at the edge of the new transport network.

3.3. Other public subsidies related to the fragmentation of terrestrial and aquatic habitats

The Eurovignette (motorway tolls)

The revision of the Eurovignette directive relative to the taxation of heavy goods vehicles (directive 2006/38/CE, known as Eurovignette II) allows the countries concerned to charge heavy-goods vehicles part of the costs of construction, maintenance and operation of

[1] Carrez G. (2009), *Grand Paris*, *financement du projet de transports* (Greater Paris, financing the transport project), report to the Prime Minister presented on 30 September, 54 p.
[2] Keller F. (2009), La gare contemporaine (The contemporary station), report to the Prime Minister presented on 10 March, 298 p.

infrastructure. The third version of the scheme (Eurovignette III) will also include certain externalities (atmospheric pollution, noise and congestion). However, the impact on biodiversity is not taken into account. The level of this tax is therefore likely to be below the optimum price for using the network that internalises the externalities on biodiversity.

River tolls

Article 124, paragraph III of the finance act n° 90-1168 dated 29 December 1990 defined the applicable tolls, both for carriers of goods and passengers and the owners of pleasure boats.

The implementing decree n° 91-797 dated 20 August 1991, modified, relative to income established for the benefit of Voies Navigables de France defines, in its articles 2 and 3, the elements to be taken into account for calculating these tolls.

These are:

- the characteristics of the vessel;
- the period of use of the waterways on the network;
- the navigable sections used;
- the journey made (for passenger boats);
- the period of use of the network.

The price is independent of the externalities produced during and after construction of the canal and consequently seems sub-optimal compared to a price that would internalise all the effects on biodiversity.

The tax on obstacles in watercourses

This tax, created by the law covering water dated 30 December 2006, does not prohibit the structures but encourages them to be laid out or operated in a manner that best maintains or re-establishes proper functioning of the river ecosystem.

The base for the tax is the product, expressed in metres, of the surface level changes between the lines of water upstream and downstream of the structure, by a flow coefficient and a restriction coefficient.

The rate of the tax is fixed by the board of directors of the water agency within the competence of which the structure is installed.

The owners of structures forming part of a hydroelectric facility subject to the extraction tax are exempt from the tax on obstacles (see chapter 4, section 3.3.2.).

3.4. Public icentives that contradict the “green and blue network” public policy

The “green and blue network” is a flagship measure of the environment round table that has the ambition of preserving ecological continuity.

Ecological continuity corresponds to all of the living zones (reservoirs of biodiversity) and the elements (ecological corridors) that allow a population of species to travel and access the zones corresponding to the various activities of their lives (reproduction, feeding, resting, etc.). The “green and blue network” is thus composed of reservoirs of biodiversity and the corridors that connect them.

The public subsidies mentioned below contribute to funding actions of the regional authorities and, according to their mode of assignment and/or use, may affect the ecological continuity between habitats.

The overall functioning grant for departments

The overall functioning grant or (French acronym: DGF - dotation globale de fonctionnement amounting 12,016 million euros in 2010, for departments breaks down into a fixed amount grant – including a basic grant according to the population and a surety supplement –, an urban adjustment grant allocated according to the rate of density (if the density of the department is greater than 100 inhabitants/km) and rates of urbanisation (if the rate is greater than 65%)[1], and a minimal functioning grant.

The activities financed by these grants depend on the policies implemented by the local authorities in question and may be potentially harmful to biodiversity. The effects on biodiversity relate to how the amounts of these grants are calculated. Thus, amongst the criteria for assigning the DGF for departments, the length of roads is taken into account. This criterion can encourage roads to be extended, and therefore potentially have perverse harmful effects on biodiversity.

Overall grant for the functioning of municipalities and their amalgamations

The DGF paid to municipalities included a fixed-amount grant of 13,861 million euros in 2010 and adjustment grants.

The fixed-amount grant breaks down into:

- a fixed amount (6.2 billion euros in total) varying from 62.38 euros to 124.46 euros per inhabitant according to the size of municipalities. The increasing size of the basic allocation per inhabitant according to the size of municipalities is because the functioning charges per inhabitant increase with the size of the municipality;
- a part that is proportional to the surface area equal to 3.12 euros per hectare, increased by 5.19 euros in mountainous areas (214.5 million euros in total);
- a part corresponding to the old compensation for the "salaried employees' share" of the business tax and the compensation for drops in the fixed grant to compensate for the business tax (DCTP) (2.07 billion euros);
- a grant paid to municipalities whose territories are wholly or partly included within a national park.

Concerning adjustment grants, these are mainly the urban-solidarity and social-cohesion grants and the rural solidarity grant (French acronym: DSR – dotation de solidarité rurale), which break down into two parts: the "town-centres" part and the adjustment part.

Certain criteria may produce perverse effects on biodiversity. Thus, the criteria for the DGF paid to municipalities include the number of places for caravans, the length of the roads, the amount of the household waste collection charge and the amount of the sewage charge. Such criteria can favour actions such as extension of the roads, which are generally harmful to biodiversity.

[1] See article L. 3334-6-1 of the code général des collectivités territoriales (general code for regional authorities).

Incorporating a biodiversity criterion in the calculation of the DGF

The introduction of criteria related to the protection of natural spaces and the preservation of biodiversity into the calculation of the DGF has been the subject of repeated proposals.

In 1996, the Nature coordination, organised by the French environmental NGO *"France Nature Environnement"* proposed developing a "regional protection coefficient" based on the surface area of the region that was protected (assigned with a weighting coefficient according to the protection status), related to the total surface area of the region. In 2005, the Nature coordination again recommended that the fixed grant part of the DGF proportional to the surface area of the municipality should be increased in proportion to the surface areas of the parts of its territory that are subject to regulatory protection to preserve the natural heritage.

The report on the taxation of the natural heritage, published jointly by the public think tanks of the ministry of finance (*Inspection générale des Finances*) and the ministry of environment (*Inspection générale de l'Environnement*), in February 2004, proposed including a "sensitive areas" criterion in the overall grant for the functioning of departments. The report mentions an oral interview with the chairman of the local finance committee (Comité des finances locales) who, without pre-judging a more accurate analysis, expressed his interest for such a formula by stressing: (i) the necessity of having calculation parameters that cannot be disputed (surface areas classified by regulatory decision, for example); (ii) the question that he had concerning the choice of departmental level.

The association of rural mayors of France (Association des maires ruraux de France) and the association of elected representatives from mountainous areas (*Association des élus de la montagne*) have also made similar requests or recommendations, in 2005 and in 2007.

An amendment to the bill on national parks and marine national parks was presented to the Senate in January 2006. This amendment, which proposed to broaden the arrangement planned for national parks and other zones of high environmental value, was not accepted in this context, but without the appropriateness of the proposal being called into question.

The report on urban sprawl from the 2007 CGPC-IGE-CGAAER working group recommended introducing criteria into the DGF for taking into account the maintenance of natural areas. The report specifies that *"This criterion, in line with what has been determined for national parks alone, by the law of 14 April 2006 on parks, could, for example, be based on the total surface area with protected status determined by regulation (the core areas of parks, natural reserves, protected forests, zones classified Natura 2000 and agricultural land classified by decree) increased by land classified in ND zones in land-occupation or local urban development plans: it would express the solidarity between urbanised and natural areas".*

Lastly, action point n° 73 of the conclusions of the Grenelle de l'Environnement explicitly specifies "the concerted introduction of a biodiversity criterion in the DGF". The President of the Republic ratified this commitment, as well as the others, in his speech of 25 October 2007. The ministry of ecology and sustainable development mentioned this order and explicitly requested the operational committee for the "green and blue network" (TVB) to consider its operational expression.

Overall facilities grant

A commission of elected representatives sets the range of rates applicable to each category of operations, within the limit of 20% to 60% of the amount of the investment excluding taxes. The State grant for the equipment of local authorities (French acronym: DGE -

dotation globale d'équipement) is assigned according to a decision by the prefect. It is broken down between the departments and is used for:

- 9% of its amount to increase amounts paid to departments for land developments of the previous accounting period;
- 15% of its amount to increase the grants to departments for which the tax potential per inhabitant is insufficient;
- 76% of its amount to land development expenses and subsidies paid for creating facilities in rural regions.

4 • An illustration of a combination of factors linked to the deterioration of a habitat: the increasing rarity of the European hamster in the Alsace region

Considered as a pest until 1993, the European hamster is currently in a critical situation in Alsace and could permanently disappear from the natural environment in Alsace. The number of burrows listed went from 1,167 in 2001 to a figure varying between 161 and 174 in 2007. This species is protected by the Berne Convention of 19 September 1979[1] and the Habitats directive 92/43/CEE dated 21 May 1992[2]. Beyond the intrinsic value of the species, maintaining populations of the European hamster in Alsace would mean *"preserving an ecosystem of great ecological wealth, which adds to the potential of the overall biodiversity of a large part of the Alsace region"* (Balland report, 2007)[3].

Following a complaint regarding the conservation status of the populations of the European hamster in Alsace, the Commission took action against France:

- injunction dated 17 October 2007 in accordance with article 258 of the Treaty on the Functionning of the European Union – Shortened as TFEU, also known as the Treaty of Lisbon – (infringement 2006/4051);
- reasoned opinion dated 6 June 2008 as specified in article 258 TFUE for breach of article 12, paragraph 1, sub-paragraph d[4]) of the Habitats directive in which the Commission sets a last deadline of two months for France to end the alleged infringement;
- the Commission referred the matter to the CJCE (Court of Justice of the European Communities) on 25 September 2009 pursuant to article 226 (case C-383/09);

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[1] = Transposition to French law through a decree from the ministry of foreign affairs dated 7 July 1999, when the European hamster appeared in its appendix II "Strictly protected species of fauna".

[2] On 4 March 2010, France was condemned by the European Court of Justice for breaching an obligation to transpose directive 92/43/CEE from the Council dated 21 May 1992, known as "Habitats, fauna and flora".

[3] Ministry of ecology and sustainable development (2007), *Plan de sauvetage du grand hamster d'Alsace Cricetus cricetus* (plan to safeguard the European hamster in Alsace Cricetus cricetus), report prepared by Pierre Balland, member of the Inspection générale de l'environnement (inspectorate general of the environment), IGE/07/011, 74 p.

[4] Article 12.1 is written as follows: *"The Member States take the necessary measures to set up a strict system to protect the animal species shown in appendix IV, point a), in the area in which they are naturally found, preventing:*
(a) all forms of deliberate capture or killing of specimens of these species in the wild;
(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration;
(c) deliberate destruction or taking of eggs from the wild;
(d) deterioration or destruction of breeding sites or resting places".
Appendix IV, point a) of the Habitas directive, mentioning the European hamster in particular.

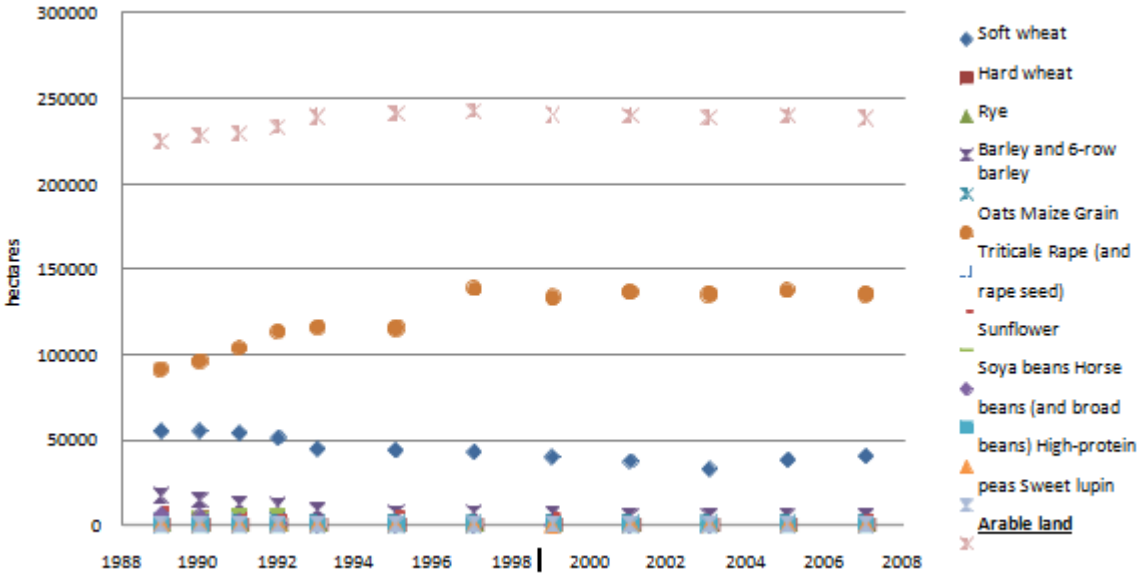
- decision of the CJCE dated 9 June 2011 in which the Court judged that the measures to protect the European hamster in Alsace implemented by France were not sufficient, as of 5 August 2008, to ensure strict protection of the species.

If the case is not regularised, the amount of the penalty will be indicated when the Court considers the case pursuant to article 260 of the TFEU.

The pressures bearing upon the populations of the European hamster in Alsace are of three kinds and are combined:

Change of agricultural practices: the natural habitat of the European hamster in Alsace corresponds to small agricultural plots with crop rotation between cereals, cabbages, beans and being left fallow. However, observing changes to crop rotation over the 1989-2007 period, the share of areas under maize has increased significantly to the detriment of soft wheat, rape and barley (see following graph). Leguminous plants are also in decline more in the Haut-Rhin than in the Bas-Rhin.

Change of areas under cereals, oleaginous plants and high-protein plants in Alsace



Source: Agreste (annual agricultural statistics)

Fragmentation by road infrastructure: we observe a loss of connectivity between the habitats of the hamster, particularly in the zones requiring the greatest vigilance. At the time of writing the Balland report (2007), numerous road projects were planned or in progress in the Alsace plain, the most worrying being the southern Strasbourg ring road, the expressway in the Vosges foothills and the great western bypass. The 2004 report from the ONCFS states that these three projects will have "very negative effects on the population of the European hamster in Alsace".

Increase in urban sprawl: the areas developed are increasing in Alsace (between 800 and 1,000 ha/yr1) and this trend could continue, given the forthcoming population growth (currently standing at 1.9 million inhabitants, it will increase by 200,000 inhabitants over the next 25 years) and the increase in the price of land (30,000 euros/ha at the edge of Strasbourg).

Amongst these factors, the CJCE stresses that the development of growing maize and the development of urbanisation are the cause of the decline of the European hamster. Although France has taken measures to deal with these factors, the CJCE considered them insufficient.

[1] According to the studies « Évolution de l'urbanisation en Alsace de 1984 à 2000 » (Development of urbanisation in Alsace between 1984 and 2000) – Alsace region (2006) Sources: PRATIS and BD OCS 2000 CIGAL and « *30 ans d'urbanisation en Alsace* » (30 years of urbanisation in Alsace) (Nov. 2007) ADEUS, Alsace Region, Regional facilities department – sources: spatial and statistical data.

Chapter 4

Public incentives encouraging the overexploitation of renewable natural resources

The natural resources examined are understood as all of the living animal and vegetable resources (fish stocks, forests, etc.) and supporting resources (water and soil). Generally, we will characterise the overexploitation of a renewable resource as harvesting that exceeds the natural ability of the resource to renew itself, meaning that it causes a reduction in the stock of the resource and is therefore not sustainable over time if the level of harvesting is maintained in future[1].

This chapter successively addresses the public subsidies that worsen the overexploitation of soils, fish resources and water resources.

1 • Soils

This part describes, firstly, the phenomenon of overexploitation of soils and its impact on biodiversity in France. It then gives an inventory of the public subsidies encouraging the overexploitation of soils via the change in land use and the change in agricultural practices.

1.1. Soils which are depleted under the effect of changes in land use and the intensification of agricultural practices

Changes to the level of exploitation of soils via the organic carbon content

The change to the organic carbon content of soils[2] is a good indicator of the level of exploitation of the soil and its state of conservation. Carbon is the main component of the organic matter of the soil (average 58% carbon), itself a source of energy for most of the organisms living in the ground (Arrouays et al., 2002[3]). The living populations, including the

[1] Overexploitation, thus defined, is therefore not strictly equivalent to non-sustainable exploitation: it becomes non-sustainable if this mode of exploitation continues indefinitely, causing the resource to become exhausted.

[2] The organic carbon content of the soil is calculated from all the components of carbon present in the soil. The residue of vegetation that is not yet decomposed, the fauna of the soil and the humus are therefore taken into account. We also distinguish fresh organic matter, which is found mainly in the upper layers of the soil, from older organic matter, located between 20 centimetres and 3 metres in depth. The first is constantly degraded and transformed into CO_2 by the fauna and micro-flora of the environment. However, the second remains largely unchanged;
www2.cnrs.fr/presse/journal/3822.htm from: Fontaine S., Barot S., Barré P., Bdioui N., Mary M. and Rumpel C. (2007), "Stability of organic carbon in deep soil layers controlled by fresh carbon supply", Nature, vol. 450, n° 7167, p. 277-280.

[3] Arrouays D., Balesdent J., Germon J.-C., Jayet P.-A., Soussana J.-F. and Stengel P. (2002), *Stocker du carbone dans les sols agricoles de France ?* (Storing carbon in French agricultural soils?, report on the

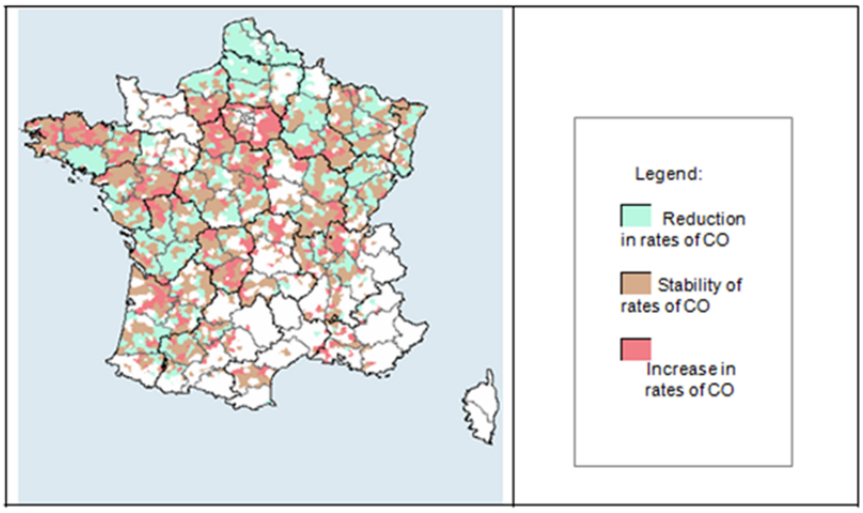
microbial biomass, increase with the carbon content of soils (Gregorich et al., 1997). Thus, the practices that allow an increase in carbon content are accompanied by an increase in the populations of worms (Haynes et al., 1993; Doube and Schmidt, 1997; Fraser, 1997; Mele and Carter, 1999), microfauna (protozoa and nematodes) and mesofauna (acarids and insects) (Gupta, 1997; Arrouays et al., 2002).

The organic matter, as reflected by the rate of organic carbon, also determines the structure of the soil in the sense of improving the penetration of roots through the soil, increasing the water-retention capacity of the soil and improving drainage (which reduces run-off and erosion). It also limits compaction and participates in the greenhouse gas cycle. Lastly, it constitutes a significant stock of carbon (Arrouays et al., 2002).

French soils have probably lost 53 million tonnes of carbon over the period between 1990-1995 and 1999-2004, representing 1.7% of their estimated stock. This stock reduction is probably around 6 million tonnes of carbon per year (IFEN, 2007).

The following map shows the change to the organic carbon content of soils in mainland France.

Change to the organic carbon content (values obtained by wet oxidation[1]) between the periods (1990-1994) and (2000-2004)



Source: BD-AT (http://bdat.gissol.fr/geosol/index.php)

According to this map, the organic carbon content, already low in Picardie, Nord-Pas-de-Calais and Haute-Normandie, is getting lower. This is also the case, but in a more qualified manner, in Alsace and in the Rhône valley.

expert appraisal carried out by INRA, 333 p.

[1] When the samples of earth collected in a zone are not sufficient to be considered as representative, the region is identified in white.

Other than the soil characteristics such as its type[1] and texture, its organic carbon content is determined by the climate (mainly the temperature and precipitation[2]), the hydrology of the soil[3] and its use by man (SoCo Project Team, 2009[4]). However, the phenomenon of the reduction in the carbon content that we have seen over the last few decades is largely attributable to this last factor and particularly to the change in land use (conversion of meadows to annual crops; making arable land impermeable, etc., and to the intensification of agricultural practices (deepening the working of soil, liming, etc.).

The impact of changes in land use and the intensification of agricultural practices on the organic carbon content of soils is addressed in greater detail in the following two sections.

The impact of changes in land use on the organic carbon content

The changes in land use cover a very wide set of transitions going from the barren artificialisation of a natural or semi-natural area (covering the land with infrastructure, housing or just making the soil impermeable) to a change in agricultural crop rotation (going from annual fodder crops to beetroot crops).

When there is barren artificialisation, the exchanges between the soil and the other ecological compartments are then interrupted. The natural cycles, including that of carbon, are affected. The soil can no longer perform its agronomic and environmental activities.

The impact of changes in land use on the organic carbon content of soils is, however, not well documented. At best, there is some data on the relationship between certain types of land use and the organic carbon content of soils, but rarely any about its change over time.

The scientific consortium on Soils (GIS-Sol – Groupement d'intérêt scientifique – Sol) shows that stocks of carbon are always higher, for identical soils, under forests, pasture and natural meadows than under crops. "Certain changes promote storage, such as the conversion of crops to meadows or forests. On the contrary, bringing meadows or forests under crops causes a reduction in the stock of carbon. The speed of changes to organic carbon in soils is nevertheless not symmetrical. Thus, in twenty years, the stock reduction caused by bringing areas under crops (1 t C/ha/year) is twice as fast as the storage resulting from abandoning crops in favour of meadows or forests (0.5 t C/ha/year)" (IFEN, 2007).

According to the report on the expert appraisal by the INRA (Arrouays et al., 2002), over a period of twenty years, bringing an area under crops removes 1 tonne of carbon per ha and per year, while abandoning crops in favour of meadows or woodland stores 0.5 tonnes of carbon per ha and per year[5].

In France, the areas under meadow, particularly permanent meadow, have considerably changed over the last twenty years (see the following graph).

[1] The type and properties of soil (e.g. the texture) are partly explained by the initial organic carbon content of the soil. Sandy soils are generally poor in organic matter. On the contrary, soils rich in clay or amorphous products can accumulate organic matter in a stable form (humus).

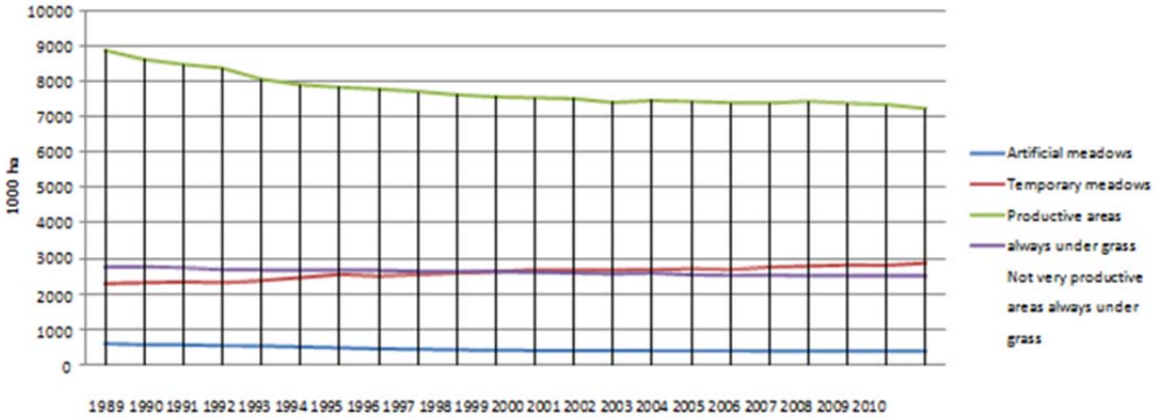
[2] The climatic factor explains the existence of a North-South gradient with high levels of organic carbon in the cold and wet regions of Europe and in the mountainous zones, and low levels in the hot and semi-arid regions of the South of Europe (Mediterranean regions).

[3] Soils that are rich in organic matter (e.g. peat) form in anaerobic and damp conditions, which favour the accumulation and decomposition of residue from plants.

[4] SoCo Project Team (2009), Addressing Soil Degradation in EU Agriculture: Relevant processes, practices and policies, Report on the project "Sustainable Agriculture and Soil Conservation (SoCo)", JRC Scientific and Technical Reports n° EUR 23767 EN – 2009, 229 p.

[5] These values are associated with relative uncertainty of 30% to 50%.

Changes to areas under meadow in France (mainland)



Definitions of terms in the legend:
Artificial meadows are composed of more than 80% of leguminous plants grown from seed. Usually mowed, these areas occupy the land for more than one year, on average 5 years, but their duration may theoretically go up to 10 years.
Temporary meadows are composed of at least 20% of grass grown from seed. These meadows are known as temporary because they give rise to six harvests, meaning up to their 6th year of exploitation. From the 7th harvest (or year of exploitation), they are placed in the same category as areas always under grass. The areas always under productive grass must at least cover the requirements of a Large Cattle Unit for 6 months. They are originally grown from seed (temporary meadows aged 6 years and more) or they are of natural origin (very old or artificial meadows grown from seed more than 10 years ago).
The not-very-productive areas always under grass have a production below the threshold of 1 Large Cattle Unit. These are paths, productive moorlands or mountain pasture.

Source: Agreste data: Annual agricultural statistics (extracted 20/05/2011); definitions: glossary from the Agreste report, 2010. Annual agricultural statistics – definitive 2008 results and near-definitive 2009 results, Chiffres et Données Série Agriculture (Agricultural Series Figures and Data) n° 212.

The permanent grassland areas, productive and not very productive (total areas always under grass), have been dropping since 2009[1], with a trend towards stabilisation from 2002. More precisely:

- over the period 1992-2000, corresponding to the implementation of the "Mac Sharry reform" the total permanent grassland areas have reduced by about 915,514 ha over 8 years;
- over the period 2000-2005, corresponding to the implementation of the "Agenda 2000" reform, the total permanent grassland areas have reduced by about 233,694 ha over 5 years;

[1] The drop in permanent meadow areas seen in 2010 corresponds to an anticipation effect of farmers, when 2010 was declared as the reference year for measuring changes to permanent meadows under the BCAE. The areas under permanent meadows were therefore under-declared, while in reality, they still existed at this date.

- over the period 2005-2009, corresponding to the implementation of eco-conditionality[1], the total permanent grassland areas have tended to stabilise, with a small drop counted at 54,776 ha over 4 years.

However, the temporary meadows (at least 20% of grass planted from seed) have increased over these three periods, while artificial meadows (at least 80% leguminous plants grown from seed) have been constantly dropping with, however, a slowdown from 2000.

The responsibility for the reduction in permanent grassland areas in relation to the drop in the organic carbon content of French soils has not been established but there is nevertheless a link between these two trends.

The responsibility for the drop in permanent grassland areas in relation to the organic carbon content of French soils has not been established, but the conjunction between these two trends should be noticed.

The impact of the intensification of agricultural practices on the organic carbon content of soils

The results of the report on the INRA expert appraisal (Arrouays et al., 2002) show that:

- amongst the crops, silage maize, potatoes and market gardening return little carbon to the soil and contribute to reducing the stock of carbon in the soils;
- intensification of arable land by fertilisation or irrigation does not change the storage potential of the areas concerned;
- the planting of hedges provides specific storage that is locally high and therefore not negligible. It is the same for grassing orchards and vineyards;
- reducing the working of the soil allows storage of 0.2 tonnes of carbon per ha and per year;
- the use of green fertiliser produces storage of 0.15 tonnes of carbon per hectare and per year;
- certain systems of fodder crops "appear" to allow a storage flow of 0.3 to 0.5 tonnes of carbon per hectare and per year. Within permanent meadows, changes to management (intensification, improvement, pasture, etc.) may lead to very uneven effects that are currently difficult to predict. The intensification of mountain meadows may, for example, lead to a reduction in the storage of several tonnes of carbon per hectare and per year.

According to the IFEN (2007[2]), planting herbaceous perennial plants on areas left fallow for long periods would result in carbon storage equivalent to that of a permanent meadow, while the storage reduction of a bare fallow field is estimated at 0.6 t C/ha/yr. Also, cultivation techniques that do not require labour (superficially working the soil, direct sowing, etc.,) would generate a storage gain that could go up to 0.20 t C/ha/yr. These practices may nevertheless have negative effects, such as compacting the soil or the proliferation of weeds or pests, which could cause the increased use of pesticides.

[1] Pursuant to conditionality, France is obliged to retain its surface areas for permanent meadows at the national level. Furthermore, France has defined a BCAE (good agricultural and environmental condition) "management of areas under grass" (BCAE sheet VI "management of areas under grass") in which it is specified that farmers must maintain 100% of their surface area under permanent meadow declared in 2010, and at least 50% of their surface area consisting of temporary meadows.

[2] IFEN (2007), "Le stock de carbone dans les sols agricoles diminue" (Carbon stocks in agricultural soils are decreasing), Le 4 pages, n° 121.

Finally, concerning intensive production systems, a recent study (Tóth et al., 2007)[1] has shown that the loss of organic matter from intensively-cultivated soil was 40% compared to an extensive production system, without taking into account the erosion effect, which would increase the loss.

1.2. Public subsidies encouraging changes in land use

The two main drivers of the change in land use identified by the working group are, firstly, urban sprawl and artificialisation and secondly, the development of biofuel crops. This part reviews the various incentives applied in each of these fields.

Public subsidies that influence the artificialisation of land

Over the period 2000-2009, the "usable agricultural surface area" (French acronym: SAU) – a partial and imperfect indicator of the areas removed from "biologically diverse" concerns – reduced by 449,190 ha, the equivalent of half of the Île-de-France region. The areas thus counted include zones that may be urbanised and which will have to be artificialised.

Discontinuous urban fabric, industrial and commercial zones and large transport infrastructure represent the great majority of artificialised areas and also include suburban gardens (see the "artificialisation of habitats" section in chapter 3).

Faced with the loss of usable agricultural surface area, farmers are adapting their crop rotation to avoid a drop in their productivity, sometimes to the detriment of areas under meadow. Poux et al. (2009)[2], show that the apparent stability of arable land at the national level hides a flow of areas exiting under the effect of urban pressure and developments, compensated by the ploughing up of meadows. Observing the transfers at the departmental level, they observe, furthermore, that the changes to meadows are not the same depending on whether they concern a department with mixed crops and meadows (variable rate of reduction of areas under meadow) or a department with extensive pastureland (increase in areas under meadows).

By reducing the cost of activities that consume land (small business and/or industrial zones, road networks and other public or private facilities, creation of new housing, etc.,), irreversibly, even though the land is a limited resource, certain incentives may contribute to an over-consumption of land, beyond what is strictly necessary for the activities concerned, to an increase in the pressure on land and to increasing the difference between the value of agricultural and urban land.

For example, in Provence-Alpes-Côte d'Azur region, "*even with an agriculture with very high added value per hectare, agricultural areas find it hard to fight the pressure of the urban land market, which dictates the value of plots*" (CETE- Mediterranean, 2008)[3].

[1] Tóth G., Stolbovoy V. and Montanarella L. (2007), "Soil quality and sustainability evaluation: An integrated approach to support soil-related policies of the European Union", JRC Position Paper, EUR 22721 EN, 52 p.

[2] Poux X., Tristant D. and Ramanantsoa J. (2009), *Assolements et rotations de la « ferme France »*, (Crop rotation on French farms), Agriculture-Energie 2030: variable sheet, Forecasting and study centre, Forecasting and statistics service *(Centre d'études et de prospective, Service de la statistique et de la prospective)*, 9 p.

[3] CETE-Mediterranean (2008), « La consommation des espaces agricoles NC dans les périmètres des agglomérations », *Études foncières* (The consumption of agricultural areas not included within the scope of built up areas, Land research), n° 8.

These incentives are presented in the part dealing with the artificialisation of habitats in chapter 3.

Public subsidies influencing the development of biofuel crops

The European Union has set a 5.75% share of renewable energy in the final consumption of energy in the transport sector by 2010, then 10% by 2020 (directives 2003/30 CE, 2009/28).

Furthermore, France has chosen to strengthen these objectives to 7% in 2010 and 10% in 2015, through the law on the direction of France's energy policy[1].

The development of biofuels has thus become essential to achieve these objectives.

Article 17 of the 2009/28 directive adds that only those biofuels that comply with sustainability criteria pre-established by the said directive may be counted in the rates of incorporation, and in particular:

- they must not be produced from raw materials coming from land of high value in terms of biological diversity, including natural meadows having great value for biodiversity (the commission defines the criteria and the geographical zones used to designate the meadows concerned);
- they must not be produced from raw materials coming from land with an extensive stock of carbon (wet zones, continuous forest zones, etc.);
- they must not be produced from raw materials obtained from land that consisted of peat bog in January 2008.

According to Guidé et al. (2008)[2], if the objective of the incorporation of 7% had to be achieved in 2015 based on agricultural production in France, the areas of rape production would have to cover 30% of usable agricultural surface area in the main French production regions. This increase would occur to the detriment of areas under cereals, high-protein plants and, indirectly but imperatively, by bringing back part of fallow areas to crop production. The objective of 10% incorporation would only be achievable by making use of imports.

The policy on biofuels is therefore likely to cause an extension of the areas devoted to activities that are hardly compatible with biodiversity objectives. Furthermore, if the energy-crop production system is intensive, it may increase nitrogen and pesticide pollution, the compaction of the soil or even, without local regulation, increase the ecological disorders related to large-scale monoculture.

The trend towards increasing the fields under oil-protein crops is currently strategically supported by the existence of an outlet, as animal fodder, for the sub-products of manufacturing biofuels. The production of biofuels from these crops therefore brings a lot of

[1] "*Given their specific advantages, particularly concerning the fight against the greenhouse effect, the state supports the development of biofuels and encourages the improvement of the competitiveness of the sector. To this end, the state is creating, particularly by approving new production capacity, the conditions for bringing, the share of biofuels and other renewable fuels in the energy content of the total quantity of petrol and diesel sold on the national market for transport purposes from 5.75% as of 31 December 2008, to 7% by 31 December 2010 and to 10% by 31 December 2015*" (article 4 of the law n° 2005-781 on energy policy, published on 13 July 2005).

[2] Guindé L., Jacquet F. and Millet G. (2008), *"Impacts du développement des biocarburants sur la production française de grandes cultures"* (Impact of the development of biofuels on the French production of large crops), Revue d'études en agriculture et environnement, n° 89, p. 55-81.

protein produced in France onto the animal feed market (dregs, oil cake, etc.) Furthermore, these proteins will compete with imports of soya cakes and generate new supply infrastructure that competes with what exists.

The influence of biofuels on the allocation of land is still not very well quantified. Several studies are in progress: in mid-2011, the European Commission will present its analysis on the inclusion of the change in the indirect assignment of the land in Europe and abroad in the evaluation of the sustainability of biofuels, and at the end of 2010, the ADEME published a call for tenders on the influence of biofuels on the assignment of land.

Also, in 2010[1], the ADEME published the results of an analysis of the life cycle of first-generation biofuels. These results show a somewhat mixed outcome, depending on the crops, in matters of the non-renewable energy consumed and greenhouse gasses emitted for all of the biofuels studied "from the field to the wheel"[2]. On the other hand, the outcome is unfavourable for emissions of nitrogen and the potential for eutrophication, with levels ten times higher than fossil fuels, both for ethanols and for esters. The outcome for emissions of molecules with an oxidising power (also called ozone precursors) between the biofuel and fossil fuel sectors depends on the biofuel in question (little difference in the case of esters, more pronounced difference in favour of ethanols).

