Managing Biodiversity is About People

Prepared for the CBD
By

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Table of Contents

Managing biodiversity is About People

Executive Summary

Managing biodiversity is about people. It is about the ways in which they claim, use, and value natural resources. How people claim, use, and value those natural resources is manifested in their individual statements and value articulations, in the institutions they create, and in their behaviour as individuals, collectives and organisations under the political ecology of power and power relations. This interplay between ecological systems and human behaviours, values, and institutions has created a deeply complex 'socio-ecological reality' that characterises our current situation.

Because human actions are critical to sustainable and equitable biodiversity management, attempts to redress the rapid decline of biodiversity and ecosystem services must begin by understanding why people – individually and collectively – do what they do. This would require us to get better insights of:

(i) How values and behaviour of individuals and collectives shape and are shaped by the formal rules and norms (formal and informal institutions) governing the way they act and interact within societies; and

(ii) The political ecological context of power and power relations within which this dynamic interplay of values, behaviours and institutions play out in determining the access and use of resources.

In light of not achieving the 2010 biodiversity targets, countries participating at the 10th COP (Conference of Parties) meeting of the Convention on Biological Diversity (CBD) agreed on the Aichi targets as part of an effort to reduce, and perhaps reverse, the rapid decline of biodiversity (see Annex 1). However, meeting the Aichi targets requires a deeper understanding of the following key elements of the social-ecological realty:

Values

- The plethora of beliefs, values, claims, and uses of natural resources that connects different societies in time and space, and impacts biodiversity management options and outcomes;
- The plurality of values that shape natural resource claims and use – and therefore the conservation and sustainable use of biodiversity which arise from a variety of social, natural and economic factors;
- The cognitive dissonance that emerges within individuals when faced with conflicting values and beliefs held as an individual and as a member of a collective.

Behaviour

- How formal control and enforcement of sanctions are limited as biodiversity management tools and the use of motivations and the social, moral, economic incentives to empower people to sustainable manage biodiversity;
- How social-psychological and material factors interacting with economic factors play differential roles in shaping behaviours pertinent to biodiversity management;
- Why emphasis on education and information regarding the value of biodiversity to society is important, but limited when pedagogical tools used are top-down or heavily dependent upon external experts.
- How identifying and understanding the factors that motivate and constrain individual, collective, and organisational behaviours can help contextualize and facilitate efforts to promote sustainable biodiversity management;

- Why individual actors are increasingly detached from the impact of their consumption decisions and how strengthening signal feedback is important for inducing individual behavioural change;

Institutions

- Why sector and/or scale specific institutions are increasingly limited in managing biodiversity in an interconnected world.
- How institutions, promoted as part of biodiversity management can allow for the expression of a plurality of individual and collective values, facilitating empowerment and motivating individuals and collectives to manage biodiversity endogenously.
- How institutions can be manipulated and used by individuals for personal advantages leading to resource degradation and social inequality
- How institutions mediate interactions between external pressures and large scale planning and lower levels of decisions regarding biodiversity management.

The paper sets out to answer three questions that cut across the five strategic goals of the CBD Strategic Plan for Biodiversity 2011–20. These questions attempt to highlight two overarching mismatches contributing to the continuing decline of biodiversity. Both of which have implications for the understanding of human behaviour regarding biodiversity management: -the mismatch between institutional arrangements put in place at different levels to conserve biodiversity; and, -the mismatch of values that individuals, groups, and organizations hold for biodiversity and ecosystem services.

The three questions are:

- **Plurality of Values and Biodiversity:** How can the different notions of and the plurality of values be articulated to enhance biodiversity management?
- **Biodiversity Management and Human Behaviour:** How can human behaviour enhance biodiversity management?
- **Institutions of Biodiversity:** How can different forms of institutional arrangements at different levels help facilitate biodiversity management?

The objective of this paper is to not provide any one social-economic conceptual framework to achieve the Aichi targets but to highlight key factors emerging from the social sciences literature that might be considered when designing policies to implement the CDB strategic plan. The paper is written to help policymakers at multiple levels involved in the implementation of the strategic plan to better understand what motivates individual and collective behaviour and how these behaviours can be influenced towards achieving the Aichi targets.

The document aims to inform policymakers and others involved in biodiversity management of how the social sciences can bring key insights on how human systems work towards achieving the Aichi targets. The paper broadens the perspectives of the human dimensions of biodiversity and ecosystem services management from an overly simplistic assumption of rational market oriented individuals to a complex interaction of values, behaviour and institutions within the political ecology background of power and power relations.

A number of key messages and recommendations are presented below to help in the deliberations on ways and means to achieve the Aichi targets. The discourse presented here should be treated as a first expose of the utility of the social sciences in this discourse and

highlights the need for more work and research if we are to make a real attempt in achieving the Aichi targets as laid out in the CBD strategic plan.

Key Message 1: Values and beliefs are multidimensional and not static
The values and beliefs humans associate with biodiversity are multi-dimensional, and are continuously evolving –shaped by numerous dynamic social, economic and ecological factors. The inter-dependency and sometimes conflicting nature of these values within an individual and across individuals, communities and organizations shapes the way biodiversity and ecosystem services are accessed and used.

Key Message 2: Economic and social insecurity can cause changes in long held beliefs and values on biodiversity conservation and sustainable use.
Recognizing the social and economic realities and needs of indigenous peoples and local populations, and confronting poverty and inequality are critical issues and challenges for biodiversity management. Social safety nets, in the form of education and health entitlements and economic facilities such as access to credit and employment guarantees can drastically reduce the potential for exploitation of biodiversity and natural resources by local communities, particularly during time of crisis and increased vulnerability.

Key Message 3: **Individuals and collectives continuously make trade-offs across biodiversity and ecosystem services with other goods and services**
Understanding trade-offs across biodiversity, ecosystem services and other goods and services contributing to human well-being is key to the conservation and sustainable use of biodiversity. Present indicators used in measuring well-being and/or biodiversity changes fail to show these trade-offs and therefore ignore the costs and benefits of changes in biodiversity.

Key Message 4: Education, information and financial incentives alone are not sufficient to promote biodiversity conservation and sustainable use practises.
Individuals are generally motivated by local needs and social contexts to manage or mismanage biodiversity, rather than by a transcendental understanding of global issues. Education, information, and financial incentives alone – especially exogenous forms of such interventions – do not result in *sustainable* changes of behaviour to manage biodiversity and ecosystem services. Instead, identifying and addressing motivations – social-psychological benefits – relevant to a particular context (whether individual, collective, or organisational behaviour) can be more effective in initiating, directing, and sustaining pro-biodiversity management behaviour.

Key Message 5: Biodiversity is now seen as a biophysical entity and not as an integral part of well-being and identity
The integration of biodiversity management in societies can be further improved by making biodiversity management a social default by encouraging individuals, communities and organizations to become agents of change and providing opportunities to connect identities and a sense of place with biological diversity.

Key Message 6: Many biodiversity related institutions (the rules and norms governing conservation and sustainable use of biodiversity) are exogenously designed and fail to consider local specificity.
Institutions that allow the expression of the plurality of individual and collective values while accommodating and respecting the cultural and social context should be promoted for biodiversity management. Ideally, these value-articulating institutions should facilitate the

empowerment of individuals and collectives to sustainably manage biodiversity as appropriate within their value systems and cultures, and without external coercion.

Key Message 7: Matching the mis-matches with institutional innovation is key to improving the conservation and sustainable use of biodiversity
Institutional mismatch is a key underlying cause of the apparent ineffectiveness in biodiversity governance reported by the GBO-3 (2010) and the MA (2005). In other words, for the Aichi targets to be reached, greater emphasis should be placed on ensuring synergies among and between institutions operating at different levels.

The recommendations that follow are not targeted at any particular policymaker. The objective of these recommendations is to provide some initial ideas to the CBD on potential areas where immediate action can be taken based on the information presented in this paper.

Recommendation 1: Develop the knowledge base on biodiversity and ecosystem services valuations
Facilitate and support valuation studies that capture the diverse values individuals and collectives place on biodiversity and ecosystem services. These studies should not assume that all individuals are market actors, but employ a variety of tools including behavioural experiments to understand underling motives (including – but not exclusively – economic) of individual actions towards biodiversity and ecosystem services.

Recommendation 2: Capture and articulate biodiversity value at the appropriate levels
Provide economic facilities such as access to markets, credit, technology, and knowledge with the aim of decreasing the probability of unsustainable use of biodiversity and ecosystem services during times of stress while increasing the economic value of biodiversity in its place of origin. This is crucial to increasing the benefits that local communities derive from biodiversity management, improving employment opportunities associated with biodiversity management, and incorporating the value of biodiversity to local development strategies, addressing Aichi target 2 in confronting poverty in areas important for conservation.

Recommendation 3: Changing the yardsticks of progress
Support on-going work to develop "inclusive" wealth accounts at the national level. Successful biodiversity and ecosystem services management will require a shift of emphasis from existing GDP-based flow accounting to an Inclusive Wealth stock accounting method that measures changes in natural capital – including biodiversity – and informs individuals and collectives on how biodiversity affects the wealth of society across time and space (UNU-IHDP and UNEP 2012.

Recommendation 4: Changing Behaviour
Employ social marketing strategies at appropriate levels. Strategies should be based on detailed information of specific population motives and barriers to pro-biodiversity behaviour, and should articulate mechanisms for possibly altering motivations and discouraging detrimental behaviours/promoting beneficial behaviours toward achieving policy outcomes. Pilot strategies should be evaluated, modified as necessary, and implemented at national level.

Recommendation 5: Reflexive biodiversity engagement processes and individual empowerment.
Build biodiversity engagement reflexively, so as to invoke a sense of ownership among individuals, allowing them to identify with the cause and providing a sense of being an agent

of change. Participatory pedagogical tools used in environmental education, anthropological studies and behavioural studies may provide a basis for tools to communicate and build support for policy goals pertinent to biodiversity management. Capacity building activities would ideally be run endogenously by communities or networks of communities, and supported if needed by external actors.

Recommendation 6: Building Bridging Institutions

Contribute to the development of deliberative participatory processes that can support the design of bridging institutions to facilitate long-term planning and support social, moral and economic incentives for people to sustainably manage biodiversity and ecosystem services without coercion. These institutions can be formal or informal depending on specific social, ecological and economic contexts. A deliberative process would ideally ensure that these institutions are built within the cultural context these institutions would operate.

Concluding remarks

There is no doubt that a deeper understanding of the human dimensions of biodiversity management is necessary if real progress on achieving the Aichi targets are to be realized. This can only be achieved by bringing the broad realm of the social sciences to bear on the problem at hand – managing biodiversity in a sustainable manner for human well-being. We acknowledge that an anthropocentric approach taken is taken in this paper but see it as a viable option we have if we are to influence and convince the broader citizenry of the value of biodiversity for maintaining a world we have come to take as granted.

