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Convention on Biological Diversity

CONFERENCE OF THE PARTIES TO THE
  CONVENTION ON BIOLOGICAL DIVERSITY
Eleventh meeting
Hyderabad, India, 8–19 October 2012
Item 12 of the provisional agenda*

DEVELOPMENT OF POVERTY-BIODIVERSITY INDICATORS AND THEIR EVENTUAL APPLICATION

Note by the Executive Secretary

I   INTRODUCTION

1.   In decision X/6, the Conference of the Parties recognized the urgent need to improve capacity for mainstreaming the three objectives of the Convention into poverty eradication strategies and plans and development processes as a means to enhance the implementation of the Convention and the Strategic Plan for Biodiversity 2011-2020 and enhance their contribution to sustainable development and well-being. It further decided to establish an Expert Group on Biodiversity for Poverty Eradication and Development mandated to further elucidate the linkages between the three objectives of the Convention and poverty eradication, and to identify the most effective approach toward a framework on capacity-development for mainstreaming biodiversity and ecosystem services for sustainable development and poverty eradication.

2.   The Expert Group met in Dehradun, India, from 12 to 15 December 2011. The following draft report was produced following the discussions of this Expert Group on the importance of developing poverty-biodiversity indicators and the recommendations of a previous report commissioned by the Secretariat[1] on the same subject. The draft report was also produced in anticipation of possible discussions at the eleventh meeting of the Conference of the Parties in Hyderabad, India.

3.   The following draft report, titled "Development of Poverty-Biodiversity Indicators and their Eventual Application", is an exploratory study commissioned by the Executive Secretary. It was produced by Tentera in collaboration with other experts,[2] and is circulated in the form and language in which it was received by the Secretariat. The draft report includes an introduction, a scoping paper of existing initiatives and indicators for poverty-biodiversity, a strategy for the development of Poverty-Biodiversity Indicators, preliminary poverty-biodiversity indicators, and conclusions and recommendations.

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* UNEP/CBD/COP/11/1.

[1] Smith, J., Mapendembe, A., Vega, A., Hernandes Morcillo, M., Walpole, M., Herkenrath, P., (2010). *"Linking the thematic Programmes of Work of the Convention on Biological Diversity (CBD) to Poverty Reduction". Biodiversity for Development: New Approaches for National Biodiversity Strategies. CBD Secretariat, Montreal.*

[2] Produced by Mr. Tristan D. Tyrrell of Tentera, Mr. Abisha Mapendembe of the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and International Institute for Environment and Development (IIED), Dr. Suneetha M. Subramanian United Nations University Institute of Advanced Studies (UNU-IAS), Mr. Sameer Punde Applied Environmental Research Foundation (AERF), and Mr. Max Fancourt (UNEP-WCMC).

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Development of Poverty-Biodiversity Indicators and their Eventual Application

Prepared for the
Secretariat of the Convention on Biological Diversity

by

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Acknowledgements

Acronyms

ABS	Australian Bureau of Statistics
BIP	Biodiversity Indicators Partnership
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CIESIN	Center for International Earth Science Information Network
COP	Conference of the Parties to the CBD
CSD	United Nations Commission on Sustainable Development
DAC	Development Assistance Committee
Defra	Department for Environment, Food and Rural Affairs (UK)
DPSIR	Drivers – Pressures – State – Impacts – Responses
FAO	Food and Agriculture Organization of the UN
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GLADIS	Global Land Degradation Information System
HPI	Human Poverty Index
IBRD	International Bank for Reconstruction and Development
ICCAs	Indigenous peoples' and Community Conserved Areas and territories
IDA	International Development Association
IIED	International Institute for Environment and Development
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
MA	Millennium Ecosystem Assessment
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
METT	Management Effectiveness Tracking Tool
MPI	Multidimensional Poverty Index
NBSAPs	National Biodiversity Strategies and Action Plans
NTFPs	Non-Timber Forest Products
OECD	Organisation for Economic Cooperation and Development
OPDI	Oxford Poverty and Human Development Initiative
PEI	UNDP/UNEP Poverty-Environment Initiative
PRSPs	Poverty Reduction Strategy Papers
SDGs	Sustainable Development Goals
SMART	Specific – Measurable – Attainable – Relevant – Time-bound
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDESA	United Nations Department of Economic and Social Affairs
UNDG	UN Development Group
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNU-IAS	United Nations University Institute for Advanced Studies
WCMC	World Conservation Monitoring Centre
WGRI	*Ad Hoc* Open-ended Working Group on Review of Implementation of the Convention
YCELP	Yale Center for Environmental Law and Policy

Contents

EXECUTIVE SUMMARY

Biodiversity and poverty alleviation are inversely related, for the first part of the trajectory (win-lose). Growth of welfare due to an increase in production and consumption of basic human needs such as water, food, wood and bio-energy goes at the expense of biodiversity. Non-useful species are replaced by a small number of useful ones. For the second trajectory, when ecosystems are over-used and become degraded, losing their productivity, the relationship is the opposite, with a lose-lose trajectory.

While indicators on the broad links between environment and poverty exist, there is no coherent and inclusive set of poverty-biodiversity indicators currently. Over recent decades, biodiversity conservation and poverty reduction have both become societal and political goals with recognition of the links between them occurring in international fora including the CBD, the UN Convention to Combat Desertification (UNCCD) and the Millennium Development Goals (MDGs). The goal of this report is to recommend a path towards the development of poverty-biodiversity indicators for the CBD, its Parties and relevant agencies, as well as create opportunities for non-conservation sector organizations to consider biodiversity in their own interventions.

The relationship between poverty and biodiversity

There is a context-specific nature of the poverty-biodiversity relationship. In particular, cross-cutting determinants such as governance, policies on poverty and biodiversity conservation, and population growth and density which are associated with the socio-economic context are critical in determining whether or not biodiversity utilization leads to actual poverty reduction. The term poverty is used in its widest sense to mean not just lack of income but also inadequate access to basic goods such as food and water; insufficient knowledge, health or skills to fulfil normal livelihood functions; poor housing, unhealthy or dangerous environment, and bad social relations; and lack of civil and political rights, assets and services.

Furthermore, no single relationship between biodiversity conservation and poverty reduction exists, and there is certainly no linear relationship with many millions of people having benefited from the transformation of ecosystems and exploitation of natural resources. However, the Millennium Ecosystem Assessment demonstrated that the benefits have not been evenly or equitably distributed, with the poor being the biggest losers. Therefore, the relationship is not simple to assess so that one can say poverty causes biodiversity loss, or improvements in biodiversity reduce poverty. Some of the challenges that hinder the achievement of both biodiversity conservation and poverty alleviation include seeking agreement on the definitions of both concepts, and understanding which components and attributes of biodiversity are important to poor people. This suggests a need to be more specific in defining what types of poverty and biodiversity issues are being assessed; and understanding that trade-offs must occur as it is not necessarily possible to achieve a 'win-win' from all situations, with a more realistic aim being to 'win more' and 'lose less'.

What is poverty?

There is agreement in the literature that poverty is multidimensional and region-specific, with considerable variance between regions and between individuals, urban and rural areas, and between ecosystems. People in forest areas, for example, often do not need to spend up to a dollar a day to have a decent meal or acquire subsistence requirements. It is a fact that the biodiversity around them is in itself a source of nourishment, clean air and water, and various other ecosystem services for which people in other ecosystems pay dearly.

Recent efforts by the CBD on poverty-biodiversity linkages

The CBD has been working towards integrating poverty and biodiversity, and considering indicators thereof, including through analysis of the linkages between its Programmes of Work and poverty reduction (Smith *et al.* 2010), the production of CBD Technical Series 53 on biodiversity indicators and Technical Series 58 on ecosystem services indicators, as well as documents on the status and development of Aichi Targets Indicators of the Strategic Plan for Biodiversity 2011-2020 adopted at the tenth meeting of the Conference of the Parties to the CBD (COP 10). Furthermore, it established the Expert Group on Biodiversity for Poverty Eradication and Development, which held its first meeting in Dehradun, India in December 2011 that produced a series of recommendations which were taken forward by the *Ad Hoc* Open-ended Working Group on Review of Implementation of the Convention (WGRI) at its fourth meeting by in turn recommending that the eleventh meeting of the COP call upon Parties and encourages all partners and stakeholders to consider the outcomes of the Expert Group, and to act accordingly.

As welcomed by COP Decision X/6, an Expert Group Meeting on Biodiversity for Poverty Eradication and Development, produced recommendations on the integration, valuation, capacity development, and monitoring of mainstreaming biodiversity and ecosystem services into poverty eradication and development processes. Specifically, the Expert Group recommended that Parties develop, integrate and monitor appropriate indicators to mainstream biodiversity and ecosystem services into poverty eradication and development processes. This report is expected to support the achievement of such cross-sectoral goals.

Conceptualising the poverty-biodiversity linkages

For the purpose of developing poverty-biodiversity indicators within the CBD framework, the Drivers – Pressures – State – Impacts – Responses (DPSIR) model was used, with a conceptual framework showing the complex inter-linkages between poverty and biodiversity.

A literature search, concentrating on a number of key organisations and initiatives in order to create a database of existing indicators, was filtered according to a set of criteria which selected indicators on the basis of sensitivity, scale, ease of communicability and understandability, whether the indicator was based on available data, scientific validity, relevance to the user's needs and whether the indicator was actually being used. Once mapped onto the Drivers, Pressure, State, Response, Impact framework, state and response indicators are more frequent with 74 and 21 indicators respectively. Impact indicators are represented with seventeen and drivers with four indicators. From this assessment it can be seen that the indicators of these organisations and initiatives tend to focus on status and response indicators with a relatively low focus being put on indicators examining the drivers or the impacts.

As an overview of the literature in general, relatively little literature concerning poverty-biodiversity indicators exists, with only one out of all organisations and initiatives studied here – World Bank – having proposed, but not yet developed, poverty-biodiversity indicators and hence a significant knowledge gap pertaining to their implementation, effectiveness and usefulness as a tool exists.

With regards to currently existing indicators, a great difference in the quality and quantity of information openly available exists. Some organisations and initiatives provide a very clear straight forwards analysis of the indicators used clearly identifying data sets used, calculations and variables utilised, the developmental status of the indicator as well as the limitations of the indicator. However, for some indicators very little data was available making a thorough analysis of the indicator difficult.

Conclusions

The link between biodiversity and poverty alleviation is complex in nature, and it cannot be dealt with just one or two indicators. However, an exhaustive set may lead to confusion or overprescriptiveness. Furthermore, indicators and monitoring systems more generally are difficult to establish for a number of reasons, not the least cost.

Even as a first step, defining poverty is a challenge and can be subject to a range of concerns that may

be spatial, temporal or cultural. While conventional international concepts have been developed, such as monetary income thresholds, some have been recognised as inappropriate for addressing the linkages between poverty and biodiversity. Instead elements such as health status, freedom of access, equity of benefits, and security in tenure are seen as being fundamental in considering whether local communities are impoverished.

While the definition of biodiversity may be more straightforward and readily agreed upon, the linkages between biodiversity and poverty alleviation are not. There exists a non-linear relationship between poverty and biodiversity, whereby while elements of biodiversity may be essential for the well-being of some communities, such as the use of traditional medicines or the trade of non-timber forest products (NTFPs) in local markets, there also exist examples of how major transformation of natural ecosystems into intensively managed agricultural land have led to huge improvements in the health and economic status of communities, at least in the short term. The development of the ecosystem services concept allows us to consider some of the direct and indirect benefits provided by natural landscapes. These would include carbon sequestration by forests, coastal erosion protection by mangroves, and spiritual well-being by natural vistas.

The development of an indicator framework on poverty-biodiversity linkages can only be as good as the underlying data upon which it is based. Unfortunately, there is likely to be a paucity of good data that clearly demonstrate such a relationship in a number of areas around the world, and in particular at coarser scales, and any effort to develop a suite of appropriate poverty-biodiversity indicators, and certainly to initiate the collection of any new data, is an expensive and time-consuming process. However, datasets do exist that can be used as starting points for indicator development, with refinement possible at a later stage as required. Equally, there are a number of institutions focusing on this area who have developed methodologies and are accumulating data that can be used in the formulation of a poverty-biodiversity indicator suite. As such, there is a need to ensure that such institutions are working collaboratively in order to avoid conflicting approaches or duplication of effort. It may therefore be a role for the CBD Secretariat to bring such

stakeholders together at an early stage to encourage dialogue and synergy.

Recommendations

The authors of this report offer the following recommendations to the CBD in its consideration of poverty-biodiversity indicators:
- Consider the scale;
- Simplify the linkages by focusing on the key questions to be answered;
- Develop a conceptual framework based on local circumstances;
- Collaborate with the relevant stakeholders; and
- The COP should support the continued work of the Expert Group.