Nevertheless, the environmental validity of biofuels is essentially examined from the point of view of flows of pollutants. Concerning biodiversity, the situations are nevertheless very uneven: from the threat to the residual habitat of orangutans caused by the extension of palm oil crops, to the possibility of managing energy crops less rigorously than their food equivalents (both concerning levels of pesticides and the acceptance of weeds, which are less harmful for the production of fuels than for human or animal consumption, etc.).

The incentives received directly by farmers for producing energy crops or indirectly by the players in the sector (processors, those bringing them to market and consumers) are essentially tax subsidies:

- limited exemption from the domestic consumption tax for approved volumes of biofuels (article 265 a section A of the customs code) (643 million euros 2010[3]): this tax advantage is maintained until 2013 (2011 finance act);
- a reduced rate of the TGAP on the consumption of premium grade ethanol, petrol or diesel in proportion to the quantities of biofuels incorporated (article 266 item 15 of the customs code) (total amount of the incentive unknown): budgetary impact ends in 2011;
- reduced rate of domestic consumption tax when there is an authorisation to experimentally use pure vegetable oils as fuels for the captive fleets of local authorities or their amalgamations (article 265 b-3 of the customs code) (total amount of the incentive is low);

[1] ADEME (2010), Life Cycle Analyses Applied to First Generation Biofuels Used in France, final report 236 p.
[2] This assessment is made without taking into account the change in land use.
[3] Source: mission budgétaire « Agriculture, pêche, alimentation, forêt et affaires rurales », (budgetary task group on Agriculture, fisheries, food, forests and rural affairs), 2010.

- exemption from the domestic consumption tax for pure vegetable oils used as agricultural fuels and for fuelling professional fishing vessels (article 265 b of the customs code) (total amount of the incentive is low);
- Exemption from the domestic consumption tax on coal for companies that recycle biomass, for which the purchases of fuels and electricity used for this recycling represent at least 3% of their turnover (article 266 item 5 B-5-4 of the customs code) (total amount of the incentive unknown).

Operators can benefit from incentives coupled specifically to energy crops until the end of 2009[1].

These incentives are likely to influence the income differential between crops intended for the biofuel sector and those intended for the food/stock breeding sector, and consequently the choice of crop rotation.

There are also support mechanisms for the biofuel sector (essentially for the biofuels of the future):

- support to re-industrialisation;
- government-subsidised green loans put in place by OSEO;
- national loan;
- call for projects;
- incentives to the construction of factories.

Also, when operators (refiners, both large and independent) put fuels on the market containing a proportion of biofuels below the threshold stated in the agricultural guidance law[2], they must pay an additional TGAP tax[3] (article 266 item 15 of the Customs code). Thus, in order to comply with the mandatory objective for incorporation and thus not to pay the penalty, fuel distributors are ready to pay more for biofuels (in effect, they have a choice between buying biofuels while benefiting from tax exemption and buying fossil fuels while paying a TGAP), which constitutes a "rent" for the producers of biofuels, which may be considered the same as a subsidy.

1.3. Public subsidies encouraging intensification or encouraging the maintenance of intensive agricultural practices

The intensification of agriculture involves the search for plant yields and animal occupation that are increasingly high per surface unit, as the land is a limiting factor for production, and mechanisation to reduce the cost of work. The natural and semi-natural infrastructure (embankments, hedges, ditches, natural and semi-natural meadows, etc.,) on farms are often eliminated to increase the farm's productive area, facilitate mechanisation or support the conversion from breeding to crop growing. It should also be noted that pesticides, which are both effective in certain prophylactic cases and are relatively cheap and easy to use,

[1] An incentive of 45 euros per hectare was granted for energy-production crops produced outside areas left fallow, known as the incentive to energy crops (French acronym: ACE - aides aux cultures énergétiques).
[2] 1.75% in 2006, 3.5% in 2007, 5.75% in 2008, 6.25% in 2009, 7% from 2010.
[3] Its rate is increasing, from 1.2% in 2005 to 7% in 2010. It is reduced by the share, per fuel, of biofuels expressed in percentage (LHV / low heating value) put on the market.

have strongly contributed to the development of intensive production systems (Aubertot et al., 2005)[1].

The intensification of systems and practices proceeds from a set of very complex processes internal and external to the agricultural sector that may be stated, in a simplified manner, as follows:

- the choice of practices is more determined by the production objective than by environmental consequences and external costs, which are undervalued or simply not counted in the process of choosing;
- labour is expensive compared to mechanisation and the use of treatments;
- resources for intermediate consumption purchased outside the farm allow extreme production specialisation;
- pesticides are a profitable means of reducing the variability of yields;
- increasing productivity involves either enlargement with specialisation and mechanisation or, when enlargement is impossible, the intensification of practices (or both at the same time);
- available good land is becoming more scarce.

Even though the usage of pesticides is well regulated today[2], they remain the cornerstone of the intensification process, which, overall, is the process that causes difficulties for biodiversity.

It is also clear that, at a constant overall production objective, less intensive production modes may lead to an increase in the use of areas that are not yet exploited, to the detriment of their biodiversity (such as wet zones that are drained).

This part sets out to identify the public subsidies likely to influence one or more of the following intensification factors: production objective, cost of labour, cost of intermediate consumption, cost of mechanisation, changes to the area of exploitation and the cost of land.

Production objective

Until 2005, direct aid from the CAP was aid that was linked[3] to the surface area and type of crop. These incentives therefore encourage farmers to enlarge their farms and to focus their crop rotation on subsidised crops, sometimes massively and on a large scale.

The de-linking of aid began in 2006, then accelerated with the health assessment of the CAP in 2008.

Most of the historically-linked European incentives have now disappeared. Only the incentive specific to high-protein plants and part of the allowance for maintaining herds of

[1] Aubertot J.-N., Barbier J.-M., Carpentier A., Gril J.-J., Guichard L., Lucas P., Savary S., Voltz M. and Savini I. (2005), *Pesticides, agriculture et environnement : réduire l'utilisation des pesticides et en limiter les impacts environnement* (Pesticides, agriculture and the environment: reducing the use of pesticides and limiting the environmental impact), summary of the report on the expert appraisal, Collective Scientific Expert Appraisal INRA-Cemagref, 64 p.

[2] Doses authorised per usage and a register must be kept for the plot.

[3] Incentives linked to production are those for which the payment depends on agricultural production. The amount of the incentive assigned is directly related to the nature and extent of the production and declared during a campaign.

dairy cattle (French acronym: PMTVA - prime au maintien du troupeau de vaches allaitantes) remain. The production of these has a clear benefit for the environment.

Also, the implementation of article 68[1] of the health assessment has allowed the establishment of new linked subsidies in France from 2010. These arrangements are defined at the national level and financed using community credits released by reorienting part of the CAP aid. Thus, in 2010, 342.8 million euros in aid (agricultural accounts commission, 2010) was used to finance linked aid that broadly benefited the animal production sectors, favouring production systems that are economical with inputs, notably:

- support to sheep/goats;
- support to milk in mountainous areas;
- suckling calves;
- additional aid to high-protein plants (crops belonging to the family of leguminous plants that do not require contributions of nitrogen and that present a positive effect on the following crop by limiting inputs);
- the maintenance of biological agriculture;
- aid to harvest insurance;
- aid to the diversity of crop rotation (only in 2010).

Certain production is therefore encouraged directly, but in the name of the maintenance or development of production systems of the extensive type (PMTVA, suckling calves, high-protein plants and biological agriculture) or the traditional type (hard wheat and milk produced in mountainous areas) or the diversified type (sheep/goats).

The aid to harvest insurance (38.1 million euros in 2010)[2] expresses a transfer from an "agricultural disasters" system where the state was wholly responsible for compensating for the consequences of climatic hazards, towards an insurance-based system, based on joint responsibility of the European Union, the state and the farmer. The state encourages the purchase of harvest insurance contracts by paying part of the insurance contributions paid by the farmers[3]. This arrangement may have two potentially contradictory effects on the choices of farmers:

- it may serve as a substitute for the use of pesticides, as it also guarantees a minimum income level. The effect here is therefore positive, i.e. a reduction in intensification;
- it may introduce a minimum income differential between crops that can be insured (such as fruit trees and cereals) and those that cannot (meadows) and, to a certain extent, cause re-linkage with intensive production systems.

[1] Incentives to sectors encountering specific problems (article 68 measures).
[2] Source : mission budgétaire « *Agriculture, pêche, alimentation, forêt et affaires rurales* », 2010.
[3] The contracts must specify a trigger threshold of at least 30% and a deductible amount of at least 25% in the case of contracts covering crops or at least 20% in the case of contracts covering farms. In all cases, the maximum deductible amount is 50% (source: MAAPRAT Internet site).

"Agricultural disasters" insurance

There is already an "agricultural disasters" compensation provided by the national guarantee fund for agricultural catastrophes (French acronym: FNGRA, previously known as *FNGCA / Fonds national de garantie des calamités agricoles* modified by the LMAP law of 2010). Agricultural disasters are considered as non-insurable damage occurring during exceptional meteorological events, against which technical means of protection and prevention prove to be inoperative. The character of an "agricultural disaster" is recognised by a decree from the minister responsible for agriculture, given following a proposal from the prefect of the department after consultation with the national committee for managing agricultural risks. A reform of this arrangement was begun from 2005 by the minister responsible for agriculture: it aims to gradually replace the "agricultural disasters" arrangement by developing harvest insurance (covering all climatic risks) for all vegetable production (currently subsidised at 65% under article 68). A range of products already exists and is gradually developing for all crops, with the exclusion of meadows, for which there is not yet any insurance product (but experiments are in progress with several insurance companies). The actual marketing of products for meadows currently depends, for the insurers, on the state setting up a public re-insurance system for limiting their exposure in case of a disaster on an exceptional scale. An analysis of the requirement for public re-insurance for the development of the French climatic insurance market is currently ongoing pursuant to the law on the modernisation of agriculture and fisheries of 2010 (article 27 of the LMAP).

The cost of mechanisation

Mechanisation can increase the productivity of agricultural work and make it less physically tiring: its unfavourable impact on biodiversity often relates to practices stemming from a certain race towards power and weight, the possibility of large-scale treatments and the adjustment of the countryside to the "imperatives" of machine productivity (size of plots, geometric straightening, etc.). On the other hand, it can also allow ways of working the ground or agronomic operations that substitute for chemical treatments. It is an important determinant of the profitability of a production system, whether it is intensive or extensive.
Farmers may benefit from incentives to investment, some of which may encourage increased mechanisation:

- deduction specific to investment (CGI: 72 D)[1] (160 million euros in 2010[2]): the effects of this measure on biodiversity depend on the equipment purchased. It may promote mechanised agriculture and the intensification of agricultural practices (the increase in the use of inputs, compacting the semi-deep boundaries of the soil, etc.). On the other hand, in the case of precision agricultural equipment (such as GPS, etc.,), this investment should normally lead to a reduction in quantities of inputs. This measure may nevertheless be seen as a distortion in relation to farmers that bear the costs of practices that require little or no inputs;
- modernisation loans ("Bleu", APAFAR mission, programme 154, action 13)[3] (< 8.4 million euros in 2010[4]): by granting a higher subsidy to mountain farms, this measure

[1] Farmers subject to an actual taxation regime may make deductions for investment for which the mount is restricted, for each financial year.
[2] Source : *mission budgétaire « Agriculture, pêche, alimentation, forêt et affaires rurales »*, 2010.
[3] These credits are used to fund the charges for subsidising special medium-term loans to cooperatives for the use of agricultural equipment (MTS-CUMA). Since the decree dated 26 May 2009, the subsidy for MTS-CUMA loans corresponds to a differential between the reference rates applied by the bank and the rate paid by the farmer. This differential stood at 2% in zones on plains and 2.5% in mountainous zones.
[4] Source : mission budgétaire « Agriculture, pêche, alimentation, forêt et affaires rurales », 2010.

encourages them to modernise compared to farms on plains. Just like the previous measure, the effects on biodiversity depend on the equipment purchased and its use;

- loans for becoming established ("Bleu", APAFAR mission, programme 154, action 13)[1] (79.7 millions euros in 2010): as most farms today are intensive and take biodiversity insufficiently into account in their production systems, these incentives are therefore mostly assigned to the takeover/continuation of farms of this type;
- nevertheless, the distinction in rates between unfavourable zones and zones on plains encourages the takeover of farms in regions where farmland has been abandoned and the maintenance of corresponding agro-ecosystems.

The exemption from the special tax on certain road vehicles (or axle tax) for vehicles intended for use on farms (amount of the incentive for the agricultural sector unknown) must also be mentioned. This arrangement has the effect of reducing the cost of owning tractors without distinguishing different types of tractors.

The cost of intermediate consumption

The cost of inputs (purchase and use) is an important determinant in the choice of crop growing practices. If the purchase price is low, intensive practices become more competitive compared to practices that require little or no fertilisers and pesticides. This is also the case for the price of cattle food, which may result in the use of these intermediate consumption products, not produced by the farmer, becoming more competitive. The reduced rate of VAT applicable to elements that constitute food for cattle and certain fertiliser products for agricultural use (60 million euros in 2010[2]) is therefore likely to increase their consumption.

The rates of VAT on these products are almost always higher in the other Member States of the European Union (see the following table).

Rate of VAT applied in the Member States of the EU on 1 January 2011 (%)

	BE	BG	CZ	DK	DE	EE	EL	ES	FR	IE	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Pesticides*	12	20	20	25	19	20	13	8	5.5	21	20	5	22	21	15	25	18	19	20	8	6	24	8.5	20	23	25	20
	21						23		19.6																		
Fertilisers	12	20	20	25	19	20	13	8	5.5	0	4	5	22	21	3	25	18	19	10	8	6	24	8.5	20	23	25	20
	21									21									20								

(*) And materials for the protection of plants.

Source: European commission (2011), "VAT Rates Applied in the Member States of the European Union: Situation at 1st January 2011", taxud.c.1(2011)39295-EN, 27 p.

Like Belgium, France has a reduced rate of VAT applicable only to pesticide products recognised by the ministry of agriculture.

It is also interesting to notice that Germany has a reduced rate of VAT on biological fertilisers (not chemical fertilisers) and Italy has one on fertilisers used in biological agriculture.

[1] This measure is applicable to young farmers and other beneficiaries (MTS and others). The loans are devoted to financing the subsidy charges relative to medium and long-term loans, subsidised by the state. The regulations set the rates according to whether the location is in a disadvantaged zone or on a plain.

[2] Source : mission budgétaire « Agriculture, pêche, alimentation, forêt et affaires rurales », 2010.

The TGAP on anti-parasitic agents was repealed on 1 January 2008. After this date, deliveries to the final user of pesticide products are subject to the tax for diffuse pollution, collected by the French Water Agencies, under the conditions specified by article 84 of the aforementioned act (see chapter 5 on pollution).

In French overseas departments, two arrangements lower the price of fertilisers and pesticides:

- exemption or rate reduction covering port duties on imports of pesticides and fertilisers;
- VAT exemption on imports of fertilisers and pesticides.

- The price of fuel will also influence choices between more or less powerful tractors, the number of passes, the depth of working the soil, etc. Two measures lower the price of fuel:

- reduced rate of domestic consumption tax applicable to domestic heating oil used as diesel fuel in agriculture (customs code: 265, table B) (1,100 million euros for agriculture and fishing in 2010[1]): this measure reduces the cost of pesticide treatments, spreading fertilisers and any other activity that consumes fuel (biological agriculture uses harrowing, for example, to avoid treatment). It consequently increases costs, in relative terms, for certain types of more extensive and non-mechanised agriculture, which is more labour intensive. Also, the increase in the consumption of fuel caused by this measure produces more emissions of greenhouse gases, fine particles, etc.;
- partial reimbursement of the domestic consumption tax on energy products (amount = 150 million euros in 2010) and natural gas[2]: as well as the reduced rate of domestic consumption tax mentioned above, this measure reduces the cost of fuel (and not only heating oil). Although not permanently established and decided subsequently in the amending finance act, it is renewed from year to year and has potentially the same effects as the previous exemption.

Overseas, the special consumption tax on petrol, premium grade fuel, diesel and emulsions in diesel (customs code: article 266 item 4) replaces the domestic consumption tax applied in mainland France. The rate of this tax is fixed by the regional council. It may not exceed 63.96 euros per hectolitre for petrol and premium grade fuel, 5.66 euros per hectolitre for diesel used for supplying fixed engines and 28.71 euros per hectolitre for diesel and water emulsion in diesel. It should also be noted that, as well as the TCS and VAT, fuels are subject to port duties.

Changes to the surface area of farms

To trigger payment, the Single Payment Scheme (or Single Farm Payment – SPS), implemented since 2006, must be "activated" with a hectare of agricultural land held by the farmer on 15 may, with the declaration of surface areas being annual. The "single payment" received by the farm is therefore higher as the number of hectares activated increases.

In theory, the link between the surface area and the amount of the single payment may encourage enlargement and accelerate the process of simplification of practices, intensification and carbon impoverishment of the soil.

[1] Source: budgetary task group "Agriculture, fisheries, food, forestry and rural affairs", 2010.
[2] This measure was renewed by the amending finance act for 2010 for the benefit of agricultural activities. The reimbursements are calculated according to deliveries of fuel or natural gas the entire year 2010. The amount of the repayment is not modified (5 euros per hectolitre for diesel; 1,665 per 100 kilograms net for heavy fuel; 1,071 euros per thousand kilowatt hours for gas).

The amount of the payment per hectare is also "determined by relating the average of the direct aid received during the years 2000, 2001 and 2002 to the number of hectares giving entitlement to these incentives (the 'reference surface area'). The number of SPS belonging to farmers will be equal to the number of reference hectares on their farm" (Chatellier, 2006)[1]. The farms benefiting from the highest payments over this period are mostly large farms with a simplified and intensive production system. These farms therefore enjoy a rent compared to diversified and extensive systems.

The CAP's health assessment (article 63 of the regulation 73/2009/CE) nevertheless qualifies this latter effect by redistributing part of the non-linked aid towards new SPS for farms with areas under grass, silage maize and field-scale vegetables. The current division of SPS is therefore no longer 100% based on the historical record.

The cost of land (specifics of farm tenancy rent)

Established immediately following the Second World War, the status of farm tenancy rent was intended overall to establish a balance between lessors and lessees and revive agriculture that was harmed by the conflict.

The methods of fixing the farm tenancy rent amount have changed significantly since it was created. Until 1994, the farm tenancy rent for a rural lease was expressed in quantities of foodstuffs: hundreds of kilos of farm-tenancy wheat, litres of milk and kilos of meat, according to scales published by prefectural decrees. Thus, the ranges setting the minimum and maximum rents were themselves determined by quantities of foodstuffs per hectare, according in particular to the duration of leases, the condition and size of buildings, the agronomic quality of soils, the plot division structure of rented assets, the crops grown,…

Since 1995, farm tenancy rents have been expressed as a monetary value. The ranges setting the minimum and maximum are simply converted to money. Their value is updated each year from the annual variation of a farm tenancy rent set at the departmental level by the prefect, after the opinion of the consultative commission on rural leases, for a period running from 1 October to 30 September of the following year.

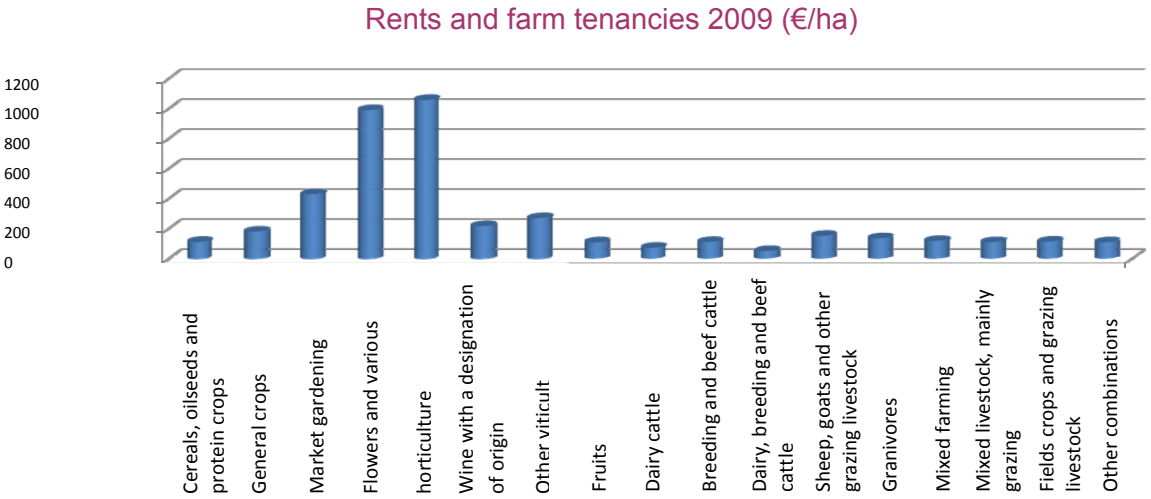
In 2010, the Agriculture Modernisation Act[2] eliminated the departmental farm tenancy rent indices and replaced them with a single index: the national farm tenancy rent index. The composition of this new index was set by act as follows:

- for 60%: weighted average of the gross income of agricultural companies (change in the gross income of agricultural companies per hectare ascertained at the national level during the last five years);
- for 40%: GDP price index.

Thus, the national farm tenancy rent index applicable to rents payable between 1 October 2010 and 30 September 2011 was 98.37% (the annual variation compared to 2009, base 100 of the new index, is -1.63%)[3].

The farm tenancy rent price nevertheless inherited the old mode of calculation and the variations in farm systems are still visible (see the following graph).

[1] Chatellier V. (2006), " Le découplage et les droits à paiement unique dans les exploitations laitières et bovins-viande en France" (Non-linking and the entitlements to a unique payment in dairy and beef farms in France), Cahiers d'économie et sociologie rurales, n° 78, 28 p.
[2] Article 62 of he act n° 2010-874 dated 27 July 2010 on the modernisation of agriculture and fisheries.
[3] According to the decree of 27 September 2010, published by the ministry of agriculture and fisheries, in the official journal on 28 September.



Source: RICA

Indexing on the income of farmers ascertained at the national level should not produce direct effects on the means of managing farms leased to farmers. But, as the calculation of the price of farm tenancy rent no longer takes into account soil characteristics, particularly the organic carbon content, the future of which is highly dependent on agricultural practices, this variable may change over time without this being reflected in the rental for the land.

The various reforms mentioned above only affected the procedures for calculating farm tenancy rent. From a legal point of view, the status of the post-war farm tenancy rent has reduced the rights of the lessor in favour of the rights of the lessee and has left the lessor to pay almost all of the taxes relating to the leased asset[1]. Farm tenancy rents are not unrestricted. They are controlled by the state. From an economic point of view, this causes, firstly, farm tenancy rents below that of numerous neighbouring countries and, secondly, nil or negative profitability of non-built land. The lessors are therefore encouraged to change the intended purpose of their asset. From the point of view of biodiversity, this is a major economic cause of the artificialisation of areas and urban sprawl. A positive yield in real terms for non-built land would be an essential precondition for reversing this trend.

Concerning the rights granted to the lessee, these have changed little since the status of farm tenancy rent was established. The lessee retains the option to (articles L. 411-28, L. 411-29 and L. 411-73-I.1 of the rural code):

- eliminate, within the limits of the rented property, embankments, hedges, channels and trees that separate them or divide them, when these operations improve the conditions for running the farm;
- plough up plots under grass;
- participate in collective drainage, cleanup and irrigation operations;
- hunt.

[1] In particular, the lessor must pay 80% of the land tax on built and non-built land and 50% of the tax for the chambers of agriculture.

The lessee can therefore significantly change the biodiversity potential of the asset under the lease.

2 • Fishery resources

2.1. State of fishery resources

Since 1960, in forty-five years, household expenditures on seafood (per inhabitant and at constant prices) have more than doubled; this consumption has partly substituted for meat and eggs, in spite of unfavourable price changes relative to meat, expressing a desire for diversification[1]. This change was driven by the significant increase in prepared products, with the share of fresh products of fishing remaining quite stable. Over the recent period, the consumption per inhabitant of seafood (fish and crustaceans)[2] increased by nearly 20% between 1998 and 2009 in France, going from 22 kg per inhabitant to nearly 26 kg per inhabitant over the period. Most of this demand was satisfied by an increase in the relative share of imports for this consumption (by volume), which went from 75% to 88%. Other than direct human food, the development of fish farming[3] (farmed fish represent 9% of the household consumption of seafood and aquaculture products) and the development of breeding, because of the fish meal that these activities use during intermediate consumption, also contribute to increasing the requirements putting pressure on fishery resources[4].

The products of professional French sea fishing (other than non-food uses) mainly supply the final consumption of households or resident downstream processing industries, but about 30% (by volume) is also directly exported[5]. French sea fishing is characterised by the diversity of its fleets, its catches and its techniques (trawls, nets, lines, drag nets, pots, etc.). The French fleet catches two thirds of its fish (mainly sole, monkfish (or angler), langoustine, scallops, hake and sea bass) in North Atlantic waters (Irish Sea, West of Scotland, English Channel, North sea and bay of Biscay), but also operates in the Mediterranean (blue-fin tuna, anchovies and sardines), in French overseas territories (shrimps in French Guiana, tuna and swordfish off Reunion Island,…) and in numerous regions of the world (cod and ling off Norway and the Faroe Isles, tropical tuna off Africa and in the Indian Ocean).

Depending on species and regions, French professional fishing contributes very unequally to catches. Out of a set of 68 stocks (species * fishing zone) examined by Ifremer[6], the share of French landings in total landings is less than 10% for 15 of them and greater than 80% for a little under twenty. We also note that, amongst the stocks for which French catches are significant, a large number of them cannot be qualified in terms of sustainability, due to lack of sufficient and robust data. Two stocks are considered to be in a critical state and a dozen at risk, with the current level of catches or the current state of the stock constituting factors

[1] Besson D. (2008), "Meals in the last 45 years: less fresh produce, more ready meals", Insee Première, n° 1208, Insee.
[2] Products from fishing represent 75% of the consumption of fishery and aquaculture products (shellfish farming and fish farming) (source: *FranceAgriMer, Consommation des produits de la mer et de l'aquaculture (Consumption of products from the sea and from aquaculture)*, 2009 edition)).
[3] Aquaculture is growing more rapidly than all other food-production sectors of animal origin, at an average annual rate of 8.8% since 1970, against only 1.2% for wild fish and 2.8% for terrestrial systems of animal production (source: Ifremer, http://aquaculture.ifremer.fr).
[4] Industrial fishing is the fishing activity where catches are processed into fishmeal (mainly for breeding pork and poultry) as well as into oil and other sub-products.
[5] FranceAgriMer (2010), Les filières pêche et aquaculture en France, Ventes à l'étranger pêche fraîche et pêche congelée (Fishing and aquaculture sectors in France, Sales abroad of fresh and deep-frozen fish), p. 6.
[6] Ifremer (2011), State in 2011 of resources exploited by French fleets, A. Biseau (dir.), RBE/2011/11.

making the resource non-sustainable. The weakening of the target stock can also affect other elements of the marine ecosystem of which it forms part (imbalance in the demographic dynamics of prey or predator species, proliferation of opportunist species to the detriment of weakened species, etc.).

Characterisation of stocks exploited by French fleets

Species	Zone	Share of the stock caught by French fleets (%)	State of the stock
Eel	North-East Atlantic / Mediterranean	80	Critical
Cod	West Scotland	15	Critical
Anchovy	Gulf of Lion	80	at risk
Sea Bass	Bay of Biscay	60	at risk
Shrimp	French Guiana	100	at risk (or critical)
Albacore	North-East Atlantic	20	at risk
Whiting	Eastern English Channel / North	90 (ME)/30 (MN)	at risk
Hake	Gulf of Lion	50	at risk
Plaice	Eastern English Channel	50	at risk
Mullet	Gulf of Lion	50	at risk
Sardine	Gulf of Lion	80	at risk
Sole	Eastern English Channel	50	at risk
Sole	Western English Channel	35	at risk
Blue-fin tuna	North-East Atlantic / Mediterranean	20	at risk
Sea Bass	Eastern English Channel	60	uncertain
Sea Bass	Western English Channel	60	uncertain
Monkfish	Bay of Biscay / Irish Sea	40	uncertain
Whelk	Western English Channel	100	uncertain
Megrim	Bay of Biscay / Irish Sea	25	uncertain
Scallops	Eastern English Channel	90	uncertain
Haddock	Irish Sea	55	uncertain
Grenadier	West Scotland	60	uncertain
Blue ling	West Scotland	60	uncertain
Marlin	Antilles	50	uncertain
Whiting	Irish Sea	33	uncertain
Cod	Irish Sea	66	uncertain
Clam	Bassin Arcachon	100	uncertain
Clam	Gulf of Morbihan	100	uncertain
Mullet	Bay of Biscay	50	uncertain
Mullet	Eastern English Channel	75	uncertain
Mullet	North Sea	75	uncertain
Scabbardfish	West Scotland	60	uncertain
Sardine	Bay of Biscay	90	uncertain
Crab	Bay of Biscay	80	uncertain
Crab	Western English Channel	80	uncertain
Crab	Irish Sea	80	uncertain

Species	Zone	Share of the stock caught by French fleets (%)	State of the stock
Anchovy	Bay of Biscay	50	secure
Scallops	Baie de Seine	100	secure (p)
Scallops	Charente	100	secure
Scallops	St Brieuc	100	secure (p)
Langoustine	Bay of Biscay	100	secure (p)
Langoustine	Irish Sea	40	secure
Saithe	North Sea / West Scotland	20	secure
Hake	Bay of Biscay / Irish Sea	30	secure
Cod	North-west Atlantic	15	secure
Sole	Bay of Biscay	90	secure

(p): probably secure

Field: stocks for which the share of French landings is below 10% of total landings are not mentioned in the table to keep it clear.

Note to the reader: Ifremer defines two stock sustainability indicators: the biomass threshold for reproducers below which the risk of compromising maintenance of the stock through renewal of the generations is very high; the catch rate (mortality per fish) beyond which the risk of reducing reproducers to a level that is below the aforementioned threshold is high. These indicators cannot always be calculated or are not sufficiently robust, due to lack of data and long series. Other information can, where applicable, shed light on the dynamics of the stock in question. To summarise this information, we have defined four possible states of the stock:

- critical, when both sustainability indicators are "negative" (biomass below the warning threshold and mortality per fish greater than the warning threshold);
- at risk, when one of these two indicators is "negative";
- secure, when both indicators are "positive";
- uncertain, when it is not possible to establish a robust diagnosis.

Source: CGDD, according to Ifremer, State in 2011 of resources exploited by French fleets

Beyond phenomena of the exhaustion of target stocks and the effects that this causes, fishing practices can also cause environmental damage and contribute to pressures on biodiversity, either by accidental catches of species other than the target, or by damage to marine habitats (see the tables above). The first of these effects is not, in itself, over-exploitation of resources, but nevertheless constitutes a catch that is harmful to biodiversity. The second clearly comes under the destruction and degradation of habitats dealt with in chapter 3, but it is nevertheless addressed here for greater clarity.

To express the matter simply, the towed gears (trawls, particularly bottom trawls, drag nets and seine nets), meaning the equipment that must be moved for the capture operation, usually affect the habitats via their mechanical action on the seabed or near to it. Conversely, passive gears (nets, lines, pots, sieves, etc.), generally have little impact on habitats; there is some marginal harm caused by nets poorly attached to the seabed in

fragile zones where there are strong currents and which accidentally capture other species: bottlenose dolphin, turtles, seals, Atlantic salmon, as well as some seabirds for certain gears (set nets, longlines…). Certain towed gears, particularly bottom trawls and purse seine nets targeting blue-fin tuna may also cause accidental catches (bottlenose dolphin, turtles and seals)[1].

[1] See, for example the report issued by the French Agency for Marine Protected Areas Agence des Aires Marines Protégées (2010), *Référentiel pour la gestion dans les sites Natura 2000 en mer - Tome 1 : Pêche professionnelle* (Reference framework for management in Natura 2000 sites at sea -Volume 1: Professional fishing), or Appendix D: Gear types and their environmental effects, in Cappell R., Huntington T. and MacFayden G. (2010), FIFG 2000-2006 Shadow Evaluation, Report to the Pew Environment Group, Poseidon Aquatic Resource Management Ltd.

Accidental captures caused by professional fishing of species of community interest

Species of community interest (DHFF)	Bottom trawl	Pelagic trawl	Beam trawl	Bull trawl	Towed dragnet (Atlantic)	Tellines dragnet	Towed dragnet (Mediterranean)	Manual dragnet (Mediterranean)	Scuobidou	Hyperborea dragnet	Purse seine targeting blue-fin tuna	Purse seine targeting various fish	Shore seine net	Set net on seabed	Drift net targeting various fish	Lift net	Elver sieve	Pot	Hand line	Longline	Fishing by diving without or with aqualung	Shellfish gathering
1095: sea lamprey (Petromyzon marinus)																						
1099: river lamprey (Lampetra fluvietilis)																						
1101: European sturgeon (Acipenser sturio)																						
1102: large shad (Alosa alosa)																						
1103: twaite shad (Alosa feliax)																						
1106: Atlantic salmon (salmo salar)																						
1152: Corsica aphanius (Aphanius fasciatus)*																						
1224: loggerhead turtle (Caretta caretta)																						
1349: bottlenose dolphin (Tursiops truncatus)																						
1351: common porpoise (Phocoena phocoena)																						
1355: European otter (Lutra lutra)														?	?							
1364: grey seal (Halichoerus grypus)																						
1365: common seal (Phoca vitulina)																						

Species of community interest (DO)																						
FORESHORE																						
FORESHORE – SURFACE																						
SURFACE																						
SURFACE PELAGIC																						
FORESHORE – SURFACE DIVED				?											?							
FORESHORE – DIVED 5 m																						
DIVERS 20 m																						
PELAGIC DIVERS																						
DEEP DIVERS up to 150 m																						

(*) The "verneux" and "capéchades" (fishing gear used in the Mediterranean) make accidental captures of Corsica aphanius

Target species

Potential accidental capture

Rare accidental capture

No accidental capture

Spatial interaction and potential pressure of professional fishing activities on habitats coming under the Habitats Directive

Habitats of the Habitats Directive	Bottom trawl	Pelagic trawl	Beam trawl	Bull trawl	Towed dragnet (Atlantic)	Tellines dragnet	Towed dragnet (Mediterranean)	Manual dragnet (Mediterranean)	Scuobidou	Hyperborea dragnet	Purse seine targeting blue-fin tuna	Purse seine targeting various fish	Shore seine net	Set net on seabed	Set surface tuna net	Drift net targeting various fish	Lift net	Elver sieve	Pot	Hand line	Longline	Fishing by diving without or with aqualung	Shellfish gathering
1110: Sandbanks with low water coverage permanent																							
1120: Poseidonion beds (posidonion oceanicae)																							
1130: Estuaries																							
1140: Muddy or sandy shelves exposed at low tide																							
1150: Coastal lagoons																							
1160: Large coves and shallow bays																							
1170: Reefs																							
1180: Submarine structures caused by emissions of gas																							
8330: Submerged or semi-submerged marine caves																							

Potential pressures

Spatial interactions (no potential pressures)

No spatial interactions

2.2. Public subsidies to professional fishing

For nearly thirty years (establishment of the community fisheries and aquaculture regime in 1983), the development of the maritime fisheries sector has come within the European framework of the common fisheries policy (CFP), which was last reformed in 2002. The four themes of this policy are the conservation and management of the resource, the common organisation of markets, the structure and management of the European fleet and relationships with third countries.