The material presented in this paper just the tip of the iceberg. The objective of the paper was to bring to the fore the value added of the social sciences for achieving the Aichi targets. The complexity of the human system presented in the paper demonstrates that simplistic assumptions of individual behaviour will not provide the solutions and responses needed to stop and reverse the rapid loss of biodiversity across the planet. Understanding how humans make decisions is key to the success of the CBD's Strategic Plan.

Introduction

Humanity has made great strides in science and technology over the past 200 years, substantially improving the overall living standards of the global population. The planet has also become increasingly interconnected. The interdependence of resource chains, institutions, behaviours and values has grown as spatial distances are narrowed through improvements in transport and information technology and the removal of commercial barriers.

There is no doubt that our social, cultural, economic and ecological systems have undergone major transformations to accommodate and facilitate these scientific and technological advancements. These transformations have however not come without a cost. Humans have altered the state of the natural environment in ways not before seen in modern history (MA 2005; GBO-3 2010). Climate systems have been altered, oceans have been depleted, and the biological diversity of the planet has been reduced at unprecedented rates.

The 20th Century saw further innovations in controlling the demand of natural resources with the advent of mass communication and marketing tools, industrial expansion into source countries, modernisations in long distance transport, and improved exchange mechanisms for global trade. The last century is also known as the period of 'great acceleration', characterized by rapid conversion of consumption patterns, technological developments, industrial outputs and waste generation, which have in turn caused changes to entire ecosystems and resource availabilities (Steffens et al 2004; MA 2005; GBO-3 2010). During this same period while large portions of the global population have been lifted out of poverty, we still have half of humanity still living on less than $2 dollars a day – a reality that is ethically unacceptable. These changes and trends have shown no sign of waning in the 21st Century.

Biological resources, as with all natural resources, are historically traded commodities, and have thus been in demand not just in local contexts but also in distant regions. Around the world, nations have embarked on the implementation of trade liberalization policies, infrastructure development strategies, privatization of property and structural adjustment programs to promote economic growth for well-being. However, many of these policies have for a variety of reasons caused increasing pressure on natural resources, biodiversity and ecosystem services (GEO 5).

Managing biodiversity[1] is therefore about people. It is about the ways in which they claim, use, and value natural resources. How people claim, use, and value those natural resources is manifested in their individual statements and value articulations, in the institutions[2] they create, and in their behaviour as individuals, collectives and organisations[3] under the political ecology of power and power relations. This interplay between ecological systems and human

[1] Biodiversity management encompasses biodiversity conservation, sustainable use and equitable sharing of benefits.

[2] Institutions are understood as formal and informal rules and norms that structure collective action behaviour (Ostrom 1990, 2005). Institutional arrangements act upon and mediate processes of natural resources claim and uses, and therefore biodiversity management. Rules and norms defined by institutions, at different levels of organization, help to reduce uncertainty for people and help to mediate competing actions and the values that individuals and groups bring to biodiversity management.

[3] Includes corporates, MEAs

behaviours, values, and institutions has created a deeply complex 'socio-ecological reality' that characterises our current situation.

Because human actions are critical to sustainable and equitable biodiversity management, attempts to redress the rapid decline of biodiversity and ecosystem services must begin by understanding why people – individually and collectively – do what they do. This would require us to get better insights of:

(i) How values and behaviour of individuals and collectives shape and are shaped by the formal rules and norms (formal and informal institutions) governing the way they act and interact within societies; and

(ii) The political ecological context of power and power relations within which this dynamic interplay of values, behaviours and institutions play out in determining the access and use of resources.

There have been several efforts to stem losses of natural resources and ecosystems, and to integrate 'environmental' goals with 'development' goals. In light of historical legacy the Convention on Biological Diversity (CBD), along with other Multilateral Environmental Agreements (MEA's) and partners, has facilitated this integration process and has shown progress on various fronts – albeit with some caveats:

- An important contribution of the CBD and related environmental agreements has been in **raising awareness of biodiversity** and its relevance to human well-being. The various activities of the CBD, including the decade of biodiversity, have certainly brought the terms 'biodiversity' and 'ecosystems' into a collective understanding within the environmental policy landscape.

  However, too little attention has been paid to explaining trade-offs within and between the individual, collective, and organizational preferences and values that determine use of resources and biodiversity, and the equity transactions between stakeholders across the value chains through which resources – including biodiversity – move.

- The efforts of various multilateral instruments on biodiversity and related sectors have helped **mainstream conservation, and sustainable use of biodiversity into national environmental and resource use policy.** Some noteworthy examples include the various national, regional and municipal biodiversity strategies. (CBO 2O11, *(King et al 2007*).

  However, the mainstreaming process has predominantly focused on resource use and environmental sectors and has largely been seen as limited to environmental impact assessments. This has caused a mis-conception of biodiversity management as purely an environmental issue while it is in reality a societal problem having impacts on human well-being resulting in various conflicts between the objectives and activities of different institutions. There are numerous examples of conflicts between biodiversity-related policies and development policies, structural reforms, trade policies, fiscal and monetary policies, employment and other sectoral policies such as transport, economy, energy.

- There has been significant creation and expansion of protected areas, including

conservation areas inclusive of resident populations, and resource management. (Ricketts et al 2010). This has contributed to a certain extent in reducing the rapid decline of biodiversity in some countries. Furthermore, recent approaches within the CBD to include social and cultural criteria to management of ecologically and biologically significant areas indicate a shift in emphasis on the human dimensions of a management intervention (CBD, 2012)

However, protected areas need to be complemented with the sustainable use of biodiversity and ecosystem services beyond those areas. It is socially unsustainable to assume that communities living in these areas would be environmental stewards when not provided the incentives to adopt conservation and sustainable use practices. Moreover, external socio-economic drivers such as urbanization, population growth, and human migration among others limit the effectiveness of protected areas in containing particular pressures that are not necessarily easily monitored.

In light of not achieving the 2010 biodiversity targets, countries participating at the 10th COP (Conference of Parties) meeting of the Convention on Biological Diversity (CBD) agreed on the Aichi targets as part of an effort to reduce, and perhaps reverse, the rapid decline of biodiversity (see Annex 1). However, meeting the Aichi targets requires a deeper understanding of the social-ecological realty and human behaviour. This is an area where the social sciences can provide valuable insights and guidance for policymakers.

Several theories from various streams of the social sciences have been proposed in efforts to build the understanding necessary to influence human behaviour that can lead to desirable environmental outcomes. These theories point to the importance of understanding human values, beliefs, norms, personalities and identities, and how these might inform human attitudes, thought and action (e.g., Stern 2000, Prager 2012, Jackson 2005). But it is important to point out here that individual and collective behaviours are also influenced by external factors such as institutions, power and power relations existing within societies (Kollmuss and Agyeman 2002, Duraiappah 1998). In this exploratory paper, we shall provide an overview of how values are formed and articulated, behaviours influenced and institutions created and mediate behaviour.

Values

- The plethora of beliefs, values, claims, and uses of natural resources that connects different societies in time and space, and impacts biodiversity management options and outcomes;
- The plurality of values that shape natural resource claims and use – and therefore the conservation and sustainable use of biodiversity which arise from a variety of social, natural and economic factors;
- The cognitive dissonance that emerges within individuals when faced with conflicting values and beliefs held as an individual and as a member of a collective.

Behaviour

- How formal control and enforcement of sanctions are limited as biodiversity management tools and the use of motivations and the social, moral, economic incentives to empower people to sustainable manage biodiversity;
- How social-psychological and material factors interacting with economic factors play differential roles in shaping behaviours pertinent to biodiversity management;

- Why emphasis on education and information regarding the value of biodiversity to society is important, but limited when pedagogical tools used are top-down or heavily dependent upon external experts.
- How identifying and understanding the factors that motivate and constrain individual, collective, and organisational behaviours can help contextualize and facilitate efforts to promote sustainable biodiversity management;
- Why individual actors are increasingly detached from the impact of their consumption decisions and how strengthening signal feedback is important for inducing individual behavioural change;

Institutions

- Why sector and/or scale specific institutions are increasingly limited in managing biodiversity in an interconnected world.
- How institutions, promoted as part of biodiversity management can allow for the expression of a plurality of individual and collective values, facilitating empowerment and motivating individuals and collectives to manage biodiversity endogenously.
- How institutions can be manipulated and used by individuals for personal advantages leading to resource degradation and social inequality
- How do institutions mediate interactions between external pressures and large scale planning and lower levels of decisions regarding biodiversity management.

The paper sets out to answer three questions related to values, behaviour and institutions that cut across the four strategic goals of the CBD Strategic Plan for Biodiversity 2011–20. These questions attempt to highlight two overarching mismatches contributing to the continuing decline of biodiversity. Both of which have implications for the understanding of human behaviour regarding biodiversity management: -the mismatch between institutional arrangements put in place at different levels to conserve biodiversity; and, -the mismatch of values that individuals, groups, and organizations hold for biodiversity and ecosystem services.

- **Plurality of Values and Biodiversity:** How can the different notions of and the plurality of values be articulated to enhance biodiversity management?
- **Biodiversity Management and Human Behaviour:** How can human behaviour enhance biodiversity management?
- **Institutions of Biodiversity:** How can different forms of institutional arrangements at different levels help facilitate biodiversity management?

The main objective of this paper is to not provide any one social-economic conceptual framework to achieve the Aichi targets but to highlight key factors emerging from the social sciences literature that might be considered when designing policies to implement the CDB strategic plan. The paper is written to help policymakers at multiple levels involved in the implementation of the strategic plan to better understand what motivates individual and collective behaviour and how these behaviours can be influenced towards achieving the Aichi targets.

The document aims to inform policymakers and others involved in biodiversity management of the valuable knowledge the social sciences can bring to the discussion on achieving the Aichi targets. The paper broadens the perspectives of the human dimensions of biodiversity and ecosystem services management from an overly simplistic assumption of rational market

oriented individuals to a complex interaction of values, behaviour and institutions within the political ecology background of power and power relations.

The paper is presented in three main sections. Each section addresses a question and provides key messages and recommendations emerging from the analysis. A number of concluding remarks are provided at the end of the paper followed by two annexes. Annex 1 provides the four strategic goals of the Strategic plan and the 20 Aichi targets. Annex 2 shows how a recommendation suggested in the text of the document corresponds to the achievement of the 20 Aichi biodiversity targets.

Plurality of Values and Biodiversity

How can the different notions and the plurality of values be articulated to enhance biodiversity management decisions and value chains?