Proposed headline poverty-biodiversity indicators

Conceptual Framework	Headline indicators
Drivers	• Trends in demographics of dependent communities • Trends in greenhouse gas emissions • Trends in social, economic and land use planning outside control of the local community
Pressures	• Trends in pressures from industrial activities • Trends in pressures from habitat conversion, pollution, invasive species, climate change, overexploitation and underlying drivers
State	• Trends in health status of the population • Trends in well-being (other than health) • Trends in livelihood generation from bio-enterprise activity • Trends in extent, condition and vulnerability of ecosystems, biomes and habitats • Trends in abundance, distribution and extinction risk of species • Trends in genetic diversity of species
Impacts	• Trends in distribution, condition and sustainability of ecosystem services for equitable human well-being
Responses	• Trends in access and equity of benefit sharing of genetic resources • Trends in accessibility of scientific/technical/traditional knowledge and its application • Trends in coverage, condition, representativeness and effectiveness of protected areas and other area-based approaches • Trends in integration of biodiversity, ecosystem services and benefits sharing into planning, policy formulation and implementation and incentives • Trends in mobilisation of financial resources

1.   INTRODUCTION

This report has been produced, with funding from the Government of Japan, for the Secretariat of the Convention on Biological Diversity (CBD), as part of the Secretariat activities in response to decision X/6 accepted the recommendations of the Expert Group Meeting on Biodiversity for Poverty Eradication and Development on mainstreaming biodiversity and ecosystem services into poverty eradication and development processes. Specifically, the Expert Group recommended that Parties develop, integrated and monitor appropriate indicators to mainstream biodiversity and ecosystem services into poverty eradication and development processes. The views expressed in this publication do not necessarily reflect the views of the Secretariat of the CBD. The goal of this report is to recommend a path towards the development of poverty-biodiversity indicators for the CBD, its Parties and relevant agencies, as well as create opportunities for non-conservation sector organizations to consider biodiversity in their own interventions.

While indicators on the broad links between environment and poverty exist, no coherent and inclusive set of poverty-biodiversity indicators currently exists. Over recent decades, biodiversity conservation and poverty reduction have both become societal and political goals with recognition of the links between them occurring in international fora including the CBD, the UN Convention to Combat Desertification (UNCCD) and the Millennium Development Goals (MDGs). The CBD has been working towards integrating poverty and biodiversity, and considering indicators thereof, including through analysis of the linkages between its Programmes of Work and poverty reduction (Smith *et al.* 2010), the production of CBD Technical Series 53 on biodiversity indicators (BIP 2010) and Technical Series 58 on ecosystem services indicators (UNEP-WCMC 2011), as well as documents on the status and development of Aichi Targets Indicators of the Strategic Plan for Biodiversity 2011-2020[3] adopted at the tenth meeting of the Conference of the Parties to the CBD (COP 10). Furthermore, it established the Expert Group on Biodiversity for Poverty Eradication and Development, which held its first meeting in Dehradun, India in December 2011 that produced a series of recommendations[4] which were taken forward by the *Ad Hoc* Open-ended Working Group on Review of Implementation of the Convention (WGRI) at its fourth meeting by in turn recommending that the eleventh meeting of the COP call upon Parties and encourages all partners and stakeholders to consider the outcomes of the Expert Group, and to act accordingly.

Establishing and monitoring poverty-biodiversity indicators is a challenging but critical exercise to ensure progress towards the Aichi Biodiversity Targets. Effective poverty-biodiversity indicators are particularly important for measuring the achievement of Aichi Targets 2 and 14 as well as for the realization of efforts to further mainstream poverty eradication and development processes into the work of the CBD. While some attempts to incorporate ecosystem services and human well-being into a linked indicator suite for 2010 (Sparks *et al.* 2011) were made through the Biodiversity Indicators Partnership (BIP), there is more work needed.

There is a context-specific nature of the poverty-biodiversity relationship. In particular, cross-cutting determinants such as governance, policies on poverty and biodiversity conservation, and population growth and density which are associated with the socio-economic context are critical in determining whether or not biodiversity utilization leads to actual poverty reduction. The term poverty is used in its widest sense to mean not just lack of income but also inadequate access to basic goods such as food and water; insufficient knowledge, health or skills to fulfil normal livelihood functions; poor housing, unhealthy or dangerous environment, and bad social relations; and lack of civil and political rights, assets

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[3] http://www.cbd.int/sp/

[4] UNEP/CBD/WG-RI/4/5

and services. For overview of the relationship between internationally agreed definitions of poverty and the CBD, see Table 1.1.

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As welcomed by COP Decision X/6, an Expert Group Meeting on Biodiversity for Poverty Eradication and Development, produced recommendations on the integration, valuation, capacity development, and monitoring of mainstreaming biodiversity and ecosystem services into poverty eradication and development processes[4]. Specifically, the Expert Group recommended that Parties develop, integrate and monitor appropriate indicators to mainstream biodiversity and ecosystem services into poverty eradication and development processes. This report is expected to support the achievement of such cross-sectoral goals.

1.1.   Defining Poverty

The definition of poverty has evolved over time. What was originally a singular focus on income – which still remains the core of the concept today – there is now a multidimensional approach on the availability of 'basic needs', which include subsistence and basic facilities and services such as healthcare, sanitation and education. By the late 20th century, understanding of poverty had become more about 'relative deprivation', which includes income and other resources, as well as social conditions (Smith *et al*. 2010).

United Nations' definition of poverty:
"Fundamentally, poverty is a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to; not having the land on which to grow one's food or a job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation." (UN Statement, June 1998 – signed by the heads of all UN agencies)

World Bank's definition of poverty:
"Poverty is pronounced deprivation in well-being, and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice, and insufficient capacity and opportunity to better one's life."

According to Sen (1999), poverty is an undesired state of human well-being, measured as a score below a certain level of human well-being. The poor generally lack a number of human well-being elements, such as income, food, education, access to land, health and longevity, justice, family and community support,

credit and other productive resources, a voice in institutions, and access to opportunity. Being poor means having an income level that does not allow an individual to cover certain basic necessities, taking into account the circumstances and social requirements of the environment and society.

There is agreement in the literature that poverty is multidimensional and region-specific, with considerable variance between regions and between individuals, urban and rural areas, and between ecosystems (King & Palmer 2007, Tekelenburg *et al.* 2009, Smith *et al*. 2010). People in forest areas, for example, often do not need to spend up to a dollar a day to have a decent meal or acquire subsistence requirements. It is a fact that the biodiversity around them is in itself a source of nourishment, clean air and water, and various other ecosystem services for which people in other ecosystems pay dearly (Suneetha *et al*. 2011).

Recognising the difficulty in coming to a unified framework that captures all variation, a number of frameworks have been developed to help researchers identify the poor and the causes of poverty. The most widely used frameworks are the Development Assistance Committee (DAC) guidelines on poverty reduction (OECD 2001), livelihood assets approach/five categories of capital (Carney *et al*. 1998), Millennium Development Goals (MDGs)5, World Bank Poverty Reduction Framework, and Millennium Ecosystem Assessment (MA 2005) (see Table 1.1). These frameworks are recognized by a large constituency of multilateral and bilateral agencies and are widely used to define and classify poverty and poverty reduction efforts.

Table 1.1. Internationally recognized definitions and frameworks for poverty and poverty reduction (adapted from Smith *et al*. 2010).

General thematic categories	Livelihood Assets/Five Categories of Capital (Carney *et al*. 1998)	Sen's Capabilities Approach (Sen 1999)	Millennium Development Goals (MDGs) (UN 2000)	World Bank Poverty Reduction Framework (World Bank 2001)	Development Assistance Committee (DAC) Guidelines on poverty reduction (OECD 2001)	Human Rights Approach to Poverty Reduction— Oxfam	Millennium Ecosystem Assessment: Human Well-being and Poverty Reduction (MA 2005)
Environmental resources (provisioning services)	Natural capital		MDG 7 (Environmental sustainability)		Environment (cross-cutting issue)	Right to a sustainable existence	Basic material for a good life
Health	Social capital	Good health	MDGs 4, 5 and 6 (Health)		Human (Health, Education, Nutrition)		Health
Food and Water	Natural capital		MDG 1 (Eradicate hunger and poverty) MDG 8: Develop Global Partnerships for Development	Facilitating empowerment			

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5 http://www.un.org/millenniumgoals/

General thematic categories	Livelihood Assets/Five Categories of Capital (Carney *et al.* 1998)	Sen's Capabilities Approach (Sen 1999)	Millennium Development Goals (MDGs) (UN 2000)	World Bank Poverty Reduction Framework (World Bank 2001)	Development Assistance Committee (DAC) Guidelines on poverty reduction (OECD 2001)	Human Rights Approach to Poverty Reduction— Oxfam	Millennium Ecosystem Assessment: Human Well-being and Poverty Reduction (MA 2005)
Education & Ability to generate income	Human capital Physical capital Financial capital	Economic facilities Access to education	MDG 2 (Education)	Promoting opportunity	Economic (Consumption, Income, Assets) Socio-cultural (Status and Dignity) Gender (cross-cutting issue)		Good social relations
Rights & Freedoms	Social capital	Political freedom Basic human rights	MDG 3 (Gender equality and empowerment)		Political capabilities (human rights, influence over public policies and freedom) Gender (cross-cutting issue)	Right to social and political participation Right to identity Right to life and safety Right to basic social	Freedom of choice and actions
Security	Natural capital Social capital			Enhancing security		Prospective (Security and Vulnerability)	Security

1.2. Defining Biodiversity

Biodiversity, or biological diversity, is the variety of life forms at all levels of biological systems (i.e., molecular, organisms, population, species and ecosystem). The CBD defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic systems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (article 2). The CBD, which entered into force in 1993, has three main objectives:
1. The conservation of biodiversity
2. The sustainable use of the components of biodiversity
3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources

Indicators of biodiversity can take a number of forms. For instance, ecosystem diversity may consider forest or protected area extent, while species diversity would look at taxonomic richness of a geographic area through indices such as Species Richness, Simpson Index, Shannon index, Mean Species Abundance, Living Planet Index or the Red List Index. Finally, genetic diversity would consider the total number of genetic characteristics across a number of species. A range of such indicators have been developed for the CBD by the Biodiversity Indicators Partnership (BIP)[6].

Biodiversity conservation can be taken to mean the protection, maintenance and/or restoration of living natural resources to ensure their survival over the long term. However, it is variously defined depending on different values, objectives and world views which vary from place to place, culture to culture and even individual to individual. The way in which biodiversity is conserved also varies hugely from place to place – from strict preservation to sustainable consumptive use – with much debate about the relative merits and effectiveness of these different approaches.

The concept of how biodiversity supports human well-being has been taken forward in recent years with the emergence of 'ecosystem services' concept, or the benefits that humans receive from the resources and processes supplied by natural ecosystems. While the depth of the role of biodiversity in the provision of such services is still being explored, such an anthropocentric perspective has clear and important connotations when discussing the linkages between biodiversity and poverty. The seminal text on this subject, the Millennium Ecosystem Assessment (MA 2005), uses four different categories of ecosystem services:

> **Definition of an ecosystem:**
> An ecosystem is a dynamic complex of plant, animal, and microorganism communities and their non-living environment interacting as a functional unit. Biomes are the largest unit of ecological classification that is convenient to classify (below the entire globe). Terrestrial biomes are typically based on dominant vegetation structure (e.g. forests, grasslands). Ecosystems within a biome function in a broadly similar way, although they may have very different species compositions. For example, all forests share certain properties regarding nutrient cycling, disturbance, and biomass that are different from the properties of grasslands. Marine biomes are typically based on biogeochemical properties.

- Provisioning services such as food, water, timber, and fibre;
- Regulating services that affect climate, floods, disease, wastes, and water quality;
- Cultural services that provide recreational, aesthetic, and spiritual benefits; and
- Supporting services such as soil formation, photosynthesis, and nutrient cycling

1.3. *Proposed Conceptual Framework for Poverty-Biodiversity Linkages*

Poverty and biodiversity are interlinked. However, the linkages are poorly understood and moreover difficult to measure. To overcome the challenges of capturing poverty-biodiversity interactions into a set of indicators, developing a conceptual framework is a recommended starting point (Smith *et al*. 2010).

A conceptual framework may appear to be a simplification of a rather complex process or interaction but it serves as a useful exercise in providing greater focus on key issues and relationships as well as in understanding the dimensions of the phenomenon that is to be measured (Ash *et al*. 2010). Significant efforts have been made in developing conceptual frameworks for the wider poverty-environment interface (Shyamsundar 2002), as well as in understanding the complex relationships between ecosystem services

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[6] www.bipindicators.net

and human well-being (UNEP-WCMC 2011); however, conceptual frameworks for poverty-biodiversity indicators are still underdeveloped (Smith *et al*. 2010).

As a preliminary step toward developing poverty-biodiversity indicators, existing conceptual frameworks were referred to and incorporated into a single framework. However, an "off-the shelf" approach for utilising conceptual frameworks may be misleading, particularly for a complex issue such as poverty-biodiversity inter-linkages. Therefore, it is recommended that site specific, ecosystem specific or sector specific poverty-biodiversity conceptual frameworks be developed for robust poverty-biodiversity indicators.