The policy on conservation and management of the resource relies in particular on a quantitative management instrument, annual fishing quotas (or total acceptable catches) defined for each stock at the European level and divided between Member States (see framed section), and regulatory technical measures (authorised fishing gears, size and structure of catches, access limits to certain fishing zones, etc.

Fishing quotas

From the point of view of the economic analysis, fishery resources come within the "tragedy of the commons" described by Hardin (The Tragedy of the Commons, 1968). In the absence of clearly-established ownership rights, the free access to these common resources generally leads to them being overexploited and ultimately exhausted (Buisson and Barnley, 2007). From an economic point of view, the rent (the income drawn from exploiting a non-produced resource) therefore tends towards zero.

A possible regulation policy is to limit quantities caught by defining and allocating limited ownership rights over the resource, or quotas, and by organising, where applicable, exchanges of these rights based on a regulated market. These fishing quotas may be collective (QC), individual (QI), or transferable individual (QIT). According to the economic theory, the use of individual transferable quotas would minimise the aggregate cost of compliance with the overall quota. Individual transferable quotas could also have a positive environmental effect by encouraging collective responsibility for the stock, due to the fact that the quota is an economic asset for the fishermen who wish to benefit from it over the long term. In redistributive terms, individual transferable quotas could encourage the concentration of players to the detriment of "small fishermen" if economies of scale exist, and the question of the initial allocation of rights must be examined closely. Although this instrument is still in the minority, an increasing number of fisheries throughout the world have established a system of individual transferable quotas. Systems of non-transferable quotas (individual or collective) are more extensive (see CGDD, 2010 and Bureau and De Lara, 2010 for examples and references).

The European Union, as well as measures of a regulatory nature covering fishing intensity, sets annual fishing quotas or "Total Acceptable Catches" (TAC) at the European level. These quotas are defined for each stock of fish based on a scientific analysis, followed by political negotiations. The distribution of the European TAC defined for each stock into national quotas is done according to the principle of relative stability, meaning according to a scale based on the historic catches of states, associated with possible compensation between states.

From its own national quota, each country can then establish a system to regulate access to the resource that it owns, to comply with this catch level. Effectively, although fishing policy is a European competence, the management of the various fishing rights is a national responsibility. In practice, there are highly diverse systems between Member States and sometimes even within them. The rights relate to different variables (fishing intensity, catches), the groups of people

concerned (individual fishermen, groups of fishermen) and the characteristics of the rights, such as their duration or transferability.

In its memorandum on the reform of the common fisheries policy of January 2010, France reaffirmed its opposition to establishing a market for individual transferable quotas at the European Union level. At the national level, it nevertheless proposes carrying out experiments to establish collective management of individualised quotas for the species subject to long-term management plans.

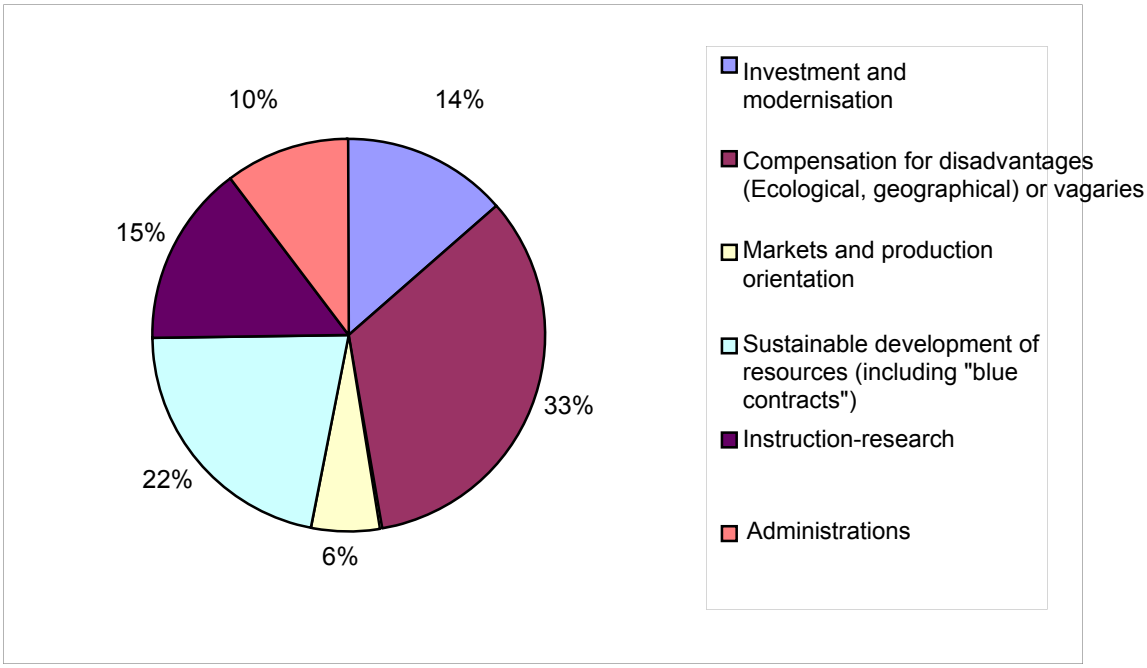
Other than defining rights and standards, this common policy governs and defines national public subsidies that may be allocated in this sector and also contributes financially to these solutions via payments from the European Fisheries Fund (EFF). This fund superseded the Financial Instrument for Fisheries Guidance (FIFG), which was in operation until 2007.

These public subsidies[1] to maritime fishing and marine farming, (without, at this stage, prejudicing their harmful or non-harmful character in terms of biodiversity) represented about 259 million euros per year over the period 1998-2008 (national and European funding combined, with European funding representing a little less than 20% of the total). Since 2004, they have been constantly increasing (with the exception of 2007) and reached 351.6 million in 2008[2]. This public support covered mainly aid to investment and modernisation, measures to compensate for economic or geographical disadvantages or the vagaries of production, and measures undertaken in the name of the sustainable development of fisheries resources (fleet retirement, temporary or definitive activity closure, control of fishing and monitoring the environment).

[1] Source: Ministère de l'Agriculture (2009), " *Les concours publics aux pêches maritimes et aux cultures marines en 2008*" (Public subsidies to maritime fisheries and marine farming in 2008), January, http://agriculture.gouv.fr/soutiens-publics-peche. The amounts specified include credits for instruction and research (52 million euros) and expenses for personnel and the functioning of the administrations concerned (36.5 million euros), namely the ministry of agriculture (DPMA and OFIMER services) and the ministry in charge of sea issues. They also include support to facilities for port infrastructure. They do not include public support to the social-security protection of sea fishermen and those practising aquaculture (665.3 million euros in 2008).

[2] This level of support is exceptional, firstly, due to the implementation of the plan for sustainable and responsible fisheries and, secondly, due to the strong increase in the price of diesel.

Breakdown of public support in 2008



Other than direct support, sea fishing is the subject of several tax provisions aiming to reduce operating costs (remission of tax on fuel) or to support income from the activity (deduction of 50% from the taxable profits of young fisherman), or sometimes providing indirect support by giving a price advantage to produce from the sea (VAT exemption on seafood sold by fishermen). These support measures contribute directly to maintaining and renewing fishing intensity.

Measure N°	Name of the measure	Cost 2009	Cost 2010	Number of beneficiaries	Comments
110255	Tax reduction on cash subscriptions to the capital of approved companies for funding small-scale fishing (SOFIPECHE) made from 1 January 2009	-	epsilon	ND	
180304	50% reduction on the taxable profit of young fishermen who become established between 1 January 1997 and 21 December 2010	epsilon	epsilon	ND	
230509	Staggering the short-term capital gain made by sea fishing companies when selling fishing vessels or part of the joint ownership of such vessels (carried out before 31 December 2010)	epsilon	epsilon	ND	Measure which ends in 2010
300101	Exemption, under certain conditions, from corporate tax for co-operatives (total cost: €50 M), including maritime co-operatives and their associations	?	?		
720206	Exemption from VAT on fishing products sold by sea fishermen and the owners of sea fishing vessels	€10 M	€10 M	ND	
800101	Exemption from the domestic consumption tax for oil products used by certain vessels (including fishing vessels)	€98 M	€98 M	ND	Measure downgraded
800111	Exemption from the domestic consumption tax for pure vegetable oils used as agricultural fuel or for fuelling professional fishing vessels[1]	epsilon	epsilon	ND	
	Exemption from the contribution on added value and the company real estate contribution for small-scale fishermen using one or two boats, small-scale fishing companies and maritime cooperative companies (subject to conditions)				

Epsilon: estimated cost below 0.5 million euros; ND: not determined; TIC: domestic consumption tax on energy products; VAT: value-added tax.

[1] The estimate of this tax subsidy at 98 million euros (*Évaluation des Voies et Moyens, tome 2 : Dépenses fiscales* - Evaluation of Means and Resources, volume 2: Tax subsidies, Budget bill 2011) appears, at first sight, difficult to reconcile with macroeconomic data from the national accounts, as the latter estimate intermediate consumption of fuel in the fishing and aquaculture sectors at 308 million euros in 2007. Even using the most favourable assumptions (50/50) concerning the division of this consumption between fishing and aquaculture, an estimate of the tax subsidy on this consumption basis would lead to an amount of around 144 million euros (using the reference diesel taxation rate of 42.84 euros/hl) for fishing alone (and even though the exemption estimated at 98 million euros includes types of activities other than fishing, notably maritime goods transport and maritime passenger transport). A possible cause of this divergence could be in the choice of reference rates, as the evaluation of Means and Resources used a "state share" reference rate of 25.24 euros/hl, meaning after deducting the share of the domestic consumption tax that is passed on to the regions and departments.

In the field of fishing, much scientific work[1] has been devoted to analysing and categorising public subsidies from the point of view of their environmental impact. By relying on these principles and reusing the typology proposed in these various works, we can try to divide these different incentives into three categories:

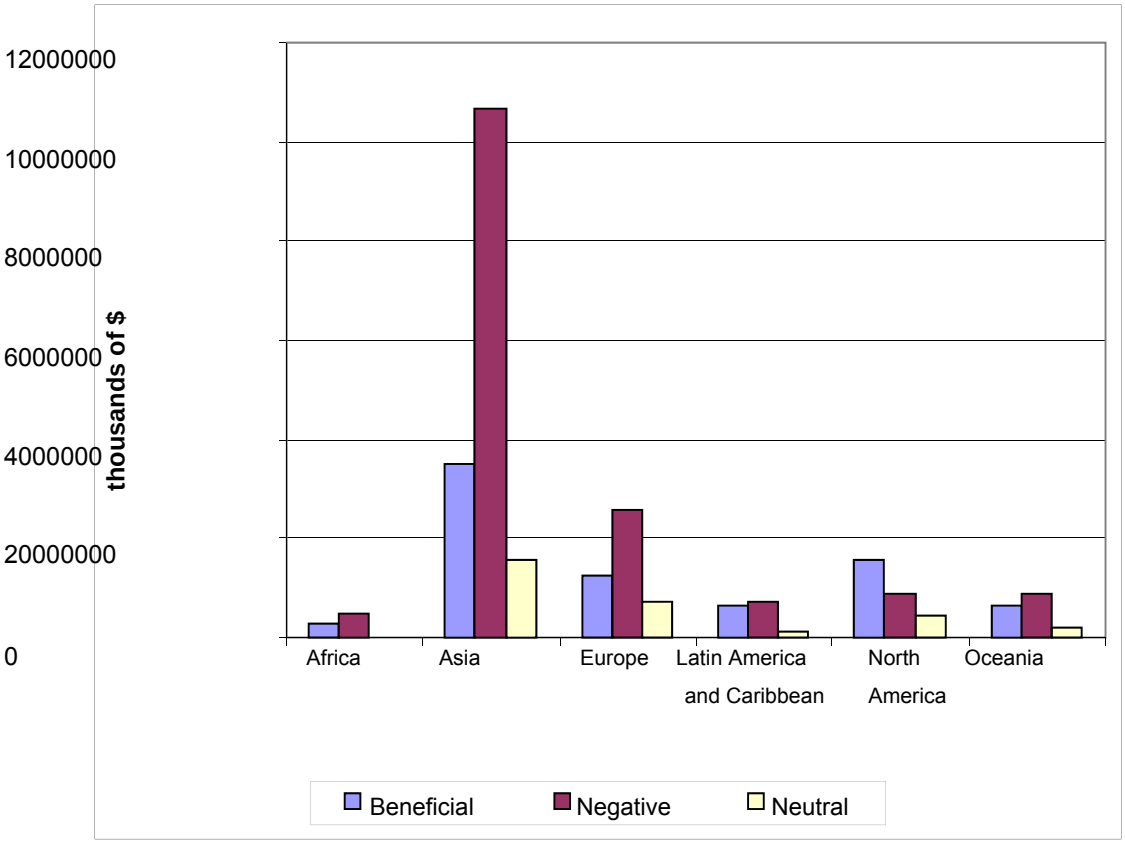
- the incentives that appear to be favourable to marine biodiversity, to the maintenance and renewal of the natural marine capital, such as incentives to retiring vessels or cessation of activity, or measures improving the control of catches and the monitoring and knowledge of stocks;
- incentives that appear harmful to marine biodiversity, meaning measures promoting the development of fishing capacity by downwardly influencing costs or upwardly influencing income, either directly (increasing the size of the fleet) or indirectly (increasing infrastructure (port, storage) used by fishing);
- "neutral" or "ambiguous" incentives, the effects of which are uncertain.

Such an attempt was carried out at the worldwide level by researchers in the fisheries centre at the University of British Columbia[2]. In their work, they use a strict approach and only count, in the category of beneficial incentives, measures in favour of controlling catches, monitoring the environment or protective measures in themselves (such as protected areas). “Programmes for assistance to fishermen” (compensation for temporary halts in activity and compensation for vagaries) are counted as "neutral".

[1] For example, see Sumaila U. R. and Pauly D. (dir.) (2006), Catching more bait: A bottom-up re-estimation of global fisheries subsidies, Fisheries Centre Research Reports, vol. 14(6), University of British Columbia, 114 p., www.fisheries.ubc.ca/publications/reports/report14_6.php, or Cappell R., Huntington T. and MacFayden G. (2010), op. cit.

[2] Sumaila U. et al. (2010), "A bottom-up re-estimation of global fisheries subsidies", Journal of Bioeconomics, vol. 12, p. 201-225.

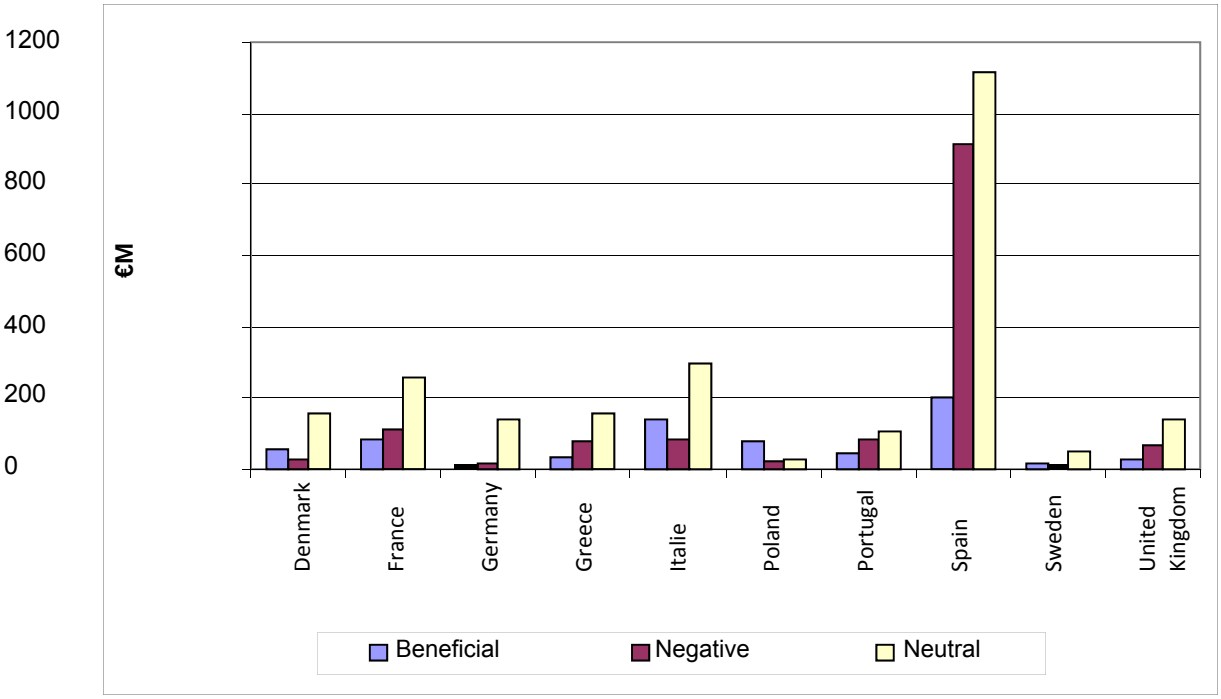
Breakdown of public subsidies to fisheries in 2003, by large regions of the world



Source: Sumaila U. et al. (2010), "A bottom-up re-estimation of global fisheries subsidies", Journal of Bioeconomics, vol. 12, p. 201-225

Similar work (FIFG 2000-2006 Shadow Evaluation, cited above) was carried out at the European level for financing (national and European) paid under the Financial Instrument for Fisheries Guidance (FIFG) over the period 2000-2006. Incentives for retiring vessels or cessation of activity (even temporary) are counted here as "beneficial" incentives.

Breakdown of 2000-2006 funding paid pursuant to FIFG,
for the ten main beneficiary countries



Source: Cappell R., Huntington T. and MacFayden G. (2010), FIFG 2000-2006 Shadow Evaluation, Report to the Pew Environment Group, Poseidon Aquatic Resource Management Ltd.

In this context, the funding is generally mainly neutral. For France, the respective shares of favourable incentives (18%) and unfavourable incentives (25%) are of the same order of magnitude. The largest imbalance in terms of relative shares concerns Spain, where 41% of the incentives are unfavourable and only 9% are favourable.

We can try to update this categorisation for France for the year 2008, as proposed in the table below, by including the tax subsidies when we are able to quantify them (and ignoring some for which the cost is negligible, below 0.5 million euros). At this level of generality, categorising these incentives may be very difficult. Thus, support to the modernisation of marine farming may be beneficial if it can ease pressure on the "natural" resource, but can also cause increased pressure due to fishmeal requirements for this activity.
Likewise, support to the modernisation of vessels does not always mean an increase in fishing capacity, but can also mean an improvement, which is beneficial, to selective fishing.

Breakdown of public subsidies in 2008

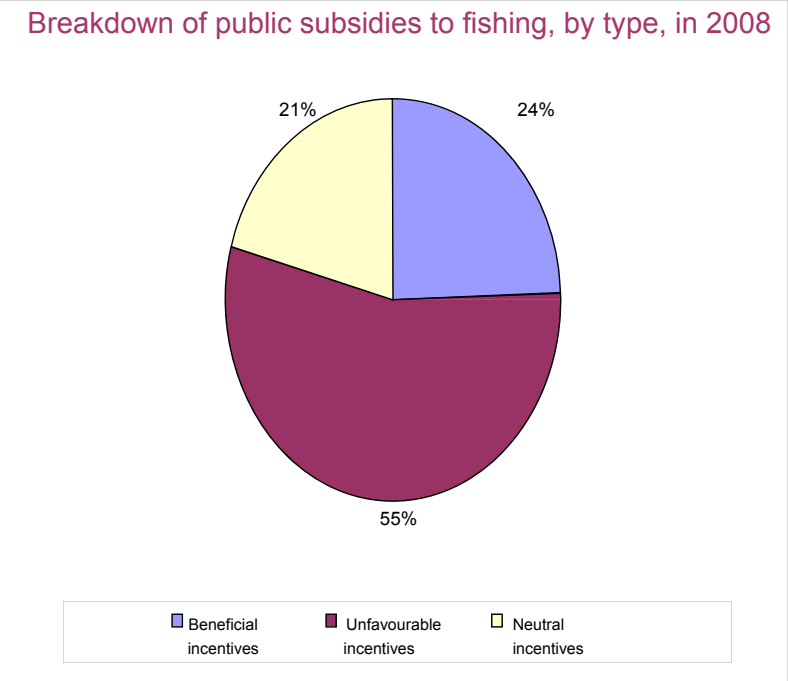
Public subsidies	Cost (€M)	Type
Blue contracts*	15	beneficial
market regulation (storage or withdrawal)	4	beneficial
Vessel retirement (+ social incentives)	35	beneficial
Temporary halt in activity	4.8	beneficial
fishery control and environment monitoring	20.6	beneficial
Research	33.2	beneficial
Fleet modernisation (excluding "blue contracts")	25.7	negative
Modernisation of marine farming	8.5	negative
Port infrastructure	14.6	negative
compensation for economic disadvantage (diesel)**	74	negative
geographical compensation (shrimp in French Guiana, tuna and swordfish in Reunion Island)***	14.3	negative
commercial development/bringing to market	16.3	negative
Domestic consumption tax exemption	100	negative
compensation for vagaries (bad weather and disasters)	30.3	neutral
instruction	18.8	neutral
Administrations	36.5	neutral
VAT exemption	10	neutral
Total	461.6	

(*) "Blue contracts" are arrangements provided by the 2008 plan for sustainable and responsible fisheries, intended to take into account and provide a solution to concerns relative to the preservation of the resource and the marine environment. They come under measure 3.1 "collective actions" of the European fisheries fund and provide for payments in return for commitments going beyond the regulations (selectivity, cleaning the sea, scientific partnership,...).

(**) The compensation measures for economic disadvantage correspond to emergency measures decided by the government following the increase in the price of diesel.

(***) The geographical compensation measures are granted to certain productions and aim to compensate for extra costs caused by insularity and distance from centres of consumption.

Source: CGDD, based on Public subsidies to maritime fisheries and marine farming in 2008, quoted above.



Source: CGDD, based on Public subsidies to maritime fisheries and marine farming in 2008, quoted above.
This structure is based on the categorisation used above, which is sometimes difficult to establish at this level of generality

For the period 2007-2013, the operational programme prepared by France pursuant to the European fisheries fund organised the actions to be funded according to five topics, with the funding structure presented in the following table.

Mainland France	Funding	European Fisheries Fund share (%)
Topic 1 Adaptation of the fishing fleet	171.4	35%
Topic 2 Aquaculture/Processing and marketing products	112.7	45%
Topic 3 Measures of common interest	212.2	30%
Topic 4 Sustainable development of fishing zones	10.9	50%
Topic 5 Technical assistance	4.0	50%
Total	511.2	36%
French overseas departments		
Topic 1 Adaptation of the fishing fleet	7.5	75%
Topic 2 Aquaculture/Processing and marketing products	11.1	75%
Topic 3 Measures of common interest	25.8	75%
Topic 4 Sustainable development of fishing zones	0.3	75%
Topic 5 Technical assistance	0.9	75%
Total	45.7	75%
All of France		
Topic 1 Adaptation of the fishing fleet	178.9	37%
Topic 2 Aquaculture/Processing and marketing products	123.8	48%
Topic 3 Measures of common interest	238.1	35%
Topic 4 Sustainable development of fishing zones	11.2	51%
Topic 5 Technical assistance	4.9	55%
Total	556.8	39%

Source: Operational programme 2007-2013, version revised in July 2010, MAAPRAT.

These topics contain various measures[1], the aim of which are to finance actions to manage fishing from a perspective of sustainable development or actions to protect the environment, and even specifically to conserve habitats and Natura 2000 species. In particular, we note that the mid-term assessment of the funding disbursed under the FIFG between 2000 and 2006 concluded the necessity of "promoting investments devoted to changing fishing methods and moving towards less aggressive and more selective methods"[2]. Article 26 of the 2007-2013 operational programme thus specifies funding dedicated to small-scale coastal fishing. A breakdown of this 2007-2013 funding according to the previously-accepted typology would require detailed allocation of budgets by measure.

To go beyond and judge whether they are actually favourable or unfavourable to marine biodiversity, we would have to be able to refine the analysis by breaking down the types of fishing (fishing methods and characteristics of vessels) and the state of the stocks of resources exploited by the fisheries that benefit from these incentives (because the previously-identified incentives are not distributed uniformly according to these characteristics) and particularly according to effects on fishery resources or other environmental effects.

[1] As a reminder, we can mention, for example: support to coastal fishing (topic 1, article 26), support to the inclusion of fishing professionals in the management of Natura 2000 zones (topic 3, article 38), support to eco-labelling and information provision on products obtained according to methods that respect the environment (topic 3, article 40), etc.
[2] Operational programme 2007-2013, version revised in July 2010, MAAPRAT.

Subsequent evaluation of the FIFG 2000-2006 funds (mentioned above) was able to break down the allocated funds according to the type of beneficiary vessels (power and fishing technique). For France, the positive measures (from the environmental point of view), meaning financing the retirement from the fleet of vessels with towed gear, have proved to be of the same order of magnitude as the negative measures (construction and modernisation of this type of vessel), and clearly greater than those devoted to passive gear. Concerning certain specific practices, such as bottom trawls, the net balance is positive from the environmental point of view (94 vessels built against 193 vessels retired from the fleet). Over the most recent period, we also note that the greatest reductions in the fleet have taken place for trawlers and elver sieves (current harvesting of elvers being considered much too great).

Structure of the French fishing fleet by types

	2005	2008	Change (%) 2005-2008
Trawlers exclusively	670	570	-14.9
Multi-purpose trawlers	628	566	-9.9
dragnet vessels	381	362	-5.0
elver sieves	419	336	-19.8
gillnetters	436	406	-6.9
multi-purpose passive	523	493	-5.7
crab boats	201	209	4.0
methods using hooks	203	187	-7.9
miscellaneous coastal fishing methods	68	99	45.6
Total	3,529	3,228	-8.5

Field: Atlantic coast, English Channel, North sea.

Source: Ifremer, *Synthèse des flotilles 2005 et 2008*, calculs CGDD (Summary of fishing fleet types 2005 and 2008, CGDD calculations).

Likewise, the exemption from domestic consumption tax on oil products does not constitute a uniform transfer to fisheries because their fuel intensity is highly variable (see the following illustration). Because of this, public expenditure gives a relatively higher subsidy to the fishing practices that are most harmful for the environment, both from the energy and climatic point of view and from the point of view of the impact on habitats (impact of trawls and drag nets on sand banks or posidonia beds) and on species (accidental captures in trawls).

Fuel intensity, by types of fishing methods and size of vessels

	Vessels < 12 metres		Vessels > 12 metres	
	Passive gear	Towed gear	Passive gear	Towed gear
Share (%) of fuel in turnover	6.6	11.8	8.5	21.8
Public subsidy given through the exemption from domestic consumption tax for €100 of value added	€9	€18	€13	€43

Source: Ifremer-SIH, Summary of fishing fleet types, 2008

The table below endeavours to compare the impact in terms of biodiversity and the differences in relative implicit subsidy given through exemption from the tax on fuels (which may be approximated by the relative size of the cost of fuel in turnover, as explained in the figure above).

Impact on biodiversity and implicit subsidy through the exemption from the tax on fuels, by fleet type and coast

English Channel – North Sea coast

Fleet types	Impact on biodiversity			Socio-economic impact			Political action	
	Number of species threatened amongst the 10 most important species caught in terms of tonnes and value per fleet type	Number of inhabitants of the "Habitats Directive" potentially threatened by the fleet types	Number of species of community interest potentially threatened by the fleet types	Average turnover (€) Per vessel	Number of fishermen per fleet type (FTE)	Number of vessels per fleet type	Fuel consumption (€) for €100 of turnover	Ability to adapt / average number of items of fishing gear used
Trawlers exclusively	4	9 for bottom trawls and 5 for beam trawls	8 for bottom trawls, 3 for pelagic trawls and 2 for beam trawls	07,665 (12 to 40 m)	911	156	27.3 (12 to 40 m)	1
Non-exclusive trawlers	6 (including lessor-spotted dogfish)	9 for bottom trawls and 5 for beam trawls	8 for bottom trawls, 3 for pelagic trawls and 2 for beam trawls	185,992 (< 12 m) 380,145 (12 to 40 m)	885	331	18.7 (< 12 m) 19.5 (12 to 40 m)	2.2
Dragnet vessels	4	6 for towed dragnets	0	139,180 (< 12 m) 304,717 (12 to 40 m)	611	270	8.5 (< 12 m) 16 (12 to 40 m)	2.2
Elver sieves	6 (including elver, eels, various rays and rock lobsters)	0	2 for elver sieves		18	16		2.1
Gillnetters	5 (including lessor-spotted dogfish)	0	12 for bottom set nets and 5 for drift nets	218,459 (< 12 m) 511,554 (12 to 40 m)	516	174	7.3 (< 12 m) 9 (12 to 40 m)	1
Multi-purpose passive	3 (miscellaneous rays)	0	0	123,518 (< 12 m)	358	217	7.5 (< 12 m)	2.3
Crab boats	3 (including spotted dogfish)	0	2	184,565 (< 12 m)	365	166	7.6 (< 12 m)	1
Methods using hooks	4 species of sharks (smooth hounds, lessor and greater spotted dogfish, tope shark)	0	5 for hand lines and 10 for longlines		76	63		1.2
Miscellaneous coastal fishing methods	1	0	0	102,500 (< 12 m)	38	22	2.9 (< 12 m)	1.6

Atlantic coast

Fleet types	Impact on biodiversity			Socio-economic impact			Political action	
	Number of threatened species amongst the 10 species with the most important catches in tonnes and by value by fleet type	Number of inhabitants of the "Habitats Directive" threatened	Number of species of community interest threatened	Average turnover (€) per vessel	Number of fishermen (FTE)	Number of vessels	Fuel consumption (€) for €100 of turnover	Adaptation capacity / average number of items of fishing gear used
Trawlers exclusively	5 (including the black scabbardfish and the cuckoo ray)	9 for bottom trawls and 5 for beam trawls	8 for bottom trawls, 3 for pelagic trawls and 2 for beam trawls	560,671 (12 to 40 m)	1,683	414	26.4 (12 to 40 m)	1
Non-exclusive trawlers	4	9 for bottom trawls and 5 for beam trawls	8 for bottom trawls, 3 for pelagic trawls and 2 for beam trawls	118,188 (< 12 m)	385	235	14 (< 12 m)	2.7
Seine netters	5 (including blue-fin tuna)	0	3 for purse seine for blue-fin tuna and 1 for purse seine for miscellaneous fish	394,350 (12 to 40 m)	347	50	6.7 (12 to 40 m)	1.1
Dragnet vessels	3	6 for towed dragnets	0	120,689 (< 12 m)	162	92	8.5 (< 12 m)	2.8
Elver sieves	5 (including salmon and elver)	0	2 for elver sieves	68,161 (< 12 m)	347	320	6 (< 12 m)	2.3
Gillnetters	3	0	12 for bottom set nets and 5 for drift nets	132,200 (< 12 m) 547,703 (12 to 40 m)	862	232	7.3 (< 12 m) 10.5 (12 to 40 m)	1.1
Multi-purpose passive	4 (including mako shark)	0	0	124,704 (< 12 m) 544,654 (12 to 40 m)	499	276	8.6 (< 12 m) 11 (12 to 40 m)	2.5
Crab boats	2 (including eels)	0	2	128,517 (< 12 m)	65	43	11 (< 12 m)	1.2
Methods using hooks	3 (lessor-spotted dogfish and smooth hounds)	0	5 for hand lines and 10 for longlines	139,096 (< 12 m)	222	124	9.1 (< 12 m)	1.5
Miscellaneous coastal fishing methods	1 (eels)	0	0	70,582 (< 12 m)	110	77	2 (< 12 m)	1.7

Sources:
- for biodiversity effects:
Agence des Aires Marines Protégées (2009), Reference framework for management in Natura 2000 sites at sea -Volume 1: Professional fishing
Ifremer (2011), State in 2011 of resources exploited by French fleets, A. Biseau (dir.). Seafood Choices Alliance (2008), Guide des espèces à l'usage des professionnels (Guide to species for professional use).
- for the socio-economic and technical data:
Ifremer-SIH (2011), Summary of fishing fleet types, 2008

Notes on methods

The characterisation of catches of "threatened species" (column 1) is based on several criteria: declining target stock (sole, whiting, cod, mullet, langoustines, blue-fin tuna, plaice, eel, clam, rock lobster, Spanish mackerel and Atlantic salmon), the fishing method having an impact on the species (trawls for sea bass), the official classification as a threatened species (miscellaneous rays, sharks, eels, elvers, blue-fin tuna), and the vulnerability of species (black scabbardfish, for example).

The indicator "number of species threatened amongst the 10 most important species caught in terms of tonnes and value per fleet type" remains a qualitative indicator for judging the relative pressures from the different fleet types on the threatened target species. To this end, it should be adjusted to take into account volumes actually caught by each of these fleet types (related, for example, to the total catches from these stocks), because the latter may turn out to be very low.

Lastly, the indicators of potential impact on habitats and species are based primarily on opinions of experts, taken from the publications cited in the sources.

"Fishing gear" designates a type of fishing technique (trawl, dragnet, net, etc.). A type of fishing gear may then be broken down for a target species type (for example, a bottom trawl with panels for monkfish or a bottom trawl with panels for sole): the combination of a fishing gear type and a species defines a fishing method. The indicator on the "average number of fishing gear types used" thus gives information on the ability to adapt within fleet types.

In terms of catches of threatened target species, the different fleet types, whether they use towed or passive gear, apply pressures that, in the first analysis (see method notes above), are substantially similar, slightly greater in the case of towed gear (six threatened species in the catches of non-exclusive trawlers in the English Channel-North Sea, and five in the catches of exclusive trawlers or elver sieves in the Atlantic).

From the point of view of species and habitats of community interest and/or that are protected and affected by fishing activities, the fleets of trawlers, whatever the coast, account for a much greater number of affected species and habitats. Conversely, crab boats and multi-purpose passive vessels are the fleet types that are least threatening for biodiversity.

Also, the trawlers and large dragnet fishing vessels in the English Channel-North Sea benefit relatively more from the exemption from domestic consumption tax on fuels because of the much greater influence of fuel in the activity, which stands at between 14 and 27 euros for 100 euros of turnover, while the other fleet types have fuel costs below 10% of turnover.

This observation suggests rebalancing the exemption from domestic consumption tax for fuels used by vessels in favour of the fleet types that are less harmful to biodiversity, with the aim of reducing fleets composed of vessels that use fishing gear that has a significant impact on marine biodiversity (particularly trawlers and dragnet vessels) and increasing the relative size of the fleet types using other techniques with less impact.

2.3. Public subsidies to recreational fishing

In France, we estimate that there are 2.45 million (+/-0.15 million) people aged 15 and over who practice recreational fishing at sea. They practice an average of 1.4 different fishing modes: 71% declare that they practice shellfish gathering, 33% practice shore fishing, 25% fishing from a boat and 7% spearfishing (Ifremer, 2008).

The impact on biodiversity may be of several types: participation in the over-exploitation of stocks for all modes of fishing, catches of threatened species, degradation of marine habitat (via anchoring and pollution (hydrocarbons or waste) for fishermen from boats) or coastal habitats (trampling and turning rocks on the foreshore for shellfish gatherers). There is no quantitative information on the impact of shellfish gatherers, nor on the impact of anchoring or pollution associated with fishing from boats.

On the other hand, there are estimates of catches for the large groups of target species by recreational fishermen[1].

We estimate that, on average, a recreational fishermen in the French seas (all types of fishing combined) catches about 10 kg of fish per year[2]. Sea bass is the most sought-after species (19% of catches) for an overall catch estimated at 5,600 t. Mackerel (12% of catches) is the second most fished species, with an overall catch estimated at 3,600 t. Then comes pollock, with an overall catch estimated at 3,500 t, sea-bream with an overall catch estimated at 2,000 t and white sea-bream with an overall catch estimated at 840 t. The first five species caught thus represent a total catch of 15,540 t. All of the other species caught, for which the data collected is not sufficient to infer reliable estimates of catches per species, represents total catches estimated at between 4,360 t and 13,560 t according to different estimates obtained.