A wide range of social science and humanistic perspectives has been employed in examining how humans perceive and value biodiversity. The understanding of what biodiversity means varies across individuals. At one end of the spectrum, some individuals perceive biodiversity as a reference to conserving specific species such as the humpback whale or the African elephant threatened by extinction. At the other end of the spectrum we have individuals who understand biodiversity as 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 – the definition adopted by the CBD. These different notions of biodiversity in turn influence the way individual's value biodiversity ranging from biocentric to purely anthropocentric (Dunlap and Jones 2002, Maier 2012).

Those with biocentric orientations may emphasize the intrinsic worth of nature independent of human interests (Colyvan et al. 2009). Individuals with more anthropocentric outlooks may emphasize the instrumental values of nature and biodiversity. These include biodiversity's *provisioning services* – for example, the provision of food and energy. Biodiversity may also provide *cultural* services (e.g. aesthetic or spiritual experiences), *supporting services* (e.g. nutrients cycling) as a foundation for other ecosystem services, and *regulating services* (e.g. pollination, waste decomposition and detoxification) (MA 2003).

Yet even the nuance offered by these intrinsic-instrumental and biocentric-anthropocentric continuums still oversimplify the range of values humans associate with biodiversity. A more extensive and representative typology of orientations can be found in the work of Kellert (1993, 2009), who identified nine basic values of nature and living diversity that characterize individual environmental outlooks (see Table 1).

These different value orientations are not mutually exclusive, with individual expressions of biodiversity values often multi-faceted and intersectional (Hunter and Brehm 2004)

Table 1. A typology of basic values attributed to wildlife and biodiversity.

Value	Definition
Utilitarian	Practical and material exploitation of nature
Naturalistic	Direct experience and exploration of nature
Ecologistic-Scientific	Systematic study of structure, function and relationship in

	nature
Aesthetic	Physical appeal and beauty of nature
Symbolic	Use of nature for language and thought
Humanistic	Strong emotional attachment and "love" for aspects of nature
Moralistic	Spiritual reverence and ethical concern for nature
Dominionistic	Mastery, physical control, dominance of nature
Negativistic	Fear, aversion, alienation from nature
Source: Kellert 1996, 38	

These environmental perspective(s) and related values of biodiversity held by stakeholders shape policy and management preference (e.g. Colyvan et al. 2009; Hunter and Rinner 2004). A too-narrow management approach can alienate stakeholders and obscure common ground between biodiversity policy and other socio-ecological issues (Reyers e.al 2012), as illustrated in the Narok case study in Figure 1. (Duraiappah 2004).

Box 1 Case Study 1: Clash of values and Institutions in the Narok district, Kenya

The Narok district of Kenya comprises two distinct geographical zones - the highlands and the plains. The highlands are characterized by rich volcanic soils and high rainfall, and have been defined as "high potential" areas. The plains are characterized by less-fertile soils, lower rainfall, and are classified as "mid- to low-potential" areas. The highlands are predominantly forest, while the plains are savannah-type rangelands home to one of the richest sources of biodiversity on the planet.

The Maasai, the ancestral habitants of this district, were, and remain to a large extent, nomadic pastorlists, using the plains for livestock during the wet season, and the highlands during the dry season. In this nomadic culture, land is treated as communal property, while livestock is considered as individual or family wealth.

In the 1950's and 60's a series of land reforms were implemented, creating individual land titles and giving rise to a wealthy local farming community. In the Narok region, in addition to establishing private land ownership, another objective of the government was to sedentarise the Maasai, driven by the belief that the nomadic lifestyle was an inefficient use of land resources. IN addition, external pressure to conserve the rich forms of wildlife in the savannah plains led to large tract of communal lands being reclassified as protected areas.

However, it was primarily newcomers from outside the district (largely from the Kalienjin and Kikuyu groups) who adopted small-scale farming, growing a combination of food and cash crops for the most part in the fertile highlands. Another group to take advantage of the land reforms were large-scale commercial farmers of White and Asian heritage, who primarily began commercial wheat, barley and dairy farming operations in the plains. In addition, the tourist industry became major players in the region as the size of the wildlife parks grew in size.

The expansion of commercial farming in the plains and small-scale farming in the highlands, combined with an expansion of nature reserves for eco-tourism essentially boxed the Maasai into a narrow corridor with very little degree of maneuverability. This eventually led to impoverishment of the Maasai forcing them to encroach on wildlife in the parks, overgraze

the land with their cattle herds, and finally leaving their lands for the cities. This displacement was the reason for many of the violent clashes between the different groups.

The differences in the way land was perceived, valued and used by the various groups, together with the privatization of communal areas, led to the breakdown of a relatively socio-ecologically stable production landscape, and to the marginalization of the pastoralists, while enriching other groups. The differences in values on land also led to land degradation, affecting soil retention and water regulation ecosystem services. The rate of biodiversity loss across the overall landscape in the region increased while numbers of species popular with eco-tourism in the nature parks increased.

Possible solutions identified by the study included:
i. Individualization of communal land with well-defined and secure rights, but governed by community participatory-derived rules (an example of a bridging institution discussed in the next section) on type and intensity of land use and on transfer of ownership.
ii. Creation of a communication network (again a form of a bridging institution) involving all stakeholder groups allowing for information exchange and transfer regarding land use, land values and land ownership.

Better understanding and integrating in land management of these different groups values would directly contribute to Aichi targets 2 and 7 as well as 18 in terms of respecting local communities practices. It may also contribute to the Aichi target 14 if the newcomers ways of land management led to disruption of some ecosystem services such as land fertility or pollution of watershed.

See Duraiappah 2004 and Amman and Duraiappah 1998

In addition, as expressed by Simaika and Samways (2010:905), "all these valuations are important in setting management goals because they encompass the entire breadth of the human experience." A focus on economic value through only markets and payments neglects consideration of other values (Sagoff 2008, Brondizio et.al 2010) such as aesthetic and biophilia[4]-oriented humanistic perspectives (Kellert and Wilson 1993; Farber et al. 2002).

On the other hand, values not associated with use or economic gains pose tremendous measurement challenges (Colyvan et al. 2009; Godoy et al. 2000). A key challenge to achieving the Aichi targets is in articulating these various values, and understanding the trade-offs that might emerge across these values in a dynamic environment.

Equally important to note is that these values are not necessarily static over time, but can be altered by changing social, economic and ecological conditions. For example, in recognizing the strategic role of local populations on conservation, terms such as 'traditional populations' have been created and codified in law (as in Brazil), based on the expectation that these populations will maintain economic systems with low levels of consumption, minimum technology, and limited resource use practices (Barreto Filho 2009). An example of a rapidly evolving changing environment is urbanization, which represents a powerful force re-shaping, values related with biodiversity across the globe (Elmqvist e.al forthcoming)

In many cases, however, these views have concealed the material poverty of local

[4] The deep affiliations humans have for nature is an instrisic part of their biologval systems.

populations, reframing them instead in terms of ethnic identity (Comaroff and Comaroff 2010). Today, as inhabited conservation areas have become a key strategy in managing biodiversity, there is great pressure put on local populations to protect biodiversity, while their modern surroundings neatly continue with "business-as-usual".

Indeed, local populations have expectations of improving their economic situations, consumption levels, education for their children, and access to technology, in addition to retaining traditional values of spiritual well-being, traditional landscapes, sacred groves and biodiversity, among others. This is further compounded by the values they might have on biodiversity as an individual or as a household member vis-à-vis as a member of a collective. This creates in essence multiple identities that one individual might have towards biodiversity and conflicts across these identities leads to what psychologists call cognitive dissonance that might lead to behaviour different from what standard rational models might suggest. For example, a park ranger may hold a pro-biodiversity identity while executing the functions of conservation in a park, and yet purchase invasive species for food or ornament for a variety of other social-psychological (e.g. social norms) and/or material (e.g. economic factors) reasons.

Therefore, economic and social entitlements might be key to ensuring that individuals and communities have an incentive to manage biodiversity and ecosystem services, especially during times of crisis and vulnerability when cognitive dissonance is greatest. These entitlements might reduce the internal conflicts of values when it comes to access and use of biodiversity and ecosystem services.

The expression of environmental values can come in many forms, although the expression that is simplest to use in broader socio-economic policy making processes is a monetary one. Translating all values into a monetary metric may be morally questionable. For instance, the value an individual or as part of a collective places on a sacred forest might not be able to be expressed in dollars, and may be seen as a matter of cultural and spiritual identity for the community (Sagoff, 1998). However, a monetary metric does allow for the analysis of trade-offs and synergies across other goods and services of value to individuals within or outside that community.

The decision to use or not use a monetary metric to express all values would depend on the use of these values in decision-making. For example, a monetary metric might be useful if the objective is to monitor changes in the stocks of biodiversity and ecosystem services – elements of "natural" capital – vis-à-vis other forms of capital at an aggregate level. On the other hand, if the objective is to convert a particular area of forest at the local level, then a purely monetary expression will be lacking, and instead a deliberative process that allows other values to be articulated and incorporated into the decision making framework would be preferable (Dryzek 2000).

Key Message 1: Values and beliefs are multidimensional and not static
The values and beliefs humans associate with biodiversity are multi-dimensional, and are continuously evolving –shaped by numerous dynamic social, economic and ecological factors. The inter-dependency and sometimes conflicting nature of these values within an individual and across individuals, communities and organizations shapes the way biodiversity and ecosystem services are accessed and used.

Key Message 2: Economic and social insecurity can cause changes in long held beliefs and values on biodiversity conservation and sustainable use.

Recognizing the social and economic realities and needs of indigenous peoples and local populations, and confronting poverty and inequality are critical issues and challenges for biodiversity management. Social safety nets, in the form of education and health entitlements and economic facilities such as access to credit and employment guarantees can drastically reduce the potential for exploitation of biodiversity and natural resources by local communities, particularly during time of crisis and increased vulnerability.

Key Message 3: **Individuals and collectives continuously make trade-offs across biodiversity and ecosystem services with other goods and services**
Understanding trade-offs across biodiversity, ecosystem services and other goods and services contributing to human well-being is key to the conservation and sustainable use of biodiversity. Present indicators used in measuring well-being and/or biodiversity changes fail to show these trade-offs and therefore ignore the costs and benefits of changes in biodiversity.

Recommendation 1: Develop the knowledge base on biodiversity and ecosystem services valuations
Facilitate and support valuation studies that capture the diverse values individuals and collectives place on biodiversity and ecosystem services. These studies should not assume that all individuals are market actors, but employ a variety of tools including behavioural experiments to understand underling motives (including – but not exclusively – economic) of individual actions towards biodiversity and ecosystem services.

