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CLUSTER REPORT ON RESOURCE REQUIREMENTS FOR THE AICHI BIODIVERSITY TARGETS

TARGET 19: ENABLING ACTIVITIES

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ASSESSING COST OF IMPLEMENTING THE AICHI TARGETS OF THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020

Target 19

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

1. Background

1.1 Material used

The present note assesses costs for implementing target 19 at three levels (national, regional, and global), which was inspired by the financial needs assessment for implementing the Strategic Plan for Biodiversity 2011-2020 and the Aichi biodiversity targets, undertaken for the sixth replenishment cycle of the Global Environment Facility (GEF).[1] It uses data on national biodiversity-related research expenditures of the United Kingdom as well as annual expenditures of select national institutes undertaking such research (CONABIO and INBIO). Existing or proposed budgets for major pertinent regional and global programmes and mechanisms, such as the Diversitas International Biodiversity Science Programme[2], bionet and its regional programmes,[3] and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), were also taken into account.[4] Specifically with regard to monitoring and biodiversity information management, an assessment of financial needs was received from GBIF and was integrated into the present analysis. Some of the information was received by personal communications and is referenced accordingly.

The analysis in particular of the research component is presently based on a very limited number of data points and the estimates, based on extrapolation, are therefore rough. More data points could be added in further iterations of this exercise, in order to gauge sensitivity and increase robustness, but are not expected to change the order-of-magnitude of the estimates.

1.2 Technical Rationale

Each country needs access to information to identify threats to biodiversity, to determine priorities for conservation and sustainable use, and to monitor and evaluate the impacts of policy measures. While nearly all Parties report that they are taking actions related to monitoring and research, most also indicate that the absence or difficulty in accessing scientific information is an obstacle to the implementation of the goals of the Convention. Action taken to reach this target will also benefit the other targets of the Strategic Plan by encouraging new research, the development of new technologies, and improved monitoring. Such actions will strengthen the policy-science interface and will contribute to the fulfilment of the other elements of the Strategic Plan.[5]

1.3 Activities

Strengthening scientific biodiversity-related research will be a major activity. This may include the establishment of new chairs, teacher visiting programs, student exchange programs, national and international scholarships, research grants, among others, and strengthened long-term scientific and

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[1]/ A summary of this needs assessment is provided in document UNEP/CBD/COP/11/15.

[2]/ http://www.diversitas-international.org/

[3]/ http://www.bionet-intl.org

[4]/ http://www.ipbes.net/

[5]/ http://www.cbd.int/sp/targets/rationale/target-19/

technological cooperation programmes. For the purpose of the present costing, only public research expenditures were considered.[6]

Biodiversity-related research typically already includes observation and monitoring activities, but these are frequently related to specific research projects and, as such, time-bound and restricted in scope. However, it is long-term and reasonably comprehensive monitoring programmes and associated user-friendly information systems which enable recognition of trends and thus the design of more effective biodiversity policies. As stated in the GEO-BON report on "Adequacy of Biodiversity Observation Systems to support the CBD 2020 Targets", a key overarching challenge is to shorten the response time from when information is created to when it is available to decision makers. The aim must be to allow for a quicker response time through an appropriate data flow infrastructure and analysis in support of policy makers and to ensure sustainable funding to deliver and sustain such global infrastructure.

Representatives of the international biodiversity informatics community met in Copenhagen in July 2012 for the Global Biodiversity Informatics Conference (GBIC) to discuss priorities for data capture and infrastructure development in support of biodiversity science and policy. GBIC focused on the components and initiatives required to transform and maintain the global knowledge base on the world's biodiversity as an integrated digital resource in support of research and science-based policy. In the associated costing used in the present assessment,[7] it is assumed that the following activities will continue independently and do not need to be considered as part of the costing:

- continued development of global earth observing systems and access to resulting imagery and data;
- open access to other geospatial and socio-economic data sets required to carry out modeling and analysis of biodiversity data in support of the Aichi targets;
- business-as-usual data capture which can be expected to flow from satellites, existing field monitoring, ongoing scientific research etc.

In consequence, the establishment of such monitoring and information systems, including through the establishment and further development of clearing-house mechanisms at national and global levels, is presented as a separate category.