Concerning shellfish, the assessments of catches vary very greatly according to the estimation methods used. For oysters, the estimates go from 1,200 t to 3,000 t, for clams from 600 tonnes to 2,300 tonnes and for cockles 490 t to 4,500 t and for mussels from 460 t to 4,300 t. In total, these annual catches of shellfish are estimated at between 3,100 t and 8,300 t

Concerning crustaceans, only an overall approximation of annual catches by recreational fishing on the coasts of mainland France could be obtained (1,600 t). Most of the catches are composed of spider crabs and shrimps.

Lastly, amongst the threatened species that may be targeted by recreational fishermen, the blue-fin tuna and eel are at the head of the list. For the eels, an assessment was performed in Bretagne: it shows that catches of eels by animator fishermen using lines represented between 120,931 and 131,278 eels in Bretagne in 2009 for an estimated total weight of 29.7 tonnes (according to the Bretagne Great Migrators study, 2011). Also, as catches of blue-fin tuna by recreational fishermen now have to be declared, an estimate of catches by recreational fishermen was able to be made: 27.2 tonnes in 2010.

There are no incentives or subsidies targeted to these leisure fishing practices. Neither are there any regulatory or economic instruments for regulating this practice: no licence limiting the number of users, no individual quotas…

[1] Ifremer-BVA-DPMA Survey, 2009.
[2] If we limit this estimate to those catching fish, namely 55% who declare having caught at least one fish in 2005 in the Ifremer survey (1,347 million fishermen), we obtain an average catch of 18 kg per fishermen.

Several possible changes may nevertheless be mentioned: disseminate information on the impact of this activity on biodiversity, improve the control and monitoring of catches, set up a fishing licence for certain species, increase the limit sizes for catches, etc. Fishermen are generally in favour of these measures (source: Ifremer-BVA-DPMA Survey).

3 • Water

The annual contribution of rainfall corresponds to 440 billion cubic metres. 270 billion evaporates (mainly through evapotranspiration of plants), 70 billion directly run off towards rivers and stagnant pools, 100 billion sink into the ground and resupply the groundwater table and then supply springs and surface outlets[1], 10 billion reaches us from other countries and 18 billion goes in the opposite direction[2].

The quantity of water available has a direct influence on biodiversity, both aquatic and terrestrial. Massive abstraction from rivers or groundwater, at an inadvisable time, such as at the low-water period in summer, may have harmful consequences for the environment (flow reduction, increased concentration of pollutants and health risks, eutrophication, threats to fish life, etc.).

Also, the installation of facilities of any kind (mills, navigation structures, hydroelectric power stations, dams) may have the effect of changing the water flow regime by introducing sudden or staggered changes in the flow compared to the natural flow rate, accelerate the pollution of the resource if the water becomes stagnant, and increase discontinuity and therefore obstacles to the migration of species or their reproduction. However, the law n° 2009-967 of3 August 2009 (known as the "Grenelle I law") recognised the principle of ecological continuity, particularly for watercourses, by establishing the concept of the green and blue network, by 2012, in French law[3].

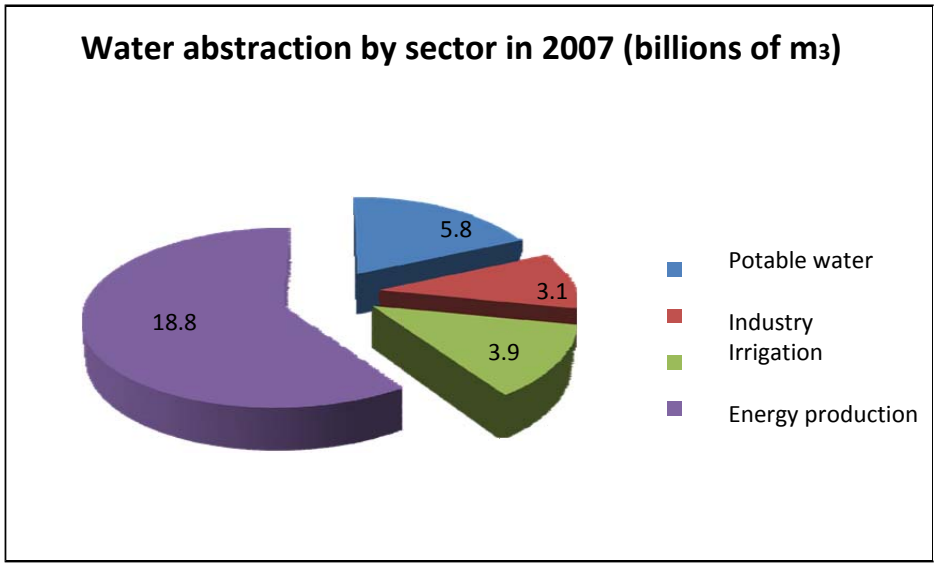
This chapter presents the various uses of water, then the public subsidies relating to each main use (domestic, industrial, agricultural and energy production).

3.1. The uses of the resource

The diagram below shows the share of each main sector in water abstraction in mainland France.

[1] Source : www.senat.fr/rap/l02-215-1/l02-215-1_mono.html.
[2] Source: www.ssents.uvsq.fr/spip.php?article1122.
[3] Circular issued by the Ministry of Ecology, Sustainable Development and Energy on 25 January 2010 relative to the implementation, by the state and its public institutions, of an action plan to restore ecological continuity in watercourses.

Breakdown of volumes of water extracted per use in 2007



Source: Water Agencies - SOeS, 2010

The greatest sector by far in water abstraction is the energy production sector, with 59% of volumes abstracted (water is used as a coolant for electricity production systems). A large share of this abstraction is returned to rivers after use and the rest evaporates, which corresponds, for energy, to a net consumption of about 23%. Irrigation represents gross abstraction of 12% but, in contrast to the energy sector, returns a low volume of water to the environment, as the water is subject to evapotranspiration or stored by plants. Irrigation therefore has net consumption of 49%. Lastly, potable water consumption stands at 18% of abstracted volumes and industry consumes 10% (see table below).

Gross and net abstraction (not returned to the environment) per use in 2007 (in billions of m^3)

	Potable water		Industry (excluding energy)		Irrigation		Energy		All uses	
Gross abstraction	5.8	18%	3.1	10%	3.9	12%	18.8	59%	31.6	100%
Net abstraction	1.4	24%	0.25	4%	2.8	49%	1.3	23%	5.7	100%

Source: Water Agencies - SOeS, 2010

The table below shows that volumes of water are mostly abstracted from surface waters, but if we remove the share used by energy, the breakdown between surface waters and groundwater is more balanced: the search for a constant resource, high-quality and protected, leads to groundwater being preferred for potable water and certain industrial uses, even though some very large urban areas depend on the treatment of surface water.

Origin of water resources abstracted per use in 2007 (in millions of m^3)

	Potable water		Industry		Irrigation		Energy		All uses	
Surface waters	2,161	37%	1,823	59%	3,136	80%	18,785	99.90%	25,905	82%
Groundwater	3,614	63%	1,285	41%	787	20%	25	0.10%	5,710	18%
Total	5,775	100%	3,108	100%	3,923	100%	18,810	100%	31,615	100%

Source: Water Agencies - SOeS, 2010

3.2. Public subsidies to domestic and industrial uses

Changes to ways of life have often contributed to the increase in water consumption. Thus, the provision of fresh water to households (today, 99% of the French population is connected to a distribution network) has changed domestic uses and considerably increased rates of consumption of potable water. Nevertheless, over the last few years, abstraction of water for treatment to make it potable has been trending downwards (by 1% to 2% a year over the last 10 years), as a consequence of the increasingly economical behaviour of consumers[1] and technological progress in domestic appliances.

Abstraction for purely industrial purposes has dropped by 27% since 1997, notably due to the optimisation of industrial techniques. Several industrial sectors nevertheless remain large consumers of water: basic chemical production and the manufacture of synthetic fibres, pulp for papermaking and cardboard, metallurgy, speciality chemicals and the pharmaceutical industry, as well as food processing. This consumption is concentrated in the traditional industrial regions.

The price of water for domestic and industrial use is composed of the following elements:

The pricing of water

The pricing of water is intended to cover the costs of supplying potable water and the costs related to sewage, which are provided by the local authorities who control the public potable water and sewage services. The charges for this service are covered by the water bill, which normally includes a fixed share, a variable share based on a price per volume consumed (two-part tariff) and various taxes, including VAT.

Since 1 January 2010, greater flexibility has been allowed to municipalities, as they can vary the price per cubic metre according to consumption. Several municipalities have opted for progressive pricing which, together with the elimination of the monthly fixed-amount subscription, includes a low price for a first tranche corresponding to basic domestic requirements and higher pricing beyond this.

The fight against waste and the improved recovery of rainwater for certain domestic or industrial uses have triggered a "price-consumption" spiral that is good for the environment but problematic for the operators. This is because more than 80% of the income of operators is related to the volume consumed, while fixed costs represent 80% of charges. Consequently, the drop in volumes consumed is pushing the operators to bid up the unit price for all users.

[1] The proportion of people who say that they have voluntarily saved tap water in their homes over the last twelve months went from 52% in 1995 to 66% in 2010 (Crédoc, 2010).

To cope with this difficulty, it may also be possible to authorise municipalities to partially pay operators (up to 20% or 30%, for example) according to performance criteria (particularly environmental) that are independent of the volumes invoiced. The de-linking between the price of water to the user and the payment to operators would thus continue to encourage users to lower their consumption of water and operators to improve their networks[1].

The water-resource abstraction charge2

Abstraction of water resources is also subject to the charge for doing so (environment code, article L. 213-10-9), which is supposed to cover the scarcity cost of water. This charge is assigned to the French Water Agencies.

A certain number of abstractions are exempt from the water-resource abstraction charge:

- drainage of mines for which the activity has ceased, abstraction made necessary to execute underground work and abstraction made during drainage performed to keep buildings or structures dry or to lower a water table in accordance with a performance specification;
- abstractions related to geothermal energy production;
- abstractions related to aquaculture;
- abstractions related to fighting against frost for perennial crops.

These exemptions[3] should be assessed with regard to their harmful impact on biodiversity.

The amount of the water-resource abstraction charge is proportional to the volume of water abstracted. Its price is adjusted according to use (potable water, industrial cooling, supplying a canal, irrigation,…) and the scarcity of the water resource (abstraction from a balanced or unbalanced zone)[4]. For example, the abstraction charge is fixed by the *Agence de l'Eau Rhin Meuse* as follows:

[1] 2010 annual report from the Conseil d'Etat (Council of State) "L'eau et son droit" (Water and its fees).
[2] See table.
[3] Non-quantified exemptions.
[4] See appendix "Inventories of subsidies harmful to water resources".

Price in €/1,000 m³ abstracted		2010 to 2012	
Uses	Water bodies	Category 1 Water resources located outside the water distribution zone	Category 2 Water resources located within the water distribution zone
Irrigation	Surface water	2.14	30
	Groundwater	2.14	30
Potable water supply	Surface water	30.1	80
	Channelled Rhine	15	80
	Groundwater	52	80
Industrial cooling with return > 99%	Surface water	1.82	5
	Channelled Rhine	0.908	5
	Groundwater	2.49	5
Other economic uses	Surface water	4.38	40
	Channelled Rhine	2.19	40
	Groundwater	7.57	40
Canal supply	Surface water	0.15	0.3
	Channelled Rhine	0.15	0.3
	Groundwater	0.15	0.3

However, the uses that return the lowest share of their abstractions of water[1] (such as agricultural irrigation) benefit from charge rates that are lower than for domestic use. The latter nevertheless returns more water to the environment in relation to what it abstracts. This is therefore doubly disproportionate at the environmental-impact level, as it consumes less water per m³ abstracted. Furthermore, within the "potable water" use, the charge does not allow a variation in rates depending on whether the uses are essential or recreational (supplying private swimming pools, manufacturing artificial snow).

Furthermore, the adjustments related to the scarcity of the resource do not take into account priorities for managing the water resources according to local conditions, due to their low rate (from 1 to a maximum of 2) and its limited zoning (regulatory distribution zones). Indeed, adjustment is only possible when there is already a situation of resource over-exploitation.

Ultimately, rate adjustment essentially depends on usage categories and not the pressure on the resource.

Also, the price of the charge is determined by the Water Agencies so that only the financial costs of the services for providing the water (investment, maintenance, operational and administrative costs) are recovered and not the environmental costs, including the cost for biodiversity.

[1] Most of the volume of water abstracted for domestic uses is returned to the natural environment after use, which is not the case for abstractions for cooling power stations (the evaporation is around 1m³/s per nuclear power plant) or for irrigation (most of the water used for irrigation by spraying or drip systems is evaporated).

The result of these procedures for determining the water-resource abstraction charge is that, in 2008, the share in the abstraction charge paid by local authorities (households) corresponds to 74.5%, while that of industry (including energy production) was 21.9%, and that of agriculture was 3.6%[1]. Water abstraction is therefore very largely financed by households. The water resource abstraction charge takes greater account of the ability to contribute or the consent to pay, than it does of the impact on the resource. Consequently, there is no incentive to reduce abstraction from water resources.

Exemption from the water-use charge

This tax, paid to Voies Navigables de France (VNF) to contribute to the funding of the operation, maintenance and development of the network belonging to *Voies Navigables de France*, is paid by the hydraulic structures intended to abstract or evacuate volumes of water from the public waterways. The water-use charge is based on an element relative to the footprint on the public waterway occupied (equal to the product of the area on the ground of the structure by a base rate that varies depending on the number of inhabitants in the municipality where the structure is located) and an element equal to the product of the volume that can be abstracted or discharged by the structure multiplied by a base rate of between 1.5 euros and 7 euros per thousand cubic metres, and identical for all users. This second element is subject to a reduction coefficient of between 90% and 97% for agricultural uses and between 10% and 30% for industrial uses. These reductions may be considered as subsidies harmful to biodiversity.

Also, conceded hydroelectric facilities are exempt from the water-use charge (transport code, article L. 4316-3).

3.3. Public subsidies to energy-production uses

In order to meet the objectives concerning the interior production of renewable electricity, the Planning Act n° 2005-871 dated 13 July 2005 on the orientation of energy policy, modifies article L. 211-1 of the environment code to mention the development of the production of renewable electrical energy as the extraction of economic value from water and its distribution, as a contribution to the security of the electrical system.

Article 19 of the Grenelle I law also classifies hydroelectric energy as renewable energy and plans to double its contribution to the energy balance by 2020.

The implementation of this objective raises legal difficulties for certain projects. In particular, the Water Framework Directive considers any dam as an element in the degradation of the body of water and requires it to be justified in the name of general-interest considerations. Furthermore, the Grenelle 1 law recognises the principle of ecological continuity of watercourses through the green and blue network.

Also, the first renewals of concessions according to the open competition procedure will be staggered until 2015, in compliance with a certain number of criteria, including environmental criteria[2].

Energy production benefits from a certain number of potentially harmful public subsidies:

[1] Appendix to the finance act for 2010: "Water Agencies", 70 p.
[2] The environmental criterion will be established from projects to protect ecosystems and incorporate all non-energy uses of water, for example for irrigation or leisure.

The abstraction charge on water intended to operate a hydroelectric facility is insufficiently internalising

This charge is based on the product of the volume of water going through the turbines in the year expressed in millions of cubic metres multiplied by the total height of the gross drop of the facility as shown in its administrative permit, expressed in metres. Thus, the procedures for determining the charge are related to the quantity of water abstracted (diverted) (the coefficients indirectly take into account the length (in fact the altitude difference) of the watercourses from which this water is diverted and whether or not this water is continuously returned). These procedures could be refined, and in particular, the charge could be adjusted by taking into account the relationship between the quantity diverted and the average flow of the river (or rather the module) and whether or not the water is returned to the same watercourse (inter-basin water transfer).

Furthermore, the rate of the charge is fixed by the Water Agency within a limit of 1.8 euros. This rate is multiplied by 1.5 when the facility does not function on a continuous basis. However, this limit rate is never reached in practice. Furthermore, it does not take into account certain environmental externalities caused by hydroelectric facilities, particularly the temperature. The negative impact of the variation of temperature on aquatic ecosystems should be taken into account to determine the charge, all the more so as heatwaves and droughts risk to become more common with the climatic change that is taking place (which itself risks being the cause of an increase in electricity production during these periods to power more numerous air-conditioning equipment, etc.). This externality will therefore become increasingly important. It is hard to think of any reason why it should not be internalised.

What is more, the charge is not due when the volume of water passing through the turbines during the year is less than one million cubic metres[1].

The charge for creating obstacles

Certain facilities on rivers, such as hydroelectric power stations, may have the effect of modifying the water flow regime by introducing sudden or offset variations in flow with regard to the natural flow rate, accelerating pollution of the resource if the water becomes stagnant and increasing discontinuities and consequently obstacles to the migration of species or their reproduction.

According to the circular dated 25 January 2010 relative to the implementation, by the state and its public institutions, of an action plan for restoring ecological continuity of watercourses, for 50% of surface water bodies, the channelling of watercourses and obstacles to flow alone constitute a risk that the good condition will not be achieved. Also, the Planning Act n° 2009-967 of 3 August 2009 (known as the "Grenelle I law") recognised the principle of ecological continuity, particularly for watercourses, by establishing the concept of the green and blue network, by 2012, in French law[2].

To take into account these effects, the charge for creating obstacles should therefore apply to hydroelectric facilities. And yet, hydroelectric facilities subject to the charge for water abstraction are exempt from this charge. Creating obstacles and water abstraction constitute two different effects on biodiversity. Each should therefore be the subject of a

[1] This exemption is of a budgetary order: collecting it would cost more than it would bring in.
[2] Circular of the Ministry of Environment of 25 January 2010 relative to the implementation, by the state and its public institutions, of an action plan to restore ecological continuity in watercourses.

specific charge. As hydroelectric power stations cause two types of impact, it is hard to think of any reason for exempting them from the charge for creating obstacles.

3.4. Public subsidies to agricultural uses

These abstractions mainly concern irrigated crops and, to a lesser extent, stock breeding and forestry.

The areas that are irrigated or that may be irrigated have constantly increased since the 1970s[1]. But since 2003, this trend has reversed for irrigated areas, which now reach 1.6 million hectares, representing a little less than 6% of the usable agricultural surface area (French acronym: SAU).

The drop in irrigated areas seen since 2003 partly results from the gradual elimination of the extra premium for irrigation (additional aid per irrigated hectare) since the last reform of the CAP (de-linking has been total since 2010).

Other factors explain the maintenance of water consumption.

Firstly, as highlighted by the economic, social and environmental council, most of the players in water, in France, consider that "*water is sufficiently abundant in France*", which does not allow the reappraisal of irrigation systems[2].

Furthermore, the recent weakening of the collective management of water and the public ownership of infrastructure means that individual decisions to acquire irrigation equipment precede the creation of collective water resources. 56% of the surface area is currently supplied by individual facilities and 44% by collective networks [of which 23% from authorised joint-owners associations (French acronym: ASA - *associations syndicales autorisées*)[3], 13% by inter-municipal or inter-departmental associations, co-operatives and free joint-owners associations and 8% from regional development companies (French acronym: SAR - *sociétés d'aménagement régional*)[4]]. These organisations present a dual guarantee for the state: firstly, knowing the amounts abstracted and controlling them and secondly, creating the water resource before equipping individual farms. And yet it is the opposite that happens when the initiative is private.

Subsequently, in case of drought, when abstraction from watercourses and groundwater should be limited, those practising irrigation increase it and farmers operate the resources to satisfy their requirements at full power. Decrees from prefects covering drought, which limit abstraction based on days when water may be pumped, are easily bypassed: more powerful pumps quickly recover what would have been extracted during the days when pumping is prohibited[5].

Furthermore, usually, French irrigation does not use techniques that save the most water or are the most efficient: for more than 90% of the usable agricultural surface area (SAU), spraying is used, which is sensitive to wind (evaporation), using hose-reel guns (50% of the SAU), the efficiency of which oscillates between 60 and 75%, or using pivots and front

[1] According to the data from the Recensement général de l'Agriculture (general agriculture census).
[2] *Conseil Économique, Social et Environnemental* (2008), Les activités économiques dans le monde liées à l'eau (Economic activities throughout the world related to water), report presented by Marie-José Kotlicki, p. II-121.
[3] Public administrative institutions of a cooperative nature intended to group farmers using irrigation within the same area in order to collectively implement structures for drainage and irrigation that they own, then maintain them. They are not attached to any local authority.
[4] Joint stock companies whose capital is mainly held by the regional authorities.
[5] Conseil d'État (2010), Water and its fees, 584 p.

ramps (40% of the SAU)[1]. Admittedly, spraying uses far less water than gravity irrigation, used in zones that were formerly irrigated, particularly in the south-east and for arable crops. But drip-system irrigation is more economical and it can be developed by organising production; for example in fruit crops, for vines (see 3.3: the Israeli example which has improved its irrigation techniques, adapted the types of crops grown, replanted varieties of trees that consume less water and has reformed education programmes and conducted information campaigns amongst farmers[2]).

Lastly, certain incentives to irrigation still remain:

The modes of providing support to agricultural irrigation

These incentives are granted in particular by regional and general councils.

For example, the Midi-Pyrénées region allocates aid to the modernisation of collective irrigation equipment (water retention ponds if necessary, pumping station and distribution network, excluding mobile spraying equipment). The operation must have been accepted pursuant to the programme for agricultural irrigation investments of regional interest or pursuant to the specific programming *Compagnie d'aménagement des coteaux de Gascogne* (French acronym: CACG). Thus, as part of the contract for the 2007-2013 state-region project, the Midi Pyrénées regional council paid aid of 507,000 euros to the CACG to modernise networks (standards upgrading, securing facilities, automating and regulating pumping stations) over a total irrigation area of 1,723 hectares.

The general councils may also grant subsidies for irrigation (see the example presented in the table below).

[1] Ibid.
[2] OECD (2010), Taxation, Innovation and the Environment, Appendix B: "Water pricing in Israel".

Subsidies to irrigation granted by a general council in 2011

Subsidy	Rate of aid	Limit to which subsidy is applicable	Limit of the incentive
Creation or enlargement of expanses of water	40% (or 50% in ZD)	€3,300/irrigable ha, representing €2.2/m^3 of stored water (based on 1,500m^3/irrigated ha)	€16,000 per farm (for GAEC and EARL, the incentive limit is multiplied by the number of shareholder farmers, within the limit of 3) over a period of 10 years
Studies, surveys and topographical surveys necessary to creating or extending a water resource	40% or 50% in ZD	€15,000 excluding taxes per project	
Renovation of retention ponds aged more than 10 years and of more than 5,000 m^3	20%	€0.75/m^3 of water initially stored	
Creation or enlargement of reserves to substitute for river pumping	40% (or 50% in ZD)	€2,250/irrigable ha, representing €1.5/m^3 of water stored (based on 1,500 m^3/irrigated ha)	€12,500 per farm (for GAEC and EARL, the incentive limit is multiplied by the number of shareholder farmers, within the limit of 3)
Electric pumping stations and/or buried water conduits	40% or 50% in ZD	€1,100/irrigable ha, representing €0.73 €/m^3 of water stored or per m^3 agreed from replenished rivers (based on 1,500 m^3/irrigated ha)	€5,500 per farm. If GAEC or EARL, the limit for aid is multiplied within the limit of 3 shareholder farmers; condition: pump from a replenished river or a retention pond on high ground
Drainage			
Drainage work by plot	20% of the amount of work excluding tax		
Development of collective sewage outlet channels	40% of the amount of work excluding tax or 50% in ZD		
Prior studies and technical support	40% of the amount of work excluding tax or 50% in ZD		

- concerning support to initial investments: the 2007-2013 mainland France rural development programme (*French acronym: PDRH - programme de développement rural hexagonal*) specifies a "support to collective retention ponds on high ground or for substitution". Its objective is the construction of retention structures in zones that lack them, to reduce current pressures on the resource, providing the environmental compatibility of these structures has been validated. This measure aims to accompany investments made by collective organisations (particularly ASA). The measure is financed by regional authorities and/or Water Agencies and/or other local financiers, as well as by the EAFRD (European Agricultural Fund for Rural Development). The maximum rate of public aid is 70%. A report prepared in June 2007 by the French general council for agriculture, food and rural areas and by the French Inspectorate general of the environment[1] suggests toughening the procedures for environmental compatibility of high-ground substitution retention ponds and maintaining financing by those using irrigation at no less than 30%;
- concerning incentives to the renewal of infrastructure: these incentives for improving the network (eliminating leaks, more efficient new techniques,…) are not ineffective. On the contrary, a drop in this form of support could appear counter-productive for the existing networks: for example, the ASA (authorised joint-owners association) of the Tarn has passed on the reduction in support to the renovation of infrastructure via an increase in the fixed-amount share of the water price, which has had the effect of increasing water consumption by farmers to compensate for the drop in income. Studies presented to the working group have concluded that this paradoxical consequence is indeed real.

Pricing for the collective or individual service network that does not provide incentives

The pricing for the collective or individual service network is essentially outright (fixed amount per irrigated hectare for gravity irrigation systems) and calculated so as to cover all or part of the operating expenses. It therefore provides no incentive effect. Pricing based on two components (fixed amount + invoicing by volume), either simple or by increasing price stages according to the quantity of water consumed, would be more efficient in lowering the consumption of water. A graduated price according to the volume consumed could encourage operators to lower their overall consumption. This system is relatively flexible because it leaves several options to farmers, including changing the crop choices (developing non-irrigated crops). It may also have the effect of favouring small farms, thus achieving a social aim. If there is a high degree of progressiveness, meaning if the price of water becomes dissuasive from the upper tranche, it would be similar to a quota system[2].

[1] "Préconisation pour la mise en œuvre du plan national de gestion de la rareté de l'eau" (Recommendation for the implementation of the national plan for managing water scarcity) – General council for agriculture, food and rural areas (CGAAER 1208) and General inspectorate of the environment (IGE/06/018) – June 2007.
[2] Ibid.

A charge for abstraction and consumption of water resources that does not include externalities

The share of the abstraction charges paid by agriculture represents only 3.6% (against 74.5% for households and 21.9% for industry)[1].

The water resources abstraction charge, based on the volume of water abstracted, is limited to 2 or 3 euro cents per m^3 of water according to the water resources of each basin for irrigation (0.10 or 0.15 euro cents per cubic metre of water for gravity irrigation). The low level of the charge for abstracting untreated water from the resource, taken by agricultural catchments (between 0.2 euro cents and 0.3 euro cents per m^3 depending on the basins) has not been able to reduce agricultural abstraction for irrigation[2]. Furthermore, abstraction intended for irrigation taken from high-ground retention ponds cannot be subject to adjustment according to whether or not they are located in water distribution zones, and therefore according to the scarcity of water.

In this respect, the price of access to untreated water for agriculture does not take into account the opportunity costs (economic use, to a greater or lesser extent, of the water through the nature of the product cultivated or bred) or the environmental costs (treatment with pesticides, fertilisers and slurry), even though these costs remain difficult to determine.

Drawing a similar conclusion that the level of the charge for abstracting untreated water was insufficient, the Council of State recommended that the legislature increase the floor and the ceiling for this charge[3]. This being so, the charge would have to be increased by at least 30% or 40% to cause a drop in water consumption.

The Israeli example is interesting on this point. In order to encourage more efficient use of water resources (demand for water in Israel stands on average at 300 m³ per year, against an international average close to 1,700 m³ per year), Israel has established a progressive price of water based on quotas allocated per farm. Between 1995 and 2005, the price of water for agricultural use increased by more than 68%, to reach 0.33 USD per m³.

Price of agricultural water in Israel
(USD /m^3)

Level of quotas	1995	2005	Increase %
A	0.165	0.282	70.9
B	0.199	0.335	68.3
C	0.267	0.441	65.2
Average	0.196	0.330	68.3

Sources: OECD (2009). A =; B =; C=

These tranches are determined according to volumes of water granted to each farm (quotas). These quotas are not strict: a farm can abstract more water than the volume specified by the quota, but it will then have to pay for the abstracted water at a higher price

[1] CGDD (2011), "Le financement de la gestion des ressources en eau en France : étude de cas pour un rapport de l'OCDE" (Financing the management of water resources in France: case study for a report from the OECD), Études et documents, n° 33, January.
[2] Conseil d'État (2010), op. cit.
[3] Ibid.

than that of the quota. On the contrary, it will pay a lower water price if it has abstracted less water than specified by the quota.

This system of adjustment of abstractions according to the price of water has encouraged more efficient use of water, particularly through the use of more efficient irrigation techniques (for example, drip-system irrigation), as well as substitution solutions (from recycled and re-treated waste water, which costs about 0.20 USD per cubic metre). The reduction in quotas in 1991 following the drought of 1990 did not result in an increase in abstractions when these quotas were again raised, because of changes in crop growing practices and the increase in the price of water. Crop-growing practices had therefore sustainably adapted to the price of water. The increase in the price of water had the effect that farms used only 74.5% of their quotas for 2005. Nevertheless, the value of agricultural production per cubic metre of water has more than tripled since 1958[1]. For example, between 2000 and 2005, the fruit sector increased its production by 42%, in spite of a drop of 35% in its quotas.

[1] OECD (2010), Taxation, Innovation and the Environment, Appendix B: "Water pricing in Israel".

Chapter 5

Public incentives that encourage pollution

This chapter successively presents the public actions that may increase pollution of the air, soil and water.

1 • The air

The atmosphere contains polluting elements of natural origin (particles put into suspension by the wind, volcanic activity, marine aerosols, and so on) and anthropic origin (industrial discharges, automobile traffic, waste incineration, domestic heating, and so on). This part concentrates on pollutants emitted by humans.

An appraisal of emissions is first presented, then the public subsidies that are likely to increase them.

Emissions of greenhouse gases (GHG) are covered in this chapter.

1.1. A drop in polluting atmospheric emissions that is almost general

Every year, the CITEPA (*Interprofessional Technical Center for Studies on Air Pollution*) inventories the main atmospheric pollutants in mainland France and has also recently begun to do so in French overseas departments and territories. A summary of these inventories is made for each main category of pollutants that are toxic for biodiversity, as well as for pollutants emitted by any type of combustion. Overseas emissions are presented in a final independent section.

Situation of pollutants contributing to acidification, eutrophication and photo-chemical pollution

Sources of effects on biodiversity

Emissions of SO2, NH3 and NOx (commonly defined as NOx = NO + NO2) are involved in "acid pollution" phenomena. Acid fallout modifies the chemical composition of soils and water, which, in turn, can seriously affect ecosystems. This pollution may affect zones that are very far from the sources of emission. In particular, it contributed to the acidification of Scandinavian and Canadian lakes in the 1970s and to the decline of forests in Europe in the 1980s, as well as to changes in the soil balance (release of heavy metals).

Sources of emission

Amongst the pollutants monitored by the CITEPA, nitrogen oxides (NOx) and NH3 are the ones that have most reduced since 1990.

For NOx, the progress made by equipping cars with catalytic converters has not been sufficient to cope with the increase in the automobile fleet and the transport sector remains the main contributor to NOx emissions.

Concerning ammonia (NH_3), agriculture is the origin of almost all emissions. Although it has reduced its emissions by reducing the quantities of fertilisers that are spread, opposite trends have led to a slowdown in the overall reduction in emissions: abolition of obligatory fallowing in 2008 and an increase in arable areas to the detriment of areas under meadows, which leads to an increase in the spreading of chemical fertilisers.

Discharges to the air of pollutants contributing to acidification, eutrophication and photo-chemical pollution between 1990 and 2008 and the main sources in 2008 (mainland France)

Pollutants	Emissions in 2008	Change 1990-2008	Share of sector in the 2008 emissions
SO_2	358 kt	-73%	Energy conversion (> 51%, mainly due to oil refining and electricity production)
Nitrogen oxides (NOx)	1,272 kt	-34%	Road transport (52%) Manufacturing industry (12.5%), energy conversion (8%, mainly electricity production) Agriculture/forestry (14.2%, mainly caused by agricultural soils following the use of nitrogen fertilisers, and the rest by the combustion of oil products)
NH_3	754 kt	-5%	Stock breeding (76%) Crops (21%)
Non-methane volatile organic compounds (NMVOC)	1,086 kt	-60%	Manufacturing industry (31.4%) Residential/tertiary (31.1%, mainly through the use of solvents for domestic use or in building (paint, glue, etc.), and burning wood in small domestic facilities). Agriculture/forestry (14.5%, in particular biotic sources)
Carbon monoxide (CO)	4,435 kt	-59%	

Source: CITEPA

Regulations

Pollutants contributing to acidification, eutrophication and photo-chemical pollution have led to several regulations establishing national emissions limits.

Following table presents the objectives of France for each of these pollutants, and the level of its emissions in 2008.

Regulatory emissions limits for France in 2010

	SO_2 Emissions 2008 = 358 kt	NOx Emissions 2008 = 1,272 kt	NMVOC emissions 2008 = 1,086 kt	NH_3 Emissions 2008 = 754 kt
Gothenburg protocol (adopted on 1 December 1999 and came into force on 17 May 2005)	400 kt	860 kt	1,100 kt	780 kt
NEC directive (adopted on 23 October 2001 and came into force 27 November 2001)	375 kt	810 kt	1,050 kt	780 kt
National programme to reduce atmospheric emissions	375 kt	810 kt	1,050 kt	780 kt
New NEC directive for 2020 (draft)	289 kt	682 kt		

Source: CITEPA

More recent data confirm that although France is well on the way to reaching its objectives on SO_2, NH_3 and NMVOC, on the other hand, it will require more time for NOx.

Heavy metals

Impact on biodiversity

The metals discharged into the atmosphere have numerous effects on plants and animals, causing, for example, drops in growth, productivity or biodiversity (arsenic, cadmium and vanadium), the appearance of chlorosis (nickel), a reduction in the reproductive function (chrome) or neurological, digestive, cardiovascular or renal problems (mercury). Furthermore, "generally, all plants (including fungi) accumulate metals. As the first link in the food chain, plants are the point of departure for the transfer of metals into the food chain, which can then become concentrated, sometimes significantly, in the upper trophic layers (biomagnification)" (Vindimian E. and Parfait G., 2010)[1].

More generally, the ecotoxicity of heavy metals is characterised at the level of biocenosis by a loss in specific and genetic diversity, and at the level of environments by a loss in the biodiversity of biotopes. The overall result of these "local" losses is the loss of biodiversity in ecosystems as a whole[2].

[1] Vindimian É. and Parfait G. (2010), *"Réduire les pollutions et les impacts sur la biodiversité"* (Reducing pollution and the impact on biodiversity), French conference for biodiversity, outline note for the "pollutions" workshop, 10-12 May, 28 p.

[2] Ribera D. (2002), "Evaluation of sublethal effects of contaminants on soil fauna: A case study using pure chemical mixtures and biomarkers in the worm", Science of the Total Environment; Labrot F., Ribera D., Tisnerat G., Cabridenc R. and Narbonne J.-F. (1996), *Contamination des écosystèmes et effets biologiques dans l'environnement* (Contamination of ecosystems and biological effects in the environment), J. Morlot (ed.), Paris, Lavoisier, p. 3-17; ADEME (2002), *Écotoxicité des sols et des déchets* (Ecotoxicity of soils and waste), 96 p.

Sources of emission

Heavy metals are mostly emitted by manufacturing industry.

We have seen very sharp drops in emissions since 1990, particularly for lead, zinc and chrome (emissions reduced by more than 90%).