Recommendation 2: Capture and articulate biodiversity value at the appropriate levels
Provide economic facilities such as access to markets, credit, technology, and knowledge with the aim of decreasing the probability of unsustainable use of biodiversity and ecosystem services during times of stress while increasing the economic value of biodiversity in its place of origin. This is crucial to increasing the benefits that local communities derive from biodiversity management, improving employment opportunities associated with biodiversity management, and incorporating the value of biodiversity to local development strategies, addressing Aichi target 2 in confronting poverty in areas important for conservation.

Recommendation 3: Changing the yardsticks of progress
Support on-going work to develop "inclusive" wealth accounts at the national level. Successful biodiversity and ecosystem services management will require a shift of emphasis from existing GDP-based flow accounting to an Inclusive Wealth stock accounting method that measures changes in natural capital – including biodiversity – and informs individuals and collectives on how biodiversity affects the wealth of society across time and space (UNU-IHDP and UNEP 2012.

Human Behaviour and Biodiversity Management

How can understanding and influencing human behaviour enhance biodiversity management?

A central aspect of biodiversity conservation is the recognition that actual conservation management happens on the ground, often far-removed from the policy process, and where people as individuals and collectives take actions in the interest or otherwise of biodiversity management.

Understanding and influencing those actions – the human behavioural elements of biodiversity management – are crucial, as biodiversity management occurs at the interface of nature and human behaviour. Why people act the way they do to facilitate biodiversity loss or conservation, and how pro-biodiversity conservation and management behaviours could be promoted, deserves thorough attention (Saunders, 2003; Clayton & Brook, 2005).

So far, most efforts to motivate biodiversity conservation have focused on financial/economic incentives. While such incentives may have undeniably promoted biodiversity conservation in the short term, they do not guarantee sustainability for the following reasons:

- The continuous availability of such resources is prohibitively uncertain;
- Financial incentives for biodiversity management often originate from sources external to the individuals and communities whose behaviours directly affect biodiversity, thus imparting agency and responsibility to actors outside the biodiversity-behavioural interface. Studies in behavioural sciences show that people are more likely to engage in and sustain behaviours when the motivations are intrinsic – including ascription of responsibility and agency to the self (e.g., Ryan & Deci, 2000; Stern, 2000; Osbaldiston & Sheldon, 2003; Bamberg & Moser, 2007)
- Financial incentives based on economic rationalism alone – de-coupled from the intrinsic motivations and self-determination of individuals and communities – may induce perceptions of the commodification of biodiversity, potentially clashing with spiritual and cultural values and beliefs, and in doing so influencing attitudes and behaviours in disfavour of sustainable biodiversity management.

Substantial efforts to ensure the sustainable management of biodiversity have been focused on creating awareness through information provision and education. However, while awareness might change attitudes, it does not necessarily lead to behavioural change (McKenzie-Mohr, 2000; Schultz, 2011). Instead, motivations – social-psychological and material benefits – are more influential in initiating, directing, and sustaining behaviour.

Educational and information strategies must couple awareness intent with persuasive appeals that evoke motivations. Cognitive psychology has shown that communication appeals that match the recipients' motivations are more likely to influence behaviour than appeals with only awareness intent (Clary et al., 1994).

Social marketing is the most common and effective approach to promoting pro-environmental behaviours (McKenzie-Mohr, 2011; McKenzie-Mohr et al., 2012). Social marketing consists of a suite of research and execution techniques informed by the psychology of persuasion and influence (Cialdini, 2006; Kenrick et al., 2006). The approach involves:

i. **Careful selection of the behaviours to be promoted and competing behaviours to be discouraged.** Biodiversity conservation and sustainable use in any particular place often involves a multiplicity of behaviours. It is encouraged to select behaviours with the potential for most impact, for example, by surveying biodiversity experts with such knowledge. Another key element in selecting behaviour is the assessment, through surveys or experience, of the probabilities that people will engage in those behaviours, and the proportion of a target population that has adopted that behaviour (penetration). The combination of impact, probability and penetration should help guide the selection of behaviours to promote.

ii. **Identification of the motivations and barriers associated with the behaviour of interest.** The target population should be studied in detail, through interviews, surveys, field observations, etc., to identify their motivations and perceived barriers to engaging in desired behaviours. Respondents' ranking of their motivations may not correspond with what actually influences their behaviours; studies show that highly rated motivations are not necessarily influential (Ryan et al. 2001; Asah & Blahna 2012; Asah & Blahna In press). It is important not only to assess motivations but also to analytically verify how those motivations influence behaviours.

iii. **Design of a strategy that uses behaviour-change techniques to address the motivations and barriers.** Armed with knowledge about plausible behaviours and their respective motivations and constraints, a behaviour change strategy can be designed. Persuasive communication appeals are a key technique in behaviour change strategies. Such appeals often evoke salient motivations and social norms. For example, certain species provide medicinal, spiritual, aesthetic, and other cultural values to people of a particular place. Awareness campaigns should emphasize how sustainable management of biodiversity facilitates the attainment of these values, rather than focusing too much on the benefits of sustainable use to the environment.

The implementation of these approaches might include:

(i) Piloting and evaluation of the strategy with a sample of the target population,
(ii) Modification of the pilot strategy as relevant, and
(iii) Implementation and continuous evaluation of the strategy.

Studies show that the environment, as a biophysical entity, does not have a significant effect on peoples' commitment to, and engagement in, biodiversity conservation behaviours (Ryan et al., 2001; Asah & Blahna, 2012; Asah & Blahna, In Press). Instead, social and community-relevant factors are more influential.

Another form of communication appeals focuses on evoking social norms, by stating, for example, that many people in a particular target community are engaged in that behaviour. These behaviours could include any of the actions steps recommended in several of the Aichi targets. Communication appeals and/or awareness campaigns are most successful when people who are known and trusted within their respective communities and organizations conduct them through personal contact.

The planning and management of biodiversity management and capacity building activities could also be more reflexive by making efforts to ensure that relevant motivations, social norms, and values are more salient in program plans and activities. By aligning program plans and activities with the values, motivations and norms of target populations, capacity-building activities are more likely to result in self-determination that empowers people to take action towards sustainable use of biodiversity.

Several other techniques used in behaviour change strategies include the use of commitment. People are more likely to engage in behaviour if they make a prior, and especially public, commitment to do so. Norms, the idea that people look to the behaviour of others around them to determine how they will respond, could also be a powerful tool for the attainment of targets that require specific behavioural changes.

Social diffusion has also been shown to influence behaviour, through what is commonly known as 'setting the example'. This approach often involve identifying key respected community and organizational members and persuade them to engage in and "display" pro-biodiversity management actions. The combination of commitment, norms and social diffusion can be very helpful in mainstreaming biodiversity and making sustainable use of biodiversity a social default as illustrated in Case study 2 (McKenzie-Mohr, 2011).

Box 2 – Case Study 2: The Seafood Watch Program to Promote Sustainable Seafood choices and Protect Fish Diversity Loss

The Monterey Bay Aquarium was concerned about the decline in ocean health (and consequent biodiversity) due to farmed seafood species. They developed a social marketing behavioural change strategy, called the Seafood Watch Program, to address the problem. The program targeted people who identified themselves as green consumers and therefore, are more likely to engage and role model "green" sea food consumption. The understanding here is that the bottom-up approach of starting with the consumer will more effectively initiate and sustain change because individual purchasing and consumption choices influence the practices of midstream entities such as restaurants and grocery stores, which in turn influence upstream entities such as wholesalers and the aquaculture industry (McKenzie-Mohr et al., 2012).

Secondly, the choice of the initiation target population is not just any consumer but those that have been determined through research to be more likely to engage in the desired behaviour. The program was intended to encourage green consumers to buy more sustainable seafood, and to ask questions and make requests at restaurants, grocery stores and fish markets to create a salience for sustainable seafood (seeding descriptive social norms). Notice that the choice of the target population (green consumers) to initiate and sustain green consumption is strategically identified a priori, through research. This has two forms of normative influences on sustainable seafood consumption that goes beyond information. The first influence is the push factor wherein suppliers of seafood in restaurants and grocery stores seek to provide sustainable seafood because customers are demanding it. The second influence is the notch factor wherein other consumers who were not aware of sustainable seafood seeing others (who shop in the same grocery stores or eat at the same restaurants—elements of social identification and consequent normative influence) request sustainable seafood triggers cognitive pathways that might ultimately influence their choice of seafood consumption. These choices are somewhat more subtly influenced by peer rather than some policy or "outside" authority.

Seafood Watch formalized relationships with potential advocates and outreach and distribution channels such as conservation organizations, zoos, service organizations, aquariums, restaurants and food markets to help reach out to consumers about sustainable seafood consumption. This goes beyond a one-way transfer of information to a collaborative initiative with institutions that are motivated by pro-environmental causes. That is, seafood watch searched for entities that have similar motivations to help promote desired related pro-environmental behaviours.

A study was conducted to understand the barriers to sustainable seafood consumption. Seafood watch created products that addressed most of the barriers identified in that research, including pocket guides that help purchasing choices for each target region—because results of the study showed that people could not distinguish between sustainable and unsustainable

seafood. The most popular seafood options were listed as green (best choices), yellow (good alternatives) or red (avoid). Best choices were defined as well-managed, abundant, and caught or farmed in environmentally friendly ways (McKenzie-Mohr et al., 2012). Good alternatives were an option but concerns about how they were caught or farmed and how they impacted human health were expressed. Asterisks were used to indicate and explain the health concerns for various seafood types. To address concerns about trust (determined by a research study as a barrier—people may not trust the source of information about sustainable seafood), the website of Seafood Watch explained the credibility of their information sources and procedures for quality control. While these might appear to be mere provision of information, it is done to address specific barriers identified through research. Additionally, mentioning here that information aimed at verifying creditability is different from information aimed at creating knowledge about seafood watch. That is, information aimed at addressing an identified barrier is different from information aimed at educating people without knowing what the knowledge gap is.

Other strategies that Seafood Watch used include the featuring of seafood watch recipes on their website, encouraging chefs in selected restaurants take pledges (use of commitment) to promote sustainable seafood to their customers and in their cuisine, free pocket guides and cell phone apps, Facebook and Twitter outreach, and special event promotions. Some remarkable outcomes of the seafood watch program include (i) the elimination of farmed salmon from all Target stores, (ii) Safeway grocery stores strengthened seafood buying policies in favour of sustainable seafood, (iii) seafood suppliers such as the Compass group are making landmark policies to purchase and supply sustainable seafood, and (iv) fisheries eco-certification is on the rise. See McKenzie-Mohr et al., 2012 for more details of this and other successful social marketing programs that have significantly influenced pro-environmental behaviours.