Target 19 also relates to technology transfer which, according to Article 16 of the Convention, is essential to attain its objectives. However, no attempt is made here to quantify associated expenditures as a separate activity. This approach has been taken because it has been recognized under the Convention that *"technology transfer, in particular in the context of the third objective of the Convention, will not be effective as an on-off and one-way activity, but needs to be embedded in in integrated, long-term scientific and technological cooperation, which may involve the joint development of new technologies and, as based on reciprocity, would also provide a key mechanism for the effective building or enhancement of capacity in developing countries and countries with economies in transition."* [8] Such integration is needed because technologies that are relevant for implementing the Convention are frequently 'soft' technologies (technological information or know-how), and it is such 'soft' technology that *"is often transferred within long-term scientific and technological cooperation including though joint research and innovation which move ideas from invention to new products, processes and services."* [9] Scientific and technological cooperation is however an integral part of research, and trying to showcase associated expenditures separately would arguably imply a major risk of double-counting.

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[6]/ Bearing in mind that the funding of public-interest research institutions analysed may include private sources.

[7] Personal communication of Mr. Donald Hobern, GBIF.

[8] Strategy for practical implementation of the programme of work on technology transfer and scientific and technical cooperation, decision IX/14 Annex, paragraph 4.

[9] Ibid, paragraph 6.

1.4 Levels

The financial needs assessment for GEF-8 provides figures at three different levels: national, regional and global. With regard to monitoring and information management, activities need to be undertaken both at national and international levels as a global observation and monitoring system, as well as a scientific network that national activities relate to, may enhance cost-effectiveness. The present assessment therefore follows this approach, bearing in mind that there is a certain risk of double-counting, in particular with regard to assessing research expenditures at national and at regional levels.

2. Assessment

2.1 Activities at national level

2.1.1 Research

(i) Assessing current global expenditures

As a first step towards quantifying additional research costs, an attempt was made to assess current global expenditures on biodiversity-related research. Undertaking such an assessment faces considerable methodological challenges, including:

1. how to differentiate biodiversity-related research that is of direct relevance to implementing the Convention from biological research more generally (e.g. as undertaken by definition by universities' biology departments);
2. how to account for the fact that research expenditures that involve international cooperation may, in highly aggregated statistics, be accounted for twice (as a research expenditure both of the provider and of the recipient country and/or research institution).[10]

Disaggregating relevant national and institutional statistics (assuming that they are readily available) and adding up numbers one-by-one would imply prohibitive resource needs and the net value added would be questionable. For the purpose of assessing a global figure, the following alternative approach has been taken:

- In order to suitably differentiate the assessment in accordance with countries' different economic conditions, separate assessments were undertaken by World Bank income level country group;
- For high income countries, detailed information on biodiversity-related public research spending was used from a reasonably 'average' country, where average was determined in terms of (i) public research expenditures as a share of GDP and (ii) share of health and environment expenditures among those.[11] The amount was than extrapolated to the country group by using population data.[12]
- For upper middle income countries, annual expenditures of select national biodiversity institutes (as stated in annual reports) were again extrapolated by using population data.
- Lower middle income and lower income countries were not analysed explicitly because of the same risk of double-counting: while biodiversity-related research takes place, it is likely to be funded, to significant extent, from foreign sources. However, lower middle income and lower income countries are taken into account in the assessment of financial needs.

Further methodological explanations are provided along the analysis presented below.

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[10] For instance, OECD statistics on government budget appropriations of outlays for R&D measures the funds committed by governments (principally federal/central) for R&D to be carried out domestically or abroad (including by international organisations). See OECD Science, Technology and Industry Scorecard 2011, p. 118.

[11]/ As per the OECD Science, Technology and Industry Scorecard 2011.

[12]/ Population data was retrieved from the World Bank database at http://data.worldbank.org.

High income countries

Detailed information on public biodiversity-related public research expenditures was received[13] from the United Kingdom.[14] The criterion for selection of projects/programmes with biodiversity as a major component was that the work has been given a primary classification of one or more of the following:

E2.3.3	Genetic modification
E2.3.4	Introduction of alien species
E3.2.1	Change in or loss of biodiversity
E3.2.2	Changes in, damage to or loss of ecosystems
E3.2.3	Changes in, damage to or loss of habitats
E3.2.4	Changes in population, distribution & migration of specific species
E3.2.5	Genetic changes in, or damage to, specific species & genera
E5.B.4.1	Maintenance & improvement of habitats & ecosystems
E5.B.4.2	Conservation or control of specific species

Retrieval of the LWEC Envirobase database and amendment of recent spending increases via NERC Theme Action Plans leads to an estimate of the United Kingdom's 2008-2009 public biodiversity-related research expenditures (excluding observation/surveillance, as explained above) of approximately £60mn annually, or USD 95mn. Extrapolating by population numbers[15] leads to an estimate of total annual biodiversity-related public research expenditures in high income countries of USD 1.71bn.