Copper, selenium and, to a lesser extent, arsenic have changed less (CITEPA, SECTEN 2010 report):

- selenium (-11%): comes from the use of heavy fuel oil and biomass (for example, wood and wood residue) (traces);
- arsenic (-38%): comes from the use of solid mineral fuels and heavy fuel oil (traces) and the use of certain raw materials containing arsenic (production of glass, ferrous and non-ferrous metals);
- copper (-8%): the drop in emissions from the manufacturing and residential sectors is compensated by the increase in contributions from transport: wear on brake pads for road transport, wear of overhead power lines for railways.

Discharges to the air of heavy metals between 1990 and 2008 and main sources in 2008 (mainland France)

Pollutants	Emissions in 2008	Change 1990-2008	Share of the sector in 2008 emissions
Arsenic	10.4 t	-38%	Manufacturing industry (70.2% mainly the sub-sectors of non-metallic minerals and construction materials) Residential/tertiary (14.9%) Energy conversion (14.5%),
Cadmium	3.8 t	-81%	Manufacturing industry (80.3%) Energy conversion (13.3%) Residential/tertiary (6.2%)
Chrome	30 t	-92%	Manufacturing industry (62.2%, mainly the sub-sector of ferrous metals production and particularly electric steel plants) Residential/tertiary (25.2%) Energy conversion (12.2%)
Copper	165 t	-8%	Road transport (53.0%) Other transport (34.8%) Manufacturing industry (7.4%)
Mercury	4.0 t	-83%	Manufacturing industry (68.4%, particularly the production of chlorine and cement manufacture) Energy conversion (25.9%, and particularly the incineration of household waste with energy recovery)
Nickel	104 t	-65%	Energy conversion (55.8%, the great majority from oil refining and electricity production) Manufacturing industry (32%, mainly the sub-sectors of chemistry, manufacturing industry and food processing).
Lead	95 t	-98%	Manufacturing industry (73.4%, particularly due to metallurgy using ferrous metals and non-metallic minerals and construction materials)
Selenium	13 t	-11%	Manufacturing industry (86.1%) Residential/tertiary (8.9%) Energy conversion (4.8%)
Zinc	186 t	-90%	Manufacturing industry (66.5%, particularly the metallurgy sub-sector) Residential/tertiary (24.8%), Energy conversion (8.3%, particularly the incineration of household waste with energy recovery)

Source: CITEPA

Persistent organic pollutants

Impact on biodiversity

Persistent organic pollutants (POP) cover a large number of organic pollutants (such as polycyclic aromatic hydrocarbons (PAH), Hexachlorobenzene (HCB), dioxins and furans). They come from various sources, some of them diffuse. They can also pollute at long distances.

POP can cause significant damage to ecosystems. They have a persistent toxic action and great power of bioaccumulation in the food chain (Ifen, 2008[1]). The Stockholm convention on POP, signed on 22 May 2001, identified twelve POP or categories of POP, for which emissions must be reduced. This convention was signed by several countries and was taken up, for example, by the European Union.

Sources of emission

The CITEPA lists four categories of POP (see table below). All have dropped strongly, particularly HCB, dioxins and furans (>90% reduction). Emissions of PAH have dropped, but by only half as much. They have dropped for all emitter sectors except for road transport, due to the increase in traffic and the increase in the diesel automobile fleet.

Discharges to the air of persistent organic pollutants between 1990 and 2008 and main sources in 2008 (mainland France)

Pollutants	Emissions in 2008	Change 1990-2008	Share of sector in the 2008 emissions
Dioxins and furans	101 g ITEQ	-94%	Manufacturing industry (76.2%) Residential/tertiary (16.6%) Energy conversion (3.9%, mainly the incineration of waste with energy recovery).
Polycyclic aromatic hydrocarbons (PAH)	19 t	-52%	Residential/tertiary (67.6%, mainly combustion of biomass) Road transport (25.1%, particularly diesel vehicles)
Polychlorinated biphenyl	65 kg	-64%	Manufacturing industry (56.5%) Energy conversion (22.6%, mainly electricity production) Residential/tertiary (19.7%, mainly due to energy consumption)
Hexachlorobenzene (HCB)	14 kg	-99%	Road transport (55.9%) Energy conversion (19%) Manufacturing industry (13.9%, particularly incineration of sewage sludge)

Source: CITEPA

[1] Ifen (2008), *Émissions nationales d'hydrocarbures aromatiques polycyliques (HAP), Indicateurs de suivi des engagements européens : Air* (National emissions of polycyclic aromatic hydrocarbons (PAH), Indicators monitoring European commitments: Air), 2 p.

Particle emissions (PM10, PM2.5 and PM1.0)

Total emissions are down since 1980, with the exception of 1991, during which great consumption of wood in residential and tertiary sectors was observed. All sectors contributed to this reduction, apart from transport (road and other transport), which has remained relatively stable since 1990.

Since 2005, the limit concentration values applicable to PM10 given in the directive 2008/50/CE[1] have nevertheless not been complied with in 16 air-quality zones in France: Marseille, Toulon, Avignon, Paris, Valenciennes, Dunkerque and Lille, the regions of Nord Pas-de-Calais, Grenoble, Montbéliard/Belfort, Lyon, the rest of the Rhône-Alpes region, the urbanised coastal zone of the Alpes-Maritimes, Bordeaux and Reunion Island. The European Commission has already sent a reasoned opinion to France for non-compliance with limit values on air-quality imposed by the directive 2008/50/CE, and announced on 19 May 2011 that it was suing France at the European court of justice.

Discharges to the air of particles between 1990 and 2008 and main sources in 2008 (mainland France)

Pollutants	missions in 2008	Change 1990-2008	Share of sector in the 2008 emissions
Fine particles less than 10 µm (PM_{10})	452 kt	-34%	Agriculture/forestry (34.7%, particularly crop growing) Manufacturing industry (29.1%, particularly the non-metallic minerals sub-sector and construction materials) Residential/tertiary (21.8%, particularly combustion of wood and, to a lesser extent, coal and heating oil, and road transport)
Fine particles less than 2.5 µm ($PM_{2.5}$)	282 kt	-41%	Residential/tertiary (34.1%) Manufacturing industry (29.4%) Agriculture/forestry (20.5%) Road transport (12.0%)
Fine particles less than 1.0 µm ($PM_{1.0}$)	156 kt	-53%	Residential/tertiary (60%) Road transport (17.7%)
Total particles in suspension	1,109 kt	-21%	-

Source: CITEPA

[1] The directive 2008/50/CE concerning the quality of the ambient air and clean air for Europe requires Member States to limit the population's exposure to micro particles known as PM_{10}.

Greenhouse gases (GHG)

The following table shows emissions of greenhouse gases over the 1990-2008 period, distinguishing anthropic emissions from emissions coming from biomass (LULUCF)[1].

Emissions of greenhouse gases with or without LULUCF in kt eq. CO_2 between 1990 and 2008 (mainland France)

Pollutants	Emissions in 2008	Change 1990-2008
Carbon dioxide (CO_2)		
CO_2 without LULUCF	391,243	-1.1%
CO_2 LULUCF	-70,803	- 81.1%
CO_2 with LULUCF	320,440	-10.1%
Methane (CH_4)		
CH_4 without LULUCF	55,954	-17.5%
CH_4 LULUCF	1,898	+66.5%
CH_4 with LULUCF	55,954	-16.0%
Nitrous oxide (N_2O)		
N_2O without LULUCF	65,186	-29.2%
N_2O LULUCF	1,524	-50%
N_2O with LULUCF	66,711	-29.8%
Other greenhouse gases		
Hydrofluorocarbons (HFC)	15,284	+ 313%
Perfluorocarbons (PFC)	554	- 87.1%
Sulphur hexafluoride (SF_6)	707	- 65.0%

Source: CITEPA

Amongst the greenhouse gases listed, only emissions of HFC are increasing. According to the CITEPA this increase is explained by the increase in the use of HFC from 1995, as this substance was substituted for CFC following its prohibition. The sustained increase in air conditioning has also contributed to this phenomenon. It should be noted that the impact of HFC on the destruction of stratospheric ozone is lower than that of chlorofluorocarbons (CFC).

Greenhouse gases are dropping overall more slowly than other atmospheric pollutants, particularly CO_2.

It is interesting to note that the balance concerning "emissions less absorption" through biomass (LULUCF)[2] indicates an increase in the storage of CO2 and of N2O over the period 1990-2008 and a reduction in storage for CH4.

[1] LULUCF: Land use, land-use change and forestry. This indicator measures emissions or savings coming from land use, land-use change and forestry (equivalent biomass).
[2] According to the SECTEN inventory method from CITEPA, the total LULUCF represents the balance of absorption and emission sources that covers forest harvesting and growth, the conversion of forests (clearance) and meadows and soil for which the carbon composition is sensitive to the nature of the activities dedicated to it (forest, meadows, cultivated land, etc.).

The main sources of CO2, CH4 and N2O in 2008 are given in the table below.

Main sources of greenhouse gases in mainland France in 2008

Pollutants	Share of the sector in 2008 emissions
CO_2 (excluding LULUCF)	Transport (33.2%, mainly road) Residential/tertiary (22.6%, mainly residential) Manufacturing industry (23.8%, mainly combustion) Energy industry (17%)
CH_4 (excluding LULUCF)	Agricultural/forestry (79.1%, mainly enteric fermentation and animal excrement) Treatment of waste (13.7%, mainly landfilling)
N_20 (excluding LULUCF)	Agriculture/forestry (85%, mainly agricultural soils) Manufacturing industry (8.4%, mainly processes in the chemical industry)

Source: CITEPA

Emissions of atmospheric pollutants coming from the use of combustibles

Emissions of certain pollutants listed above are attributable at more than 50% to the use of combustibles (see following table).

Atmospheric emissions attributable at more than 50% to the use of fossil fuels and biomass

Pollutants for which emissions are attributable at more than 50% to the use of combustibles	nitting combustibles*	Share of emissions coming from the use of the combustible
SO_2	Solid mineral combustibles (except lignite)	35%
	Heavy fuel oil	30%
	Petrol	6%
Nitrogen oxides (NOx)	Diesel	53%
	Domestic heating oil	18%
Carbon monoxide (CO)	Wood	49%
	Petrol	35%
CO_2 (excluding land use, land-use change and forestry)	Diesel	30%
	Natural gas	25%
Nickel	Heavy fuel oil	94%
Lead	Wood	68%
	Jet fuel	20%
PAH	Wood	67%
	Diesel	24%
HCB	Diesel	75%
PM 2.5	Wood	59%
	Diesel	20%
	Domestic heating oil	14%
PM 1.0	Wood	61%
	Diesel	19%
	Domestic heating oil	13%

(*) The oil products consumed by maritime and air transport activities are not taken into account.
Source: CITEPA, 2010

According to this table, diesel, heavy fuel, domestic fuel, wood and coal appear as the main contributors to the emissions of SO_2, NOx, CO, CO_2, nickel, lead, PAH, HCB, $PM_{2.5}$ and $PM_{1.0}$

The situation of wood and vegetable components of biomass should nevertheless be distinguished from that of other combustibles. The incomplete combustion of ligneous matter indisputably produces pollutants: it is at the origin of significant carbon particulate pollution (studied by the European CARBOSOL programme) and also produces PAH. These are qualified as pollutants by various legal instruments, such as the directive 2004/107/CE dated 15 December 2004 which sets, for one of the most studied PAH – benzopyrene – a "target value" for exposure that is not to be exceeded (1 nanogram per m^3 and per year). However, these aromatic components are also natural constituents of oil and coal and are also discharged into the atmosphere during volcanic eruptions[1]. Conversely, the combustion of ligneous plants produces no SO_2 and quantities of nitrogen oxide (NOx) that are significantly below those resulting from the use of fossil fuels.

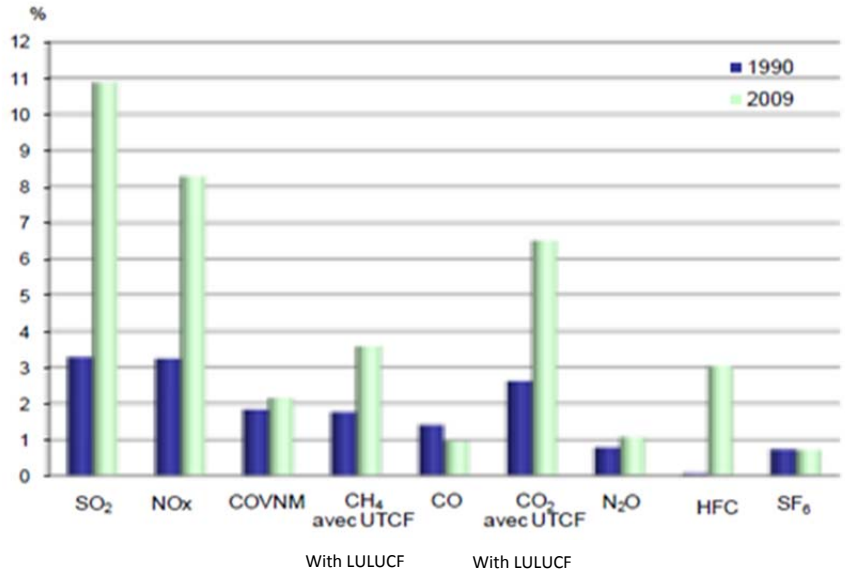
[1] Source: Conseil Général du Doubs et Université de Franche-Comté, *Accumulation des HAP dans les sédiments de la rivière Doubs* (Accumulation of PAH in the sediments of the Doubs river), final report, p. 11.

Lastly, the life cycle analysis (LCA) of biofuels made by ADEME in 2010[1] is unfavourable concerning emissions of nitrogen, both for ethanols and esters, with levels ten times higher than fossil fuels. On the other hand, the balance of emissions of volatile organic compounds (ozone precursors) between the biofuel and fossil fuel sectors depends on the biofuel in question. The gap is not a very pronounced in the case of esters. It is more pronounced in favour of ethanols. For greenhouse gases, the balance is highly variable depending on the supply infrastructure and remains highly dependent on the consequences of indirect changes in the assignment of land on the soil carbon content, but this parameter was not considered by the ADEME's life-cycle analysis.

Situation in French overseas territories

The graph below shows that most of the emissions in French overseas territories compared to those in mainland France are much higher for certain pollutants, particularly for SO_2, NOx and CO_2.[2]

Share in French overseas departments (Guadeloupe, Martinique, Reunion Island, French Guiana, Saint-Barthélemy, Saint-Martin and Mayotte and French overseas territories (French Polynesia, Wallis-and-Futuna, New Caledonia and the TAAF[2]) compared to mainland France



Source: CITEPA/Format SECTEN – April 2011

These changes are explained by the demographic, geographic and economic situation in French overseas territories. The population there increased by 35.8% between 1990 and 2009, while it increased by only 10.4% in mainland France. GDP increased by 198% over the same period in French overseas territories and 84% in mainland France. The energy structure in French overseas territories is strongly focused on oil (Citepa, 2011[3]).

[1] ADEME (2010), Life Cycle Analyses Applied to First Generation Biofuels Used in France, final report 236 p.
[2] The TAAF (French Southern and Antarctic Lands) are not permanently inhabited but host, several scientific stations.
[3] CITEPA (2011), SECTEN report.

The emissions of SO_2 come mainly from the energy production, transformation and distribution sector (90% of the emissions of French overseas departments excluding those designated as "overseas territories").
In the overseas territories, the emissions are essentially produced by the manufacturing industry sector (57% of the emissions in the overseas territories).

The emissions of NOx have two main origins, whether in French overseas departments or in French overseas territories: the production, transformation and distribution of energy (67% of French overseas emissions) and road transport (19.5%).

Lastly, the CO_2 is emitted by the energy production, transformation and distribution sectors (31% of French overseas emissions), land use, its changes and forests (26%), and road transport (22%) (Citepa, 2011).

1.2. Public subsidies favouring the use of fossil energy and biomass

The quantities of fossil energy and biomass used may be influenced by three taxes[1]:

- the Domestic Consumption Tax on Energy Products (DCTEP). This tax is applied to the use of energy products as fuels or heating combustibles;
- Value-added tax (VAT);
- the General Tax on Polluting Activities (GTPA).

The DCTEP is an excise duty fixed by unit of volume, which is added to the cost of crude and the cost of refining. It was designed originally with the aim of financial yield and not that of internalising environmental externalities (greenhouse gases in particular). Its level is therefore not set according to that. Furthermore, numerous exemptions and rate reductions as well as reimbursements of DCTEP are applicable, notably:

- exemption or reduced rate for certain combustibles according to conditions of use (white-spirit, kerosene, liquefied petroleum gas and jet fuel);
- exemption on domestic household gas and heating networks;
- reduced rate on butane and propane used as a fuel according to conditions of use;
- exemption for coal used other than as a combustible, for dual use, used in a technique for manufacturing non-metallic mineral products, used within establishments for producing energy products, for manufacturing these products, used for producing electricity or used for the requirements of its extraction or production, consumed by private individuals, including in collective form, used by companies recovering energy from biomass;
- reduced rate for low-sulphur content heavy fuel;
- exemption for certain armed forces, certain international organisations and in the context of diplomatic and consular relationships;
- exemption for mineral oils and natural gas consumed for cogeneration purposes during a period of five years from commissioning facilities;
- exemption for oil products and natural gas used to produce other oil products.

[1] The incentives specifically assigned to agricultural sectors (including biofuels) and fishing are dealt with in the chapters "overexploitation of natural resources".

- exemption for energy products used for extracting and producing natural gas;
- partial reimbursement for taxis;
- reimbursement of a fraction of the DCTEP used by certain road vehicles (road transport of goods);
- reimbursement of a fraction of the DCTEP on the diesel used by operators of public road passenger transport;
- exemption for energy products used as fuel or combustible on-board aircraft, excluding private tourism aircraft;
- aviation;
- fishing;
- agriculture;
- building and public-works.

Generally, these tax spending encourage increased consumption of fossil energies and biomass, the first causing atmospheric pollution (NOx, particles, etc.), and the second possibly causing changes in the use of land, the effects of which on biodiversity are shown in the "soil" part of chapter 4.

Also, when these incentives are applied in sectors that are heavy consumers of combustibles per production unit or per person, they introduce a comparative advantage compared to other sectors that are less dependent.

Also, the rates of DCTEP applicable are different from one energy product to another (see the following table for several examples).

Rates of DCT applicable per energy product in 2011

Fuels	Rate (€)	Unit
Aviation fuel	35.90	Hectolitre
Jet fuel, petrol type, under usage condition	2.54	Hectolitre
Diesel	42.84	Hectolitre
Bioethanol*	14 (from 2011)	Hectolitre
Biodiesel*	8 (from 2011)	Hectolitre
Premium-grade ethanol (E 85)	17.29 (since 1 January 2011)	Hectolitre
Premium grade fuel E10* premium grade fuel 95 and 98	60.69	Hectolitre
Emulsions of water in diesel*	26.27 (since 1 January 2009)	Hectolitre
Combustibles		
Tar from coal, lignite or peat and other mineral tars, even dehydrated or distilled, including reconstituted tars used as combustibles.	1.50	100 kg net
Domestic heating oil	5.66	Hectolitre
Heavy fuel oil	1.85	Hectolitre

(*) Circular n° 09-013 dated 20/02/09 relative to energy products, general tax on polluting activities, domestic consumption tax on natural gas and domestic consumption tax on coal.

The fuels are generally taxed at a relatively high rate compared to fossil products used as combustibles. Callonnec (2009[1]) shows that the CO_2 from burning petrol is heavily taxed (265 euros per tonne of CO_2 in France and 244 euros on average in the countries of the EU-27) and that heavy fuel is lightly taxed (6 euros per tonne of CO_2 in France and 15 euros on average in the EU-27).

The consumption of fuel nevertheless does not emit significantly more carbon than the consumption of fossil products used as combustibles. The price of these combustibles therefore seems lower than the optimal price to internalise the external costs, including those on biodiversity.

The VAT is proportional to the value of the product calculated based on the price of crude, the cost of refining and the domestic consumption tax. Like the domestic consumption tax, it gives rise to various tax subsidies that are potentially harmful to biodiversity because they contribute to increasing the consumption of energy products:

- VAT deductible at 100% on diesel and E85 high-grade ethanol for company utility vehicles and at 80% for company cars for individuals;
- VAT deductible at 100% on liquefied petroleum gas, liquefied propane and liquefied butane for company utility vehicles and for company cars for individuals;
- the exemption on oil products intended for fuelling aircraft performing commercial connections beyond the customs territory of mainland France;

[1] Callonnec G. (2009), " *Fiscalité comparée de l'énergie et du CO2 en Europe et en France*" (Comparative taxation of energy and CO_2 in Europe and in France), ADEME&vous, Stratégie & Études, n° 20, 8 July.

- rate reduced to 13% on oil products in Corsica.

Overseas, the special consumption tax on fuels is applied, rather than the domestic consumption tax. The regional councils set the rates and the exemptions applicable to fuels and the income from this tax is assigned to developing roads and transport.

The TGAP on the release for consumption of fuels is fixed per unit of volume of fuel. Even though it is intended to encourage oil producers to incorporate biofuels in their fuels, it does not take into account costs to the environment (including those for biodiversity) and may be considered as not including externalities.

1.3. Industrial pollutants insufficiently internalised

Industrial facilities that discharge the following substances to the atmosphere beyond a certain threshold are subject to the "Polluting emissions TGAP":

- sulphur dioxide and other sulphur compounds;
- nitrous oxide;
- oxides of nitrogen and other nitrogen oxide compounds, with the exception of nitrous oxide;
- hydrochloric acid;
- non-methane hydrocarbons, solvents and other volatile organic compounds;
- and, since 1 January 2009, total particles in suspension (PTS).

This tax is calculated according to the quantity of substances discharged to the atmosphere according to the rates below.

Rates of TGAP applicable by atmospheric pollutants in 2011

Description of materials or taxable operations	Unit of collection	Share in euros	Share in euros
		2010	2011
Oxides of sulphur and other sulphur compounds (eq.SOx)	Tonne	44.67	45.34
Hydrochloric acid	Tonne	44.67	45.34
Nitrous oxide (N_2O)	Tonne	67.01	68.02
Nitrogen oxide and other oxygen compounds of nitrogen, with the exception of nitrous oxide (eq.NOx)	Tonne	53.60	107.20 and 160.8 from to 01/01/2012
Non-methane hydrocarbons, solvents and other volatile organic compounds (eq. NMVOC)	Tonne	44.67	45.34
Total dust in suspension	Tonne	85.34	86.62

Source: general tax circular on polluting activities dated 30 March 2011

The following table compares the rates applied in France and several Member States for emissions of NOx and SO_2 in 2010.

Country/type of pollutant	Sulphur dioxide (SO_2)	Nitrogen oxides (NOx)
Denmark	2,830 €/t S	-
Hungary	185 €/t SO_2	444 €/t
Italy	106 €/t SO_2	209 €/t
Norway	Rate according to the type of fuel	2,017 €/t
Czech Republic	39 €/t	31 €/t
Sweden	3,000 €/t S	5,000 €/t
France	44.67 €/t SO_2	53.60 €/t NOx 67.01 €/t N_2O

We see that Denmark and Sweden stand out, with rates higher than 2,000 euros per tonne of sulphur emitted and, for Sweden, a rate of 5,000 euros per tonne of NOx, while France is situated around 50 euros per tonne for SO_2 and NOx. It is difficult to identify the incentive element at the origin of the drop in emissions of NOx and SO_2 seen over the last twenty years. It is probably due to the downward change in regulatory emission thresholds (see following table for the example of emissions of NOx coming from cement manufacturer kilns).

Limit values of NOx emissions from classified installations

Regulatory text	Parameters expressed in mg/Nm^3
Cement works ministerial decree 3 May 1993	Kiln without co-incinerator: 1,200 (dry process with pre-heater) 1,500 (semi-dry and semi-wet processes) 1,800 (wet process and dry process without pre-heater)
Ministerial decree on incineration 20 September 2002 applied from 28 December 2005	Kiln with co-incinerator*: 800 existing 500 new
IPPC, BREF Cement and Lime directive (before 2010)	200 to 500 with the implementation of the SNCR
IPPC, BREF Cement and Lime directive (after 2010)	< 200-450 with pre-heaters 400-800 with Lepol kiln and long rotary kiln

Nevertheless, as biodiversity was not taken into account when designing the TGAP, its rates are probably below the optimal level of prices internalising environmental externalities, including those of biodiversity.

It should also be stated that emissions of heavy metals, of essentially industrial origin (see table at the beginning of the part), are not taken into account in the "polluting emissions" component of the calculation of the TGAP. Yet these pollutants, just as much as pollutants that are already regulated, directly affect organisms and/or modify the living conditions of organisms by disrupting their environments. Amongst them, emissions of selenium and arsenic have dropped less rapidly than most of the other heavy metals over the period 1990-2008 observed by the CITEPA. However, there does seem to be some room for

manoeuvre. For arsenic, INERIS[1] shows, for example, that emissions can diminish, especially when they are in particulate form[2].

1.4. Public subsidies favouring transport

The subsidies are listed here by type of vehicle.

Heavy goods vehicles (Eurovignette)

The 1999/62/CE directive ratifies the principle that the "user pays" by authorising Member States to make charges based on the distance travelled (tolls) to cover the cost of building, maintaining and operating infrastructure.

It was modified by the directive 2006/38/CE which revised the procedures to be complied with concerning road tolls paid by heavy-goods vehicles of more than 3.5 tonnes on the trans-European network. Thus:

- the tolls must be based only on the principle of recovery of the cost of infrastructure (construction, operation, maintenance and any development);
- it is possible to increase, up to 25%, the amount of tolls in mountainous zones in order to co-finance the development of a certain category of alternative infrastructure, namely priority projects within the trans-European network.

The general principles of this directive correspond to the heavy-goods-vehicle tax that will normally be applied in France from 2013 to vehicles weighing between 3.5 tonnes and 12 tonnes.

The European Parliament and Council have also published a draft directive (COM(2008) 436 final[3]) modifying directive 1999/62/CE in which the Member States are encouraged to "apply a differentiated pricing policy to improve efficiency and the environmental performance of the road transport of goods". This proposal distinguishes the costs of atmospheric pollution (emission of particles and ozone precursors such as nitrogen oxide and volatile organic components), the costs of noise pollution and the costs of congestion. When a Member State decides to include the cost of one or more of these externalities in the toll price, these costs must be at least equivalent to the amounts stated in the three following tables for atmospheric and noise pollution and congestion.

[1] INERIS (2008), "*Arsenic et composés inorganiques : Panorama des principaux émetteurs*" (Arsenic and inorganic derivatives: Overview of the main emitters), Technical – economic data on chemical substances in France, 64 p., http://rsde.ineris.fr.

[2] As arsenic is mainly discharged in particulate form, particle-reduction techniques are recommended for all industrial sectors emitting particles.

[3] The final text of the directive was ratified on 7 June 2011 by the Parliament. Noise and pollution may henceforth be taken into account in motorway tolls. Congestion will only be partially counted: the states may raise the price of tolls to a maximum of 175% compared to the average during at least five peak hours.

Cost of atmospheric pollution due to traffic

Euro cents/vehicle.kilometre	Suburban highways	Other inter-urban highways
EURO 0	16	13
EURO I	11	8
EURO II	9	8
EURO III	7	6
EURO IV	4	4
EURO V and less polluting	3	2

Values in euro cents, in 2000.

Cost of noise pollution due to traffic

Euro cents/vehicle.kilometre	Day	Night
Suburban highways	1.1	2
Other inter-urban highways	0.13	0.23

Values in euro cents, in 2000.

Cost attributable to congestion due to traffic

Euro cents/ vehicle.kilometre	Off-peak period (stable traffic flow)	Peak period or close to peak (unstable traffic flow)	Extreme peak period (restrictive or halted state of traffic)
Suburban highways	0	20	65
Other inter-urban highways	0	2	7

Values in euro cents, in 2000.

The values in these tables are taken from the *Handbook on Estimation of External Costs in the Transport Sector* published by the Commission in 2008[1]. This document also gives the values for biodiversity (and for water, the soil, landscape, etc.). But the directive as revised in 2011 does not take these values into account.

It is therefore possible to suggest that the future Eurovignette, although it provides some degree of progress in the internalisation process, does not fully internalise all of the environmental externalities, including those covering biodiversity.

The "heavy-goods vehicle charge related to services" (RPLP) implemented by the Swiss, seeks, on the other hand, to internalise the various costs of transport, particularly those corresponding to damage caused to biodiversity (see following framed section).

[1] European commission (2008), Handbook on Estimation of External Costs in the Transport sector.

The Swiss heavy-goods vehicle charge

The primary aim of the heavy-goods vehicle charge is to cover all costs related to transport, whether these are direct non-covered costs or external costs to the environment and health.

The charge is calculated from three components: the distance (measured in vehicles-kilometres), the emissions of the vehicle and the vehicle's permissible weight.

The calculation of the charge takes into account the categories of external costs in the following table:

	External costs of road transport in millions of Swiss francs	Cost as a percentage of the total cost
Accidents	2,017	25%
Noise (taken into account through the costs to the health of exposed persons and by the drop in rent that it causes)	1,101	14%
Health costs due to air pollution	1,834	23%
Damage to buildings due to air pollution	274	3%
Climate	1,256	16%
Nature and countryside	687	9%
Agricultural losses due to nitrogen in the soil	63	1%
Damage to forests due to acidification	64	1%
Damage to soil	107	1%
Additional costs in urban zone due to loss of time for pedestrians	78	1%
Upstream and downstream process	593	7%
Total	8,074	100%

The external costs of road transport for 2005 are valued at 8,074 million Swiss francs. Harm to biodiversity – taken into account in the Nature and Landscape category – represents about 9% of the total cost (3% for loss of habitat and 6% for fragmentation), namely 687 million for roads.

In the external costs of lorry traffic, the Nature and Landscape part represents 59 million euros. It is this part of the external cost that should be covered in the heavy-goods vehicle charge. The amount to be covered by the heavy-goods vehicle charge should be more or less equal to this sum.

Comment: the values of externalities proposed in the Swiss report are below the Boiteux II values and European values.

Private vehicles

Private vehicles do not come under the Eurovignette directive. Although they are highly variable from one network to another, there are nevertheless prices applicable to these vehicles:

- generally, the networks are free, even though we may consider that users pay, in some cases, an indirect toll via taxes on fuel or parking fees;
- in the case of payable networks, the prices aim to recover all or part of the costs of using, constructing, maintaining, renewing and managing the infrastructure and, in certain cases, the external costs related to transport.

Company vehicles

Company vehicles represent half of new registrations in Europe[1]. Various arrangements aim to limit their costs for companies, particularly:

- deduction of VAT on the purchase of utility vehicles;
- depreciation of company vehicles deductible from taxable profit;
- passenger vehicles used by companies, on the other hand, are subject to an annual tax (tax on company vehicles – TVS), the amount of which is determined according to emissions of CO_2[2] or the fiscal rating[3] (see article 1010 of the general tax code). There are several total or partial exemptions from this tax on company vehicles for:
  - vehicles that function using electrical power, natural gas or liquefied petroleum gas;
  - vehicles that function alternatively on premium-grade fuel and liquefied gas (50% exemption);
  - for the whole company, depending on the activity that it exercises. This is the case in particular for certain sectors related to automobiles (particularly taxis, automobile transport and rental companies).

Other types of vehicles

The special tax on certain road vehicles (vehicle weight tax) is intended to compensate for the costs of maintaining the highways caused by certain categories of very heavy vehicles. The event generating the tax is the travel, on the public highway, of a transport vehicle with an authorised weight greater than or equal to 12 tonnes. Certain vehicles are exempt from it, which constitutes an incentive encouraging their use, even though they are also emitters of pollution. These are:

- vehicles specially designed for transporting persons;
- vehicles intended for farm or forestry use (under certain conditions);
- vehicles exclusively assigned to interior transport within work sites or companies;
- military vehicles, including Fire Brigade vehicles;

[1] www.foes.de/veranstaltungen/dokumentation/2011/bruessel-28022011/ ?lang=en#presentation.
[2] For vehicles first entering service from 1 June 2004, and which were not owned or used by the company before 1 January 2006.
[3] For other vehicles.

- vehicles intended for sale or performing tests (under certain conditions). Specialised public-works and industrial vehicles registered and used exclusively for the transport of equipment installed permanently (exempt until 31/12/2014).

2 • Soils

A summary appraisal of the pollution of soils in France, and its origins, is first presented. Secondly, the various public subsidies that may influence the level of these sources of pollution are presented.

2.1. Pollution that is both diffuse and specific

Soil pollution is addressed under three main topics: polluted sites and soils, diffuse pollution and the risks of the contamination of agricultural soils by spreading sewage sludge.

Numerous polluted sites and soils exist

According to the French ministry of environment[1], "a polluted site is a site where pollution is likely to cause a nuisance or long-term risk for persons or the environment".

Here, the pollution is usually local. It has a concentrated character, namely content often high over a small surface area (several tens of hectares, but some sites greater than 1,000 hectares suffer from long-term pollution).

More than 230,000 sites have been inventoried in France as having been sites of industrial or service activities, according to the BASIAS database, and more than 4,300 sites are polluted or potentially polluted according to the BASOL database. Usually, these involve (Afsset, 2006[2]):

- old landfill sites;
- deposits of mining and incineration waste;
- abandoned chemical products;
- seepage or spillage of substances (such as hydrocarbons or PCB);
- dust fallout (such as metals), following atmospheric discharges, accumulated over long periods.

The former activities of phosphorus extraction from the Alsace potash mines, for the production of phosphate fertilisers, are still producing discharges of cadmium (about 70 tonnes of cadmium per year[3]).

Amongst the 4,300 sites inventoried in BASOL[4]:

- around 10% are "able to be used normally", in other words, renovation work has been done and no other monitoring or restrictions are necessary;

[1] http://basol.ecologie.gouv.fr/accueil.php.
[2] Afsset (2006), "Sites et sols pollués" (Polluted sites and soils), Environment and locations, 6 p.
[3] Source: DRIRE Alsace Bilan 2003, in INERIS (2005), *"Cadmium et ses dérivés"* (Cadmium and its derivatives), Technical-economic data on chemical substances in France, 25 p.
[4] Statistics from http://basol.environnement.gouv.fr/tableaux/home.htm.

- about 10% are in the process of treatment. Residual pollution is revealed by diagnostics and/or work carried out on the sites, which authorises their current use, but which requires particular precautions before changing usage;
- just over 50% are under monitoring. Several cases are possible: the diagnosis was carried out on the site and no renovation work is necessary in the immediate future or, the site is already treated and monitoring is required;
- a little more than 20% are polluted and are in the process of assessment. Diagnosis of these sites is stipulated by prefectural decree;
- about 5% are potentially polluted, but this has not yet been verified.

It has also been possible to establish a link between these sites and the pollution of soil or the surrounding water table in about 70% of cases. The ten main pollutants observed (alone or in mixtures) are, in decreasing order of occurrence, hydrocarbons, lead, PAH, halogenated solvents, chrome, copper, arsenic, nickel, zinc and cadmium.

Diffuse soil pollution of atmospheric and agricultural origin

Contamination of soils by trace elements (metals (copper, lead, nickel), metalloids (boron, arsenic) or non-metals (fluorine, chlorine, bromine) is perhaps the best monitored. Diffuse contamination is related to contributions by aerial means (industrial discharges, transport) and agricultural spreading. The spreading of pig slurry, for example, may contain copper and zinc coming from foodstuffs (Gourmelen et al., 2002[1]). We also find veterinary residues in slurry.

Several trace elements are essential to life, in very low quantities (copper, iron and arsenic). However, beyond a certain threshold, depending on their chemical nature, they can become toxic for very many plant or animal species, accumulate in the food chains of ecosystems and harm the biodiversity of soils.