This case study related to behavioural understanding and change shows added value to achieve Aichi targets spanning across the 4 CBD strategic goals from creating awareness on linkages between biodiversity (Aichi target 1) and consumption patterns to limiting ecosystem and fish stock damages (Aichi targets 3, 8, 10, 19) and to sustainable use of fish stocks (Aichi targets 4, 6, 7). It will also contribute to achieving the Aichi target 19.

On the basis of this, we argue that sustainable (empowering through self-organization) institutions for resource management may also emerge from finer social processes within which key individual actors are embedded. Thus, based on understandings of the factors that influence human behaviour, and learning from the psychology of influence, the social marketing approach is increasingly being used to promote and facilitate pro-environmental behaviours (e.g., McKenzie-Mohr, 2011). The fundamental premise of the social marketing approach is that people at the forefront of the target behaviour can be motivated to engage in pro-environmental behaviours irrespective of power differentials that might impede desired behavioural changes.

Key Message 4: Education, information and financial incentives alone are not sufficient to promote biodiversity conservation and sustainable use practises.

Individuals are generally motivated by local needs and social contexts to manage or mismanage biodiversity, rather than by a transcendental understanding of global issues. Education, information, and financial incentives alone – especially exogenous forms of such

interventions – do not result in *sustainable* changes of behaviour to manage biodiversity and ecosystem services. Instead, identifying and addressing motivations – social-psychological benefits – relevant to a particular context (whether individual, collective, or organisational behaviour) can be more effective in initiating, directing, and sustaining pro-biodiversity management behaviour.

Key Message 5: Biodiversity is now seen as a biophysical entity and not as an integral part of well-being and identity
The integration of biodiversity management in societies can be further improved by making biodiversity management a social default by encouraging individuals, communities and organizations to become agents of change and providing opportunities to connect identities and a sense of place with biological diversity.

Recommendation 4: Changing Behaviour
Employ social marketing strategies at appropriate levels. Strategies should be based on detailed information of specific population motives and barriers to pro-biodiversity behaviour, and should articulate mechanisms for possibly altering motivations and discouraging detrimental behaviours/promoting beneficial behaviours toward achieving policy outcomes. Pilot strategies should be evaluated, modified as necessary, and implemented at national level.

Recommendation 5: Reflexive biodiversity engagement processes and individual empowerment.
Build biodiversity engagement reflexively, so as to invoke a sense of ownership among individuals, allowing them to identify with the cause and providing a sense of being an agent of change. Participatory pedagogical tools used in environmental education, anthropological studies and behavioural studies may provide a basis for tools to communicate and build support for policy goals pertinent to biodiversity management. Capacity building activities would ideally be run endogenously by communities or networks of communities, and supported if needed by external actors.

Institutions and Biodiversity

How can different forms of institutional arrangements at different levels help facilitate biodiversity management?

The CBD has undoubtedly been instrumental in recognizing and promoting institutional arrangements for the management of biodiversity at different levels. Along with many other players, it has been particularly effective in contributing to the creation of different types of conservation units and protected areas, including those directly involving local populations and communities on the management of natural resources. Protected areas have been recognized as one of the main advances in biodiversity conservation, particularly in tropical regions experiencing economic pressures on resource use and extraction (Ricketts et al 2010).

The expansion of protected areas has occurred side by side with high levels of biodiversity degradation. While protected areas and resource areas managed by local populations have been effective in protecting biodiversity at the local level (Cox et al 2010), they are subsumed and in many cases overwhelmed by pressures and transformations occurring around them.

There is growing understanding that level-specific institutional[5] arrangements (whether national or local) are limited in promoting biodiversity management over the medium and long-term. One main reason might be the mismatch of institutions overseeing the management of biodiversity and ecosystem services across the different social-economic and ecological scales (Brondizio et al 2009). The case study of the indigenous park of Xingu demonstrates some of the socio-economic tensions arising from this mis-match as illustrated in Case Study 3).

Box 3 – Case Study 3. Institutional scale mismatches

Nested within the larger Xingu River watershed in the Brazilian Amazon, the Indigenous Park of Xingu (PIX) was originally created in 1964 and demarcated in 1991 (Figure 1). PIX has an area of 2.6 million hectares (ha), and is occupied by 14 ethnic groups with a total population of over 5000.

PIX territory overlaps nine municipalities and is surrounded by one of the most active agro-industry and cattle ranching economies of Brazil. As a whole, the Xingu watershed encompasses 51 million ha, cutting across 35 municipalities and 27 indigenous groups. The region is considered a national and international priority for biodiversity conservation and cultural patrimony.

The demarcation of PIX left out significant portions of indigenous territories and the headwaters of most tributaries of the Xingu River. The federal government has promoted aggressive incentives for the occupation of the area around the park through the expansion of cattle ranching and farming. Deforestation around the watershed soared since the early 1990s, while PIX maintained nearly intact forest cover.

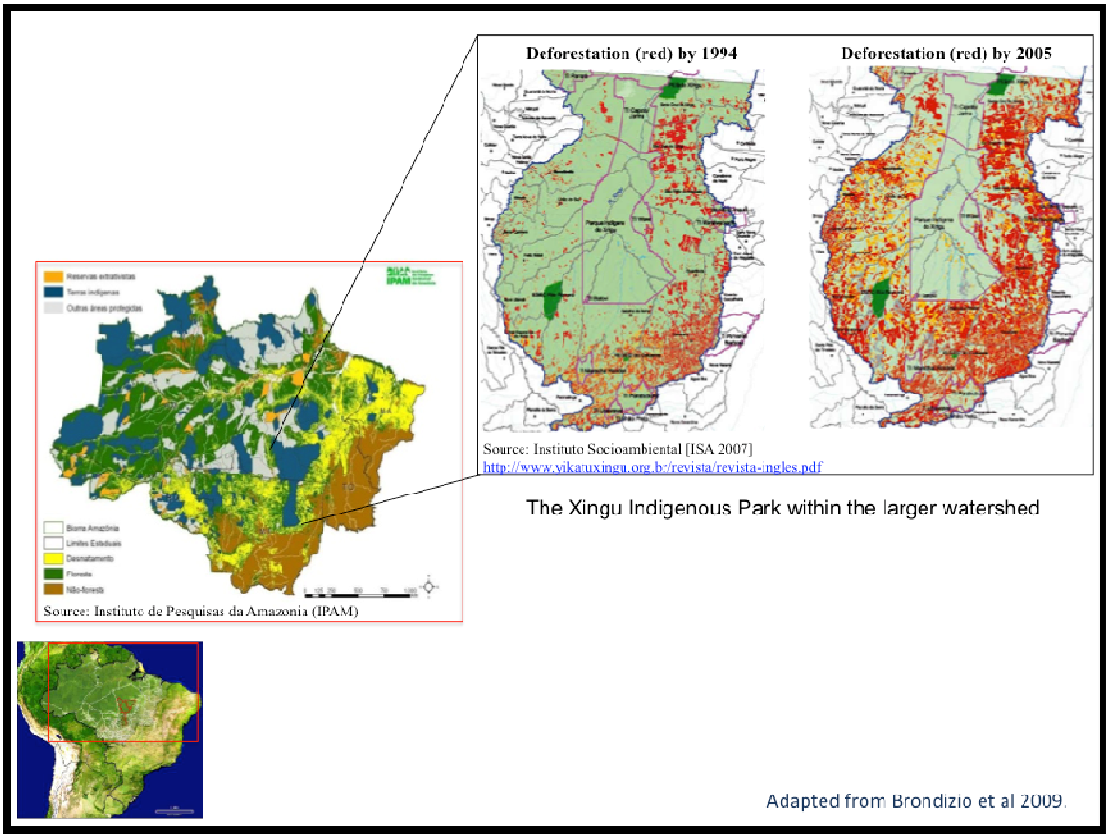
The perception of the "unwanted hug," as assessment reports termed the deforestation surrounding the park, and the threat of invasion around park borders led indigenous groups to identify mechanisms and forms of internal organization to enhance and enforce exclusion rules for non-Indians. Over time, however, the lack of larger governance units (watershed), with appropriate incentives to buffer the pressure created by international commodity markets (e.g., beef, soybeans, and lumber), has allowed extensive deforestation all around the protected park, The park has since become the sink and "corridor" for multiple pollutants derived from the clearing of vegetation around headwater springs, overuse of fertilizer, extensive smoke from forest clearing and impacted by logging and deforestation. Now PIX itself is threatened by pressures from the surrounding agricultural areas, as well as logging and mining, as are a significant number of indigenous and protected areas in the Amazon.

The PIX provides examples both of a successful local effort to manage the environment of a diverse multi-ethnic area, and of the challenges of conserving biodiversity through a level-specific institutional arrangement in isolation from the surrounding socio-economic landscapes. This case helps us to understand both the conditions under which local populations can successfully manage biodiversity, as well as the necessity of institutions to include different stakeholder groups within an interdependent ecosystem.

[5] Institutions are understood as formal and informal rules and norms that structure collective action behaviour (Ostrom 1990, 2005). Institutional arrangements act upon and mediate processes of natural resources claim and uses, and therefore biodiversity management. Rules and norms defined by institutions, at different levels of organization, help to reduce uncertainty for people and help to mediate competing actions and the values that individuals and groups bring to biodiversity management.

Building bridging institutions between different landscape and areas under different management regimes will contribute to achieving the Aichi targets 3, 4, 5, 14 and 15 by linking management of different areas of a mosaic landscape ensuring that management in some areas (e.g. under intensive agriculture) does not impact negatively other areas status (e.g. nature reserve). It will also contribute to act upon the proximate and ultimate drivers of biodiversity and ecosystem change, e.g. Aichi targets 7, 8, 9 and 10. Finally, it will also allow some knowledge acquisition and transfer e.g. Aichi targets 18 and 19.

FIGURE 1: Today conservation units, management reserves, and indigenous areas correspond to around 30% of the Brazilian Amazon. Increasingly, these areas are becoming 'islands of conservation' surrounded by agro-industrial, logging, cattle ranching, mining, and urban areas, exerting different levels of pressure and impacts on their biodiversity and ecosystems.



For a detailed description of this case and related citations see Brondizio et al 2009.

Conservation mechanisms to manage biodiversity rely on formal, constitutive agreements and depend heavily on enforcement as a source of compliance. These institutions play a key role in constraining how individuals and groups act upon their values and goals. However, they are limited in motivating individuals to manage biodiversity, both inside and outside protected areas, when self-enforcing incentives and motivations are not in place. In addition, if these institutions are manipulated and "captured" by special interest groups or powerful individuals for their own purposes and goals, then the effectiveness and equitable access and use of resources is further eroded leading to conflicts and eventual decline in biodiversity and ecosystem services (Chopra and Duraiappah 2004).