For the purpose of developing poverty-biodiversity indicators within the CBD framework, the Drivers – Pressures – State – Impacts – Responses (DPSIR) model was used. The DPSIR model was first developed by the Organisation for Economic Cooperation and Development (OECD) and later expanded by the European Environment Agency and now widely applied in the development of global indicator frameworks. It is, however, a liner model that has its limitations particularly in situations where complex interactions exist. This can be overcome by developing composite indicators or by aggregated existing poverty indicators with existing biodiversity indicators based on the inter-linkages revealed in the conceptual framework. The following conceptual framework (page 16) shows the complex inter-linkages between poverty and biodiversity along with potential indicators within each category.

Section 2 reviews existing relevant indicator suites used by international initiatives for those which may be appropriate for use in a CBD context. Section 3 then proposes a general strategy for indicator development and use, before Section 4 provides some preliminary indicators that currently exist which may be considered for development at regional, national or local scale.

> **DPSIR Framework**
>
> **Drivers:** indirect drivers of change, such as population growth and consumption
> **Pressures:** direct drivers of change, such as acidification, land conversion, and hunting
> **State**: condition and trend of studied subject, such as biodiversity, and water, soil, air quality and of dimension of poverty such income, health, nutrition
> **Impacts:** how the change in the state affect people in socio-economic or health terms
> **Responses**: the measures taken to change D-P-S or I. DPSIR are sequential steps in the effect-chain. They all have a past, present and future value.
>
> Source: Adapted from Tekelenburg *et al*. (2009)

POVERTY

RESPONSES

- **Policy / regulatory mechanisms**
- **Positive subsidies / incentives**
- **Community initiatives / projects**
- **Traditional Knowledge / Systems**

DRIVERS

- **Economic changes / fluctuations Markets / prices:** change in market value of basic goods & services; the provision of non-supportive incentives
- **Political changes:** conflicts / change in leadership
- **Social changes:** loss of cultural & change in belief systems, migration
- **Climate change and environmental change:** alteration in provisioning ecosystem services

PRESSURES

- **Resource Extraction / Depletion**: Amount extracted / depletion of income generating resource pool
- **Vulnerability / Resilience:** Loss in quality & quantity of basic life support services (e.g., food, water, energy)

STATE

Dimensions of Poverty:
- **Livelihoods:** Income; dependence on biodiversity/biomass
- **Health & nutrition**
- **Water & energy**
- **Education & capacity**
- **Rights & Security**

Linkage: E.g. Income Subsistence Insurance

Components of Biodiversity:
- **Genetic diversity:** - Income generated from genetic resource
- **Species diversity**
- **Ecosystem diversity:** structure, function, services

IMPACTS

Poverty Impact:
- Positive
- Negative
- Neutral

"Poverty

Biodiversity Impact:
- Positive
- Negative
- Neutral

BIODIVERSITY

Case Study 1: MAPPING THE OVERLAP OF POVERTY IN GLOBAL BIODIVERSITY HOTSPOTS USING ECOLOGICAL POVERTY INDICATORS

Biodiversity hotspots are a concept developed to identify global conservation priorities. Recognizing that most biodiversity hotspots are in countries where poverty is widespread, Fisher & Christopher (2006) show the geographic overlap of key areas for poverty alleviation and biodiversity conservation. To this end, socio-economic indicators, which have an impact or feedback into conservation, were used. Traditional indicators of poverty such as national debt service and percentage of people living below the national poverty line were considered. In addition, a broader range of poverty indicators were also used, which included undernourishment, access to clean water and potential population pressure. These broader indicators were referred to as "ecological poverty indicators" due their connection to life-supporting ecosystems.

Data was sourced from the United Nations Least Developed Countries Report (2002), UNDP Human Poverty Index (HPI), UN Millennium Indicators Database (2005), the World Bank's World Development Indicators (2005) and the CIA World Fact book (2005).

A total of 125 countries within the 34 global hotspots were ranked using these indicators. The total hotspot area and 25 countries within them, most affected by socio-economic conditions were highlighted as a result this study. The authors further state that measuring the magnitude of overlap and the interaction between poverty and biodiversity conservation is useful in identifying "win-win" solutions, including the development of Integrated Conservation and Development Projects (ICDPs) and Payment for Ecosystem Services (PES) initiatives. However, the limitations of using such indicators are the discrepancy in each country's definition of poverty line and gaps in available data sources.
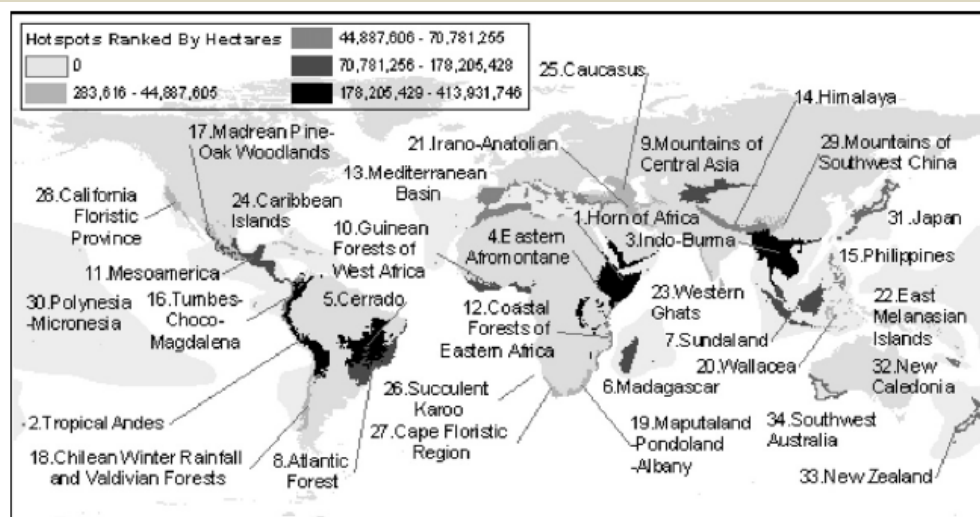

Fig. 1 – Darker shades show the more imperiled of CI's 34 biodiversity hotspots according to this multifactor assessment, based on aggregate area of hotspot affected by conditions of socio-economic poverty.

Source: Fisher & Christopher 2006.

2. STATE OF THE ART: SCOPING PAPER ON EXISTING INITIATIVES AND INDICATORS FOR POVERTY-BIODIVERSITY

It is broadly accepted that biodiversity loss and poverty are linked problems but the relationship is not well understood. Biodiversity underpins the ecosystem services that all people ultimately depend on at all scales. Due to the complex nature of these inter-linkages, one poverty-biodiversity indicator will try to measure a specific aspect of this mutual interaction. The literature provides many examples of poverty and human well-being indicators and their linkages with specific environmental variables. Those indicators are trying to establish a connection between environmental degradation and the consequences to human well-being. This section aims to provide a summary of the work done by a number of key global institutions and initiatives.

A poverty-biodiversity indicator should measure the linkages between the multiple dimensions of both poverty and biodiversity and not attempt to be captured by a single metric. A poverty-biodiversity indicator, therefore, for this review is defined as a measure that demonstrates the direct contribution of the state or trend of biodiversity that leads to the change in livelihoods for impoverished people, in particular where the loss of biodiversity exacerbates the cycle of poverty. A set of indicators is necessary to measure the interconnections at different levels of interaction of biodiversity and poverty. Currently, no coherent and inclusive set of poverty-biodiversity indicators exists, in particular that which would meet the needs of the CBD. While a number of community-based natural resource management (CBNRM) initiatives utilise relevant biodiversity and livelihood indicators for monitoring at that scale, a universally applicable or transferable set that would be relevant globally does not exist.

This review is a broad, non-exhaustive assessment of existing initiatives and indicators for poverty-biodiversity such as the CBD, Millennium Development Goals indicators, relevant poverty and biodiversity Rio Markers, the Oxford Poverty and Human Development Initiative, the Human Development Index, GDP for the poor, the Human Poverty Index and analyze them in order to identify which indicators and initiatives might be suitable candidates for poverty-biodiversity indicators, existing datasets and metadata behind the indicators, map these indicators against Aichi Targets especially Targets 2[7] and 14[8] and identify where gaps may exist in the evidence base. Existing indicators were assigned to one or more of the DPSIR (Driving force, Pressure, State, Impact, Response) categories by applying definitions of each category (Table 2.1) and assigning more than one category where overlap occurred. Results are intended to inform and guide subsequent development of a strategy for poverty-biodiversity indicator development and preliminary poverty-biodiversity indicators.

2.1. Methods Used

2.1.1. Compilation of existing initiatives and indicators for poverty-biodiversity

This review was compiled by means of a desk-based review of literature and on-line resources complemented by personal communication with experts on the subject. A list of indicators were compiled

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[7] By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

[8] By 2020, 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.

for each of the existing relevant key organisations and initiatives that were identified, these being the past and current work of the: Convention on Biological Diversity, Millennium Development Goals Indicators, relevant poverty and biodiversity Rio Markers, the Oxford Poverty and Human Development Initiative, the Human Development Index, Gross Domestic Product for the Poor and the Human Poverty Index.

Information on each indicator was captured in information fields, covering broad categories such as:
- *Name of Organisation*
- *Name of Initiative*
- *Goal of Indicator*
- *Grouping*
- *Name of Indicator*
- *Variables Considered* (calculation included where provided)
- *Relevance to the DPSIR framework*
- *Indicator Description*
- *Link to biodiversity/poverty*
- *Scale*
- *Current use*
- *Relevance to Aichi Targets*
- *Year of Indicator Development*
- *Year of each Data Point*
- *Status* (how well developed is the indicator?)
- *Dataset*
- *Limitations of the indicator/Future Development*
- *Cost of developing the indicators*
- *Contact details*
- *Website and Reference*

A full list of each information field is provided in a supplementary Excel sheet entitled "Existing initiatives and indicators for poverty-biodiversity".

2.1.2. *Assessing existing initiatives and indicators for poverty-biodiversity*

After initial compilation of the indicators, the list underwent a review and refinement process. Simple criteria were developed to exclude non-poverty-biodiversity indicators. The key criterion being that the biodiversity or poverty indicator should demonstrate a clear link to poverty, or biodiversity respectively. By identifying this key link, the indicator is then able to convey information about both biodiversity and poverty. Those not meeting this criterion were not included in the final table of existing initiatives and indicators for poverty-biodiversity. The reviewed and refined list of indicators formed the basis for analysis.

The assessment focused on existing poverty-biodiversity indicators initiatives, existing poverty-biodiversity indicators, definitions used and key questions they seeking to answer, what stakeholders are involved in their development, map the indicators against Aichi Targets, especially Targets 2 and 14, datasets and metadata behind the indicators and identification of where gaps may exist in the evidence base.

Finally, a column was added asking according to the proposed conceptual framework used in this publication the indicator was categorised as Driving forces , Pressure, State, Impact or Response (DPSIR)

indicator. In order to assign these categories definitions of driving force, pressure, state , impact and response were used, the definitions used are adapted from those used by Tekelenburg *et al.* (2009) are are shown below in Table 2.1. In cases where an indicator fits under more than one definition, both categories were then assigned.

Table 2.1. Criteria for selecting poverty-biodiversity indicators

Category	Definition
Driving Force	Indirect drivers of change, such as population growth and consumption.
Pressure	Direct drivers of change, such as acidification, land conversion, and hunting.
State	Condition and trend of studied subject, such as biodiversity, and water, soil, air quality and of dimension of poverty such as income, health, nutrition.
Impacts	How the change in the state affect people or biodiversity in socio-economic or health terms.
Responses	The measures taken to change D-P-S or I, such as policy responses, and monetary flows.

2.1.3.   Criteria in developing and using indicators

There are many different sets of criteria that have been produced to guide the selection of indicators, including consideration of the use of the indicators and the technical capacity available. One such set of criteria was produced by the Biodiversity Indicators Partnership (BIP) to determine 'successful' indicators (BIP 2011) (Table 2.2).

Table 2.2. Criteria for selecting poverty-biodiversity indicators

Criteria	Description
Sensitivity	It can be used to make assessment
Scale	Global, regional, national, sub-national
Easily communicable and understandable	Conceptually, how the measure relates to the purpose, in its presentation, and the interpretation of the data.
Based on available data	The data used are reliable and verifiable, and the indicator can show change over time
Scientifically valid	There is an accepted theory of the relationship between the indicator and its purpose, with agreement that change in the indicator does show change in the issue of concern
Relevant to user's needs and it is used!	Relevant for measuring progress, early-warning of problems, understanding an issue, reporting, awareness-raising, etc.

2.2.   Results of the review

2.2.1.   Existing poverty-biodiversity indicator initiatives

A total of eleven relevant poverty-biodiversity indicator initiatives were identified and included in the analysis. While only global initiatives are shown here, owing to the operational scale of the CBD, local and national level initiatives and indicators do exist and are in many cases the data sources for these global initiatives. Some examples of such indicators are shown in case study 2, these however are not as relevant for the scale for the work of the CBD and so are not the focus of this report (Table 2.3).