In mainland France, 55% of the sites in the soil-quality measurement network have surface lead contents less than 30 mg/kg. For 43.5% of sites, the contents are between 30 and 100 mg/kg. On the other hand, contents greater than 100 mg/kg represent only 1.5% of sites. A third of them are located less than 30 km from a major urban area (Grenoble, Lille, Lyon, Montpellier, Nantes, Paris, Strasbourg, and so on.). Another third are located within a radius of 30 km around smaller built-up areas (Alès, Arras, Belfort, Lens, Tarbes, and so on.). The soils of the French Antilles have very low lead content, because soils developed from basalt are particularly poor in lead[2].

There are no standards for maximum concentrations in soils that can distinguish, from a regulatory point of view, polluted from non-polluted soils or define contents that are not acceptable for trace elements.

Pesticides have a direct effect on the organic matter in the soil by reducing the number of earthworms and soil arthropods (Le Roux et al., 2008)[3].

[1] Gourmelen C., Royer E. and Rugraff Y. (2002), *Facteurs de croissance et produits alternatifs en alimentation porcine* (Growth factors and alternative products in pig food), Institut technique du porc, 11 p.
[2] www.statistiques.developpement-durable.gouv.fr/lessentiel/article/272/1122/contamination-sols-elements-traces.html.
[3] Le Roux X. et al. (2008), op. cit.

The use of phosphate fertilisers containing cadmium is also a determinant of soil pollution. On this subject, the European Commission has published several texts and decisions concerning national provisions relative to the maximum acceptable cadmium content of fertilisers[1].

The use of "Bordeaux mixture" in agriculture and viticulture is also a source of copper pollution/accumulation in soil.

The spreading of sewage sludge[2] may also be the cause of some contamination of soil by trace metallic elements (copper, chrome, lead, and so on), PAH, PCB, pathogenic micro-organisms and residue from medicines. Sludge of urban origin is less loaded with trace elements than sludge of industrial origin (Wiart, 2000[3]). In 2004, 60% of these sludges were spread on agricultural soils, 16% of which were in the form of composted sludge. Spreading is done on 2% to 3% of the French usable agricultural surface area, at a rate of 25 tonnes per hectare of raw material (SOeS[4]).

The decree dated 8 December 1997 relative to spreading sewage sludge sets the usage precautions in relation to the quality of the sludge and the properties of soils. It is the same for the spreading of fermentable compost made from food and/or household waste. Also, all products for spreading resulting from organic waste are governed by the standard NFU-44-051 relative to organic enriching agents.

Run-off water coming from surfaces that have been made impermeable, roofs and buried and surface construction materials draw relatively significant quantities of chemical substances into the soil, then towards the aquatic area. The following diagram illustrates the example of DEHP, a substance that is on the FWD's list of priority dangerous substances for which discharge, emission or loss must be gradually stopped or eliminated within twenty years. DEHP, as well as five other substances, have also just been put on the list of candidate substances for being subject to authorisation under the REACH regulations.

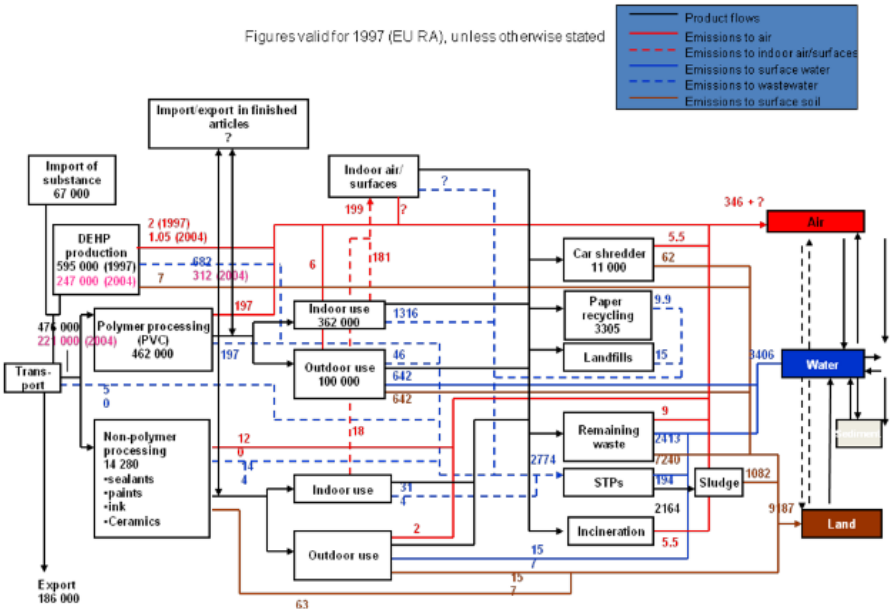
[1] Decisions 2006/347/CE, 2006/348/CE, 2006/349/CE, 2006/390/CE: dispensations applying to the maximum acceptable cadmium content of fertilisers notified by Sweden, Finland, Austria and the Czech Republic.

[2] Pursuant to positive law, urban sewage sludge receives two qualifications that, at first sight, seem opposed. On the one hand, they are considered as waste according to the meaning of law n° 75-633 dated 15 July 1975, pursuant to article 2 of decree n° 97-1133 on the spreading of municipal sludges. On the other hand, they are considered as "fertilisers" according to the meaning of the law dated 13 July 1979, and, in this respect, are covered by the definition given in article L. 255-1 of the rural code ("*all products whose use is to provide for or improve the nutrition of plants as well as the physical, chemical and biological properties of the soils*"). In fact, this dichotomy appears compliant with the bacteriological and chemical characteristics of sludges, which potentially combine the effects of a fertiliser and a pollutant. The first category of effects relates to the undeniable concentration in these sludges of nitrogen, phosphorus, lime and potash.

[3] Wiart J. (2000), *Les boues d'épuration municipales et leur utilisation en agriculture* (Municipal sewage sludges and their use in agriculture), Dossier ADEME.

[4] www.statistiques.developpement-durable.gouv.fr/lessentiel/article/272/1122/lepandage-boues-stations-depuration-urbaines-sols.html.

Material Flow Analysis for DEHP in tonnes in Europe in 1997 (with some figures from 2004)



Source: European project SOCOPSE, WP2, 2007

This diagram shows that three quarters of the quantities of DEHP present in the environment are in the soils (9,187 tonnes), four fifths of which (7,240 tonnes) come from waste and deposits transported by run-off ("remaining waste" in the diagram).

Residue from dredging may also contain high concentrations, particularly of PAH, a group of substances classified amongst "priority substances" and "dangerous priority substances" in the Water Framework Directive.

Overseas, more precisely in the French Antilles, the use of chlordecone, an organochlorine pesticide, was prohibited in September 1993. The soil contamination is long-term. Its current presence in the soils of this region is mainly related to agronomic practices in banana plantations between 1971 and 1993 (Cabidoche et al., 2006[1]).

[1] Cabidoche Y-M., Jannoyer M. and Vannière H. (2006), *"Pollution par les organochlorés aux Antilles : aspects agronomiques"* (Pollution by organochlorines in the French Antilles: agronomic aspects), Conclusions of the study and forecasting group, CIRAD-INRA, 66 p.

2.2. Subsidies related to determinants of the specific pollution of soils ("polluted sites")

Some mechanisms may be likened to forms of support to the pollution of sites. Many of them stem from the fact that the "polluter pays" principle has not, or not fully, been applied in their cases. The entity responsible for the soil pollution is insolvent or has organised its insolvency. The pollution is sometimes discovered decades after the activity that caused it ceased, with its perpetrator no longer existing from a legal point of view. The land is then declared as an "orphan site". A well-known example is that of the restructuring of the French Metaleurop group, which led to the liquidation, in March 2003, of its subsidiary Metaleurop Nord, which operated a foundry at Noyelles-Godault (Pas de Calais).

The state then substituted for the operator and had the work executed by the ADEME. Afterwards, it pursued those responsible (operator and owner) to try to recover the amounts spent. In reality, it has little chance of obtaining payment and enforcing the "polluter pays" principle. In other words, the "soil pollution" externality is not borne by its perpetrator and this arrangement may ultimately be likened to a state subsidy to polluting companies. The following table shows that state expenditure for managing polluted sites and soil increased over the period 2000-2008.

State expenditure for managing polluted sites and soils
(millions of €)

	2000	2004	2005	2006	2007	2008p
Management of polluted soils	276	388	366	445	601	686

Source: CGDD (2010), L'économie de l'environnement en 2008, (Environmental economics in 2008), report from the environmental economics and accounts commission (2010 version), References, 102 p.

2.3. Subsidies related to determinants of the diffuse pollution of soils

Atmospheric deposits

Diffuse contamination of soils with metallic trace elements of human origin are partly related to atmospheric deposits (industrial discharges and transport). Public subsidies available in this field are covered in the previous part relative to air pollution.

The agricultural spreading of sewage sludge

The tax on urban and industrial sewage sludge and the arrangement to compensate risks related to the agricultural spreading of these sludges may be considered as a state subsidies that is pernicious for biodiversity.

A guarantee fund[1] compensates harm suffered by farmers and owners of agricultural and forestry land if this land, after having been spread with urban or industrial sewage sludge, becomes totally or partially unfit for crops (health risks or the occurrence of ecological damage related to the spreading).

[1] Decree n° 2009-550 dated 18 May 2009.

By setting up the guarantee fund, the regulatory authority quite clearly recognises the danger of pollution by spreading sludge. The prevention of this danger is also the subject of various preventive and control measures, sometimes coming under the responsibility of the administrative police, which also shows how dangerous the practice is. A "national veterinary health team for monitoring sludge spreading" was created in 1997, bringing together the national veterinary schools, the ADEME and public and private institutions. In a similar vein, article L. 251-1 of the Rural code organises (a “territorial biological monitoring”), a concern that was admittedly introduced by the 2008 law on genetically-modified organisms, but which has the more general objective of "ensuring the health and phytosanitary state of plants and monitoring any appearance of unintentional effects of agricultural practices on the environment"[1].

The maximum amount of the guarantee fund is set at 45 million euros. It is mostly financed by an annual tax due by the producers of urban or industrial sewage sludge (article 302 a ZF of the general tax code). Sludges produced in another state and imported into France are not subject to the tax.

The amount of the tax is fixed by decree submitted to the French Conseil d’Etat within the limit of 0.5 euros per tonne of dry sludge matter produced. Those liable to pay settle the tax due for the previous year when filing their VAT declaration for the month of March or the first quarter of the calendar year.

The compensation provided through the fund is subject to several conditions, listed in article L 425-1 of the insurance code[2]. The amount of the compensation depends on the harm suffered and may not exceed the value of it for the owner of the land.

It is also important to note that a certain proportion of the sludge intended for agricultural use is imported, and therefore introduced into France. The quantities concerned are difficult to measure, particularly due to the relative inaccuracy of the approved nomenclature for French activities and products (*French acronym: NAF-CPF*)[3]. It is nevertheless certain that this movement escapes the regulation on the annual tax. The existence of a directive devoted to the use of sewage sludge in an agricultural context (n° 86/278 dated 12 June 1986) suggests that the sludge coming from other Member States has characteristics similar to that produced by French operators. Indeed, the directive introduces several usage restrictions concerning spreading (it prohibits the practice at certain periods of the year on animal fodder and market-garden crops), and a system for limiting concentrations of heavy metals.

In spite of this first observation, which relates to the intrinsic characters of the sludge employed, it is quite striking that imported substances, intended for a use that the French legislator has implicitly recognised as being potentially dangerous, are not subject to the same tax constraints as the locally-generated product. Moreover, the decree dated 8

[1] This objective must be monitored by a "regional biological monitoring committee" established by decree n° 2008-1282 dated 8 December 2008. According to the first article of this instrument, the Committee – not yet established – must be consulted, particularly concerning the protocols and methodologies required for monitoring the effects on the ecosystems of using the "fertilisers" mentioned in articles L. 253-1 and L. 255-1 of the rural code.

[2] The conditions are as follows: that the risk or harm could not be known at the time of spreading, that it could not have been the subject of a civil liability insurance contract by the producer of the sludge and that the sludge comes from determined industrial sectors, in this case urban sewage works (this is known as STEP sludge), the food industry and the paper and cardboard industry.

[3] This nomenclature puts sewage sludge and household waste together in the same statistical category (designated E 37Z): the result of this is that the volume of these exports remains relatively confidential and, in any case, barely transparent.

December 1997 does not settle the question as to whether harm generated by using imported sludge may give rise to compensation in the same way as harm caused by "local" sludge. The feasibility should therefore be studied of taxing these products at the borders, if only to ensure their comparative alignment with regard to the contribution to the compensation fund.

3 • Water

A key objective of the Water Framework Directive (WFD) is to promote sustainable use of water, based on the long-term protection of the available water resources (article 1). By "use of water", the directive means all services related to the use of water and any other activity likely to significantly influence the state of water. It also defines "services related to the use of water" as all services that cover, for households, public institutions or any economic activity whatsoever:

- the capture, confinement, storage, treatment and distribution of surface or subsurface water;
- any facilities for collecting and processing waste water, which then discharge to surface water.

In matters of environmental objectives, the WFD specifies that Member States must implement the necessary measures targeting (article 4):

- a good ecological and chemical state of surface water bodies by 2015.
  The Member States must, in particular, gradually reduce pollution due to priority substances and gradually limit or halt emissions, discharges and losses of priority dangerous substances;
- a good quantitative and chemical state of underground water bodies by 2015.

Lastly, in its article 9, the WFD states that Member States must comply with the principle of recovery of the costs of services related to the use of water, including the costs for the environment and resources and particularly in compliance with the polluter pays principle[1]. It therefore requests Member States to make sure that by 2010:

- the policy on pricing water encourages users to use the resources efficiently and thus contributes to achieving the environmental objectives of the directive;
- the various economic sectors, broken down into at least the industrial sector, the household sector and the agricultural sector, contribute appropriately to the recovery of the costs of water services, given the polluter pays principle.

This part presents an appraisal of the pollution observed in French bodies of water, then the various public subsidies that may worsen some of this pollution (essentially nitrogen and pesticide).

3.1. A critical assessment of water pollution

Chemical state of water bodies according to the meaning of the FWD

France has 574 subterranean water bodies and 11,523 surface water bodies (94% being watercourses).

[1] The cost-recovery principle was transposed in article L. 210-1 of the environment code.

The chemical state of the water bodies is assessed from 33 substances or groups of substances listed in appendix X of the Water Framework Directive. This list includes metals (cadmium, lead, mercury, nickel), polycyclic aromatic hydrocarbons, Di(2-ethylhexyl)phthalate (PVC plasticiser) and pesticides, including some that are already prohibited (such as atrazine).

The assessment of the chemical state of water bodies in 2009 shows results that are satisfactory overall:

- 21% of surface water bodies had a chemical state considered not good and 34% had an indeterminate chemical state;
- 24% of the highly-modified or artificial or semi-artificial water bodies (representing 7% of the surface water bodies) had a chemical state considered bad;
- 41% of underground water bodies are not in a good chemical state.

Nearly 17% of surface water bodies are subject to a dispensation from the objective of a good chemical state by 2015.

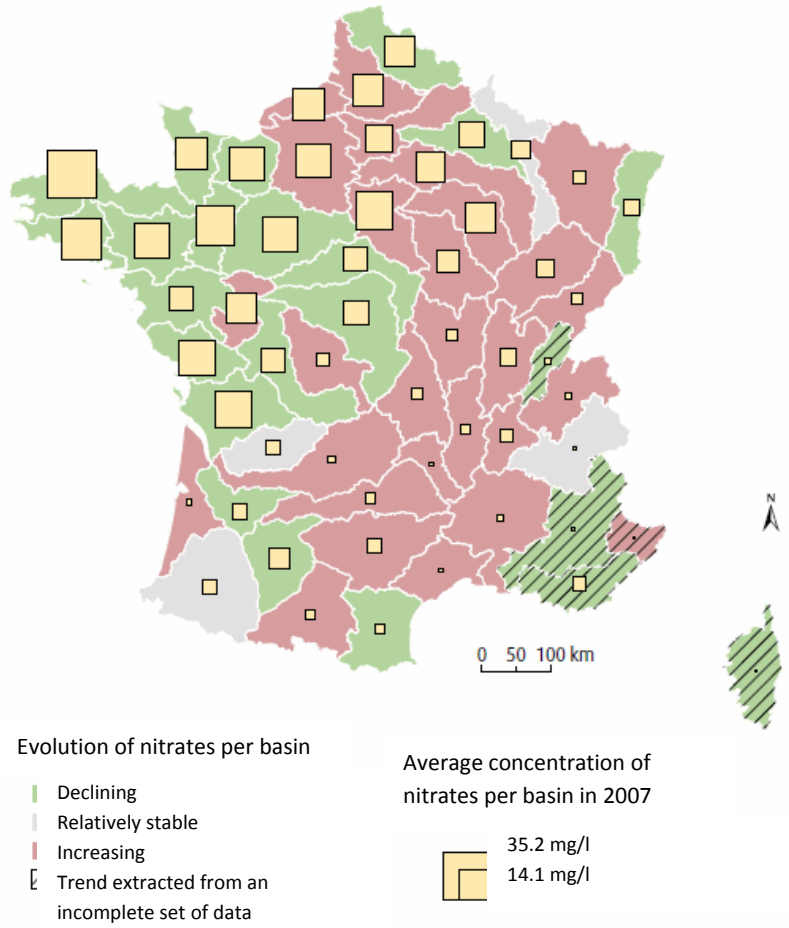
About 36% of underground water bodies are subject to a dispensation from the objective of a good chemical state

State of aquatic environments in relation to nitrogen

France has long had several networks for monitoring the quality of surface and underground water (network providing general information, phytosanitary network), which covers more than 3,300 points of measurement. This observation system shows that the average content of nitrogen (NO_3)[1] in surface water went from 3 mg/l at the beginning of the twentieth century to 16 mg/l at the beginning of the twenty-first century; over the same period, that of underground water went from 2 mg/l to 21 mg/l.

[1] 4.4 g of NO_3 = 1 gram of nitrogen.

Change, by catchment area, in the nitrates index (1998-2007)



Source: Water agencies, OIEau (BNDE), Ministry of Environment; treatments: SOeS

Recent trends observed over the 1998-2007 period showed no improvement of the nitrate concentration of surface waters at the national level[1], stable around 16 mg/l on average, but with contrasting levels and changes per catchment area[2]. To the north of a line stretching from Bordeaux to Nancy, the hydrographic sectors generally have concentrations above 20 mg/l, 25 of them even have concentrations greater than 30 mg/l, while the hydrographic sectors to the South of this line have concentrations below 10 mg/l (with the exception of certain catchment areas in Aquitaine). For the half of the catchment areas with the highest concentrations (above the national average) in 2007, we saw a downward trend between 1998 and 2007, particularly in Bretagne of around -20%; at the same time, two thirds of catchment areas with concentrations below the average have undergone changes that are rather unfavourable. In March 2007, the European commission nevertheless again referred the matter to the CJCE due to persistent non-compliance at 11 sampling points (France had already been found guilty in 2001 for the non-compliance of 37 sampling points in Bretagne for overrunning the threshold of 50 mg/l) and the risk of a financial penalty is still not ruled out, as the *Cour des comptes* recently noted[3].

[1] This in spite of spectacular investment for the tertiary treatment of nitrogen in urban discharges (nearly 1,100 million euros between 2006 and 2011 for nitrogen for the SIAAP/Greater Paris, as an illustration).
[2] CGDD (2009), "*La qualité des rivières s'améliore pour plusieurs polluants – À l'exception des nitrates*" (The quality of rivers is improving for several pollutants – With the exception of nitrates), Le Point Sur, n° 18, and CGDD (2010), " *Des nitrates toujours très présents" (Nitrates still very much present), in "L'environnement en France*", References.
[3] Cour des comptes (2010), Les instruments de la gestion durable de l'eau (Instruments for the sustainable management of water), annual public report, February, p. 617-655.

For ground water, the worsening trend seen since the 1960s has continued over the last ten years: the share of measurement points with concentrations above 40 mg/l went from 9% to 12% and the measurement points recording concentrations below 10 mg/l have become a minority (from 56% to 48%). The nitrogen currently stored represents three years of total absorption capacity for the plant cover and the soil and it would take at least 17 consecutive years with no new contributions for ground waters to dilute their nitrates by half.

We also note that the average nitrogen content of our continental resource is already 3 to 4 times greater than the threshold for triggering the phenomenon of green algae in coastal bays (5 mg/l of nitrates according to the February 2011 report from the scientific committee on green algae). This phenomenon, which is increasingly frequent and early from year to year, is therefore inevitably bound to continue.

The impact of nitrates on aquatic and littoral environments is well documented[1]: as a nutrient material, it encourages the development of microscopic plants, micro-algae and microscopic bacteria. Because of the large quantities of oxygen that they consume, these can cause asphyxia of the environment (known as eutrophication) if the quantities of nutrients are high. In time, these imbalances have numerous harmful consequences for biodiversity, such as the development of undesirable or toxic plants or bacteria (cyanobacteria and phytoplankton), the asphyxia of fish and the reduction in the wealth of animal and plant species in the environment.

Nitrates, which naturally follow the flow of the water from the catchment area to the sea, play a predominant role in degrading the quality of coastal waters. Excessive concentrations of nitrogen, beyond 5 mg/l of nitrates (2011 report from the scientific committee on green algae), encourage the proliferation of green algae. During the last twenty years, this phenomenon has grown considerably in Bretagne (mainly on the north coast of Bretagne in coastal waters that are not subject to much intermingling, but also on the south coast), both due to its regularity and its extensiveness. 2008 and 2009 were record years for surfaces covered, combined tonnages and seasonal peaks of sea lettuce in Bretagne, with nearly 200,000 tonnes collected. The unprecedented early nature of this phenomenon was confirmed in 2010 and 2011.

Nitrates are also nutrients that stimulate the development of marine phytoplankton, which may be toxic, particularly three species of toxic phytoplanktonic algae regularly seen in Bretagne. In 2009, they generated lipophilic toxins and amnesic toxins in mussels, donax clams, pink clams, cockles and scallops in Finistère and Morbihan: the concentration of amnesic toxins in the scallops reached 33 mg/kg in the Brest roads and 40 mg/kg in the Bay of Quiberon, representing twice the health safety threshold (20 mg/kg). For shellfish gathering, the percentage of good-quality sites went from 39% in 1997 to 6% in 2009, and the direct consumption of shellfish from 20% of sites in Bretagne was prohibited in 2009. In its 2009 assessment, the decentralised office of the ministry of environment in Bretagne (DREAL Bretagne) noted that the "examination of the micro-biological results of the last thirteen years shows, in spite of the slight improvement in 2006, a general trend towards the degradation of natural sources of shellfish in Bretagne". Concerning the changes to the 116 classified shellfish grounds in Bretagne over the last ten years: three grounds have seen improvement while 42 grounds have worsened and 72 have not changed. On 1 January 2010, only two of these 116 grounds were still of good quality (A).

[1] See, for example, GIP Bretagne Environnement-INRA-ARS (2006), Les impacts des nitrates sur la santé et l'environnement (Effects of nitrates on health and the environment).

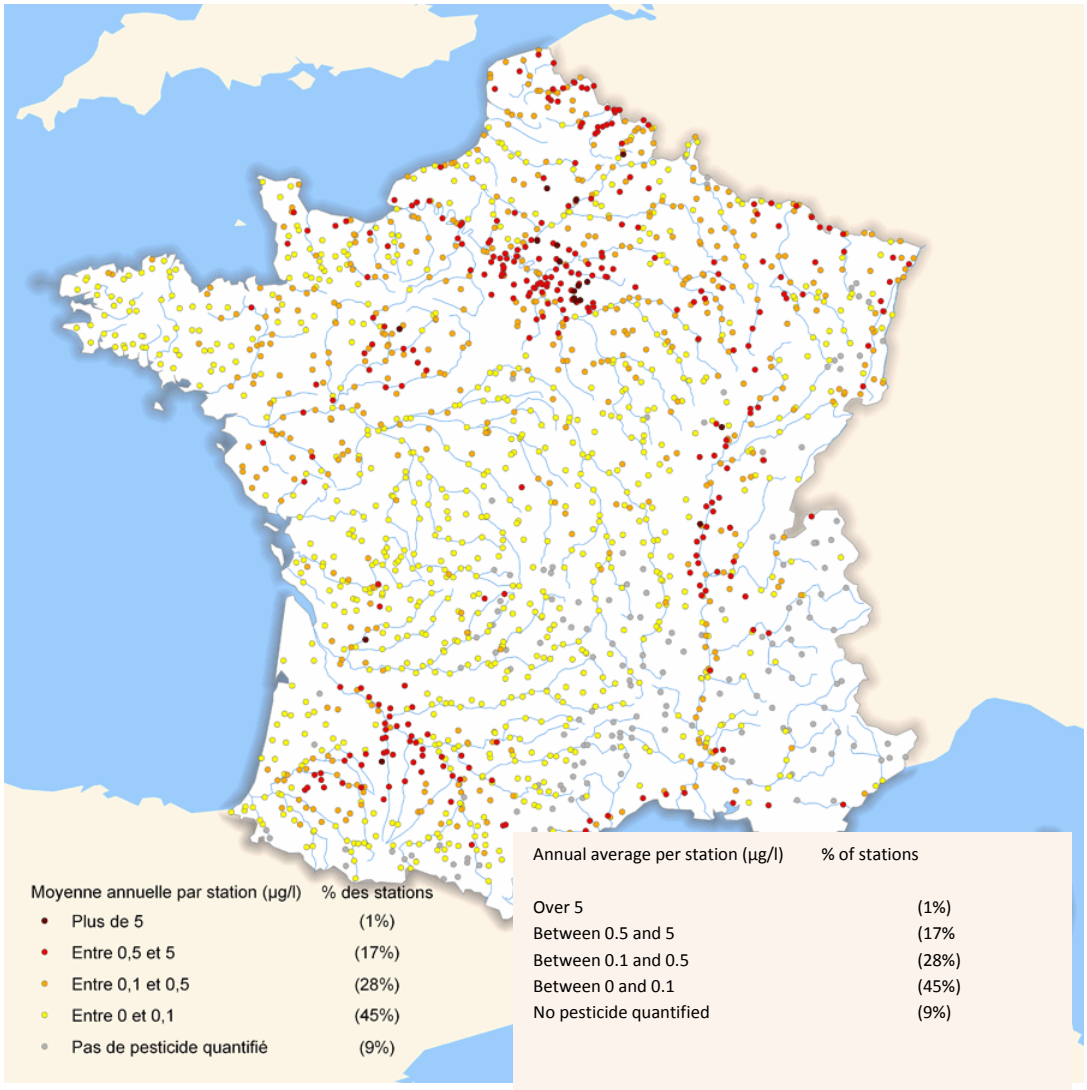
Nitrates have few direct toxic effects on aquatic fauna[1]. Studies carried out by INRA show that enrichment of the environment may have two types of conflicting effects on populations of salmonids: accelerated growth in their populations due to the increase in nutrient contents (nitrates and phosphorus), thus increasing the primary production of the river and therefore the productivity of the ecosystem; a high rate of mortality of eggs and young fish due to an extensive phenomenon of clogging spawning grounds leading to a lack of oxygen. This rate of mortality would be worsened by the presence of nitrates (chemical reduction of nitrates) in the spawning grounds during the phase of life when trout and salmon live under pebbles, causing a reduction in the abundance of juveniles.

Pesticide pollution

Pesticide concentrations in all water resources are constantly increasing and a growing proportion of drinking water must be treated before distribution to comply with public health standards (100% of the surface waters in the Paris area and more than 65% of the entire production capacity of Bretagne in 2009).

[1] See the site www.observatoire-eau-bretagne.fr.

Total concentration of pesticides in watercourses, 2007 annual average



Source: Water agencies – MEEDDM, BD Carthage 2008; treatments: SOeS

In 2005[1], pesticides were identified by a majority of monitoring stations and most often in surface waters. The active substances that were sought were quantified at least once respectively in 91% of the measurement points in watercourses and 55% of the measurement points in groundwater. The levels of contamination are often significant: 36% of the surface water measurement points had medium to bad quality.

Although the gradual prohibition of the most toxic molecules has eliminated the massive mortality amongst non-target organisms, "the ecosystem damage caused by these substances is proven, but unequally quantified", concludes the report on the INRA-CEMAGREF appraisal[2]. The direct effects which remain include a reduction in the abundance of prey or the abundance of predators, behavioural problems amongst prey and an increase in their vulnerability, or behavioural problems amongst predators and a

[1] Outline note for the "Pollution" workshop.
[2] Aubertot J.-N. et al. (dir.) (2005), *Réduire l'utilisation des pesticides et limiter leurs impacts environnementaux* (Pesticides, agriculture and the environment. Reducing the use of pesticides and limiting their environmental impact), collective scientific expert appraisal, summary of report, INRA and Cemagref.

reduction in their hunting efficiency, changes of habitat (such as death of plants), a reduction in the abundance of certain competitors, and so on. The report noted that "these effects, which are less visible and usually non-lethal, are more difficult to detect" and observed "that it is extremely difficult to quantify their real impacts on the environment and to analyse their evolution".

According to the “Pollution” workshop outline note (published in 2010 during the French conference on biodiversity[1], the populations most directly exposed to pesticides are fauna (macro-fauna and micro-fauna) and the micro-organisms of the cultivated ecosystem. Estimates of the effects are difficult to make, due to the lack of an appropriate observation system. Using indirect methods, for lethal risks, this estimate was made at the scale of the United States and led to a significant figure (Mineau and Whiteside, 2006, Environmental toxicology and chemistry). From long-term monitoring, it showed a correlation between the decline in certain bird species and the use of insecticides (Mineau et al., 2005, Ecoscience).

Pollution by medicines

After progress in physicochemical analysis, residue from medicines (antibiotics, antidepressants, beta-blockers, oral contraceptives, etc.) are now found in all types of aquatic environments: surface and underground water, sediments and biota. Certain sites, such as the outflows from sewage works, are more contaminated. Unlike pesticides, which have very great seasonal variations in quality and quantity, the presence of medicines in the environment is more constant, due to regular consumption by a large number of people.

Amongst the residues of medicines that are always detected in surface waters, hormonal components can induce endocrine disruption, causing, for example, impairment of growth, organ development or reproduction. Antibiotics are also a group of products that cause risks. The constant exposure of the environment to antibiotic residue is suspected of encouraging the development of antibiotic-resistant bacterial strains that are then likely to infect animals[2].

The effects of these residues on biodiversity are often still very poorly known. Examples that illustrate "cause-and-effect" relationships of pharmaceutical substances on numerous non-target species are nevertheless increasingly numerous. *"These relationships, established in the laboratory, leave no doubt about the ability of these active substances to cause biological responses"*[3].

The control of risks related to medicine residues in water is also one of the action points of the Grenelle de l’Environnement (action point n° 103).

Thermal pollution

The thermal pollution of water must also be considered carefully. It appears when water is used as a cooling liquid by industrialists (thermal and nuclear power stations in particular). The water is pumped from watercourses or the coastal marine environment, then returned on output from the plant at a temperature that is higher by 4°C to 5°C. These discharges warm the water into which they are discharged, which can disrupt aquatic life, both animal and plant, notably by modifying the physiological rhythms of species (reproduction, winter

[1] Vindimian É. and Parfait G. (2010), op. cit.
[2] Source: www.onema.fr/Medicaments-dans-l-eau.
[3] French conference on biodiversity – 10-12 May 2010 – Outline note – Workshop "Pollution" – "Reducing pollution and impact on biodiversity" – 26 April 2010.

survival, etc.)[1]. Also, the O_2 concentration of the water reduces with the temperature and the biological consumption of O_2 increases. The activity of certain pathogens may be stimulated.

Accidental pollution

The pollution of the aquatic environment may also be of accidental origin. According to the association *"Robin des bois"*, the number of "inland oil spills" occurring over a period of three years between January 2008 and December 2010 is 643, a figure that is up compared to a period of four years between January 2004 and December 2007 ("*Robin des bois*", 2010)[2].

Furthermore, marine pollution may come from spillages related to the hazards of maritime traffic, pollutions of an accidental nature in port environments, as well as illegal discharges from ships (Marchand, 2003)[3]. The following table lists the most significant accidents and incidents on the French coasts between 1979 and 2001, and the nature of the pollutants spilled (source: Cedre[4]).

Statement of the most significant accidents and incidents causing pollution or threats of pollution (period 1979-2001)

Pollution or threats of pollution	mber of accidents or incidents
Hydrocarbons The most significant cases: Amoco Cadiz (1978): 227,000 t Gino (1979): 41,000 t Tanio (1980): 6,000 t Erika (1999): 20,000 t	18
Loss of containers with dangerous substances The most significant cases: Brea (1988): 700 drums (miscellaneous products) Perintis (1989): 14 containers (pesticides including 5 t of lindane) Sherbro (1993): 88 containers (pesticides)	11
Spillages of chemical products The most recent cases: Allegra (1997): 700 t of palm oil levoli Sun (2000): 4,000 t of styrene Balu (2001): 8,000 t of sulphuric acid	8
Atypical cases Cases concerned: Atlantique (1993): 23,000 detonators stranded Fenes (1996): 2,600 t of wheat	2

[1] www.cnrs.fr/cw/dossiers/doseau/decouv/degradation/12_pollution.htm.
[2] Robin des bois (2010), Atlas des marées noires dans les eaux intérieures (Map of oil spillages in inland waterways), edition 2008-210, 69 p.
[3] Marchand M. (2003), "*Les pollutions marines accidentelles : au-delà du pétrole brut, les produits chimiques et autres déversements en mer*" (Accidental marine pollution: beyond crude oil, chemical products and other discharges at sea), Responsability and Environment, Annales des Mines, p. 70-92.
[4] Research, experimentation and documentation centre on accidental pollution of water.

3.2. Public subsidies related to the determinants of nitrogen pollution

Sources of emission

The main activities that are the sources of nitrogen pollution of water are agriculture, which uses 2,370,000 of mineral nitrogen per year, and stock breeding, for which spreading slurry on soil represents an annual volume of 1,410,000 tonnes of organic nitrogen[1]. These contributions of non-gaseous nitrogen to the soil thus reach an annual volume of 3,780,000 tonnes, while all of the gross industrial and urban discharges (before treatment) do not represent more than 360,000 tonnes. As the export of nitrogen via the soil, plant cover and crops is estimated at 3,064,000 tonnes, and the sewage works eliminate 270,000 tonnes, the final discharges to ground and surface water are about 806,000 tonnes per year.