Upper middle income countries

Annual expenditures as stated in annual reports were sampled from the following biodiversity research institutes:

- Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), Mexico: USD 11.4mn in 2010;
- National Biodiversity Institute (INBio), Costa Rica: USD 8.8mn in 2009.

Extrapolating by population numbers leads to an estimate of total annual biodiversity-related public research expenditures in upper middle income countries of USD 400mn.

The revenue overview of INBIO's national report provides some indication of funding sources. Correcting, as far as possible, for funding received from foreign donors, in order to avoid double-counting, and assuming a similar share for CANABIO, would cut the number above in half. In the calculation of total additional expenditures below, a suitable correcting factor was therefore applied in the low end scenario.

Both CONABIO and INbio are regional centers of excellence and the question arises whether they (and the associated expenditures) can be taken as representative for the country group as a whole, or whether this does not lead to an overestimate of the total. Moreover, both countries are megadiverse countries, which may also lead to an overestimate. On the other hand:

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[13]/ Personal communication of Ms. Marion Bartholomew, Environmental Research Database Manager, Living with Environmental Change (LWEC).

[14]/ As per the OECD Science, Technology and Industry Scorecard 2011, the United Kingdom is slightly below average in terms of public research expenditures, but above average in terms of its share of health and environment research expenditures among those. See ibid, at page 119.

[15]/ That is, dividing by the population of the United Kingdom (63 mio) and then multiplying by the total population number of high income countries (1.135 bn).

- The aggregate per capita figure of these two countries is driven down significantly by Mexico's large population.
- The upper middle income country group includes a significant number of other megadiverse countries.
- While these two institutions are important national players, their expenditures may not exhaustively represent the respective biodiversity-related research.

Total estimate

Based on the above, annual expenditures on public biodiversity-related research in high income and higher middle income countries can be roughly estimated at around USD 2bn.

(ii) Additional research costs

For high income countries, a compounded annual nominal increase of 5 percent (approximately increasing nominal research expenditures over the next 8 years by fifty percent) would imply additional total costs of **USD 3.4bn**, or approximately USD 430mn annually on average – bearing in mind that some fraction of this number would actually be disbursed in developing countries; [16]

For higher middle income countries, a compounded annual nominal increase of 10 percent (approximately doubling research expenditures over the next 8 years) implies additional total costs of **USD 1.84bn**, or USD 230mn annually on average;

For lower and lower middle income countries, current biodiversity-related research expenditures are presumably on a level insufficient for effective implementation of the Strategic Plan and its Aichi targets. Assuming that funding on a level similar to INbio and CONABIO (on per capita basis) would enable such implementation implies additional annual costs of USD 535mn, or a total additional **USD 4.28bn**.

2.1.2 Monitoring and information systems

According to the GBIC/GBIF assessment, since several national activities have already established working models and best practices, and since software components and many data sets may be reused, an average investment of between USD 8mn and USD 20mn (over a 5-year period) would be required to establish a well-managed national biodiversity information facility at national level, with annual operating costs of USD 1mn on average. This amounts to total average costs of USD 16 mn to USD 28mn per country, or **USD 3.316bn to USD 5.488bn**.

2.2 Activities at sub-regional and regional levels

As an example, the global network for taxonomy BioNET has ten regional networks - the 'Locally Owned and Operated Partnerships' (LOOPs) which help their members build and apply taxonomic capacity to address issues in various fields, including other sciences, biodiversity research, management and use, agriculture, food security and poverty reduction, industries, and policy decision making. BioNET comprises to date 10 government-endorsed regional networks with 105 member countries in Africa, Asia, the Caribbean, Latin-America, and Oceania. [17] Enabling these regional networks to effectively discharge this portfolio of activities would require an average of $3 million US per year and network, or $30 million per year[18] – and this would just be for implementing the Global Taxonomy Initiative, notwithstanding other areas where regional or sub-regional scientific and technological cooperation programmes would be useful (e.g., on invasive alien species), in addition and beyond national research expenditures.

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[16]/ See footnote 10.

[17]/ See http://www.bionet-intl.org/opencms/opencms/regions/default.jsp

[18]/ Personal communication of Ms. Junko Shimura, programme officer on GTI, CBD Secretariat.

Another important area of regional cooperation is ensuring effective information flow and integration from national, regional to global level. There are many reasons why biodiversity data management depends on international collaboration to support effective and sustainable information:

- Biodiversity patterns require analysis at regional and global levels.
- Understanding species distributions requires review of data from across the entire range of each species.
- Given the limited availability of monitoring data, each party can benefit from data on species from other countries.
- Expertise on the identification and biology of different species groups is scattered between the world's research facilities.