Organisations leading these global initiatives are mainly Multilateral Environmental Agreements (MEAs), UN agencies, and bilateral and research institutes.

Table 2.3. Global organisations and initiatives using poverty-biodiversity indicators

Organisation	Initiative	Reference website
Convention on Biological Diversity	Global indicators developed in support of the Convention on Biological Diversity (CBD)'s 2010 Biodiversity Target	http://www.bipindicators.net
United Nations	Millennium Development Goal Indicators	http://unstats.un.org/unsd/mdg/Metadata.aspx
United Nations Commission on Sustainable Development	Indicators Of Sustainable Development	http://www.un.org/esa/sustdev/natlinfo/ indicators/methodology_sheets/
United Nations Development Programme	Human Development Index	http://hdr.undp.org/en/statistics/hdi/
	Human Poverty Index	http://hdr.undp.org/en/statistics/indices/hpi/
United Nations Convention to Combat Desertification	United Nations Convention to Combat Desertification Indicators	http://www.unccd.int/en/programmes/Science/Monitoring-Assessment/Documents/White%20paper_ Scientific%20review%20set%20of%20indicators_Ver1.pdf
The Economics Of Ecosystems and Biodiversity (TEEB)	GDP For The Poor	http://www.teebweb.org/Portals/25/Documents/ TEEB%20for%20POLICYMAKERS%20chapter%203.pdf
Development Assistance Committee	Rio Markers	http://www.oecd.org/dac/aidstatistics/46782010.pdf
World Bank	Poverty - Environment Indicators	http://documents.worldbank.org/curated/en/2002/01/ 7003287/poverty-environment-indicators
	World Bank Indicators Catalogue	http://data.worldbank.org/indicator
Oxford poverty and Human Development Initiative	Multidimensional Poverty Index	http://www.ophi.org.uk/policy/multidimensional-poverty-index/
Yale University	Environmental Performance Index	http://epi.yale.edu/sites/default/files/downloads /appendix01_indicator-profiles.pdf

2.2.2.   *Existing poverty-biodiversity indicators and metrics*

A total of 141 indicators were included in our analysis (Annex 1) which largely include socio-economic 'poverty' indicators and environment 'biodiversity' indictors. Some of the indicators could be categorised as both socio-economic 'poverty' and environment 'biodiversity' indictors. We attempted to subsequently classify each indicator according to the DPSIR framework (Table 2.4).

Table 2.4. Classification of the indicators using the DPSIR framework

DPSIR framework	Acronym	Number of indicators
Drivers	**D**	**4**
Drivers/Pressures	D/P	1
Pressures	**P**	**9**

DPSIR framework	Acronym	Number of indicators
Pressures/State	P/S	15
Pressures/Responses	P/R	1
State	**S**	**69**
State/Impacts	S/I	3
Impacts	**I**	**16**
Responses	**R**	**22**
Responses/Impacts	R/I	1

According to this assessment, state and response indicators are more frequent. Both are represented with 74 and 21 indicators respectively. Impact indicators are represented with seventeen and driving forces with four indicators. Some indicators could fall under more than one category. We therefore expanded the five indicator categories to account for such multiple relevance – drivers/pressures (1 indicator), pressures/state (13 indicators), pressures/responses (1), state/impacts (3 indicators), and responses/impacts (1 indicator).

Our analysis revealed that datasets and/or sources of data used for the identified indicators vary from one indicator initiative to another. The majority of datasets used are from organisations such as UN agencies and conventions such as United Nations Commission on Sustainable Development, United Nations Development Programme, Convention on Biological Diversity, United Nations Convention to Combat Desertification and other bilateral agencies and international initiatives such as the Development Assistance Committee, World Bank, the Economics of Ecosystems and Biodiversity, Oxford poverty and Human Development Initiative and Yale University.

2.2.3. What definitions are used and what key questions are they seeking to answer

Many of the indicators presented in this section of the report, although not necessarily explicitly designed to be poverty-biodiversity indicators, are still considered relevant. Due to the diversity of initiatives and organisations, the goals which these indicators were designed to track vary significantly.9

Table 2.5. Key goals addressed by the indicators of relevant poverty-biodiversity initiatives.

Initiative	Key goals the indicators are designed to answer
Convention on Biological Diversity	To monitor: 1. Status and trends of the components of biodiversity. 2. Sustainable use. 3. Threats to biodiversity. 4. Ecosystem integrity and ecosystem goods and services.
Rio Markers	To track aid flows supporting activities on: 1. One of the three objectives of the CBD: • The conservation of biodiversity. • Sustainable use of its components. • Fair and equitable sharing of the benefits of the utilisation of genetic resources. 2. The objective of stabilisation of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration. 3. Activities that combat desertification or mitigate the effects of drought in arid, semi arid and dry sub-humid areas through prevention and/or reduction of land degradation, rehabilitation of partly degraded land, or reclamation of desertified land.

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9 See Annex 1 for more details on the goals of specific indicators.

Initiative	Key goals the indicators are designed to answer
Multidimensional Poverty Index	To identify overlapping deprivations at the household level across living standards, health, and education and to show the average number of poor people and deprivations with which poor households contend.
GDP For The Poor	To show the dependence of poor people on natural resources and the links between ecosystems and poverty.
Millennium Development Goal Indicators	To monitor progress towards the Millennium Development Goals.
Indicators Of Sustainable Development	To monitor: 1. Biodiversity – Ecosystems. 2. Biodiversity – Species. 3. Oceans, seas and coasts – Marine Environment. 4. Freshwater – Water Quantity. 5. Freshwater – Water Quality.
United Nations Convention to Combat Desertification Indicators	To monitor the effectiveness of the convention in addressing: 1. Sustainable land management. 2. Sustainable ecosystem management. 3. Poverty reduction. 4. Global environmental benefits
UNDP Human Development Index	A composite index measuring average achievement in three basic dimensions of human development: a long and healthy life, knowledge and a decent standard of living
Poverty - Environment Indicators	To monitor: 1. Income and opportunity. 2. Food Security. 3. Vulnerability to Natural Disasters.
World Bank Indicators Catalogue	To monitor: 1. Agriculture & Rural Development. 2. Aid Effectiveness. 3. Climate Change. 4. Education. 5. Gender equality. 6. Poverty
Environmental Performance Index	To monitor: 1. Ecosystem Vitality – Biodiversity and habitat. 2. Ecosystem Vitality – Forests. 3. Ecosystem Vitality – Fisheries. 4. Ecosystem Vitality – Agriculture. 5. Ecosystem Vitality - Climate Change. 6. Environmental Health - Environmental Burden Of Disease

2.2.4. Summary of the work done by the key indicator initiatives

Convention on Biological Diversity

The CBD signed at the 1992 Rio Earth summit by 150 government leaders, and to date now having 193 Parties, has the ambitious objective to aid the conservation of biodiversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.[10] In order to see if the various outputs of the CBD are effective in achieving this goal a number of indicators have been developed. Due to the objectives of the CBD leading to its 2010 Biodiversity Target, many of the indicators used fall under the definition of poverty-biodiversity indicators, and the

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[10]http://www.cbd.int/convention/articles/?a=cbd-01

general groupings that these indicators fall under are the monitoring of: status and trends of the components of biodiversity; sustainable use; threats to biodiversity; ecosystem integrity and ecosystem goods and services; status of traditional knowledge, innovations and practices; status of access and benefit-sharing; and status of resource transfers. The CBD has created a large variety of indicators from relatively simple single dimension metrics such as Coverage of Protected Areas to complex multidimensional indicators such as the Living Planet Index or the Ecological Footprint. Table 2.6 shows the indicators meeting the criteria.

Table 2.6. Indicators used by the CBD Biodiversity Indicators Partnership

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
Convention on Biological Diversity	Biodiversity Indicators Partnership	Extent of forests and forest types	S
		Extent of marine habitats	S
		Living Planet Index	S
		Global Wild Bird Index	S
		Coverage of protected areas	R
		Protected area overlays with biodiversity	R/I
		Management effectiveness of protected areas	R
		IUCN Red List Index	S
		Ex-situ crop collections	S
		Genetic diversity of terrestrial domesticated animals	S
		Area of forest under sustainable management: certification	R
		Area of forest under sustainable management: degradation and deforestation	R
		Area of agricultural ecosystems under sustainable management	R
		Status of species in trade	P/S
		Wild Commodities Index	S
		Ecological Footprint	P
		Nitrogen deposition	S
		Trends in Invasive Alien Species	P/S
		Marine Trophic Index	S
		Water Quality Index for Biodiversity	S
		Forest fragmentation	P
		River fragmentation and flow regulation	P
		Health and well being of communities directly dependant on ecosystem goods and services	S/I
		Nutritional Status of Biodiversity	I
		Biodiversity for food and medicine	S/I

Millennium Development Goals indicators

Signed in the year 2000 by 189 nations worldwide the MDGs are the result of a pledge made by these countries to free the people of the world from extreme poverty and of the many deprivations to their basic entitlements as set out in the Millennium Declaration[11]. In order to monitor progress towards these goals a number of indicators were created, with the data from these indicators being collected and analysed by the Inter-agency and Expert Group (IAEG) on MDG Indicators, coordinated by the United Nations Statistics Division[12]. The MDG indicators, due to nature of the MDGs that they monitor, are primarily

[11] http://www.undp.org/content/undp/en/home/mdgoverview.html

[12] http://mdgs.un.org/unsd/mdg/Default.aspx

poverty-focused; however a number of indicators as shown in Table 2.7 met the criteria of also acting as indicators for biodiversity.

Table 2.7. Indicators used for the Millennium Development Goals

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
United Nations	Millennium Development Goals	Proportion of population below $1 purchasing power parity per day	S
		Poverty gap ratio (incidence x depth of poverty)	S
		Share of poorest quintile in national consumption	S
		Proportion of employed people living below $1 (PPP) per day	S
		Prevalence of underweight children under five years of age	S
		Proportion of population below minimum level of dietary energy consumption.	S
		Infant mortality rate.	S
		Proportion of land area covered by forest.	S
		Proportion of fish stocks within safe biological limits	S
		Proportion of total water resources used	P/S
		Proportion of species threatened with extinction	P
		Proportion of population using an improved drinking water source	S

Relevant poverty and biodiversity Rio Markers

When countries signed the Rio conventions – Convention on Biological Diversity, United Nations Convention to Combat Desertification and United Nations Framework Convention on Climate Change – they made a commitment to strive towards achieving the ambitious goals of Agenda 21[13] put forward in the 1992 Earth Summit. In response to a request from the Secretariats of the three Rio Conventions a number of indicators commonly referred to as the "Rio Markers" were developed by the OECD Development Assistance Committee (DAC) to identify aid activities targeting the objectives of the three Conventions[14]. Table 2.8 shows the indicators meeting the criteria of providing information about both biodiversity and poverty.

Table 2.8. Indicators used as the Rio Markers

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
Development Assistance Committee	Rio Markers	Trends in mobilization of financial resources to biodiversity focused activities	R
		Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for biodiversity	R
		Trends in the number of activities reported scoring significant objective (A objective of the activity was to aid biodiversity) for biodiversity	R
		Trends in mobilization of financial resources to climate change adaptation focused activities	R
		Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for climate change adaptation	R
		Trends in the number of activities reported scoring significant objective (A objective of the activity was to aid biodiversity) for climate change adaptation	R

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[13] http://www.cbd.int/rio/

[14] OECD Development Assistance Committee (2002). Reporting Directives for the Creditor Reporting System, Addendum. DCD/DAC(2002)21/ADD.

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
		Trends in mobilization of financial resources to climate change mitigation focused activities	R
		Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for climate change mitigation	R
		Trends in the number of activities reported scoring significant objective (A objective of the activity was to aid biodiversity) for climate change mitigation	R
		Trends in mobilization of financial resources to desertification focused activities	R
		Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for desertification	R
		Trends in the number of activities reported scoring significant objective (A objective of the activity was to aid biodiversity) desertification	R

The Oxford Poverty and Human Development Initiative

The Multidimensional Poverty Index (MPI) created and developed by the Oxford Poverty and Human Development Initiative (OPDI) aims to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values[15]. The OPDI work towards this by: broadening poverty measurements, improving data on poverty, building capacity and impacting policy. Since its inception the OPDI has grown in credibility and performance to a level where it is now used by the Human Development Report in its global reports[16] replacing the long standing Human Development Index previously used. Table 2.9 shows the indicators meeting the criteria of providing information about both biodiversity and poverty.