Nitrogen contributions and residues in aquatic environments for the year 2001
(in tonnes and in millions of equivalent-inhabitants) (MEI)

Gross nitrogen production

Domestic and industrial nitrogen production	360,000 tonnes	80 MEI
Spreading agricultural mineral fertiliser	2,370,000 tonnes	540 MEI
Spreading slurry and stock breeding excrement	1,410,000 tonnes	320 MEI
Total gross production of nitrogen	4,140,000 tonnes	940 MEI

Sewage treatment

Treatment of domestic and industrial sewage	270,000 tonnes	60 MEI
Agriculture and plant cover	3,064,000 tonnes	698 MEI
Total treated and purified	3,334,000 tonnes	758 MEI

Surplus-pollution discharged to aquatic environments

Domestic and industrial nitrogen discharges after treatment	90,000 tonnes	20 MEI
Mineral surplus	416,000 tonnes	94 MEI
Organic surplus	300,000 tonnes	68 MEI
Total residual contamination of resources	806,000 tonnes	182 MEI
Including residue from agriculture and stock breeding	716,000 tonnes	162 MEI

Source: Agreste (Primeur n° 123, April 2003)

Nitrogen contributions and residues in aquatic environments
(1988 to 2001)

	1988	1990	1993	1995	1997	2001
Mineral fertiliser	2,489	2,621	2,132	2,243	2,432	2,370
Organic fertiliser	1,318	1,152	1,278	1,266	1,240	1,410
Use by the plant cover	- 3,322	- 3,052	- 3,147	- 3,191	- 3,265	- 3,064
Surplus (+)	485	715	263	318	407	716

Source: Agreste (Primeur n° 53, March 1999 and Primeur n° 123, April 2003)

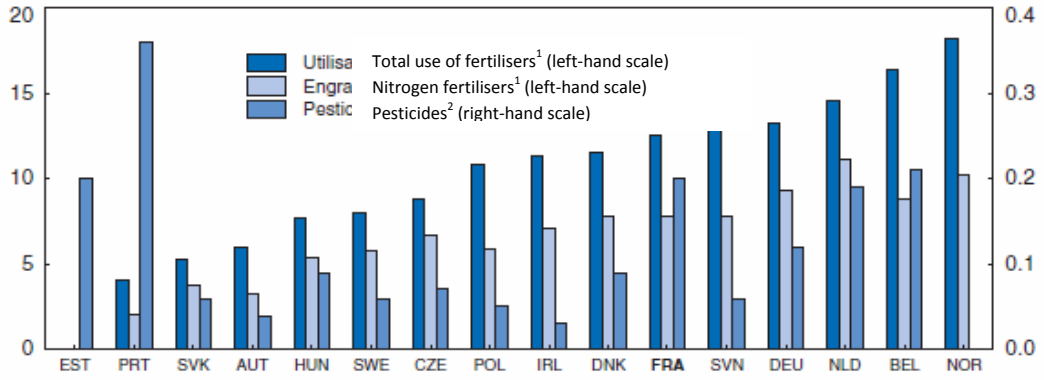
[1] Source: Conseil d'État, Agreste and studies by CGDD.

Over the recent period[1], the downward trend in mineral nitrogen contributions seen between 2000 and 2005 (-10%) has interrupted and, in 2007-2008, these contributions had almost returned to their levels at the end of the 1990s.

European comparisons

The four countries that are most intensive in mineral nitrogen contributions are the Netherlands, Slovenia, Germany and Belgium-Luxembourg, with ratios of kilograms of nitrogen per hectare greater than 100 (see Eurostat, Statistiques et comptes environnementaux, 2010). France, with 85 kg/ha, is in an intermediate situation, with the other countries having ratios below 80. The dropping trend in volumes of nitrogen fertiliser used observed over 1998-2006 is more pronounced in France (-11%) than in Germany or Belgium (-6.5%), but much less than that seen in the Netherlands (-25%). However, the new peak seen in 2008 compared to 2006 is more pronounced in France (Source: Eurostat (env_ag_fert)).

Use of fertiliser and pesticides in Europe, 2008



1. Tonne per hectare of total agricultural land.
2. Tonne per active ingredient per hectare of total agricultural land.

Source: OECD calculations, according to Eurostat data.

http://dx.doi.org/10.1787/888932377884

An obvious lack of internalisation

In the area of water, economic instruments covering pricing do exist to a certain extent, but without being always set at the correct rates or without covering the whole of the sources of this pollution. This lack of internalisation constitutes an implicit public incentive which worsens this harm, in contradiction with the polluter pays principle.

The principle of such a financial mechanism was nevertheless defined by the law on water of 1964 and implemented by the Water Agencies in other fields. Article 9 of the Water Framework Directive expressed it as a principle of "cost recovery" by category of use or pollution, even though the total recovery of costs was not set as an inviolable principle. The transposition into French law (law n° 2004-338 dated 21 April 2004, art.1) accepted this

[1] See CGDD (2010), "Agriculture", in Rapport sur l'état de l'environnement (report on the state of the environment).

important nuance, stating that "cost related to the use of water, including costs for the environment and resources themselves, are borne by the users, taking into account the social, environmental and economic consequences, as well as the geographic and climatic conditions". Via the system of charges collected by the Water Agencies there is thus an implicit transfer from households to the agricultural sector. In particular, the charges collected allow the Agencies to fund actions aiming to reduce nitrogen discharges, but the contributions of farmers and stock breeders to the budgets of the Water Agencies remain significantly below the incentives that they receive[1]. The contributions of householders to agricultural de-pollution financed by the Agencies (mainly through the charge on domestic pollution) stood at between 40 and 70 million euros in 2003[2].

Going beyond the principles, the control of nitrogen pollution was the priority objective of the water and aquatic environments bill (French acronym: *LEMA - loi sur l'eau et les milieux aquatiques*) registered in 1999. This initial bill, noting the failure of the Agencies system on diffuse agricultural pollution, aimed to overhaul all of the charges and create taxation that was effective concerning nitrogen (TGAP). There is no taxation covering mineral nitrogen, but the LEMA, finally adopted in December 2006, established a "stock breeding" charge, based on the livestock units (LU), which is the equivalent of a dairy cow discharging 85 kg of nitrogen per year. It is due by farms having more than 90 LU (150 in mountainous zones) with a charge rate greater than 1.4 LU/ha. This charge is not intended to concern only nitrogen discharges, but also covers other discharges related to stock breeding (microbiological, organic and phosphorus). Its total income[3] is estimated at 5.5 million euros in 2008 (all of the agency charges bring in a little less than 2 billion euros).

Several developments are possible: creation of a specific tax on nitrogen fertilisers, broadening the tax base of the diffuse pollution charge (see section 3.3. "Public subsidies related to determinants of pollution by pesticide products") in order to include nitrogen products, and the establishment of a market for spreading rights. The latest analysis by the OECD concerning the environmental policies carried out in France[4] recommended, in application of the polluter pays principle, establishing a tax on nitrogen fertilisers or a market for quotas for farmers. In its latest report devoted to the subject, the Cour des comptes[5] also mentioned the Danish experience, where the establishment of nitrogen quotas (coupled with a tax on pesticides) lead, over a decade, to breaking the link between production (which increased by 3%) and contributions of nitrogen, pesticides and phosphorus (which were down by 30%).

The previous analyses show that quantitative elements are available to contribute to configuring taxation intended to cover the costs caused by mineral nitrogen surpluses.

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[1] The Cour des comptes (2010) reported that this ratio between incentives and charges stood at 10 for the 7th programme and 4.8 for the 8th programme (2001-2006). Over the recent known period (2007-2009), this downward trend seems to be confirmed, with ratios of around 3 (budgetary documents in the appendix to the draft finance law, Water Agencies, appendices to the finance bill).

[2] This old estimate is probably on the low side. Indeed, in 2009, the incentives for de-pollution paid by the Agence de l'Eau Loire-Bretagne to the agricultural sector in the four Bretagne departments represented 22.7 million euros (2009 assessment, DREAL Bretagne, 2011), while this sector paid only 1.55 million euros in charges (all of the charges for abstraction and pollution collected from the agricultural sector). Out of these four departments, the contribution of households to the Water Agency's agricultural incentives was therefore 19.5 million euros.

[3] For illustrative purposes, the rate applied in the Seine-Normandie basin is 3 euros/LU /year.

[4] OECD (2011), Étude économique de la France 2011 (Economic study of France 2011), Chapitre 3 : Les politiques environnementales (Chapter 3: Environmental policies).

[5] Cour des comptes (2010), Les instruments de la gestion durable de l'eau (Instruments for the sustainable management of water).

In an approach through the costs of restoration, we could envisage recovering the costs of treating the annual nitrogen surpluses coming from agriculture and stock breeding. These treatment costs may be inferred from the unit costs of nitrogen treatment by units treating water to make it potable for human consumption, which stands at between 59 and 106 euros per kilogram of nitrogen treated[1]. In this hypothetical restoration scenario, the complete elimination of 716,000 tonnes of the nitrogen surplus contributed annually to natural environments to maintain these environments in their current state, would represent annual treatment expenditure of between 42 and 76 billion euros. Generating such income from the tax base of the 2,370,000 tonnes of mineral nitrogen would mean configuring a charge of between 17 and 32 euros per unit of nitrogen (kg), representing 30 to 60 times the current purchase price of nitrogen.

Other older references (Von Blottnitz et al., 2006[2]), cited notably in the report from the OECD (mentioned above), evaluated the external costs of nitrogen fertilisers at 0.15 euro/kg (excluding production): the external harm thus evaluated mostly comes (0.12 euro/kg) from climatic change (via emissions of N_2O), with eutrophication remaining marginal (0.3 euro/kg), but very approximately evaluated.

A recent study at the European scale[3] sought to estimate the cost of the harm caused by the various nitrogen components (NOx, N_2O, NO_3, etc.) to health, the climate and the state of ecosystems. It concluded that the 11 million tonnes of nitrogen fertilisers spread (half of which is surplus) caused 20 billion euros of harm in terms of biodiversity. The recovery of the cost of this damage over all fertilisers used would therefore lead to taxation of around 1.82 euro/kg of nitrogen. This approximation is consistent with that of several other studies indicating that the threshold for an effective nitrates tax would be between 1.5 and 2 euros per kilogram of nitrogen.

[1] The unit cost of "restoring" the environments referenced here is the unit cost estimated in denitrification for the purpose of producing potable water. As the potable water commission from the ASTEE (water and environment professionals) pointed out, this restoration cost is perhaps overestimated if the restoration of environments aims at levels of concentration far below the level required for making water potable (threshold of 5 mg/l for triggering green algae against 50 mg/l for the nitrates directive). Also, the average cost of denitrification is going down.

[2] Blottnitz, H. et al. (2006), "Damage Costs of Nitrogen Fertilizer in Europe and their Internalisation", Journal of Environmental Planning and Management, vol. 49, n° 3, p. 413-433.

[3] Sutton, M. A. et al. (dir.) (2011), The European Nitrogen Assessment, Cambridge University Press.

Impact on human health… towards total external costs?

Other than the impact on ecosystems mentioned above, nitrates, beyond certain levels of concentration, also present risks for human health. The actions undertaken to prevent these risks represent a set of direct or indirect economic costs that are ultimately borne by households, identified and evaluated below from the analysis carried out by the French Minister of Environment (CGDD, SEEIDD).

Direct economic costs of nitrogen pollution
(in millions of euros per year)

Direct economic costs of nitrogen pollution	Min.	Max.
Costs of potability treatment (curative)	320	710
Costs of potability treatment related to nitrates	120	360
Costs of purification treatment for waste water related to agricultural nitrates	100	150
Costs of cleaning generated by eutrophication of catchments	60	100
Costs caused by moving the catchments used	20	60
Costs of interconnections for the producers of potable water	20	40
Costs of preventive actions		
Costs of actions to reduce agricultural pollution (Water Agencies)	60	70
Total costs passed on to households via the water bill (a)	380	780
Costs of substituting tap water with bottled water due to nitrates	220	220
Cost of filtering tap water due to agricultural pollution	140	160
Total costs borne by households (not passed on via the water bill) (b)	360	380
Costs of cleaning green algae on the coasts	30	50
Loss of economic income due to eutrophication (harm to tourism)	70	100
Total other costs borne by local authorities (c)	100	150
Total direct economic cost of nitrogen pollution (a) + (b) + (c)	840	1,310

Source: Minister of Environment, CGDD, 2010-2011

Expenditure by municipalities passed on to households via the water bill

The annual costs and volumes for the treatment of nitrates by stations producing potable water intended for human consumption[1] are known through various studies and recent synthesis work carried out in 2011 by the SEEIDD[2] with the help of the ASTEE's potable water commission. These induced costs include the costs of nitrate treatment in potability plants, as well as moving the catchments or mixing raw contaminated water with good-quality water.

[1] According to the decree n° 2001-1220 dated 20/12/01 relative to water intended for human consumption, other than natural mineral waters, water intended for human consumption must not contain a number or a concentration of microorganisms, parasites or any other substance constituting a potential danger for the health of persons and must be compliant with the quality limits defined by the same decree. Nitrates, for example, must not exceed 50 mg/l.

[2] CGDD (2011), Le coût des principales pollutions agricoles de l'eau (The cost of the main agricultural pollutants of water)

The potability plants of the public services of water and sewerage (French acronym: *SPEA - services publics de l'eau et de l'assainissement*) treat between 3,000 and 7,000 tonnes of nitrogen per year to comply with the nitrates standard of 50 mg/l in potable water. The unit costs of treatment are within a range of between 59 and 106 euros per kg of nitrogen treated. This range is coherent with an average value of 74 euros per kg of nitrogen published following an in-depth study modelling costs in the Flemish region in 2010. The quantity of nitrogen removed from potable water by the SPEA per hectare of catchment area used for cereal crops is estimated at between 35 and 40 kg, which works out at an expense per hectare of between 2,065 and 4,240 euros.

The annual cost of nitrogen treatment performed by the SPEA for 2003 (see table) would thus be between 220 and 510 million euros (between 120 and 360 million euros for the extra cost due to potability treatment related to nitrates and between 100 and 150 million euros for the extra cost due to tertiary treatment for purifying waste water related to agricultural nitrates), to which are added the other extra costs caused for these services by agricultural nitrates valued within a range of between 100 to 200 million euros per year (between 60 and 100 million euros for mechanical cleaning of catchments and aspiration pipes subject to eutrophication, between 20 and 60 million euros for moving catchments and, between 20 and 40 million euros for the interconnections made by the producers of potable water).

These costs for treatment and operations, directly passed on in the water bill, would therefore be between 320 and 710 million euros per year. This expenditure only treats about 3,000 tonnes of nitrogen, representing barely 0.4% of the surplus discharged to aquatic environments.

Households pay pollution and domestic abstraction charges to the Water Agencies via their water and sewerage bills. Amongst other things, these charges allow the agencies to finance incentives to farmers and stock breeders to reduce their discharges of nitrogen to aquatic environments and resources. These specific incentives from the agencies should in theory be covered by the charges paid by the farmers; but firstly, these contributions from farmers and stock breeders to the Water Agencies' budgets remain significantly below the incentives that they receive from these budgets, and secondly, there is no charge for nitrogen pollution. The contributions of householders to agricultural de-pollution financed by the Agencies (mainly through the charge on domestic pollution) stood at between 60 and 70 million euros in 2008-2009. However, this estimate appears very low, since the 2009 assessment prepared by the DREAL Bretagne in February 2011 on the four Bretagne departments costed the de-pollution incentives received in 2009 from the Loire-Bretagne Water Agency by the agricultural sector in these departments at 22.7 million euros, but this sector paid only 1.55 million euros in charges (all of the charges for abstraction and pollution received from the agricultural sector). The report also noted that 89% of all charges (domestic, industrial and agricultural) collected in 2009 in these departments came from the domestic sector. In these four departments, the contribution of domestic water bills to agricultural incentives from the Water Agency was therefore 19.5 million euros in 2009.

The total expenditure from households disbursed by the SPEA and the Water Agencies due to agricultural nitrogen pollution and recovered through water bills is thus estimated at between 380 and 780 million euros, representing 3.94% to 8.19% of the income from domestic water bills.

Other costs borne by municipalities

The accumulation of green algae on beaches may be the cause of anoxia phenomena when it decomposes and emissions that are toxic for humans (INERIS task group 2010) and for fauna, so it requires regular collection. Annual expenses for cleaning the coasts were estimated by the ministry of environment through the national plan to combat green algae. Also, 8 million euros were spent in 2009 by municipalities in Bretagne and the ADEME to incinerate 55,000 tonnes of green algae (out of a total of 90,000 tonnes collected in Bretagne). Total annual expenses for cleaning the coasts are thus estimated at between 30 and 50 million euros.

Also, the presence and accumulation of green algae on the coasts can cause harm to tourism and drive tourists towards other coasts: this loss of economic income related to lower tourist activity was estimated, by an inter-agency study in 1991 (in the process of being updated), as coming within a range of 70 to 100 million euros.

Concerning biodiversity, studies are in progress: we observe that beaching can harm posidonia beds and ecosystems. The compounds in sea lettuce can stimulate the conditions for the existence of faecal bacteria and pathogens when their limiting factors (light and nutrient resources) are modified. Also, collection on the foreshore seriously disrupts the ecology and submits it to pollution (heavy machinery, scraping, etc.). Lastly, often the contributions of the foreshore to the ecosystem are harmed even though, sometimes, this habitat is not hostile to certain birds (geese).

Cost of community litigation (as a reminder)

This concerns the share attributable to agriculture for non-compliance with the former nitrates, potable water and groundwater directives. Other directives could also be concerned: bathing, water in shellfish grounds and the Water Framework Directive. Discharges of nitrates from agriculture and stock breeding are clearly the greatest visible obstacle[1] to the achievement of a good ecological state of the continental and marine waters. The cost of litigation caused by non-compliance or delays in applying these directives has not been evaluated.

In total, current known expenditure driven by nitrogen pollution from agriculture and stock breeding is estimated as coming within a range going from 840 to 1,310 million euros per year, of which 740 to 1,160 million is committed by households and 100 to 150 million is borne by regional authorities.

3.3. Public subsidies related to determinants of pollution by pesticide products

As previously, we can come near to finding a cost of restoring aquatic environments by using the costs of potability treatments used by the SPEA to comply with sanitary standards in matters of pesticides. Based on the unit costs of the techniques used[2], the costs of de-pollution (with an objective of lowering the average concentration by 1 mg/l) of the total annual flows of pesticides conveyed by our aquatic resources are estimated at nearly 20 billion euros per year[3].

The only "internalising" instrument that exists is the charge "for diffuse pollution, instituted by the LEMA, which took over from the TGAP on certain pesticide products. Depending on the case, it taxes the substances at between 0.9 euro/kg and 5.1 euro/kg (0.6 and 3.7 euros until 2010) and brings in about 60 million euros including about 31.8 million euros per year for the agencies and the rest for funding the Ecophyto plan. These amounts are therefore clearly below just the cost of treatment for making contaminated water potable, and are completely incommensurate with the external costs of a hypothetical treatment of all of the annual flows quantified above. Also, although the environmental costs of pesticides are still poorly evaluated (because their effects are themselves difficult to measure[4]), an American study[5] estimated the external costs for human health at about 2 euros/kg. The previous

[1] Pesticides constitute another recognised source of pollution, but for which the impact on aquatic environments is not yet clearly understood.
[2] Internal note from the SEEIDD, cited above.
[3] The professionals at ASTEE nevertheless emphasise that setting up a specific infrastructure for large-scale treatment of pesticides would certainly lead to a drop in treatment costs.
[4] Although services related to biodiversity have begun to be evaluated (study on the value of pollination, earthworms – in the soil of pasture meadows – or auxiliary insects), there are few studies for making this link with the passive exposure of environments to pesticides.
[5] Tegtmeier E. M. and Duffy M. D. (2004), "External costs of agriculture production in the United States",

figures and these references suggest that current rates of the charge for "diffuse pollution" are insufficient to cover all of the external costs, not only to health, but also to the environment.

Chapter 6

Public incentives that promote the introduction and dissemination of invasive alien species

Invasive alien species (IAS) are considered one of the greatest dangers threatening biological diversity[1]. Their effects are numerous and their intensity is variable depending on the situations, which makes an overall assessment of their difficult damages. After illustrating how certain human activities can favour the introduction of IAS, this chapter presents the different types of incentives that influence these activities.

1 • Harmful activities

Man has now become the main player in IAS dissemination, not only through intentional transport (trade) or accidental transport of plant or animal species, but also by the profound changes to ecosystems that he has caused, making them able to host certain species that could never have become established without these changes.

Thus the channels for introducing invasive alien species are directly or indirectly associated with movements of species associated with the movements of people and goods. The rapid development of trade and transport activities increases the risk of introducing invasive alien species, while pressures on the environment, such as climate change and particularly the degradation of habitats, could favour the movement of species, their propagation and proliferation.

Most of the alien vascular plants and vertebrates were introduced voluntarily for economic purposes (agriculture, forestry, stock breeding, aquaculture, etc.), scientific purposes (acclimatisation or educational, such as the botanical gardens constructed at the end of the nineteenth century) or to satisfy recreational leisure activities such as hunting, sport fishing (invasiveness related to live fishing bait) and ornamental plants (and associated horticulture).

These various activities cause a risk of biological invasion which may be structural, accidental, intentional or result from negligence or ignorance or result indirectly from modifying habitats allowing the proliferation of potentially invasive species.

1.1. Activities that cause a structural risk of introduction

International trade is indisputably one of the causes of the dispersion of species throughout the planet. An analysis carried out by Westphal et al. (2008) shows that imports of goods

[1] Millennium Ecosystem Assesment, 2005.

are the most explanatory variable: the greater the degree of international trade, the more the number of invasive alien species. As an example Cohen and Carlton (1998)[1] calculated that, between 1850 and 1960, San Francisco Bay received a new species every 55 months, against a new species every 14 months between 1965 and 1995.

New types of commercial transactions over the Internet promote the availability of ornamental plant and animal species. This trade relates to animal or vegetable species, which may or may not be protected and which are alien or rare, offered by reputable companies, but also by individuals via numerous classified advertisement sites (certain animal species reproduce well in captivity, providing the sellers with additional income that is not negligible). The commercial transactions concerning these species still very often seem to overlook or ignore the risks of invasion in the receiving country, in the same way that they overlook the pressures on the populations taken from the countries of origin.

Long-distance transport is also an important cause of the dissemination of invasive alien species. This is because 60% of goods (by volume) are transported by sea. Ballast water, with between 3 and 5 billion tonnes of water transported by ships throughout the world and up to 7,000 different species moved each day, is one of the most powerful vectors for introducing species into coastal waters.

The worldwide economic crisis has caused a slowdown in maritime traffic. Ship turnaround has reduced, which will favour organisms becoming attached to the hulls of unused ships at anchor (biofouling). This accumulation of organisms during immobilisation, then their transport, is also a means of introduction by pleasure sailing.

1.2. Activities that can cause a risk of accidental introduction

The following examples of activity may be cited:

- live collections, museums and aquariums, which can let specimens escape (for example, the Caulerpa in the Mediterranean sea represents this channel, which nevertheless tends to come from equipment owned by individuals);
- specific events (wood parasites arriving with wooden crates used by the U.S. Army, etc.);
- unforeseen consequences (mosquitoes arriving in cargoes full of used tyres to Asian hornet arriving in a pottery on a boat, etc.);
- trade in live goods (such as firewood or productive livestock) may increase the area of distribution of pathogens, commensals and associated parasites.

1.3. Activities that intentionally introduce certain invasive species

This concerns new crops or new auxiliaries: examples are the introduction of Crassostrea gigas at the beginning of the 1970s for the revival of shellfish farming and the introduction of the Japanese clam, which were intended to commercially develop the invasive character of these species (see the socio-economic impact in section 3 below). There were also fruitless attempts at breeding such as the coypu (*Myocastor coypus*), introduced in the nineteenth century for its fur and which is proliferating in wet zones, undermining river banks and dykes.

[1] Cohen A. N. and Carlton J. T. (1998), "Accelerating invasion rate in a highly invaded estuary", Science, vol. 279, n° 5350, p. 555-558.

Biological pest control was the origin of several intentional introductions. For example, to fight against invasion by the giant bramble (Rubus alceifolius), which was covering and smothering the indigenous vegetation, the French research centre for international cooperation in agronomic research for development (CIRAD) introduced the blue fly (the sawfly Cibdela janthina) at the beginning of 2008 after ecological, biological and genetic studies verified that the sawfly larvae fed only on the giant bramble. However, it has since turned out that adult sawflys have been observed on strawberry plants causing defoliation. This is why the Academy of Sciences refused the introduction of an animal that grazes on Caulerpa into the Mediterranean, as the associated risks were potentially high in a site considered as a hotspot of biodiversity. Nevertheless, this method has the advantage of substituting for pesticides.

The intentional import of exotic pets has also been the cause of biological invasions. Gergominy et al. (1998) describe the change, over time, of the reasons for introductions, giving the example of vertebrates in New Caledonia and showing the sudden growth, from the 1950s, of the "leisure" argument. This is the case of red-eared slider terrapins, pet squirrels and other fancy rodents, which are prolific and are sold according to passing fashions (such as following the "Ratatouille" movie) and released in urban environments.

1.4. The introduction of invasive species through negligence or ignorance

The release of individuals, such as red-eared slider terrapins, in the natural environment by citizens.

More specific to French overseas territories, a common cause of invasion is the return to the wild state of domestic animals such as cats and dogs. These are known as feral species (feral cats). This is also the case for the return to the wild of domesticated plant taxons which acquire, when they escape, dominant genes through mutation and wild crossbreeding and selection (feral taxons).

1.5. Activities causing a change of habitat allowing the proliferation of potentially invasive species

The disruption, transformation and degradation of habitats through the creation of empty or unbalanced spaces that are rich in resources, create opportunities for opportunistic species, including indigenous ones, that are capable of multiplying rapidly with a great ability to disperse. This explains the striking success of ragweed in the Rhône Valley and the presence of higher alien species after eradication of Himalayan balsam.

The transformation of habitats, by compromising local adaptations, is a major cause. Faced with these new conditions, local and alien species find themselves on an equal footing in terms of adaptation. Eutrophication favours the water hyacinth, the water primrose and the zebra mussel that was introduced by ships to North America. Certain agricultural practices that denude or disintegrate soils damage habitats, which contributes to the movement of species and may have facilitating effects on the establishment and proliferation of invasive alien species. For example, clear-cutting forests facilitates the proliferation of the American black cherry (Prunus serotina); the high availability of nitrates in Bretagne coastal environments, resulting from agricultural run-off, has an effect that facilitates the proliferation of alien molluscs such as the crepidula (*Crepidula fornicata*), which monopolises the space and resources of sandy shallows that are the habitat of scallops.

Transport infrastructure represents both a host environment and a means of dispersion for introduced species. Furthermore, it favours the movement of species (rodents along roads

and bypasses, fish, molluscs and other aquatic organisms along canals, etc.). It is therefore indirectly responsible for extending the range of numerous species. For example, several aquatic invertebrate species from Eastern Europe have taken advantage of the river connection between the Danube and Rhine basins to colonise French waterways (43 species of alien invertebrates have been reported in French waterways since the middle of the nineteenth century). This is also the case of the Chinese mitten crab (*Eriocheir sinensis*).

The creation, for environmental purposes, of ecological corridors can also contribute to the movement of invasive alien species. Quality engineering must therefore govern their implementation and continuity alone is not a guarantee of ecological quality. For example, the red-bellied squirrel seems to have left Antibes by going under the motorway via passages for fauna (which were established for ecological purposes). In fact, it is the very principle of ecological continuity that functions both for normal biodiversity and for exposure to species (and/or associated pathogens) with invasive and rapid-migration potential. But, on the other hand, certain exogenous species may progress via degraded or transformed environments. In this case, meeting healthy and preserved ecosystems may constitute a barrier to their progress.

Also, certain indigenous species may become invasive (wild boar) due to the disruption of the ecosystem and disrupt the balance between agriculture, forestry, biology and hunting: for example, drop in predators, excessive food supply or releases into the wild.

Lastly, alien species may be accompanied by a loss of biodiversity, but they may often be the symptom of this degradation rather than the cause. In other words, an effective way of limiting invasions would be to limit disruptions to habitats to favour their resilience.

Some of these activities are encouraged by public subsidies.

2 • Identified public subsidies

Public subsidies in favour of certain activities have the effect of facilitating the introduction and dissemination of species with invasive potential, or weakening the environment that allows the establishment and proliferation of invasive alien species.

Generally, there seem to be few cases of direct subsidies to the introduction or dissemination of invasive alien species, such as state incentives to growing or breeding certain species. These subsidies are mainly indirect, resulting largely from public inaction in the fight against invasive alien species at the regulatory level and by not internalising negative external costs.

Many bottlenecks still hinder effective governance of invasive alien species. In particular:

- difficulties in defining and implementing effective regulation through lack of knowledge of the species concerned and the lack of dedicated means of monitoring;
- the reticence of politicians to intervene due to socio-economic issues;
- difficulties in correctly assessing the issues involved in managing invasive alien species and the necessary funding;
- the differential between short-term benefit and long-term cost.

Furthermore, the eradication of invasive alien species also requires action at the supranational level.

2.1. Direct subsidies

Public subsidies may be paid by the European Union, the state or local authorities to support certain activities, sometimes taking into account their impact on biodiversity but not necessarily the risk of introducing IAS.

In the transport field

Transport activities, as well as road, port and airport infrastructure, are highly subsidised by the state and regional authorities.

Public subsidies to the construction of transport infrastructure, urban development or intensive agriculture that disrupts habitats indirectly contribute to the establishment and dissemination of IAS.

In the field of fishing and agriculture

Certain approved crops are subsidised even though they could be considered as invasive: certain alien conifers (Sitka spruce – Picea sitchensis Bong. Carr. – has suffered from an aphid, *Elatobium (Aphis) abietinum*), invasive plants for biofuel (*Miscanthus giganteus* for which the tissue of the rhizomes and roots of cultivated miscanthus is dense and seems difficult to quickly or easily destroy).

Furthermore, subsidies are paid for research into selection of varieties and the dissemination of imported plants with invasive potential, for example for plants supporting the production of biomass and agrofuel. The Global Invasive Species Programme (GISP) has listed all varieties currently used for the production of agrofuel, or for which usage is envisaged, and has categorised them according to the risk that they present as potential invasive alien species (they grow quickly and reproduce easily). The giant reed (*Arundo donax*), for example, is a plant that may be used to produce agrofuel, originating in Asia minor. It is already considered invasive in parts of North and Central America. It is naturally flammable and increases the risk of fires. In South Africa, it is considered a real pest due to its water consumption of about 2 cubic metres per plant for each metre of growth, which competes with the water requirements of the country's population[1]. What is more, if the tax exemptions for agrofuel and the use of biomass are continued whether or not the supporting plants have a potentially invasive character, this will be a case study in the non-inclusion of the impact on biodiversity.

Subsidies for shellfish farming that aim to counteract the recent mortality in oysters were paid without any prior impact study: notably the massive use of hatchery oyster spats related to the possible introduction of new resistant stock (triploid oyster spats with restricted origins) was done without any study of the impact, using public funds, dictated by the "economic urgency".

The activities of fishing associations are subsidised even though they may cause a risk of invasion (invasion of certain fish baits, uniform fish stocking of various bodies of water, including Alpine lakes to the detriment of endogenous invertebrate fauna) or cause problems of intra-specific biodiversity. Work is going on to bring together the associations

[1] The report published by the GISP, Biofuel Crops and Non Native Species: Mitigating the risks of invasion, calls upon countries to assess the risks before planting new seeds. It urges governments to use species with low levels of risk and to establish appropriate procedures for controlling the risks related to invasive alien species.

and scientists on the inclusion of inter and intra-specific biodiversity in fish stocking policies. Controversies also exist even within associations on the scope for restoring the natural state of environments in relation to the management of fish populations.

2.2. Tax spending

Tax spending (exemptions or reduced rates) are granted in support to certain activities.

Tax exemptions

Long-distance transport benefits from various tax advantages (for example: exemptions, reduced rates of domestic consumption tax or VAT) which has the effect of significantly underpricing them in relation to the environmental externalities that they cause (see chapter 5).

Indirectly, tax spending in favour of road infrastructure and ports (see chapter 3) contribute to habitat degradation and consequently the establishment and proliferation of IAS

Tax spending applied to woods and forests (temporary or partial exemptions from land tax, transfer taxes or wealth tax) sometimes apply no matter what the species planted, which may encourage the growing of invasive alien species (see the "Degradation of habitats" chapter)

Reduced VAT rates

Ornamental plants, whether indigenous or not, are covered by a reduced VAT rate of 5.5% in the same way as for plants intended for food or reforestation. In application of sub-paragraph 3 of article 278 a of the general tax code, the reduced rate of 5.5% applies to products of horticulture that have undergone no processing, meaning products in the state in which they are generally obtained at the agricultural stage (whether these products are grown in France or not):

- fresh or dried flowers, sold with or without foliage;
- living plants;
- turf;
- ornamental horticultural plants (trees and shrubs), as well as plants used for market-gardening and fruit trees. Aquarium plants (many of which are alien), which have undergone no processing, should also be able to benefit from the reduced rate of VAT.

Reduced-rate VAT is charged on entry fees for zoos (whichever animal species are presented, for example tropical butterflies, providing that the presence of the animals is the main attraction of these parks) and botanical gardens (general tax code, article 279 b, sub-paragraph B).

Botanical gardens, whether they contain indigenous species or not, are not subject to VAT:

- when they are operated by a legal entity under public law (CGI art. 256 B) or by a non-profit-making organisation able to benefit from the exemption specified by article 261, 7-1 of the general tax code;
- when no entry fee is charged.

However, this tax spending also has positive effects because it facilitates research and discoveries in nature and science, as well as the educational role of these institutions.

2.3. Non-internalisation

Certain economic activities that indirectly cause the introduction of invasive alien species due to the way in which they are organised, but which do not internalise this, are consequently under-priced. This is the case with maritime, air and land transport, tourism and the construction of transport infrastructure.

Furthermore, the socio-economic assessment of the impact study on transport infrastructure does not take into account their effect on the dissemination of invasive alien species.

Also, differentiated customs duties cause imbalance in trade flows in favour of products that are potentially the most invasive. This is because customs duties tend to increase with the degree of processing of products. Yet the probability of introducing alien species reduces with the degree of processing (wood, food products, etc.). In 2003, economists studied the case of a country that protected its agriculture by high customs duties. A drop in these duties on agricultural goods resulted in an increase in its imports, and therefore the probability of introducing species that are harmful to these crops (Costello and McAusland, 2003)[1].

2.4. An insufficient regulatory framework?

Insufficient international monitoring?

Generally, international conventions on nature protection, prior to the awareness of the dangers of IAS for the environment, did not specify monitoring measures concerning IAS.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) which came into force on 1 July 1975, controls and regulates international trade in specimens of the species recorded in its appendices. All imports, exports, re-exports (exports of imported specimens) or introduction of specimens of the species covered by the Convention must be authorised by a licensing system. Even though this is not its main objective, it could be adapted so that its control activities contribute to co-ordinated monitoring of alien species that are potentially invasive. Indeed, the illegal trafficking of animal or vegetable species may be the cause of biological invasion.

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), also known as the Bonn Convention, which came into force on 1 November 1983, is intended to conserve migratory species and their habitats by strict protection of the migratory species in danger listed in Appendix I of the Convention, by concluding multilateral agreements for the conservation and management of migratory species listed in Appendix II; and by undertaking research and co-ordinated monitoring activities and exchanging information between the parties. More precisely, the CMS states in its article III that: "*Parties that are Range States of a migratory species listed in Appendix I shall endeavour […] c) to the extent feasible and appropriate, to prevent, reduce or control factors that are*

[1] Costello C. and McAusland C. (2003), "Protectionism, trade and measures of damage from exotic species introductions", American Journal of Agricultural Economics, vol. 85, p. 964-975, used by Gozlan E. and Thomas A. (2009), "Une espèce invasive, combien ça coûte" (An invasive species, what does it cost?), in "Pour la science", dossier n° 65, October-December, p. 102-107.

endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species".

Organisations[1] that could perform monitoring do exist, but they seem poorly adapted to cope with the extent of trade and they lack the resources for performing the necessary checks.

Concerning ballast water, an international convention on the management of ballast water and sediment from ships should oblige ships to treat their water before discharging ballast (from 2011, probably). The International Convention for the Control and Management of Ships' Ballast Water and Sediments was proposed in 2004 by the International Maritime Organisation (IMO) concerning the procedures for renewing ballast and for standardisation/approval of equipment for ballast treatment. It was planned to come into force after ratification by at least 30 states, which should represent 35% of world gross tonnage. However, six years later at the beginning of 2010, only 22 countries (which transported 22.65% of world maritime freight tonnage) had ratified it. France ratified it in 2008. At its 60th meeting of 22 to 27 March 2010, the IMO voted a resolution calling upon states to ratify this convention and quickly established systems for managing ballast water for all ships, in accordance with the application dates contained in the convention (between 2009 and 2016 depending on the size and age of the ship). According to the terms of this convention, the party states undertake to prevent, reduce and eliminate the transport of harmful and pathogenic aquatic organisms by ships through inspection and measures to manage ballast water and sediment. The convention specifies two restrictive rules:

- initially, ships will be obliged to renew at least 95% of their ballast water in the open ocean;
- subsequently, ships must have a system for managing ballast water by treatment in order to be able to ensure compliance with a maximum content of living microorganisms.