As explained earlier, individual and community values are constantly changing with social, economic and ecological conditions. This compounds the limitations of enforcement and sanctions in motivating behavioural change, as policy makers cannot and should not solely expect local and indigenous populations to act as inherited environmental stewards for protected areas, regardless of socio-economic realities.

Similarly, although the recognition of the value of local and indigenous knowledge has been a tangible and important aspect of the CBD, indigenous populations and local communities have asserted that the valorisation of such knowledge was akin to commodifying a belief system (Schroeder, 2010). The idea of 'paying to conserve' was enthusiastically promoted, but generated recurrent disappointments and failures (Hyden 2003; several others). The institutional arrangements put in place today to manage biodiversity, from different kinds of protected areas to various forms of REDD+ agreements, do not acknowledge these social realities, resulting in calls for more participatory and human focused approaches taking cognizance of bio-cultural realities (Sikor et al, 2010).

Therefore, much of the work on institutions and institutional arrangements related to natural resources and biodiversity has focused on the way institutions are organized at local (Ostrom 1990; 2011; Cash 2006) or higher levels, such as national or global levels (Young 2006; 2008). At the local and sub-regional levels, research has demonstrated the effectiveness of protected and indigenous areas in curbing, at least to some extent, deforestation and other pressures on resources as illustrated in the PIX case study (see Box 4; Rickletts et al 2010; Soares-Filho et al 2010). There is also considerable agreement on the conditions that facilitate the successful and long-term governance of natural resources and biodiversity by local populations.

Research (e.g., Ostrom 1990; Cox et al 2010) using case studies from around the world has shown that long-term effective and robust resource management systems at the local level share key characteristics, or 'design principles', which include:

i. Clearly defined social and physical boundaries;

ii. Congruence between local conditions, appropriation, and provision rules;

iii. Adaptability of collective choice arrangements;

iv. Appropriate monitoring;

v. Graduated and implementable sanctions;

vi. Mechanisms for conflict resolution;

vii. Recognized rights to organize; and

viii. Nesting of local into higher-level institutional arrangements.

It is this last condition that poses particular challenges to the Aichi targets. Open global systems of trade and the ubiquitous presence of inter-urban and inter-rural networks have increasingly shaped the way local communities and landscapes – and in some cases entire regions – are evolving as inter-dependent systems (Seto et al 2012; Lambin and Meyfroidt 2011).

Market systems might emphasize economic values for short-term gains in using biodiversity and natural resources if appropriate bridging institutions (see box 3) are not formulated in a manner that acknowledges the broader social-ecological reality within which these local communities find themselves. In this context, the case of PIX also illustrates how different and evolving value systems and views of the environment (as well as national political economic goals) have impacted the region as a whole and undermined a particular unit of governance within the larger watershed. Key to understand the challenges of achieving the Aichi targets

(especially those relating to Strategic Goals A and E) are fit, scale, and interplay (Young 2006; Young et al 2008).

Box 4. Bridging Institutions

A bridging institution is a rule or norm formulated specifically provide coherence across existing institutions operating at the same scale or institutions working at different scales towards the conservation and sustainable use of biodiversity and ecosystem services. An example could be a legal agreement among land users in the Catskill watershed in New York to adopt certain land use practises that would not disrupt the water purification services of the watershed. The legal agreement acted as a bridge across private land ownership that allowed landowners to use the land as they see fit with the clean water act requiring the provisioning of clean water by city governments.

The issue of fit is, in essence, a matter of congruence or compatibility between the social and ecological systems, i.e. the nature of environmental problems varies across scales and an institutional arrangement that performs well at a particular scale may fail in solving problems at other scales (Acheson 2006; Brondizio et al 2009).

Given the plurality of scale-dependent institutional arrangements, cross-scale interactions among governance systems are likely to generate tensions. These tensions lead to what Young (2006) call the issue of interplay – interactions between discrete governance arrangements, which will become both more common and more significant as the density of governance arrangements increases. Polycentric governance has been proposed as a potential alternative and framework to this problem (Nagendra and Ostrom 2012).

The concept of polycentric governance systems rests on the idea that "autonomous, self-organized resource governance systems may be more effective in learning from experimentation than a single central authority" (Ostrom, 2005, p. 281). The argument here is an important one for biodiversity conservation. Institutional arrangements managing smaller systems have a higher degree of success and easier adaptation to change than larger ones. And the existence of many smaller systems (e.g., at local, municipal or state levels) opens up opportunities to make use of natural or quasi experiments to explore the consequences of different governance arrangements (e.g., different policy instruments that can be put in place to guide the behaviour of users of ecosystem services in areas like in the example of PIX showed in box 3). Under appropriate circumstances, these individual systems can be linked to form dynamic networks capable of addressing macro-level issues, i.e., into polycentric systems (Costanza et al 2001).

Extensive empirical research in complex metropolitan areas and linked water systems have shown that when local governance systems have autonomy to seek out ways of achieving economies of scale in the production of some public goods (and avoiding diseconomies of scale in other public goods) higher levels of performance are achieved (McGinnis, 1999a, 1999b). There is increasing evidence of the effectiveness of polycentric systems for the governance of common pool resources (Nagendra and Ostrom 2012). The rise of connectivity and the disconnection between institutional and ecosystem boundaries, however, may introduce further challenges. These problems, thus, highlight the importance of the development of bridging institutions coordinating efforts at different levels.

An important role for the CBD in this context is that of dealing with, and bridging, a plurality of the institutional arrangements that have emerged within different contexts over the past 20 years. In this sense, contributing to the development of regional zoning tools (a form of a bridging institution) for planning, including those paying attention to the ways different conservation areas can be interlinked to guarantee basic ecosystem functioning and buffer external pressures, will help to overcome some of the limitations of current approaches to conservation based on isolated protected areas. This essentially relates to effective implementation of the principles of the ecosystem approach.

Key Message 6: Many biodiversity related institutions (the rules and norms governing conservation and sustainable use of biodiversity) are exogenously designed and fail to consider local specificity.

Institutions that allow the expression of the plurality of individual and collective values while accommodating and respecting the cultural and social context should be promoted for biodiversity management. Ideally, these value-articulating institutions should facilitate the empowerment of individuals and collectives to sustainably manage biodiversity as appropriate within their value systems and cultures, and without external coercion.

Key Message 7: Matching the mis-matches with institutional innovation is key to improving the conservation and sustainable use of biodiversity

Institutional mismatch is a key underlying cause of the apparent ineffectiveness in biodiversity governance reported by the GBO-3 (2010) and the MA (2005). In other words, for the Aichi targets to be reached, greater emphasis should be placed on ensuring synergies among and between institutions operating at different levels.

Recommendation 6: Building Bridging Institutions

Contribute to the development of deliberative participatory processes that can support the design of bridging institutions to facilitate long-term planning and support social, moral and economic incentives for people to sustainably manage biodiversity and ecosystem services without coercion. These institutions can be formal or informal depending on specific social, ecological and economic contexts. A deliberative process would ideally ensure that these institutions are built within the cultural context these institutions would operate.

Concluding Remarks

There is no doubt that a deeper understanding of the human dimensions of biodiversity management is necessary if real progress on achieving the Aichi targets are to be realized. In this context, the ecosystem approach promoted by the CBD provides a useful framework for biodiversity management at different ecological scales and administrative levels under different socio-cultural contexts. Principle 2 of Decision V/6 relating to the ecosystem approach states “An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems”.

Much knowledge has been gained over the past three decades on the human drivers of biodiversity change. What we now need is to gain a better understanding of what motivates individuals and individuals as part of collectives to adopt a particular behaviour towards access and use of biodiversity and ecosystem services.

The values- behaviour-institutions framework within the broader context of the political ecology presented in this paper provides a conceptual basis to begin unpacking this complex nexus that goes beyond seeing the individual simply as an economic rational agent when making decisions on conservation and sustainable use of biodiversity and ecosystem services. Moreover, the plurality of values and the presence of conflicting identities individuals face when deciding on access and use of biodiversity coupled with power inequities and power relations across different communities can be seen as potentially a barrier to achieving the Aichi targets and real efforts need to be made to minimize these cognitive dissonances that are part of the socio-ecological reality.

The document stresses on providing a metric that allows a more transparent picture of trade-offs that are occurring across biodiversity, ecosystem services and other goods and services that influence values, beliefs and the final behaviours individuals and collectives adopt. Understanding these trade-offs and minimizing the need for individuals to adopt unsustainable activities with regards to biodiversity management by providing safety nets and equal platforms for fair and transparent deliberation and negotiation is one way to reduce the negative changes in biodiversity. This supplemented by providing incentives through empowerment to give individuals and collectives a sense of place and agency is also seen as a powerful tool to make biodiversity a "social default" for humanity.

Last but not least, is the mis-match of institutions within specific scales and across scales has been shown to cause unsustainable behaviour towards biodiversity management. The role of polycentric governance systems and "bridging institutions" was highlighted as a potential way to improve the governance of biodiversity management. These institutions and emphasized frequently in this paper that these do not refer to organizations or entities but the rules (formal and codified legally and norms (informal understanding of acting and doing) can if developed within the cultural specificity of the location be useful in resolving many of the mis-matches accruing from the present institutional landscape.

The key messages and recommendations presented in this paper, we hope are useful in the deliberations on ways and means to achieve the Aichi targets. The discourse presented here should be treated as a first expose of the need for the social sciences in this discourse and much more work and research is needed if we are to make a real attempt in achieving the Aichi targets as laid out in the CBD strategic plan.

References

Acheson, J. 2006. Institutional failure in resource management. Annual Review of Anthropology 35: 117-134.

Araujo, C., C. Bonjean, J. Combes, P. Motel, E. J. Reis. 2009. Property rights and deforestation in the Brazilian Amazon. *Ecological Economics* 68 (2009) 2461–2468

Asah, S.T., Blahna, D.J. In Press. Practical Implications of Understanding the Influence of Motivations on Commitment to Voluntary Urban Conservation Stewardship. *Conservation Biology*

Asah, S.T., Blahna, D.J. 2012. Motivational functionalism and urban conservation stewardship: implications for volunteer involvement. *Conservation Letters*, 5:470-477

Bamberg, S. Möser, G. 2007. Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology,* 27: 14–25

Barretto Filho, H. (2009) Traditional peoples: introduction to the political ecology critique of a Notion. in C. Adams, R.S.S. Murrieta, W.A. Neves & M. Harris (eds.) *Amazon Peasant Societies in a Changing Environment: Political Ecology, Invisibility and Modernity in the Rainforest.* Springer.

Brondizio, E. S., F. Gatzweiler, C. Zagrafos, M. Kumar. 2010. Socio-cultural context of ecosystem and biodiversity valuation.(Chapter 4) In P. Kumar (ed.) *The Economics of Ecosystems and Biodiversity* (TEEB). London, UK: Earthscan Press. Pp. 150-181.