Table 2.9. Indicators used by the Oxford Poverty and Human Development Initiative

Name of Initiative	Name of Indicator	Name of Indicator	DPSIR model
Oxford Poverty and Human Development Initiative	Multidimensional Poverty Index	Nutrition	S
		Drinking water	S

GDP for the Poor

The Economics of Ecosystems and Biodiversity (TEEB) put forward the case that the lack of valuation of biodiversity and ecosystems has resulted in their loss and degradation, and so has built a compelling economic case for the conservation of nature. As part of this ongoing project, TEEB created The GDP for the Poor initiative, which aims to create an indicator to show the dependence of the poor on biodiversity and ecosystem services and their inherent vulnerability to the loss of this biodiversity and degradation of ecosystem services[17]. The GDP for the Poor indicator is composed of a number of variables which then become part of the calculation in order to create a figure which illustrates the extent to which the poor depend on biodiversity for their income. Table 2.10 shows the indicators meeting the criteria of providing information about both biodiversity and poverty.

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[15] http://www.ophi.org.uk/about/

[16] http://www.ophi.org.uk/policy/multidimensional-poverty-index/mpi-faqs/

[17] http://www.teebweb.org/Portals/25/Documents/TEEB%20for%20POLICYMAKERS%20chapter%203.pdf

Table 2.10. Variables used in the GDP for the Poor indicator

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
The Economics Of Ecosystems and Biodiversity	GDP For The Poor	Percentage contribution of agriculture, forestry and fishing to GDP (US$ millions)	I
		Per capita agricultural GDP of the poor	R
		Contribution of NTFPs to the economy (US$ millions)	R

United Nations Development Programme

From a human development viewpoint, poverty is more than just financial deprivation but also the denial of the opportunities and choices most basic to human development.[18] In recognition of this in 1997, the Human Development Report introduced a new way of measuring poverty. Instead of just measuring income as an indicator of poverty, they introduced a multidimensional index – the Human Poverty Index (HPI) – which examines what were considered to be the most basic dimensions of deprivation namely: a short life, lack of basic education and lack of access to public and private resources. The HPI was introduced to complement the Human Development Index and out of the two is considered to better reflect the extent of deprivation in developed. Under each of these broad variables a number of sub-variables were created. Table 2.11 shows the indicators meeting the criteria of providing information about both biodiversity and poverty.

Table 2.11. Variables used in the Human Poverty Index

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
United Nations Development Programme	Human Poverty Index	Lack of access to overall economic provisioning.	S
		Population without sustainable access to an improved water source.	
		Children underweight for age.	
		Population below income poverty line.	

United Nations Commission on Sustainable Development

The United Nations Commission on Sustainable Development was established by the UN General Assembly in 1992 to ensure the effective follow up of the 1992 Earth summit.[19] Chapter 40 of Agenda 21 calls for countries and the international community to develop indicators of sustainable development. The rationale being that such indicators are needed to increase focus on sustainable development and assist decision-makers at all levels to adopt sound national sustainable development policies. In order to achieve this goal, and to aid countries to develop national indicators that measure sustainable development, the CSD has developed a number of indicators of sustainable development. The indicators which meet the criteria are shown below in Table 2.12.

Table 2.12. Indicators used by the UN Commission on Sustainable Development

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
United Nations Commission on Sustainable	Indicators Of Sustainable Development	Proportion of terrestrial area protected, total and by ecological region	R
		Management effectiveness of protected areas	R
		Area of selected key ecosystems	R
		Fragmentation of habitats	R
		Change in threat status of species	I

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[18] http://hdr.undp.org/en/statistics/understanding/indices/hpi/

[19] http://www.un.org/esa/dsd/csd/csd_aboucsd.shtml

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
Development (CSD)		Abundance of selected key species	S
		Abundance of invasive alien species	S
		Proportion of marine area protected	R
		Marine tropic index	S
		Area of coral reef ecosystems and percentage live cover	R
		Proportion of total water resources used	S
		Water use intensity by economic activity	P
		Biochemical oxygen demand in water bodies	P
		Wastewater treatment	P/R

United Nations Convention to Combat Desertification

At the 1992 Earth Summit, desertification was identified as being one of the major challenges facing sustainable development. To this end the United Nations Convention to Combat Desertification (UNCCD) was set up to undertake work to combat desertification globally[20]. In order to monitor the effectiveness of the convention in addressing: sustainable land management, sustainable ecosystem management, poverty reduction, and global environmental benefits a number of indicators were developed. Of the total set of eleven impact indicators, only eight matched our criteria of biodiversity poverty indicators, which are shown below in Table 2.13.

Table 2.13. Impact indicators used by the UNCCD

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
United Nations Convention to Combat Desertification	Impact Indicators	GLADIS "Soil Health Status"	P/S
		Land Productivity	P/S
		Percentage of Rural Population with Access to Safe Drinking Water	S
		Proportion of chronically undernourished children under the age of 5 in rural areas	S
		Soil Biodiversity	S
		Number of crop and animal varieties endangered	P/S
		Number of crop and animal species in agricultural use	S
		Water Availability and Use	S

World Bank

Started in 1944 to assist with post-war reconstruction, the World Bank's goals have since shifted to reducing poverty and supporting development to developing countries around the world.[21] Comprised of two institutions the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA), the indicators developed cover an extremely wide range of topics from development and aid effectiveness to biodiversity, financial systems and education. Table 2.14 shown below lists the World Bank indicators meeting the criteria of informing both biodiversity and poverty.

Table 2.14. Poverty-Environment Indicators used by the World Bank

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
World Bank	Poverty-	Percentage of rural population below poverty line	S

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[20] http://www.unccd.int/en/about-the-convention/Pages/About-the-Convention.aspx

[21] http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/0,,contentMDK:20103838~menuPK:1696997~pagePK: 51123644~piPK:329829~theSitePK:29708,00.html

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
	Environment Indicators	Rural per capita cereal production	I
		Time spent by household members to collect water and fuel wood	S
		Distance walked by household members to collect water and fuel wood	S
		Quantity of annual household consumption derived from common lands	I
		Quantity of annual household consumption that is derived from forest products and fisheries	I
		Percentage of irrigated area in total cultivated area by wealth/income categories	S
		Percentage of rural households with adequate water for livestock by wealth/income categories	I
		Rural per capita cereal production	S
		Percentage of farmers who grow drought resistant crops by income/wealth categories.	R
		Quantity of household consumption that is derived from forest products and fisheries.	S
		Percentage of rural children under five who are underweight.	S
		Percentage of rural children under five who are stunted.	S
		Percentage of rural children under five who are wasted.	S
		Households rendered homeless from foods/ hurricanes/ cyclones/ landslides per year by income/wealth quintiles	I
		Number of deaths from natural disasters by income/ wealth quintiles.	I
		Percentage of farmers with land on slopes/ wetlands by income/wealth quintiles.	I
		Percentage of rural children under five who are wasted.	S
	World Bank Indicators Catalogue	Agricultural irrigated land (% of total agricultural land)	S
		Forest area (% of land area)	S
		Agricultural land (% of land area)	P/S
		Forest area (sq. km)	S
		Agricultural machinery, tractors per 100 sq. km of arable land	P
		Improved water source, rural (% of rural population with access)	S
		Agriculture, value added (% of GDP)	S
		Agriculture value added per worker (constant 2000 US$)	S
		Land under cereal production (hectares)	P/S
		Arable land (hectares per person)	S
		Livestock production index (2004-2006 = 100)	S
		Arable land (% of land area)	S
		Permanent cropland (% of land area)	S
		Cereal yield (kg per hectare)	S
		Poverty gap at rural poverty line (%)	S
		Crop production index (2004-2006 = 100)	I
		Poverty headcount ratio at rural poverty line (% of rural population)	S
		Employment in agriculture (% of total employment)	P/S
		Rural population	D
		Rural population (% of total population)	D
		Food production index (2004-2006 = 100)	I
		Malnutrition prevalence, weight for age (% of children under 5)++	S
		Mortality rate, under-5 (per 1,000 live births)	S
		Agricultural methane emissions (% of total)	D
		Agricultural nitrous oxide emissions (% of total)	D
		Organic water pollutant missions (kg per day)	P
		Poverty gap at $1.25 a day (PPP) (%)	S
		Poverty gap at $2 a day (PPP) (%)	S

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
		Poverty gap at national poverty line (%)	S
		Poverty gap at rural poverty line (%)	S
		Poverty gap at urban poverty line (%)	S
		Poverty headcount ratio at $1.25 a day (PPP) (% of population)	S
		Poverty headcount ratio at $2 a day (PPP) (% of population)	S
		Poverty headcount ratio at national/rural/urban poverty line (% of population)	S

Yale Center for Environmental Law and Policy & the Center for International Earth Science Information Network

Yale Center for Environmental Law and Policy (YCELP) and the Center for International Earth Science Information Network (CIESIN) have developed its Environmental Performance Index as a means to rank countries according to a number of performance indicators tracked across policy categories that cover both environmental public health and ecosystem vitality. The Environmental Performance Index tracks, at a national level, how close countries are to having established environmental policy goals[22].

Table 2.15. Indicators used in the Environmental Performance Index

Name of Organisation	Name of Initiative	Name of Indicator	DPSIR model
Yale Center for Environmental Law and Policy and the Center for International Earth Science Information Network	Environmental Performance Index	Change in water quantity	I
		Biome protection	R
		Marine protection	R
		Critical habitat protection	R
		Forest loss	I
		Forest cover change	I
		Coastal shelf fishing pressure	P
		Fish stocks overexploited	I
		Fish stocks overexploited	R
		CO_2 emissions per capita	D/P
		Renewable electricity	R

2.3. Gaps and Opportunities: Lessons from this analysis

The state of the art section of this report performed a literature search concentrated on a number of key organisations and initiatives in order to create a database of existing indicators. This database was then filtered according to a set of criteria which selected indicators on the basis of sensitivity, scale, ease of communicability and understandability, whether the indicator was based on available data, scientific validity, relevance to the user's needs and whether the indicator was actually being used.

After this initial application of criteria indicators were mapped onto the Drivers, Pressure, State, Response, Impact framework. According to this assessment, state and response indicators are more frequent. Both are represented with 74 and 21 indicators respectively. Impact indicators are represented with seventeen and drivers with four indicators. From this assessment it can be seen that the indicators of these organisations and initiatives tend to focus on status and response indicators with a relatively low focus being put on indicators examining the drivers or the impacts.

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22 http://epi.yale.edu/

As an overview of the literature in general, relatively little literature concerning poverty-biodiversity indicators exists, with only one out of all organisations and initiatives studied here – World Bank – having proposed, but not yet developed, poverty-biodiversity indicators and hence a significant knowledge gap pertaining to their implementation, effectiveness and usefulness as a tool exists.

With regards to currently existing indicators, a great difference in the quality and quantity of information openly available exists. Some organisations and initiatives provide a very clear straight forwards analysis of the indicators used clearly identifying data sets used, calculations and variables utilised, the developmental status of the indicator as well as the limitations of the indicator. However, for some indicators very little data was available making a thorough analysis of the indicator difficult.

Case Study 2: EXAMPLES OF NATIONAL BIODIVERSITY-POVERTY INDICATORS – NAMIBIA HIGH LEVEL INDICATORS FOR COMMMUNITY BASED NATURAL RESOURCE MANAGEMENT PROGRAMME (CBNRM)