Ships built before 2009 must comply with the first rule until 2014 or 2016, according to the volume of their ballast. From these dates, they must comply with the second rule. Ships built between 2009 and 2012 must immediately comply with the second rule, with the exception of those for which the volume of ballast is greater than 5,000 tonnes, which are not required to apply it before 2012. All ships built from 2012 must comply with the second rule as soon as they are built. Nevertheless, emptying the tanks after treatment still brings organic matter into the receiving environment and cannot eliminate the risk of biological invasion.

While waiting for the actual implementation of these measures, the external costs caused by ballast water for biodiversity are not internalised.

Air transport is also a vector for introducing invasive alien species, which travel either in the cabin or the hold and benefit from the speed of the journey to reach their destinations alive. This factor is increasing with the development of long-distance flights since the gradual deregulation of the airline sector (in the 1980s), which caused prices for air transport to drop and subsequently made long-distance passenger travel and the increased use of air freight much more commonplace.

Furthermore, these biological invasions are facilitated and made worse by climatic change. It allows the survival of species that find climatic conditions less of a contrast to their

[1] In France there are "border introduction points" (French acronym: *PIF - Points d'introduction frontaliers*) where the veterinary services, with the customs, check and validate or refuse introductions.

original environment than they were previously. The chrysomelid has reappeared near to European airports.

The scant attention paid to the subject by European Community policies

Trade is an exclusive competence of the European Community and as soon as goods are put on the community market, they can be moved freely. Questions related to trade can only be effectively settled at the external borders of the European Community. Because of the single market, an invasive species introduced to the territory of a Member State, as traded goods or conveyed by traded goods, can propagate (commercially) quickly throughout the European Union. Only a European Community policy can effectively fight invasive alien species. Yet, within the European Union:

- there is no mechanism to promote a harmonious or coherent approach by neighbouring countries or countries in the same sub-region (other than for certain activities[1]);
- there is no formal requirement to always conduct a risk analysis when intentionally introducing non-indigenous species which may have an impact on biological diversity;
- accidental or negligent introductions still largely escape regulation, both at the national and community levels;
- there is no single system for monitoring and containing invasive alien species and their impact on European biodiversity[2].

This situation is rather surprising. Indeed, the European Commission has been at the forefront of the principle of including the environment in public policies, for several decades. In this case, the principle seems to be rather late in being applied.

The European strategy: a policy to combat invasive alien species, is in the process of being prepared at the community level.

On 3 December 2008, the European Commission adopted a document entitled "*Towards a European Union strategy on invasive species*" (COM (2008)789 final) suggesting several options for a community strategy, likely to include regulatory provisions, to promote the harmonisation and coherence of the fight against these species and their negative effects. Existing community legislation partially covers various aspects of invasive alien species and the Commission considers that it is difficult to ensure its co-ordinated and consistent

[1] Regulation (CE) n° 535/2008 from the Commission dated 13 June 2008 giving the procedures for the application of regulation (CE) n° 708/2007 of the Council relative to the use, in aquaculture, of alien species and species that are locally absent, specifies that "*Member States shall establish and keep up to date an information system containing details of all requests for permits to introduce an alien species or to translocate a locally absent species. For each request for a permit, the Member States shall fill in an information sheet setting out the data indicated in the Annex to this Regulation and in accordance with the format set out therein*". The Council directive 2006/88/EC of 24 October 2006 on animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals, sets public-health control rules at the community level governing this sector and specifies traceability measures to promote the prevention of animal diseases and to fight these diseases.

[2] Regulation (CE) n° 708/2007 from the Council meeting of 11 June 2007 relative to the use, in aquaculture, of alien species and locally-absent species states that transfers of alien and locally-absent species are subject to a license delivered by the competent national authority, possibly preceded by a quarantine measure, or in some cases, an assessment of the environmental risks. When the environmental impact, potential or actual, of a species transfer is likely to affect neighbouring Member States, they must refer the authorisation decision taken by the Commission to the Council, which may take a different decision.

application between the different Member States. Also, four strategic options are proposed by the Commission to deal with this difficulty:

- A) The status quo;
- B) Optimisation of the use of existing legal instruments combined with voluntary measures: the implementation of risk assessments is proposed using existing institutions and procedures, such as the European Aviation Safety Agency (EASA). The Member States would spontaneously incorporate questions about invasive alien species in their border control procedures;
- B+) Adaptation of the existing legislation: this is a variant of option B, which also specifies modification of the existing phytosanitary and veterinary legislation to cover a "*broader range of potentially invasive organisms, and extends the list of species constituting an ecological threat whose import and internal movements are prohibited by the CITES regulations*". This approach, like option B, does not require any new legislative texts but can improve the legal security of existing elements and plug several gaps. We must consider that this approach based on prohibition eliminates the question of internalising risks for the trade in at-risk species. There would remain only the risks related to activities involving imports likely to be accompanied by invasions (parasites, for example in wood);
- C) Specific and complete community legal instrument: this instrument must specify independent procedures for assessment and intervention, taking account of existing legislation. A specialised agency may be put in charge of implementing the technical aspects of this new legislation. The Member States and outermost regions would be obliged to make checks at the borders covering invasive alien species and exchange information on the subject of these species. Mandatory procedures for monitoring and communication, and efficient rapid-reaction mechanisms, must also be envisaged.

From the Commission's point of view, this option seems to be the most effective, providing greater legal and technical efficiency. Nevertheless, it is the most costly from an administrative point of view for the Member States and in direct costs for economic players. Apparently, the Commission has not ruled out mixing between options (particularly the options B+ and C); on the other hand, it stresses that a new and consistent regulatory approach would be likely to simplify the matter.

The working group could encourage the position of France in supporting option C. The committee of regions, in its opinion on "*a new impetus for halting biodiversity loss*" (80th plenary session on 17 and 18 June 2009; DEVE-IV-039) is very pleased that the Commission is paying great attention to the problem of alien species that have become invasive, which are a serious problem for local biological diversity. In this respect, it reiterates its recommendation concerning the urgency of dealing with invasive alien species (committee of regions 159/2006 final) through a proactive and clear strategy involving local and regional authorities and considers it essential that an ad hoc directive be established, given the lack of appropriate regulatory provisions at the European scale for controlling the introduction of alien animal and vegetable species and the uneven provisions and national measures that are significantly handicapping the effectiveness of strategies to fight these species. Furthermore, it recommends the urgent establishment of strict import-control measures, at least voluntarily, covering non-indigenous species on the European territory.

The conclusions of the Council of the European Union meeting of 25 June 2009 prompted the commission to focus on a combination of options B+ and C.

The commission now wishes to establish a strategy by 2012. For this, it set up three working groups in autumn 2010, each in charge of dealing with a topic:

- prevention;
- early detection and rapid eradication;
- management of established species and the restoration of ecosystems.

Directive 85/337/CEE from the Council meeting of 27 June 1985 concerning the assessment of the impact of certain public and private projects on the environment does not specify, as part of the monitoring of the environmental effects of projects, the risks of dissemination of invasive alien species (see chapter 3).

Directive 2004/35/CE from the European Parliament and Council meeting of 21 April 2004 on environmental liability concerning the prevention and reparation of environmental harm, transposed by law n° 2008-757 dated 1 August 2008 relative to environmental responsibility and various provisions for adaptation to community law in the field of the environment, does not seem to be able to be applied to cases of activities causing the introduction of invasive alien species. This is because the professional activities concerned by the introduction and dissemination of these species (garden centres, transports, etc.,) are not those listed in Annex III of the directive (at-risk industries). As a result, it is the second liability regime, meaning the regime covering liability for misconduct, that must be invoked when harm, or imminent threat of harm, is caused to natural species and habitats protected by community legislation. In this case, the liability of the professional will only be implemented if they have committed misconduct or have been negligent. Applied to invasive alien species, this liability could be implicated in case of non-compliance with the regulations on invasive alien species, such as introducing a prohibited species into the natural environment. On the other hand, this liability seems more difficult to establish for activities that have a diffuse effect (such as transport).

Shortcomings in the national regulatory framework?

Determined by community regulations for the single market, the regulations on imports to the national territory are essentially limited to phytosanitary and animal health measures prepared by the European Commission and implemented by the ministry of agriculture (articles L. 251-4, L. 251-6, L. 251-12, L. 251-18, L. 251-20 of the rural code). The checks cover mainly the absence of pests (on plants) and diseases and are applied in accordance with the phytosanitary and animal health standards in force. The French overseas departments, which are outermost European regions, are concerned by this regulatory framework. This is not the case for other French overseas territories. In matters of aquaculture, Regulation (CE) n° 708/2007 from the Council meeting on 11 June 2007 relative to the use, in aquaculture, of alien species and locally-absent species states that transfers of species are subject to a license delivered by the competent authority, possibly preceded by a quarantine measure, or in some cases, an assessment of the environmental risks.

Article L. 411-3 of the environment code sets the general rules relative to the introduction of non-indigenous species to natural environments. This article, in its original form (1995) included a general regime prohibiting the introduction of non-indigenous species to the natural environment. In 2005, the law on the development of rural territories broadened its field of application to allow the prohibition of trade and transport in non-indigenous species and also made changes by establishing a system of lists of species prohibited from introduction into the natural environment[1]. The implementing decree dated 4 January 2007

[1] This system of lists puts an end to disputes between experts about deciding whether or not a species is indigenous or exogenous, which caused a problem for the application of article L. 411-3 of the environment code in its original form.

provided for the preparation of interministerial decrees fixing the lists of species for which (a) the introduction into the natural environment and (b) marketing are prohibited. Concerning animal species, only the decree dated 30 July 2010 prohibiting the introduction, into the natural environment in mainland France, of certain vertebrate animal species has currently been issued. Concerning plant species, a comprehensive decree is in the process of being written and, while waiting, the decree dated 2 May 2007 prohibiting the marketing, use and introduction into the natural environment of *Ludwigia grandiflora and Ludwigia peploides*, and prohibiting the introduction of plant species, is applicable.

A decree dated 30 July 2010 modifying the decree dated 10 August 2004 fixing the conditions for authorising the possession of animals of certain non-domestic species in establishments for breeding, sale, hire, transit or establishments for presenting animals of non-domestic species to the public, and the decree dated 10 August 2004 fixing the general rules for the functioning of establishments for breeding fancy breeds of animals of non-domestic species, also supplemented the provisions on captive wild fauna, for defining the conditions for possessing and selling certain species of vertebrates.

Furthermore, article L. 432-10 of the environment code prohibits the introduction, into the waters concerned, of species likely to cause biological imbalance, the list of which was fixed by decree.

Finally, there are the sectoral regulations that do not result from an overall approach:

- the transfers of shellfish stocks are based on the sanitary and animal-health component;
- only the sanitary component (thresholds for limiting transfers and marketing) does not allow limitation of the transfer of alien or toxic stock (e.g., phytotoxic).

This transversal aspect is missing.

The national strategy: without waiting for changes to the European framework, a national strategy for fighting alien invasive species with a negative impact on biodiversity has been implemented in accordance with article 23 of the Act n° 2009-967 of 3 August 2009 (Loi Grenelle).

This includes:

- setting up a monitoring network to allow action immediately upon detection of the arrival of a new species or the expansion of the area of presence of a species that is already established;
- improving the means of preventing the introduction of invasive alien species by extending the current list of species of water primrose that are currently regulated in application of article L. 411-3 of the environmental code to other invasive alien species. This list, which is in the process of preparation, must be subject to an accurate risk analysis over the entire national territory, based on scientific evaluations;
- the establishment of national plans to combat invasive alien species that are both present on the territory and that provide the greatest cause for concern. These species are identified based on work to put the species concerned in order of priority according to the reasons for taking action.

  Two national plans began to be written in 2009 and this should continue in 2010 with four new action plans being written;

- a communication component, which must also raise awareness amongst the public concerning the proper actions to take and the ecological consequences of some of their actions.

Specific provisions are applicable to overseas territories (insular environments, high rates of species endemism, etc.).

To implement this strategy, the ministry responsible for the environment sought the advice of a network of experts (national natural history museum, national federation of national botanical conservatories, national hunting and wild fauna commission, etc.).

3 • An attempt to quantify the effects for the best known cases

Socio-economic effects

The economic effects include:

- the harmful effects of IAS on agricultural and fish farming yields (loss of crops, cattle diseases,… for example, Bonamia on flat oysters);
- the cost of repairing infrastructure (damage to conduits and electrical installations);
- the increase in the costs of control (weeds, predators,…);
- the cost of restoring natural environments;
- the effects of pathogens introduced on wild species and the impact on the health of humans;
- more difficult to estimate: the effects on services provided by ecosystems;
- significant additional costs could include changes to the use of certain invaded habitats and less opportunity for the direct or indirect commercial development of resources (for example, by the pharmaceutical industry). For example, tourism on the American great lakes (10 billion dollars in turnover, two hundred and fifty thousand jobs) is threatened by the proliferation of harmful species introduced (zebra mussels, viral haemorrhagic septicaemia and soon the Asian carp), without mentioning the professional fishing sector.

The coypu (*Myocastor coypus*), which originates from South America, is a perfect illustration of how a single alien species can have numerous effects: damage to crops, reduction through aquatic plant consumption of the areas of reed beds used by various aquatic birds for their reproduction and by freshwater fish as spawning grounds; damage to the banks of watercourses, acceleration of the silting of river beds and disruption of the hydrological regime[1].

The costs and benefits depend strongly on the character of the ecosystems in question. Thus, the zebra mussel is currently causing a high cost because it invades pipes in towns at the edges of the American great lakes, as well as the port infrastructure, and increases the maintenance of boats in Ireland. Nevertheless, it also has the benefit of partially removing the excess phosphates in the great lakes, which is a major ecological problem. This benefit is not quantified, but it could exceed the former costs[2].

[1] Bertolino S. and Genovesi P. (2007), "Aquatic alien mammals introduced into Italy: impacts and control strategies", in Gherardi F. (ed.), Biological invaders in inland waters: Profiles, distribution and threats, Springer.

[2] Providing that the reduction of bird populations on sources of food (benthos/clams) in the Great Lakes is taken into account in assessing the loss of biodiversity.

Another example was the introduction of the cupped oyster (*Crassostrea gigas*) at the beginning of the 1970s to replace *Crassostrea angulata* which had disappeared. The case of Crassotrea gigas is interesting because its introduction was economically beneficial to the shellfish farming sector, but by becoming an invasive species, it generated high social costs which are difficult to evaluate (risks of accident for recreational sailors, competition with other species used in shellfish farming, cleaning ports and beaches).

Lastly, the proliferation of macrophyte algae ("green tides"), which is the result of human and natural factors, caused a cost of 10 million euros between 2002 and 2006 according to the centre for the study and recycling of algae.

Within a policy of non-eradication, it would therefore be necessary to quantify all the advantages and disadvantages of the establishment of alien species.

Indeed, these invasive alien species are also sometimes beneficial to the extent that many IAS introduced during past centuries were introduced voluntarily for use in agriculture or aquaculture (almost all aquaculture is based on alien species, other than mussels and sea bass), or for horticultural or recreational purposes, and they sometimes continue to generate significant benefits. In this respect, some invasive species may be considered as having a positive impact for certain categories of users. This is the case of the common guava in Reunion Island, which, when crops are increased, as desired by some and helped by European subsidies, will inevitably increase its invasion of the natural environment, or the introduction of the Japanese clam (*Ruditapes philippinarum*) for aquaculture, which has become invasive but does not seem to have caused any economic costs for the moment. Indeed, this positive impact can only be temporary and may become negative if these species become out of control (with the costs that this causes).

As another example, as it considered that the invasion of crayfish introduced to mainland France, including the American crayfish *Orconectes limosus*, the Pacific spiny lobster *Pacifastacus leniusculus* and the Louisiana red swamp crayfish Procambarus clarkii was inevitable, the legislator authorised the live transport of these species so that they could be exploited commercially (2006 law on water and aquatic environments). The benefit of this measure remains to be demonstrated, both from an economic and ecological point of view. It should be noted that the ordinance dated 21 July 1983 relative to the protection of indigenous crayfish and preventing live imports of the Louisiana red swamp crayfish has not been revealed, which creates a legal uncertainty concerning this species.

Lastly, we may mention the prospects for marketing the crepidula, a gastropod mollusc that has invaded oyster beds, for food purposes.

The economic impact of invasive alien species has thus been evaluated:

In 1993, a first estimate of the harm caused in the United States by 79 invasive alien species showed 97 billion dollars of loss in 85 years. A subsequent study in 2003, covering ten times as many species, resulted in a value of 137 billion dollars per year. For the North American great lakes basin, Pimentel evaluated the economic and environmental loss at about 5.7 billion dollars per year (Pimentel, 2005), and at the scale of the United States, a total annual amount of loss stood at 120 billion dollars (Pimentel et al., 2005).

In Europe, a first estimate situated their annual costs at between 9.6 and 12.7 billion euros per year[1]. Nevertheless, this evaluation is considered an underestimate, because these figures are based on the combined current expenditure for operations to manage invasive alien species and the cost of the economic impact of these species, but the economic evaluations available in this field concern only some Member States. The real costs are therefore probably much higher.

However, several estimates are available in France. For example:

- the economic impact of the proliferation of crepidula in the Brest harbour on the production of scallops has been evaluated at 28 million euros, resulting mainly from the reduction in the areas that can be exploited, while the total value of the fishery, before the invasive process, was estimated at 30 million euros, which results in a value of the fishery equivalent to 2 million euros. To fight the negative consequences of the proliferation of crepidula for shellfish fishing in the Brest harbour, a programme was drawn up in 2001 combining an operation to remove crepidula with the dredged zones being seeded with juvenile scallops. An economic evaluation of the project showed a positive social yield. This modelling is nevertheless approximate because the assumptions used for the calculations were not able to take into account all of the complexity of the situation in question and the environmental uncertainties. This project to eliminate crepidula is nevertheless controversial for the Brest harbour;
- in shellfish farming, Bonamia on flat oysters caused significant losses, estimated overall at 1.6 billion francs in 1984 in turnover and 1.3 billion francs in value added (which is much higher than disasters such as Amoco Cadiz – see the note from Meuriot and Grizel, 1984). This damage accumulates over time (the situation has not returned to normal thirty years later) and also from a spatial point of view, because almost all European flat oyster production is now affected and has collapsed;
- on the Reunion Island, the eradication of a hectare of Kahili Ginger (*Hedychium gardnerianum*) was estimated at about 24,000 euros. Policies based on biological control can reduce the cost of eradication, sometimes significantly. Such is the case for South Africa as part of its programme to combat biological invasions, which used two means of control until the beginning of the 2000s: 1) biological control as an effective substitute for biochemical methods (herbicides)[2], and 2) mechanical eradication, which is very labour intensive. This arrangement allowed a large number of the unemployed in disadvantaged rural zones to work on eradication in the regions close to their homes. The benefits were apparently significant for the local economies (development of retail trade and subcontracting) and acted as a form of redistribution from the more prosperous categories of the population towards the most disadvantaged. Indeed, the funds collected to finance this program, known as "Working for Water" were used, in reality, for other social and educational programmes. The motivation for such diversion was based on the idea of the double inverted dividend: the funds intended for social programmes may be used to provide work to the unemployed in restoring the environment[3];
- in New Caledonia, the little fire ant (*Wasmannia auropunctata*) affects a large number of economic sectors (market gardening, fruit production, stock breeding, etc.,)

[1] Kettunen et al. (2008), Technical support to EU strategy on invasive species (IS) – Assessment of the effects of IS in Europe and the EU, Final Module Report for the European Commission, Brussels, Institute for European Environmental Policy (IEEP), 40 p. + Appendices.

[2] Caution: biological pest control is not always effective. We should remain prudent concerning the consequences, in terms of biological invasion, of this biological pest control (example of the giant bramble on Reunion Island).

[3] Thomas A., Gozlan E. and Loope L. (2006), Les espèces envahissantes dans l'archipel néo- calédonien – Question 5 (Invasive species in the New Caledonia archipelago– Question 5), © IRD.

by causing damage to plants and fruit due to its association with cochineal insects or aphids, or by making harvesting unpleasant due to bites.

A recent study began to estimate the impact of invasive alien species on the various services provided by the ecosystems in Europe[1]. Out of 11,000 invasive alien species catalogued by the DAISIE study (Delivering alien invasive species inventories for Europe), 11% had an ecological impact and 13% had an economic impact. A total of 15% of invasive alien species are harmful. The Canada goose, the zebra mussel, the Sika deer, the brook trout and the Louisiana red swamp crayfish are amongst those that cause the most harm to services provided by the ecosystems (regulation, supply, cultural,…). The records for annual economic costs are held by a toxic single-cell algae (*Chrysochromulina polylepis*) in Norway (8.2 million euros), the water hyacinth in Spain (3.4 million euros) and the coypu in Italy (2.8 million euros).

Invasive alien species
having caused the greatest costs in Europe

Species		Country	Measures	Funding objective	Period	Cost (€M/yr)
Carpobrotus spp	Terrestrial plant	Spain	Location	Control/eradication	2002-2007	0.58
Anoplophora chinensis	Terrestrial invertebrate	Italy	Country	Control	2004-2008	0.53
Cervus nippon	Terrestrial vertebrate	Scotland	Location	Control		0.82
Myocastor coypus	Terrestrial vertebrate	Italy	Location	Control/damage	1995-2000	2.85
Sciurus carolinensis	Terrestrial vertebrate	GB	Country	Control	1994-1995	0.46
Azolla filiculoides	Fresh water plant	Spain	Protected area	Control/eradication	2003	1.00
Eichhornia crassipes	Fresh water plant	Spain	Hydrographic basin	Control/eradication	2005-2007	3.35
Oxyura jamaicensis	Freshwater vertebrate	GB	Country	Eradication	2007-2010	0.75
Chrysochromulina polylepis	Marine algae	Norway	Country	Toxic blooms		8.18
Rhopilema nomadica	Marine invertebrate	Israel	Coastal	Harm to infrastructure	2001	0.04

Source: Vilà et al. (2010). How well do we understand the impacts of alien species on ecosystem services? A pan-European cross-taxa assessment, Frontiers in Ecology and the Environment, 8(3), p. 135-144

This study shows that in Europe, most of the expenses caused by invasive alien species relate to the costs of management, including eradication, control and monitoring, and environmental education programmes targeting outstanding natural zones benefiting from specific funding. For example, out of 100 LIFE programmes intended to eradicate invasive alien species, the expenditure totalled more than 27 million euros. By extrapolation from the sales of herbicides, Williamson (2002) estimated that the cost of chemical control for 30 invasive alien species in the United Kingdom could be greater than 150 million euros per year.

The costs of prevention are certainly lower than the costs of eradication and management when the species are established, as well as restoration costs.

[1] Vilà et al. (2010), How well do we understand the impacts of alien species on ecosystem services? A pan-European cross-taxa assessment. Frontiers in Ecology and the Environment, 8(3), p. 135-144.

The costs caused by invasive species and their control are indisputably high, but the perception of who actually bears them is sometimes not clear:

- the environmental costs and costs of restoration are borne by society, but more specifically by local communities and various people who frequent the ecosystems in question;
- the harm to crops and illnesses in cattle are borne directly by farmers, who generally also pay for the necessary health and pesticide treatments;
- sharing the costs of preventive measures (inspection and quarantine) varies from one country to another. In the United States, out of a budget of 590 million dollars devoted to these measures in 2000, 141 million came from taxes raised from users (importers, carriers, charter companies and travellers), and the rest came from public funds voted by Congress and were therefore paid by taxpayers (Mumford, 2002). A recent assessment of the French inspection system by the European Union emphasised that users are not charged for the phytosanitary analysis of samples in ports and airports;
- the cost of "market effects" of regulations (health standards, quarantine, etc.,) is more difficult to establish. As a first approach, foreign producers bear the cost of compliance with local import standards: Mumford (2002) estimates, for example, that the regulation imposing the often-mandatory treatment of wooden pallets (by heat or by methyl bromide) costs between 3 and 27 dollars per pallet, and their replacement by plastic pallets is even more costly (60 dollars for a plastic pallet against 9 for a wooden one). But part of these costs is probably passed on in prices, in such a way that the surplus of domestic consumers is also reduced. Concerning quarantine measures, they are clearly beneficial to domestic producers as they are preserved from competition from foreign imports, while domestic consumers bear the cost of these higher prices in the domestic market[1]. This de facto preference for local production is therefore a first-level restraint on invasions related to imports. Nevertheless, for industrial products, the risks of importing invasive alien species have proved to reduce with the degree of industrial processing of the imported products. Therefore, if domestic production, which is favoured, increases imports of at-risk raw materials, the mechanism could be counter-productive, all the more so as rates of VAT or customs duties increase with the degree of processing of imported products.

[1] Thomas A., Gozlan E. and Loope L. (2006), op. cit.

Appendices

Appendix 1

Referral letter

MINISTÈRE DE L'ECOLOGIE, DE L'ENERGIE,
U DÉVELOPPEMENT DURABLE ET DE LA MER
DES TECHNOLOGIES VERTES ET DES NÉGOCIATIONS SUR

La Secrétaire d'État
chargée de l'Écologie

Reference • 010014304

Dear Madam Minister,

The evolution of subsidies having an impact on the environment is currently a most important issue, both at the international and national level.

Internationally, the OECD has formulated a series of recommendations on environmental tax policy and, under the recent impetus of the G20, joint work on subsidies to fossil fuels has been carried out by the OECD, the World Bank and the International Energy Agency (IEA)..

At the national level, this issue was actually addressed for the first time as part of the general review of public policies[Révision Générale des Politiques Publiques], which made it a measure in its own right.

It was then adopted in the Grenelle 1 law, which states, in its articles 26 and 48, that the government will "assess tax measures that have negative impacts on biodiversity and propose new tools to gradually switch to a taxation scheme that is better adapted to environmental challenges", and more generally, "that it will present, to the Parliament, an assessment of the environmental impact of public subsidies, both from a budgetary and a tax spending point of view.These incentives will be gradually reviewed to ensure that they do not incentivise harm to the environment".

In response to these legislative commitments, the general commission for sustainable development, a direction of the Ministry of Environment, produced an initial interim report with the main objective of giving a detailed presentation of the main tax spending policies that are harmful to the environment and that currently exist in France, to evaluate, where possible, the extent of the associated environmental damage and to make suggestions for reforms.

To go beyond the analysis of mere tax spending policies, an interministerial coordination is necessary to involve all stakeholders, including sectors that benefit from such subsidies.

Ms Nathalie KOSCIUSKO-MORIZET
Secretary of state for planning and the development of the digital economy, reporting to the Prime Minister
35, rue Saint Dominique
75700 PARIS 07

In this context, I would be grateful if you would set up a group of experts:

who would be in chrage of establishing up up a comprehensive list of subsidies and other non tax-based incentives having an impact on the environment;

for each of these measures, analyse both, qualitatively and, where possible, quantitatively, any harm that may be caused to biodiversity;

propose avenues ideas for the evolution and reform of these subsidies, so as to reduce or eliminate their harmful impact on the environment.

In order to be able to respond as soon as possible to the objectives of the Grenelle 1 law, this task force should begin its work as soon as possible and present its conclusions by the end of 2010.

Yours faithfully,

Appendix 2

List of members

Chairman

Guillaume Sainteny, senior lecturer at the École polytechnique.

Vice-chairman

Jean-Michel Salles, research manager, CNRS, UMR 5474 LAMETA, Montpellier

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With the support of Erwann Paul, Sustainable Development Department, Centre d'analyse stratégique.

Coordinators

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Jean-Luc Pujol, Task group on Forecasting in Research/Society & Sustainable Development, INRA

Members

Christophe Aubel, director of the Ligue Roc

Michel Badré, chairman of the environmental authority, General Council for the Environment and Sustainable Development (CGEDD), Ministry of Ecology, Sustainable Development, Transport and Housing

Sylvain Bellion, in charge of the town, urban planning and habitat department, Association of French Mayors

Gilles Benest, France Nature Environnement (FNE)

Christian Béranger, environment and land manager, Cemex France, chairman of the environment commission at UNICEM (National Union of quarry industries and construction materials)

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[1] The FNSEA no longer wished to take part in the task group's studies from May 2011 due to differences of opinion with the work carried out in the group.

Patrice Lallement, head of taxation and sustainable development, sub-department of the sustainable development, Habitat, Urban-planning and Landscape Department (DHUP), Department of Development, Housing and Nature (DGALN), Ministry of Ecology, Sustainable Development, Transport and Housing

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Aude Neuville, member of the biodiversity unit, environment department, European Commission

Dominique Richard, Manager, European Topic Centre on biological diversity

Frédéric Tiberghien, chairman of the report and studies section of the Conseil d' État

Appendix 3

Persons interviewed

Directorate general for French overseas departments (Ministry of the Interior, Overseas and Regional Authorities)

Vincent Bouvier, prefect, manager, delegate general for French overseas departments and territories

Marc Del Grande, head of the public policies service

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Marion Dewagenaere, staff of the budget, public accounts and state reform ministry

Nicolas Ragache, staff of the budget, public accounts and state reform ministry

Department of customs and indirect duties (DGDDI, Finance Ministry)

Henri Havard, deputy manager for indirect duties

Isabelle Peroz, civil administrator, commission for taxation of energy, the environment and finance laws

Local authorities

Bretel Anem, delegate general from the national association of elected representatives in mountainous regions

Jérôme Bignon, chairman of the association Rivages de France

Philippe Girardin, chairman of the regional national park Ballons des Vosges

Philippe Laurent, chairman of the finance commission of the AMF

Thierry Mougey, special adviser on biodiversity and the management of areas, Federation of regional national parks of France

Appendix 4

Acronyms

AASQA	Associations agréées de surveillance de la qualité de l'air (Approved associations for monitoring air quality)
ACE	Aid to energy crops
ACV	Life-cycle analysis
AEE	European environment agency
AEM	Agro-environmental measure
AFD	*Agence Française de Développement* (French development agency)
AIE	International energy agency
AMP	*Aires Marines Protégées* (Protected marine areas)
APD	Public subsidies to development
ASA	Authorised joint-owners association
ASTEE	Scientific and technical association for water and the environment
BBC	Low consumption building
BCAE	Good agricultural and environmental conditions
CAP	Common agricultural policy
CAS	Change of land assignment
CDB	Convention on biodiversity
CET	Regional economic contribution
CFC	Chlorofluorocarbons
CFE	Business property tax
CFP	Common fisheries policy
CGAER	French Departmental council on food, agriculture and rural areas
CGCT	French General code for regional authorities
CGDD	French General commission for sustainable development
CGEDD	French Departmental council for the environment and sustainable development
CGI	French General tax code
CGPPP	French General code for ownership of public agencies
CIADT	French Interministerial committee for regional planning and development
CJCE	European Court of Justice
CLC	Corine Land Cover
CNPN	Conseil National de Protection de la Nature (National council for the protection of nature)
COFP	French Opportunity cost for public funds
COS	French Land occupation coefficient
COVNM	French Non-methane volatile organic compounds
CRE	French Energy regulation commission
CTE	French Regional economic contribution
CVAE	French Company added-value contribution
DAFN	French Annual vessel registration and navigation duty
DCTP	French Grant to compensate for the business tax
DGE	French Overall facilities grant

DGF	French Overall functioning grant
DPSIR	French "Driver-Pressure-State-Impact-Response" model
DPT	Transversal policy document
DPU	French Single payment entitlement
DREAL	French Regional departments for the environment, development and housing
DSR	French Rural solidarity grant
EEZ	Exclusive economic zone
EFF	European fisheries fund
EPCI	French Public institutions for inter-municipal cooperation
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FDC	French Departmental federations of hunters
FEADER	European agricultural fund for rural development
FFEM	French fund for the worldwide environment
FNE	France Nature Environment
FRB	French Foundation for research on biodiversity
FWD	Framework Directive on water
GEF	Global environment fund
GHG	Greenhouse gas
HCB	Hexachlorobenzene
HIPC	Highly indebted poor country
IAS	Invasive Alien Species (IAS)
ICPE	French Facility classified for the protection of the environment
IFN	French National forestry inventory
IGD	French Sustainable development indicator
IGF	French Inspectorate general of finances
IMO	International maritime organisation
IREP	French registry of polluting emissions
LEMA	French Law on water and aquatic environments
LGV	French High-speed line
LMA	French Law on the modernisation of agriculture
NRE law	French Law relative to new economic regulations
LOLF	French Organic law relative to the finance acts
LPO	French League for the protection of birds
NAC	French Exotic pets
NOx	Nitrogen oxides (NOx = NO + NO2)
OCDE	Organisation for economic cooperation and development
OGM	Genetically modified organism
ONCFS	French National commission for hunting and wild fauna
ONEMA	French National commission for water and aquatic environments
ONF	French Office National des Forêts
OPIE	French Office for eco-entomological information
PAE	French Overall development programme
PAH	Polycyclic aromatic hydrocarbon
PAS	French Social housing loan
PDRH	French rural development plan
PIB	Produit Intérieur Brut - Gross domestic product (GDP)

PLF	French Finance Bill
PLU	French Local urban development plan
PM1.0	Fine particles less than 1.0 µm
PM10	Fine particles less than 10 µm
PM2.5	Fine particles less than 2.5 µm
PMTVA	French Allowance for maintaining a herd of dairy cattle
PNR	French Regional nature park
POP	Persistent organic pollutant
PSE	Payment for environmental services
PSLA	French Social loan for rental-acquisition
PTS	French Total suspended particles
PTZ	French Zero rate loan
PVI	French Property capital gain
QIT	French Individual transferable quota
RFF	French railway network
RGPP	French General review of public policies
RPLP	French Heavy-goods vehicle charge related to services
RTM	French Restoration of mountain terrain
SAU	French Usable agricultural surface area
SCOT	French Regional coherence plan
SEM	French Semi-public company
SETRA	French Research service on transport, roads and developments
SFEPM	French society for the study and protection of mammals
SGP	Société du Grand Paris
SIH	French Fisheries information system
SNB	French National biodiversity strategy
SNIT	French National transport infrastructure plan
SOeS	French Statistics and observation service (Ministry of Sustainable Development)
SPEA	French Public water and sewerage service
SRCE	French Regional ecological coherence plan
STH	French Area always under grass
STOC	French Temporal monitoring of common birds
TA	French Development tax
TAAF	French Austral and Antarctic territory
TASCOM	French Tax on commercial areas
TCSP	French Reserved lane public transport
TVS	French Tax on company vehicles
UNEP	French United Nations programme for the environment
TDCAUE	French Departmental tax for financing architecture, urbanism and environment councils
TDENS	French Departmental tax on sensitive natural areas
TEEB	French The Economics of Ecosystems and Biodiversity
TFBN	French Tax on built land
TFNB	French Tax on non-built land
TFTC	French Flat-rate tax on the sale of land that has become approved for building

TGAP	French General tax on polluting activities
TGV	French High-speed train
THLV	French Housing tax on vacant homes
TIC	French Domestic consumption tax
TICGN	French Domestic consumption tax on natural gas
TLB	French Local office tax
TLE	French Local facilities tax
TLV	French Tax on vacant homes
TVB	*Trame Verte et Bleue* (Green and Blue Infrastructure)
TVI	French Tax on property valuation
TVS	French Tax on company vehicles
UICN	International Union for the Conservation of Nature
UTA	French Unit of human agricultural work
UTH	French Unit of human work
UVP	French Private vehicle unit
VAT	Value-added tax
VNF	Voies navigables de France
VSD	French Payment for under-density
ZNIEFF	French Natural zone of ecological, fauna and flora interest
WFD	Water Framework Directive
WTO	French World trade organisation

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