Brondizio E S, Ostrom E, Young O: Connectivity and the Governance of Multilevel Socio-ecological Systems: The Role of Social Capital. *Annual Review of Environment and Resources* 2009, 34:253–78

David W. Cash, W. Neil Adger, Fikret Berkes, Po Garden, Louis Lebel, Per Olsson, Lowell Pritchard and Oran Young. Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World. Ecology and Society, Vol 11 no 12.

CBD, 2012, Identifying Specific Elements For Integrating The Traditional, Scientific, Technical And Technological Knowledge Of Indigenous And Local Communities, And Social And Cultural Criteria And Other Aspects For The Application Of Scientific Criteria For Identification Of Ecologically Or Biologically Significant Areas (EBSAS) as well as the establishment and management of Marine Protected Areas, 50pp

Cialdini, R. 2006. *Influence: The psychology of persuasion*. William Marrow & Co. New York, USA.

Clary, E.G., Snyder, M., Ridge, R.D., Miene, P.K., Haugen, J.A. 1994. Matching messages to motives in persuasion. A functional approach to promoting volunteerism. *Journal of Applied Social Psychology*, 24:1129-1149.

Clayton, S. & Brook, A. 2005. Can psychology help save the world? A model for conservation psychology. *Analyses of Social Issues & Public Policy*, 5(1): 87-102.

Colyvan M., S. Linquist, W. Grey, P.E. Griffiths, J. Odenbaugh, H.P. Possingham. 2009. "Philosophical issues in ecology: Recent trends and future directions." *Ecology and Society.* 14(2): art22.

Comaroff, J. and J. Comaroff 2009. Ethnicity, Inc. Chicago: The University of Chicago Press.

Costanza R, Low BS, Ostrom E, Wilson J, eds. 2001. *Institutions, Ecosystems, and Sustainability*. Boca Raton, FL: Lewis

Cox, M., G. Arnold, and S.V. Tomas. 2010. A review and reassessment of design principles for community-based natural resource management. *Ecology and Society*.

Dasgupta, Partha and Anantha Duraiappah, Wealth and Well-being in The Inclusive Wealth Report 2012, UNU-IHDP and UNEP, Cambridge University Press, 2012

Dryzek,J.S. 2000, Deliberative and Beyond., Oxford University Press.

Dunlap, R. E. and R. E. Jones. 2002. "Environmental concern: Conceptual and measurement issues." In *Handbook of environmental sociology*, Eds. R. E. Dunlap and W. Michelson, pp 482–524. Westport, CT: Greenwood Press.

Duraiappah, A. K. et al.(eds). 2011. Satoyama--satoumi ecosystems and human well-being : socio-ecological production landscapes of Japan. Tokyo: United Nations University Press.

Duraiappah, A. K., *Computational Models in the Economics of Environment and Development*, Dordrecht, Holland: Kluwer Academic Publishers, Environmental Series, 2003.

Duraiappah,A.K. 1998. Poverty and Environmental Degradation: Investigation of the Nexus, World Development, Vol 26 No 12.

Easterlin, Richard A., 2003. "Explaining Happiness." Proceedings of the National Academy of Sciences, 100:19, September 16, 11176-11183

Farber S.C., R. Costanza, and M.A.Wilson. 2002. "Economic and ecological concepts for valuing ecosystem services." *Ecological Economics.* 41: 375–392.

Frey BS, Stutzer A (2002) Happiness and Economics: How the Economy and Institutions Affect Human Well-Being. Princeton, NJ: Princeton University Press.

Godoy R., D. Wilkie, H. Overman, A.G. Cubask, J. Demmer, K. McSweeney, N. Brokaw. 2000. "Valuation of consumption and sale of forest goods from a Central American rain forest." *Nature* 406:62–63.

Gu, Hongyan and Suneetha M Subramanian, 2012, Socio-ecological production landscapes: Relevance to the Green Economy Agenda, UNU-IAS Policy Report, 66 pages.

Hengeveld, R. 2012. Wasted World: How our Consumption Challenges the Planet. Chicago: University of Chicago Press.

Hyden 2003 (line 481)-Hornborg, A., J. McNeill, and J. Martinez-Alier. 2007. *Rethinking Environmental History: World-System History and Global Environmental Change*. Lanham: Altamira Press.

Kenrick, D.T., Neuberg, S.L., Cialdini, R.B 2009. *Social Psychology: Goals in Interaction* (5th Edition). Pearson Publications, London, UK.

Hunter, L. M. and J. Brehm. 2004. "A Qualitative Examination of the Values Attributed to Wildlife and Biodiversity by Rural Residents of the Intermountain West." *Human Ecology Review.* Vol. 11, No. 1: 13-26.

Hunter, L. M. and L. Rinner. 2004. "The Association between Environmental Perspective and Knowledge and Concern with Species Diversity." *Society and Natural Resources.* Vol. 17, No. 6: 517-532.

Jackson,T., 2005., Motivating Sustainable Consumption: A Review of evidence on consumer behaviour and behavioural change, A report to the Sustainable Development Research Network. Centre for Environmental strategy, University of Surrey, Guilford.

Kellert, S. R. and E. O. Wilson. 1993. *The biophilia hypothesis.* Island Press, Washington, D.C.

Kellert, S. 2009. "Biodiversity, quality of life, and evolutionary psychology." pp 99–127 in *Biodiversity change and human health: from ecosystem services to spread of disease*, Eds. O. E. Sala, L. A. Meyerson, and C. Parmesan. Island Press, Washington, D.C.

King, P.N., M. A. Levy, and G. C. Varughese, A. Al-Ajmi, F. Brzovic, G. Castro-Herrera, B. Clark, E. Diaz-Lara, M. Kamal Gueye, K. Jacob, S. Jalala, H. Mori, H. Rensvik, O. Ullsten, C. Wall, and Guang Xia, C. Ambala, B. Anderson, J. Barr, I.Baste, E. Brondizio, M. Chenje, M. Chernyak, P. Clements-Hunt, I. Dankelman, S. Draggan, P. Kameri-Mbote, S. Karlsson, C. Lagos, V. Mehta, V.Narain, H. Peters, O. Salem, V. Rabesahala, C. Rumbaitis del Rio, M. Sabet, J. Simpson, and D. Stanners 2007. Chapter 10: From the Periphery to the Core of Decision Making – Options for Action. *Global Environmental Outlook 4 (GEO-4)*. Nairobi: United Nations Environmental Program. Pp.:455-496.

Kollmuss,A., and Agyeman,J. 2002. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour? Environmental Education Research 8, 239-260.

Lambin, E. F. and P. Meyfroidt. 2011. Global land use change, economic globalization, and the looming land scarcity PNAS 2011 108 (9) 3465-347

Maier, D.S. 2012 *What's So Good About Biodiversity?: A Call for Better Reasoning About Nature's Value*. Springer Publishing: Dordrecht, Netherlands.

McGinnis MD. 1999a. *Polycentricity and Local Public Economies*. Ann Arbor: Univ. Michigan Press

McGinnis MD. 1999b. *Polycentric Governance and Development*. Ann Arbor: Univ. Mich. Press

McKenzie-Mohr, D. 2000. Promoting sustainable behaviour: An introduction to community-based social marketing. *Journal of Social Issues*, 3: 543-554.

McKenzie-Mohr, D. 2011. *Fostering sustainable behaviour: An introduction to community-based social marketing*. New Society Publishers, British Columbia, Canada.

McKenzie-Mohr, D., Lee, N.R., Schultz, P.W., Kotler, P. 2012. *Social marketing to protect the environment: What works*. Sage publications, Los Angeles, USA.

Millennium Ecosystem Assessment. 2003. *Ecosystem and human well-being: a framework for assessment.* World Resources Institute, Washington, DC.

Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being. Millennium Ecosystem Assessment

Nagendra, Harini, and Elinor Ostrom. 2012. "Polycentric Governance of Multifunctional Forested Landscapes." *International Journal of the Commons* 6(2) (August): 104–33.

Oldsbaldiston, R., Sheldon, K.M. 2003. Promoting internalized motivation for environmentally significant behaviour: A prospective study of environmental goals. *Journal of Environmental Psychology*, 23: 249-357.

Ostrom, E. 1990. *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press, New York.

Ostrom, E. 2005 . Ostrom E. 2005. Understanding Institutional Diversity. Princeton, NJ: Princeton Univ. Press

Prager, K. 2012, Understanding Behavioural Change: How to apply theories of behaviour change to SEWeb and related public engagement activities, Life10 ENV-UK-000182

Reyers B, S. Polasky, H. Tallis, H.A. Mooney, A. Larigauderie. 2012. "Finding common ground for biodiversity and ecosystem services. *BioScience*. 62: 503–507.Ricketts T H, Soares-Filho B, da Fonseca G A B, Nepstad D, Pfaff A, Petsonk A, Anderson A, Boucher D, Cattaneo A, Conte M, et al.: Indigenous Lands, Protected Areas, and Slowing Climate Change. PLoS Biol 2010, 8(3): e1000331.

Ricketts TH, Soares-Filho B, da Fonseca GAB, Nepstad D, Pfaff A, et al. (2010) Indigenous Lands, Protected Areas, and Slowing Climate Change. PLoS Biol 8(3): e1000331. doi:10.1371/journal.pbio.1000331

Ryan, RM, Deci, EL. 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1): 68-78.

Ryan, R.L., R. Kaplan, R.E. Grese. 2001. Predicting volunteer commitment in environmental stewardship programmes. *Journal of Environmental Planning & Management*, 44:629-648.

Sagoff, M. 2008. *The economy of the earth: philosophy, law, and the environment.* Second edition. Cambridge University Press: Cambridge, UK.Saunders, CD. 2003. The emerging field of conservation psychology. *Human Ecology Review*, 10(2): 137-149.

Schultz, P.W. 2011. Conservation means behaviour. *Conservation Biology*, 25:1080-1083.

Secretariat of the Convention on Biological Diversity. 2010. Global Biodiversity Outlook 3. 94p.

Secretariat of the Convention on Biological Diversity. 2012. Cities and Biodiversity Outlook. 64p.

Sen 1998, Development as Freedom, Knopf Publishers.

Sikor, T, Stahl, J , Enters,T, Ribot,JC, Singh,N, Sunderlin,WD, Wollenberg, L, 2010, REDD-plus, forest peoples' rights and nested climate governance, *Global Environmental Change,* 20(3): *doi:10.1016/j.gloenvcha.2010.04.007*

Simaika, J. P. and Samways. 2010. "Biophilia as a Universal Ethic for Conserving Biodiversity." *Conservation Biology.* 24: 903–906.