Area covered by registered conservancies and the number of people included in those conservancies: This indicator shows trends 1) area coverage by conservancies and 2) total number of people included in conservancies.
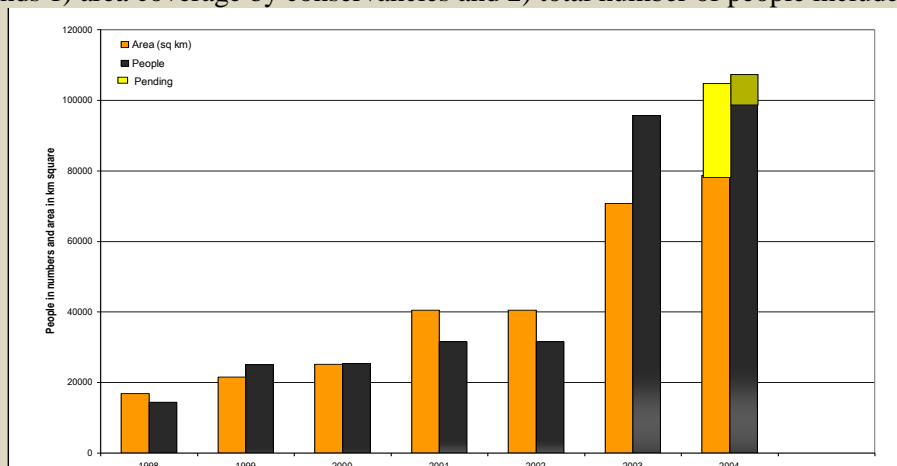
Link between Biodiversity and Poverty: The following indicators monitor the benefits that can be generated through taking nature conservation into account.
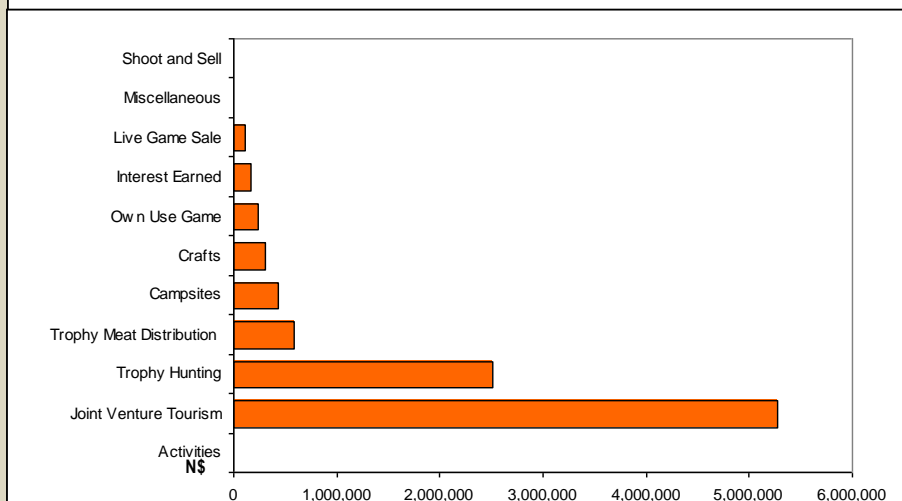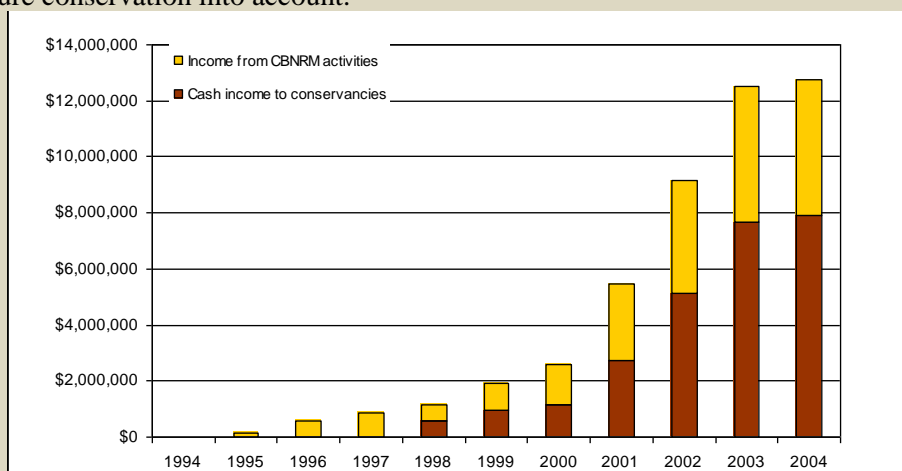
Source: Namibia Nature Foundation (2010)

3.   STRATEGY FOR THE DEVELOPMENT OF POVERTY-BIODIVERSITY INDICATORS

Whilst developing the poverty-biodiversity indicators framework, we noted the recommendations by Smith *et al.* (2010), which provides a comprehensive review of the linkages between poverty and biodiversity across different programmes of work of the CBD, and BIP (2011) that provides guidance for national biodiversity indicator development and use. Both publications chart similar strategies for development of indicators that start with identifying key questions sought to address and key stakeholders who influence and are influenced by changes to biodiversity and developmental activities. Corresponding to this line of thought, we highlight below why we need to develop poverty-biodiversity indicators, what would they capture as a minimum, what would their qualities be, and how would data be obtained.

3.1.   *Purpose of developing the indicators*

Broad linkages between biological systems and social systems are well understood. The Millennium Ecosystem Assessment (MA 2005) was a comprehensive attempt to demonstrate the various dimensions of the inter-relationship, and further the dependence of human well-being on properly functioning ecosystems. What the MA also brought into relief was the intricate relationship of people living in close proximity to various natural ecosystems that range from the economic, social and cultural. However, understanding the scale and nature of linkages, in particular owing to the complexity of the systems, still seems weak, especially when it comes to predictions of, for example, tipping points.

Acknowledging the fact that such people have served as custodians of biodiversity over generations, and further recognizing their relevance in conservation efforts, the CBD has been steering discussions and action towards ensuring biodiversity conservation along with enabling the livelihoods of the primary users of biological resources. Several later studies have further shown that areas with the highest biodiversity coincide with areas of high poverty (low incomes) consequently resulting in high pressure on the stock of biological resources (Roe 2010). Such biological resources form an asset base from which income flows for people living in areas rich in biodiversity. Indicators on the nexus between biodiversity and poverty must therefore also focus on key questions such as how much biodiversity is needed to support poor, and whether it is diversity or volume of a few key species that matters.

Trends in resource exploitation show that, in the continuum of a value chain, the least value is picked up by the primary producers. However, during the process of value addition, considerable changes in the magnitude of value accrued are often observed, as for instance in exported fish and fish products, medicines, seeds, cosmetics or perfumery (UNEP 2010). This brings forth the argument that strategies for poverty alleviation could be linked to strategies for biodiversity conservation. The experiences of hundreds of local communities, considered partners of UNDP's Equator Initiative[23], are compelling proof of this argument where community led initiatives that address conservation of biodiversity, adaptation to climate change and poverty alleviation are recognized through a broad nomination, selection and award process.

Given the direct and implicit connections between development objectives and resource conservation, it is imperative that policy planning processes focus on assessing and monitoring mechanisms through which the two goals are met. This requires the development of a comprehensive indicator framework that captures the status of biodiversity and development, consequences from loss of biodiversity and ecosystem services, the drivers that affect them, and what kind of responses would be required by different stake and interest holders to enhance both goals together.

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[23] See case studies at www.equatorinitiative.org

3.2. Scope of the indicators

The poverty-biodiversity indicators would attempt to capture parameters related to the conservation and sustainable utilization of biological resources and ecosystems and, in the process, achieve various human or developmental needs. Through different criteria to be defined, the indicators would specifically capture the status of ecosystems and resources (that can be characterized as goods and services obtained from productive capital), and linked societal needs including basic needs (food, shelter, health, energy), needs related to safety, social belonging (rights to practice knowledge, use resources and territories in a sustainable manner), and aspirational needs (education, enterprise development). They would also provide an insight into the drivers and interventions required in achieving the twin goals of conservation and development. As they serve to link the productive (natural) and consumptive (human) systems, the indicators could also be useful to indicate trends related to sustainable consumption and production process, at least with respect to the major bio-industries, such as agriculture, forestry and fisheries.

This report also takes note of the suggestions made in the CBD Technical Series Report No. 58 on Ecosystem Services and poverty alleviation indicators (UNEP-WCMC 2011, pp. 60-63), which recommended that future work on ecosystem and poverty indicators should have a systems approach.

3.3. Choosing indicators

The choice of indicators, sub-indicators and metrics relevant to poverty alleviation and biodiversity conservation would involve capturing critical elements that indicate status, trends and responses to both social and ecological parameters. In the process, we think it is important that the indicators capture various socio-ecological parameters that are important to human well-being. This would operationalize the Capabilities framework developed by Sen (1993), where human well-being is determined by the 'capabilities' (that could include knowledge, skills and assets – whether natural or technical) possessed by an individual or society and the 'freedoms' that the individual/society has to utilize these capabilities (determined by laws, regulations and customary norms).

Similar exercises have been undertaken earlier to capture well-being of local communities that predominantly depend on biological resources and ecosystems to meet their various needs – basic (e.g., food, shelter, energy, health needs in each of which a diversity of sources is stressed), security (e.g., clarity of land tenure, security from natural shocks (capturing natural vulnerabilities and resilience), security from economic shocks) belonging needs (e.g., opportunities for co-operative action, equity in prices, gender equity, non-discrimination) and self-esteem and actualization needs (captured through increased autonomy or shared responsibilities in decision making with respect to resource use and economic development choices, education, successful partnerships with external partners (Suneetha & Pisupati 2009). Other initiatives such as the OECD's Better Life Index (OECD 2012) are also aligned to this concept, where progress of societies is captured through a combination of economic, social, political and environmental indicators, although the specification of environmental indicators is not exhaustive. A specific set of indicators that would also capture species richness and ecosystem functioning within this framework would help to determine improvements in well-being (or poverty alleviation) within an ecological context. While the complexity in the biodiversity-society nexus needs to be captured, it is also important that the targets to the indicators are simple enough to be measured and acted upon at the basic levels of implementation i.e., the local and sub-national levels. This should be sufficiently emphasized since one of the reasons practitioners often allude to for non-achievement of various global or macro indicators is the disconnect between the targets and local contexts.

In line with this argument, we suggest that the indicators should be able to capture at the least the parameters listed in Table 3.1.

Table 3.1. Parameters to be captured by the poverty-biodiversity indicators

Parameter	Examples	Explanation
Diversity of resources	Types of staples, species richness, etc.	Species and genetic diversity are fundamental in the linkage between biodiversity conservation and poverty alleviation
Functioning of ecosystem services	Stocks and flows of biological resources and ecosystem services would be captured	The integrity of an ecosystem in continuing to offer different provisioning and regulating services. This directly also relates to capturing the vulnerability of a natural system to natural or human disturbances, and could offer indications to improve natural system resilience
Livelihood activities dependent on biological resources and ecosystems	Non-timber forest product collections, medicinal plants, traditional medicine, crafts, etc	Degree of dependence of proximate populations on the ecosystems for their livelihood aspect of their well being.
Cultural diversity	Languages, festivals related to resource/ ecosystem use, existence of effective demand for biological resources and related products, traditional livelihoods still in vogue with regards to traditional medicine, agricultural practices, beekeeping, etc.	Bio-cultural diversity extant in a socio-ecological system
Equity in transactions	Price, access to resources, decision making authority, etc	The 'social indicators' would indicate the degree of dependence of the proximate populations on the ecosystems, and further provide a measure of social vulnerability and resilience
Cross sectoral linkages	Water quality affected by activities such as mining or agricultural production systems.	Captures linkages between different industrial/production sectors that have direct impacts on biodiversity/functioning of ecosystems. This would be important to co-ordinate actions related to developmental aspirations and ecosystem functioning.

3.3.1.   Process of indicator selection

The process of development of a complete set of indicators would start with identification of key questions that we want to answer with respect to poverty alleviation and biodiversity conservation, identification of experts and practitioners who can help shortlist and develop relevant indicators, and finally pilot test and promote their use. A methodology for testing indicators is given in Annex 3. Ideally, the indicators should include the traits listed in Table 3.2.

Table 3.2. Desired qualities of poverty-biodiversity indicators

Quality	Remarks
SMART	Indicators should be linked to Specific, Measurable, Attainable, Relevant and Time-bound (SMART) targets.
Mix of stand-alone and composite indicators relevant to poverty alleviation and biodiversity conservation.	Stand-alone indicators are those that capture a single parameter related to an event (e.g., consumption of wild foods). Composite indicators are a set of sub-indicators to capture changes to a parameter (e.g., food security may be captured through indicators on quantity of food consumed, variety of foods consumed and quality of foods consumed). Further information on developing composite indicators is available in Annex 2.

Quality	Remarks
Interlinked indicators	The indicators need to correspond to enable linked solutions in achieving targets and goals related to various parameters that are sought to be captured (e.g., Sparks *et al*. 2011). For instance, indicators related to achieving security needs in a rural context could include clear tenure rights. This would also be relevant to ensuring access to lands and resources required to meet livelihood needs, food security, health security and so on. They are different from composite indicators in the sense that they can be achieved on a stand-alone basis- however their achievement or non-achievement would be conditioned by the achievement or otherwise of other indicator related targets. This approach would be useful to enhance inter-sectoral collaboration in implementing policies and activities that would be relevant to both.
Amenable for implementation	Parameters related to the indicators should be relevant to international, national, sub-national and local contexts, and easy to use.

3.4. Data sets that can be used

Poverty-biodiversity indicators tend to focus more on the use value of biological resources and their diversity, in addition to focusing on the productivity and functioning of ecosystems and their implications for human development. Consequently, they t would facilitate implementation of different conservation related and poverty related policies. . By drawing explicit links to them through a measurement process, it can be hoped that the three objectives of the CBD may be better served.

The metrics related to the measurement need not necessarily scout for the inventorizing or compilation of new datasets. We propose that the poverty-biodiversity indicator initiative develop on existing and available datasets, developed and maintained by different agencies (some of which are covered in the review of indicator initiatives in this report). All existing indicators, either related to biodiversity or development make good use of existing empirical datasets, usually reported at the national level. Such datasets include socio-economic data on various parameters, GIS information, species population data, etc.

We also suggest that the indicators be designed such that they can be implemented to capture changes at various scales – local, national, regional and global. The indicators could be used to also capture regional or global trends, although these could face constraints in data access and co-operation of national agencies, as for instance, can be seen from the diverse nature of reporting on national reports related to strategy and action plans on biodiversity. Furthermore, it is recognised that a broad global index for poverty-biodiversity linkages might be unrealistic given the context-specific nature of the issues within the topic.