Based on the GBIC discussions the funding required for further development or upgrading of the existing international collaborative infrastructure to support the needs of research and policy is in the range of USD 80mn to USD 120mn over a 5-year period, with ongoing yearly operating costs in the range of USD 8mn to USD 12mn. This implies total costs ranging from **USD 144mn to USD 216mn**.

For the period 2013-2020 (8 years), it is therefore suggested to define funding needs under two scenarios (or 'levels of ambition') as follows:

a) USD 144mn for information systems plus $3 million per year for 30 regional or sub-regional programmes (USD 720mn), which would require a total of **USD 864mn**:
b) USD 216mn for information systems plus $3 million per year for 40 regional or sub-regional programmes (USD 960mn), which would require a total of **USD 1.416bn**.

2.3 Activities at global level

2.3.1 Monitoring and information systems

According to GBIF, in addition to the aforementioned infrastructure for information exchange and access, additional research infrastructure is required to support advanced studies and analysis of biodiversity-related information in support of decision-makers. Such infrastructure will support predictive modeling in support of scientific research and decision-making to estimate biodiversity state (past and present) as well as predict potential changes in response to a change in biotic/abiotic conditions at any point on Earth. This would enable the creation of reference, peer-reviewed datasets, models and results repositories in support of scientific research contributing to estimating the current state of biodiversity, as well as the potential impacts of change on biodiversity to be used in everything from local decisions (e.g., development corridors) to global assessments backing international policy considerations (e.g., climate change, biofuels, logging, food security, invasive alien species)

The funding required for establishing the international collaborative infrastructure to support such modeling and analysis of the status and trends in biodiversity and the impacts and benefits associated with biodiversity is in the range of USD 80mn to USD 120mn over a 5-year period, with ongoing yearly operating costs in the range of USD 15mn to USD 30mn, or a total of **USD 200mn to USD 360mn**.

2.3.2 Global scientific and technological cooperation and science-policy interface

Scientific coordination related to the DIVERSITAS international science programme amounts to USD 3.28mn per year (for the international DIVERSITAS secretariat and the eight projects secretariats), while

the costs of the research activities associated with implementing the science programme would be disbursed at national level.[19]

As regard the strengthening of the global science-policy interface, the total annual indicative cost of operating the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is assessed between USD 5.5mn and USD 13.3mn.[20]

For the period 2013-2020 (8 years), it is therefore suggested to define global funding needs under two scenarios or levels of ambition as follows:

a) Global information modelling and analysis: USD 200mn;
Promoting global scientific and technical cooperation: USD 28mn;
Science-policy interface: USD 44mn;
With total requirements of **USD 272mn**.

b) Global information modelling and analysis: USD 360mn;
Promoting global scientific and technical cooperation: USD 40mn;
Science-policy interface: USD 106.4mn;
With total requirements of **USD 506.4mn**.

4. Summary

Bearing in mind that different scenarios or levels of ambition could be picked for different levels, summing up the above across same levels of ambition lead to indicative global figures, for 2013-2020 as follows:

Low end

National level

	bn USD
Research	
High income countries (compounded annual 5 percent increase)	3.4[21]
Upper middle income countries (compounded annual 10 percent increase)	1.84
Lower middle income and lower income countries (achieving INbio/CONABIO levels)	4.28
Double-counting correcting factor	-0.9
Monitoring and information systems	3.316
Regional level	
Research cooperation	0.72
Monitoring and information systems	0.144
Global level	
Research cooperation and policy interface	0.072
Monitoring and information systems	0.2
TOTAL	**13.072**

[19]/ Personal communication of Ms. Anne Larigauderie, DIVERSITAS Executive Director.

[20]/ See document UNEP/IPBES.MI/2/7 at http://www.ipbes.net/previous-ipbes-meetings/second-session-of-plenary.html .

[21]/ This number includes expenditures for research carried out both domestically and abroad. See footnote 10.

High end

National level

	bn USD
Research	
High income countries (compounded annual 5 percent increase)	3.4
Upper middle income countries (compounded annual 10 percent increase)	1.84
Lower middle income and lower income countries (achieving INbio/CANABIO levels)	4.28
Monitoring and information systems	5.488
Regional level	
Research	0.960
Monitoring and information systems	0.216
Global level	
Research cooperation and policy interface	0.146
Monitoring and information systems	0.36
TOTAL	**16.69**