Seto, K., A. Reenberg, C. G. Boone, M. Fragkias, D. Haase, T. Langanke, P. Marcotullio, D. K. Munroe, B. Olah, and D. Simon. 2012b. Urban land teleconnections and sustainability. *PNAS*. 109 (20): 7687-7692

Soares-Filho B, Moutinho P, Nepstad D, Anderson A, Rodrigues H, Garcia R, Dietzsch L, Merry F, Bowman M, Hissa L, Silvestrini R, Maretti C. Role of Brazilian Amazon protected areas in climate change mitigation. *PNAS* 2010 Jun 15;107(24):10821-6.

Steffen W, Sanderson A, Tyson PD, Jager J, Matson PA, Moore III B, Oldfield F, Richardson K, Schellnhuber HJ, Turner II BL, Wasson RJ. 2004. *Global change and the Earth System: A planet under pressure*. The IGBP Series, Springer, Berlin

Stern, P.C. 2000. Toward a coherent theory of environmentally significant behaviour. *Journal of Social Issues,* 56(3): 407-424.

Strategic Plan for Biodiversity 2011–2020 and the Aichi Target. 2010. Living in Harmony (COP 10 Decision X/2).

Suneetha M.S and Balakrishna Pisupati, 2009, Learning from the Practitioners: Benefit Sharing perspectives from enterprising communities, UNU-IAS and UNEP Report, 50 PP.

UNU-IHP and UNEP, 2012. Inclusive Wealth report 2012. Cambridge University Press, United Kingdom.

Vatn H. 2005, Institutions and the environment, Edward Elgar, Cheltenham.

Weber, E. 2013, Doing the rights things willingly, in The behavioral foundations of public policy by Eldar Shafir et.al. Princeton University Press.

West, P., Igoe, J., & Brockington, D. (2006). Parks and peoples: the social impact of protected areas. *Annual Review of Anthropology 25*, 251-277

Wallerstein, Immanuel (1974). The Modern World-System I: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century. New York: Academic Press.

WOLF, E. 1982. Europe and the people without history. Univ California Press.

Young O R. 2006. Vertical interplay among scale-dependent environmental and resource regimes. *Ecology and Society,* 11(1):27. http://www.ecologyandsociety.org/vol11/iss1/art27/

Young 2010, Institutional dynamics: Emergent patterns in international environmental governance, MIT Press. Cambridge.

Young O. R., L. A. King, H. Schroeder, Eds. 2008. Institutions and Environmental Change (MIT Press, Cambridge, MA.

Zimmerer, Karl S., (ed). 2006. *Globalization and New Geographies of Conservation.* Chicago: University of Chicago Press.

Annex 1. The Aichi Strategic Goals and Targets

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
Strategic Plan Target
#1: People are aware of the value of biodiversity & of the steps they can take to conserve and sustainably use biodiversity (by 2020)
#2: Biodiversity values have been integrated into national and local strategies for development, poverty reduction and planning processes and are being incorporated into national accounting and reporting systems (by 2020)
#3: Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed and positive incentives are developed and applied (by 2020)
#4: Governments, business and stakeholders at all levels have taken steps to achieve sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits (by 2020)
#5: The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced
Strategic Goal B: Reduce pressure and promote sustainable use of biodiversity
Strategic Plan Target
#6: All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably and legally [ecosystem approach] (by 2020)
#7: Areas under agriculture, aquaculture and forestry are managed sustainably (by 2020)
#8: Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity (by 2020)
#9: Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated and measures are in place to prevent their introduction and establishment (by 2020)
#10: The multiple anthropogenic pressures on coral reefs and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized (by 2015)
Strategic Goal C: Improve status of biodiversity by safeguarding ecosystems, species and genetic diversity
Strategic Plan Target
#11: At least 17 % of terrestrial and inland water areas and 10 % of costal and marine areas are conserved through systems of protected areas (by 2020)
#12: Extinction of known threatened species has been prevented and their conservation status has been improved and sustained (by 2020)
#13: Genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives is maintained and strategies developed and implemented for minimizing

genetic erosion and safeguarding genetic diversity (by 2020)
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services
Strategic Plan Target
#14: Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable (by 2020)
#15: Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through conservation and restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification (by 2020)
#16: The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation (by 2015)
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building
Strategic Plan Target
#17: Each party has developed, adopted as a policy instrument, and has commenced implementing an updated National Biodiversity Strategy and Action Plan (NBSAPs) (by 2015)
#18: Traditional knowledge, innovations and practices of indigenous and local communities and their customary use are respected and fully integrated in the implementation of the CBD with full and effective participation of indigenous and local communities (by 2020)
#19: Knowledge, the science base and technologies relating to biodiversity, its values, functioning and status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied (by 2020)
#20: The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity from all sources should increase substantially from current levels, in accordance with the Strategy for Resource Mobilization and based on resource needs assessments to be developed and reported by Parties (by 2020)

Annex 2:

Mapping the Key Messages and Key Recommendations into 20 Aichi targets (CBD Strategic Plan for Biodiversity 2011–20; 2010)

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society		
Strategic Plan Target	**Opportunities**	**Actions requested**
#1: People are aware of the value of biodiversity & of the steps they can take to conserve and sustainably use biodiversity (by 2020)	Key message 1 Key message 2 Key Message 6	Recommendation 1 – New Yardsticks Recommendation 4 -Behavioural changes
#2: Biodiversity values have been integrated into national and local strategies for development, poverty reduction and planning processes and are being incorporated into national accounting and reporting systems (by 2020)	Key message 1 Key message 2 Key message 3 Key message 7 Key Message 5	Recommendation 4 – Behavioural changes Recommendation 2 – Pluralities of values Recommendation 1 – Changing the yardstick of measuring progress
#3: Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed and positive incentives are developed and applied (by 2020)	Key message 3 Key message 4	Recommendation 4 – Behavioural changes Recommendation 6 – Bridging institutions Recommendation 3 – Providing economic facilities
#4: Governments, business and stakeholders at all levels have taken steps to achieve sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits (by 2020)	Key message 4 Key message 6 Key message 5	Recommendation 4 – Behavioural changes Recommendation 6 – Appropriate bridging Institutions instituted
#5: The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced	Key message 1 Key message 5 Key Message 4	Recommendation 4 – Behavioural changes Recommendation 6 – Bridging institutions Recommendation 1 – Changing the yardstick of measuring progress
Strategic Goal B: Reduce pressure and promote sustainable use of biodiversity		
Strategic Plan Target	**Opportunities**	**Actions requested**
#6: All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably and legally	Key message 1 Key message 4 Key message 5	Recommendation 3 –Economic Facilities provided Recommendation 4 –Changing

[ecosystem approach] (by 2020)		behaviour Recommendation 1 – Changing the yardstick of measuring progress
#7: Areas under agriculture, aquaculture and forestry are managed sustainably (by 2020)	Key message 1 Key Message 4 Key Message 5 Key Message 6 Key Message 7	Recommendation 3 –Economic facilities provided Recommendation 2 – Plurality of values expressed Recommendation 1 – Changing the yardstick of measuring progress Recommendation 4 – Behavioural changes
#8: Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity (by 2020)	Key message 1 Key message 2 Key message 4 Key message 5	Recommendation 6 – Bridging institutions Recommendation 1 – Changing yardstick of measure progress Recommendation 4 – Behavioural changes
#9: Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated and measures are in place to prevent their introduction and establishment (by 2020)	Key message 4 Key message 5	Recommendation 6 – Bridging institutions Recommendation 4 – Behavioural changes
#10: The multiple anthropogenic pressures on coral reefs and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized (by 2015)	Key message 4 Key message 5	Recommendation 6 – Bridging institutions Recommendation 4 – Behavioural changes
Strategic Goal C: Improve status of biodiversity by safeguarding ecosystems, species and genetic diversity		
Strategic Plan Target	**Opportunities**	**Actions requested**
#11: At least 17 % of terrestrial and inland water areas and 10 % of costal and marine areas are conserved through systems of protected areas (by 2020)	Key message 1 Key message 4 Key message 5 Key message 7	Recommendation 4 – Behavioural changes Recommendation 1- changing yardsticks of measuring progress
#12: Extinction of known threatened species has been prevented and their conservation status has been improved and sustained (by 2020)	Key message 2 Key message 4 Key message 5 Key message 7	Recommendation 2– Pluralities of values Recommendation 4 – Behavioural changes Recommendation 1 – Changing

		the yardstick of measuring progress
#13: Genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives is maintained and strategies developed and implemented for minimizing genetic erosion and safeguarding genetic diversity (by 2020)	Key message 2 Key message 4 Key message 5 Key message 7	Recommendation 2 – Pluralities of values Recommendation 4 – Behavioural changes
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services		
Strategic Plan Target	**Opportunities**	**Actions requested**
#14: Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable (by 2020)	Key message 1 Key message 2 Key message 3 Key message 4 Key message 5 Key message 7	Recommendation 3 –Providing economic facilities Recommendation 4 – Behavioural changes Recommendation 6 – Bridging institutions Recommendation 5 –Reflexive capacity building Recommendation 1 – Changing the yardsticks of measuring progress
#15: Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through conservation and restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification (by 2020)	Key message 4 Key message 5 Key message 7	Recommendation 4 – Behavioural changes Recommendation 6 – Bridging institutions Recommendation 5 –Reflexive capacity building
#16: The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation (by 2015)	Key message 3 Key message 4 Key message 5 Key message 7	Recommendation 6 – Bridging institutions Recommendation 4 – Behavioural changes
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building		
Strategic Plan Target	**Opportunities**	**Actions requested**
#17: Each party has developed, adopted as a policy instrument, and has commenced implementing an updated National Biodiversity Strategy and Action Plan (NBSAPs) (by 2015)	Key message 3 Key message 5 Key message 6 Key message 7	Recommendation 3 –Providing economic facilities Recommendation 6 – Bridging institutions Recommendation 5 –Reflexive capacity building

		Recommendation 2: Plurality of values program
#18: Traditional knowledge, innovations and practices of indigenous and local communities and their customary use are respected and fully integrated in the implementation of the CBD with full and effective participation of indigenous and local communities (by 2020)	Key message 4 Key message 5 Key message 6 Key message 7	Recommendation 4 –Behavioural change Recommendation 5: Reflexive capacity building Recommendation 6: Instituting bridging institutions
#19: Knowledge, the science base and technologies relating to biodiversity, its values, functioning and status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied (by 2020)	Develop the science base related to the 7 Key Messages	Develop the science base for the 6 Recommendations
#20: The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity from all sources should increase substantially from current levels, in accordance with the Strategy for Resource Mobilization and based on resource needs assessments to be developed and reported by Parties (by 2020)	Relevant to all key messages	A necessary condition for the implementation of the six recommendations.