3.5. Advantages and Challenges of strategy

Advantages: The strategy envisages an approach that would enable coherent policy-making to enhance biodiversity and human well-being/poverty alleviation. For this purpose, it considers socio-ecological systems as interactive, dynamic systems. Such consideration also allows communication of complexity of the interactions between the natural and human systems. The other advantage the approach has, is that it builds on existing initiatives to capture changes to biodiversity or poverty, and hence implementing the indicator set, especially identification of datasets would be an easier task (in addition to the prospect that it might be easier to get related initiatives to adopt elements from the Poverty – Biodiversity indicator

set). Thirdly, we propose the indicators to be designed such that they may capture changes and drivers at multiple levels of governance and thereby are relevant at different levels of implementation.

Challenges: One challenge that the approach faces would be to capture trade-offs between different resource-based activities As UNEP-WCMC (2011) perceptively notes, the impacts of the activities of one industry on another and thereby on resources cannot be completely specified, primarily due to lack of sufficient information on possible consequences. This would have a bearing on decisions related to choice of various activities that could alleviate poverty. A related challenge that is foreseen would be the insufficiency of data to capture the complexity in social-human interactions. Hence, ability to sufficiently capture cross-linkages and consequences between competing economic activities and biological resource use and ecosystem functioning, and attendant inadequacies of data would be major concerns in having a fully representative value indicating trends in poverty alleviation and biodiversity conservation.

A further challenge related to implementation of the strategy would be in terms of the financial resources that'd be required to first, develop the indicators and further to implement them. Broadly, the process of indicator development would require consultations with experts and other stakeholders (practitioners) through meetings and, perhaps use of online forums, identification of key questions and indicators, identification of data sets and means to access them, testing and piloting of the indicator set and further, capacity building or awareness raising of implementing agencies in using the indicators. This is a process that could easily take at least 4-5 years from initiation to implementation-ready stage.

3.6.   *Inventory of all possible partners for CBD Secretariat to work with*

As we noted earlier, one of the challenges to the development and eventual application of poverty-biodiversity indicators would be the high costs involved in the process. Further on, it would also be daunting to ensure application of the indicators at various scales. To defray some of the costs, and to enhance effectiveness and certainty of implementation, we suggest that the CBD Secretariat work in collaboration with different relevant agencies. Partnering with agencies that are already involved in implementing indicators specific to their areas of interest (e.g., IUCN, World Bank, UNDP, FAO, UNDESA, and Commission on Sustainable Development) could enable synergizing discrete attempts to achieve related objectives. This would also allow direct contributions to various related initiatives that aim to achieve broad goals related to sustainable development, including the proposed initiative to formulate Sustainable Development goals.

Similarly, partnering with multilateral/international research agencies working on interdisciplinary aspects of development and environmental issues (e.g., UNEP-WCMC, UNU, IIED, Stockholm Resilience Center, OECD, Oxford Poverty and Human Development Initiative, etc) would allow leveraging on collective intellectual capitals and knowledge networks and easier access to relevant expertise, both for development of the indicators and capacity building activities.
Additionally, the Secretariat may consider consulting with national agencies already involved in and piloting such initiatives such as Defra (from UK), ABS (from Australia), Eurostat (European Commission), Environment Canada (Canada), Ministry of Sustainable Development and Planning (Bolivia) among others.

A non-exhaustive list of potential partners with whom the CBD Secretariat could consider working on this initiative is proposed in the diagram below:

Poverty- Biodiversity Indicators Initiative

Co-ordination

SCBD

Development Agencies/ Specialized agencies

(IUCN, The World Bank, UNDP, FAO, UN DESA, CSD, Other MEAs, etc)

Research institutions

(UNEP-WCMC, BIP, UNU, IIED, Stockholm ResilienceCenter, OECD, Oxford Poverty and Human Development Initiative, etc)

National Agencies

USERS (Practitioners and policy makers)
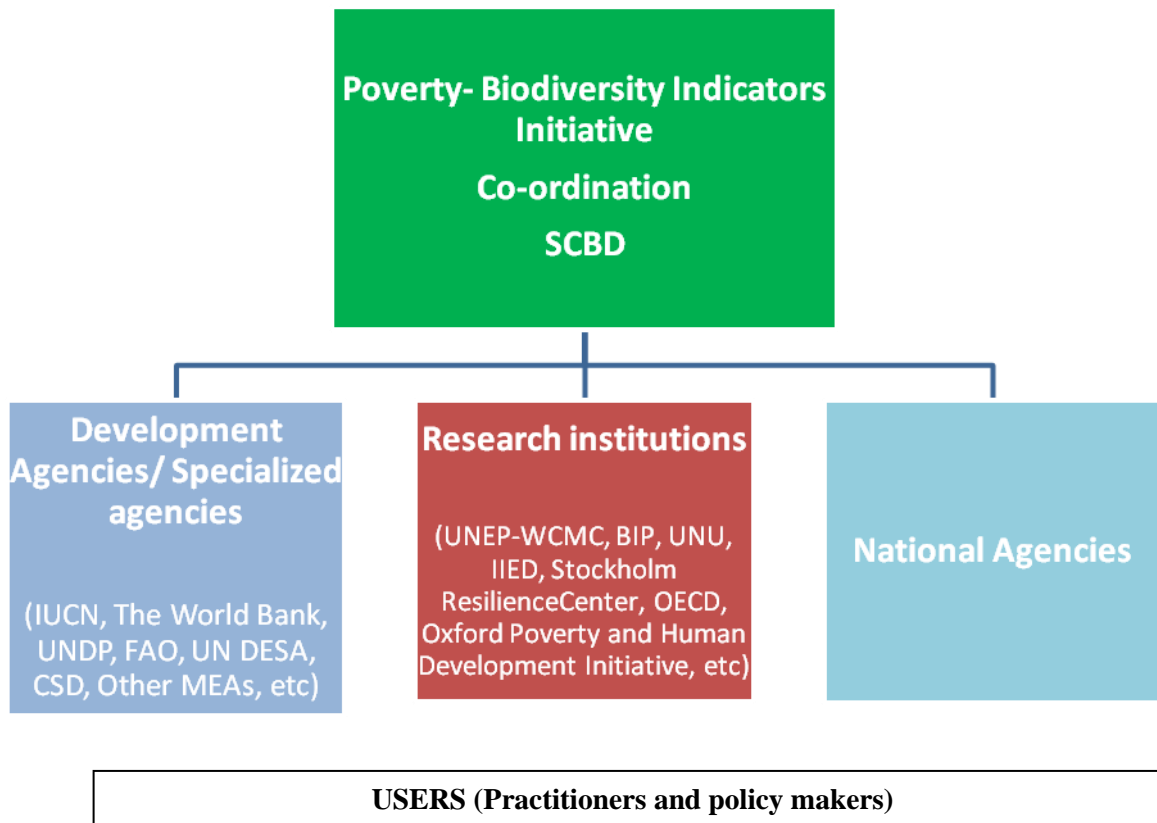
Case Study 3: Using poverty and biodiversity indicators to model agricultural development in the Pujiang County, China

The relationship between poverty, biodiversity in agro-ecosystems and agricultural development are poorly understood. Therefore, Hengsdijk *et al.* (2007) considered the Pujiang County in Zhejiang province of China, a low-land rice-based agro-ecosystem facing moderate poverty, as a case to model the consequences of poverty reduction strategies on regional poverty and biodiversity.

Two indicators for rural poverty were used concerning per capita income of the agricultural population and the ratio between the active labour force and the total available agricultural labour force in the province. The later indicates the level of underemployment in the agricultural labour force. Biodiversity indicators used in this case were closely related to those proposed by the CBD. Land productivity was considered a proxy of services provided by biodiversity in support of human well-being. Nitrogen surplus per unit agricultural area and the Biocide Index were considered as indicators of threats to biodiversity and ecosystem integrity. The extent of biodiversity in the study area was indicated by the ratio of agricultural area against that under forests.

These regional poverty-biodiversity indicators were used to model the consequence of four poverty reduction strategies: i) intensification of production, ii) diversification towards livestock production, iii) land expansion, and iv) exit from agriculture.

A regional Linear Programming model was applied combined with the use of expert systems and GIS. The existing scenario was taken as a reference against which indicator results of other scenarios were compared. Regional information was scattered and at times conflicting, therefore comparison of the scenarios against the reference was considered cumbersome. However, the results of this study illustrate the effectiveness of each poverty reduction strategy in achieving regional poverty and biodiversity goals.

Excerpt from the results table:

Results (in units per year) of the reference, intensification, diversification, land expansion and exit scenarios

Indicator	Unit	Reference	Intensification	Diversification		Land expansion	Exit
				D1	D2		
Labour income	CNY pers^{-1}	12,850	13,610	15,920	16,050	14,772	15,540
Land productivity	CNY ha^{-1}	62,250	65,920	77,110	77,720	58,716	60,180
Share active agricultural population	%	32	32	35	63	33	35
N surplus	kg ha^{-1}	425	296	412	237	251	283
Biocide index	–	756	758	747	747	632	664
Ratio agricultural area and forest area	–	0.46	0.46	0.46	0.46	0.56	0.46

Source: Hengsdijk *et al.* 2007.

4.   PRELIMINARY POVERTY-BIODIVERSITY INDICATORS

4.1.   Proposed preliminary poverty-biodiversity indicators

Following on from the conceptual framework in Section 1 and the results of the state of the art review in Section 2, this section proposes a number of core indicators that can be used to examine the linkage between biodiversity and poverty alleviation for development at local, national and regional scales.

A number of headline indicators can be derived from the review of existing indicator initiatives concerned with this topic, many of which are in line with those proposed by the CBD Ad Hoc Technical Expert Group Meeting on Indicators for the Strategic Plan for Biodiversity 2011-2020[24]. Owing to the local scale nature of the linkages between biodiversity and poverty alleviation, taking such a broader approach to proposing an accepted suite of indicators allows for context-specific interpretations to be taken. However, it therefore presents challenges when seeking to aggregate or compare results.

Table 4.1 provides a series of headline and example indicators that can be used to address the various steps of the DPSIR framework in a manner so that would allow for linked indicator development (e.g., Sparks et al. 2011). The example indicators presented meet most of the criteria used in Section 2 to evaluate their appropriateness for measuring the relationship between biodiversity and poverty alleviation. It must be insisted, therefore, that the list provided here is not complete, and primarily serves to show what can be developed based on current practices. Furthermore, causal links between the steps in the conceptual framework would need to be examined further through the implementation of the strategy given in Section 3.

How the indicators specifically relate in a particular country or area requires, next to the headline indicators, a few additional assessments from the determinants list such as a Gini Index, social security systems, education, natural resources, brittleness (vulnerability for overexploitation and ability to recover or self-regenerate; Tekelenburg et al. 2009), productivity of ecosystems, employment etc.

Table 4.1. Suggested indicators linking biodiversity and poverty using the DPSIR framework

Conceptual Framework		Headline indicators	Example biodiversity and socio-economic indicators
Drivers	Economic changes / fluctuations	• Trends in demographics of dependent communities • Trends in greenhouse gas emissions • Trends in social, economic and land use planning outside control of the local community	• Rural population (% of total population) • Change in rural population density • Agricultural methane emissions (% of total) • Area under heterogenous/mosaic landscapes (percentage area) • CO_2-equivalent emissions by sector (agriculture, forestry, etc.) per capita
	Markets / prices: change in market value of basic goods & services; the provision of non-supportive incentives		
	Political changes: conflicts / change in leadership		
	Policy changes: Land use change decisions, tenure policies on different resources and territories		
	Social changes: loss of cultural & change in belief systems,		

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24 UNEP/CBD/AHTEG-SP-Ind/1/2/ADD1

Conceptual Framework		Headline indicators	Example biodiversity and socio-economic indicators
	migration		
	Climate change and environmental change: alteration in provisioning ecosystem services		
Pressures	Resource Extraction / Depletion: Amount extracted / depletion of income generating resource pool	• Trends in pressures from industrial activities • Trends in pressures from habitat conversion, pollution, invasive species, climate change, overexploitation and underlying drivers	• Percentage contribution of agriculture, forestry and fishing to GDP (US$ millions) • Proportion of total water resources used by sector (domestic, industrial, agriculture, etc.) • GLADIS "Soil Health Status" • Number of crop and animal varieties endangered • Proportion of fish stocks within sustainable biological limits
	Vulnerability / Resilience: Loss in quality & quantity of basic life support services (e.g., food, water, energy)		

State	Dimensions of Poverty:
	• Livelihoods: Income; market value; dependence on biodiversity/biomass
	• Health & nutrition
	• Water & energy
	• Education & capacity
	• Rights & Security
	
	Components of Biodiversity:
	• Genetic diversity:
	  - Income generated from genetic resource
	  - resilience provided by genetic diversity
	• Species diversity
	• Ecosystem diversity: structure, function, services
		• Trends in health status of the population
		• Trends in well-being (other than health)
		• Trends in livelihood generation from bio-enterprise activity
		• Trends in extent, condition and vulnerability of ecosystems, biomes and habitats
		• Trends in abundance, distribution and extinction risk of species
		• Trends in genetic diversity of species
			• Percentage of rural population below poverty line
			• Time spent by household members to collect water, fuel wood and NTFPs
			• Distance walked by household members to collect water, fuel wood and NTFPs
			• Percentage of rural children under five who are underweight.
			• Quantity, percentage or value of household consumption that is derived from forest products and fisheries
			• Percentage of Rural Population with Access to Safe Drinking Water
			• Agricultural irrigated land (% of total agricultural land)
			• Forest area (% of land area), broken down primary forest, sustainably managed, protected, etc.
			• Livestock production index
			• Proportion of utilised species threatened with extinction
			• Genetic diversity of terrestrial domesticated animals and crops
			• Wild Commodities Index
			• Trends in Invasive Alien Species
			• Soil Biodiversity
			• Number of crop and animal species in agricultural use
			• Water Availability and Use
			• Fragmentation of habitats
			• Biodiversity for food and medicine

Conceptual Framework		Headline indicators	Example biodiversity and socio-economic indicators
Impacts	Effects on various dimensions of poverty caused by changes in the components of biodiversity: • decrease in income due to depletion of a resource; • degradation of community health and loss of sources of nutrition	• Trends in distribution, condition and sustainability of ecosystem services for equitable human well-being	• Quantity, percentage or value of annual household consumption that is derived from forest products and fisheries • Number of deaths from natural disasters by income/ wealth quintiles. • Per capita agricultural GDP of the poor • Contribution of NTFPs to the economy (US$ millions) • Contribution of biological resources to health care (e.g., traditional medicine industry, traditional/ native foods – US $ and percentage to total staples consumed) • Change in threat status of utilised species • Land cover change • Change in water quantity • Change in water quality
Responses	Policy / regulatory mechanisms Positive subsidies / incentives Community initiatives / projects Traditional Knowledge / Systems	• Trends in access and equity of benefit sharing of genetic resources • Trends in accessibility of scientific/technical/traditional knowledge and its application • Trends in coverage, condition, representativeness and effectiveness of protected areas and other area-based approaches • Trends in integration of biodiversity, ecosystem services and benefits sharing into planning, policy formulation and implementation and incentives • Trends in mobilisation of financial resources	• Percentage of farmers who grow drought resistant crops by income/wealth categories. • Trends in mobilization of financial resources, scored as biodiversity, climate change or desertification focused. • Improved water source, rural (% of rural population with access) • Trends in inclusion of traditional knowledge, innovations and practices for environmental management/ enterprise development • Area of agricultural, forest, freshwater and coastal ecosystems under sustainable management • Pesticide regulation • Area under protection – formal (state protected areas) and informal (e.g., ICCAs) • Management effectiveness of protected areas measured by METT

One major gap in the above suite is the lack of indicators on ecosystem resilience. The importance of such integrity underpinning other forms of resilience, such as social and institutional, is directly linked to the ability to break the poverty trap. Owing to the academic nature of ecosystem resilience, in particular on the measurement of a system relative to its thresholds, no internationally recognised system of measurement exists (Cabell & Oelofse 2012). Instead, we have proposed indicators relating to ecosystem vulnerability – e.g., proportion of total water resources used by sector (domestic, industrial, agriculture, etc.); forest area (% of land area), broken down primary forest, sustainably managed, protected, etc.; and, proportion of utilised species threatened with extinction – without trying to infer the point at which a system may be irrevocably altered.

4.1.1. Factsheets of proposed preliminary poverty-biodiversity indicators

[To be completed once final indicator list has been set]

Indicator Title

Link to Conceptual Framework:
Type of Indicator: [Relevance to DPSIR-type framework]
Lead Agency:
Scale of Appropriate Use:
Key Policy Question:

The Indicator
Storyline

Data
Data sources, collection & management

Data custodians

Data access and availability

Methods
Methods used/Calculation procedure

Data units

Technology used/Systems in use

Most effective forms of presentation

Status

Limitations of the indicator

Sources/References

4.2. Relevance of proposed poverty-biodiversity indicators to the end-users

The indicators are primarily meant for planners and decision makers to enable them to make coupled policy decisions and facilitate a closer alignment of environmental, economic and social development goals. By implication, it would also be useful to those engaged in implementation – from local communities to researchers and conservation agents – as a tool to capture interests beyond their immediate domains. Moreover, it would promote better interdisciplinary engagement between academics and separate government departments that deal with relevant but administratively disparate issues. This gains further relevance in the context of current thinking within various policy fora where the metric of development attempts to capture multidimensional criteria that include income and other parameters including environmental security, life satisfaction, equity in transactions, and social relations (Stiglitz *et al*. 2009, UN 2010, OECD 2012). The development of poverty-biodiversity indicators would serve to inform and provide guidance to processes being put in place to enhance human well-being, and to achieve a range of international objectives.

Convention on Biological Diversity

Within the CBD context, the use of poverty-biodiversity indicators is relevant in three aspects: at the convention level in achieving the Programmes of Work, and at the national level through successful implementation of National Biodiversity Strategies and Action Plans (NBSAPs) and national reporting.

As recommended by Smith *et al*. (2010), while there are many existing measures of the various aspects of poverty, livelihoods, development and well-being that are deployed as indicators by the development community, there is often a need to adapt them to the specific thematic and geographical context of each Programme of Work. It is generally agreed that the finer the scale at which data can be sourced, the more valuable it is likely to be for identifying Programme of Work-relevant change. In some cases it may be possible to extract appropriately targeted data from existing datasets; however, it is important to understand the limitations of any existing data used.

The Strategic Plan for Biodiversity 2011-2020 under the CBD – which itself looks to mainstream biodiversity conservation into other sectors – is expected to be interpreted and implemented at the national level through the revision of NBSAPs. The CBD Secretariat, in its guidance on NBSAP revision[25], promotes the involvement of national stakeholders from across all sectors and the review of existing national goals, including existing Poverty Reduction Strategy Papers (PRSPs). As a manner of reporting of progress of the implementation of the revised NBSAPs, as well as the global Aichi Targets, national reports should consider the incorporation of such indicators. Through regular consideration and updating of such indicators, there will be an inherent process of updating and improvement of the indicators themselves.

Differing levels of government (local, national, regional)

As has been identified above, the scope to which an adequate assessment of the linkages between biodiversity and poverty will depend on the scale used. However, in practice this may mean that an increasing number of assumptions will have to be taken on the representativeness of the data used.

At the local level, the relationship between biodiversity and poverty can be more easily assessed, and action can be more directed. At the national level, such action may still be feasible, but it is more likely for approaches to be broader with a review of major challenges and responses taken, such as the occurrence and intensity of disaster events or the amount of funding provided for relevant initiatives.

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[25] http://www.cbd.int/nbsap/training/

Such indicators may well be included as part of NBSAPs to track progress against national targets, and could be used as part of the national reporting process. At the regional level, it can be expected that indicators will be used to compare action taken or reported at the national level, with consideration of where increased action or support is required.

International organisations

A number of international non-governmental and inter-governmental organisations may wish to consider using such indicators in order to highlight areas requiring action, to raise awareness of the links between the conservation and development sectors, and to demonstrate progress following the implementation of initiatives at a range of scales. A number of conservation agencies, for instance, are now focusing on the link between biodiversity and poverty alleviation, and the ability to demonstrate how their field-based initiatives can have a positive impact on both objectives, could enhance the awareness and resourcing of such activities. Agencies focusing on aggregating up lessons learnt into broader-scale policy-related reviews may also see such benefits.

Within the United Nations System, there are a number of processes, in addition to the CBD and other MEAs, which could utilise such indicators. For instance, the UN Development Group (UNDG) bring together 32 UN funds, programmes, agencies, departments, and offices that play a role in development, of which notably missing is the United Nations Environment Programme (UNEP). The group's common objective is to deliver more coherent, effective and efficient support to countries seeking to attain internationally agreed development goals, such as the MDGs. The UNDG supports synergies and efficiencies that increase the impact of UN programmes and policy advice, and promotes more strategic support for national plans and priorities. Equally the UN Development Assistance Framework seeks to provide a common strategic framework for the operational activities of the United Nations system at the country level by providing a collective, coherent and integrated UN system response to national priorities and needs within the framework of the MDGs and the other commitments including through major United Nations conventions.

Another example would be the UNDP/UNEP Poverty-Environment Initiative (PEI) which supports country-led efforts to mainstream poverty-environment linkages into national development planning. The PEI provides financial and technical assistance to government partners to set up institutional and capacity strengthening programmes and carry out activities to address the particular poverty-environment context. Impact indicators that assess the success of such activities on the ground would therefore be a useful evaluation tool for this initiative.

Within the conservation field specifically, the recently formed Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) is seeking to be the mechanism that addresses the gaps in the science-policy interface on biodiversity and ecosystem services. It recognises that there are many organizations and initiatives that contribute to the science-policy interface, but that there is no on-going global mechanism that brings information together and synthesizes and analyses it for decision making in a range of policy fora. IPBES therefore will be such an interface, and the use of poverty-biodiversity indicators will be important to embed the role of natural resources into core national and international policy making.

Sustainable Development Goals

A proposed outcome of Rio+20 Earth Summit was for policymakers to adopt a series of universal Sustainable Development Goals (SDGs). The purpose of SDGs would be to address the broad challenges of poverty eradication, environmental protection and sustainable consumption and production, as well as to build on and overcome the shortcomings of the MDGs. Currently there are proposals for a range of international goals that will replace the existing MDGs after 2015, including those listed in Table 4.2.

Table 4.2. Tentative blueprint for the scope of Sustainable Development Goals (adapted from Miyazawa 2012).

Agenda 21 and Johannesburg Plan of Implementation	Overarching goal	Poverty eradication, environmental sustainability, sustainable consumption and production
	Dimensions	• Low-carbon economy • Social foundation • Environment sustainability
	Cross-cutting themes and approaches	• Protecting and managing the natural resource base of economic and social development • Sustainable development in a globalizing world • Health and sustainable development • Means of implementation • Institutional framework for sustainable development • Gender and equality etc.
	Priority areas	Food, water, sanitation, access to energy, oceans and seas, forests, desertification, health, education, shelter, etc.
Broader challenges		• Climate change • Energy security • Rise in unemployment and food price • Inequality between the rich and the poor both at global and national levels • An increasing number of natural and man-made disasters, etc.
Emerging possibilities		• Green jobs and social inclusion • Resilience and disaster preparedness • Science and Technology • South-South and triangular cooperation, public-private partnerships • Innovative financial mechanisms • Strengthened institutional framework for sustainable development, etc.

Indicators to examine the progress in achieving the SDGs will therefore be essential, and it is hoped that the indicators identified in this document, as well as subsequent reviews, will form a basis that will ensure that the achievement of the Goals adequately consider the role of biodiversity.

CASE STUDY 4: UNDERSTANDING POVERTY-BIODIVERSITY INTERACTIONS USING INPUT-OUTCOME INDICATORS AND SUB-NATIONAL CASE STUDIES

This study demonstrates the practical application of poverty-biodiversity indicators using a case study approach. From 2005 to 2008, the Netherlands Environmental Assessment Agency undertook a study to explain poverty-biodiversity interactions under different situations. Eleven case studies, all from developing countries and sub-national in scale, were reviewed. The case studies were on fisheries in Ghana and Kenya, mangrove exploitation in Vietnam, forest use, reforestation and forestry in Vietnam and Costa Rica, soy in Brazil, palm oil in Indonesia, peasant agriculture in Ecuador and Mexico, livestock production in Nicaragua and cotton in Mali.

Using a conceptual framework, input indicators were used to define the state of the system and outcome indicators to characterize changes in biodiversity, goods production, human well-being and poverty. Research partners attributed semi-quantitative scores on a scale of 1 to 5, indicating unfavourable to favourable situations for the sixteen input and output indicators for each of the eleven case studies. Indicators were selected on the basis of nine broad criteria including policy relevance, quantifiable, scientific sound, mutually linkable, sensitive, scalable and allowing worldwide comparison. The sixteen indicators selected were: population density, governance (level of corruption, equality, political stability etc.), policies for expansion/intensification of production, level of integration into national/international markets, susceptibility of ecosystems to degradation, level of poverty, access to natural resources, land and labour productivity etc. Some similar indicators were grouped and their scores averaged out to obtain a single score for that group. Data for the indicators were obtained from literature studies, input from local stakeholders, workshops, expert knowledge and sharing existing datasets from different local institutes. Literature was reviewed from the Millennium Ecosystem Assessment (MA 2005), Global Biodiversity Outlook 2 (CBD 2006), Global Environmental Outlook 4 (UNEP 2007) and the World Resources report (WRI 1998).

Based on the indicator scores for the eleven case studies, poverty-biodiversity relations were classified into four possible scenarios: 1) win-lose: a decline in poverty is accompanied by a decline in biodiversity; 2) lose-lose: an increase in poverty is accompanied by a decline in biodiversity; 3) win-win: a decline in poverty is accompanied by an increase in biodiversity; 4) win more-lose less: a decline in poverty is accompanied by biodiversity conservation policies.

The authors further state that goods, money, people and knowledge across boundaries generate trade-offs that change the relationship between biodiversity and poverty.
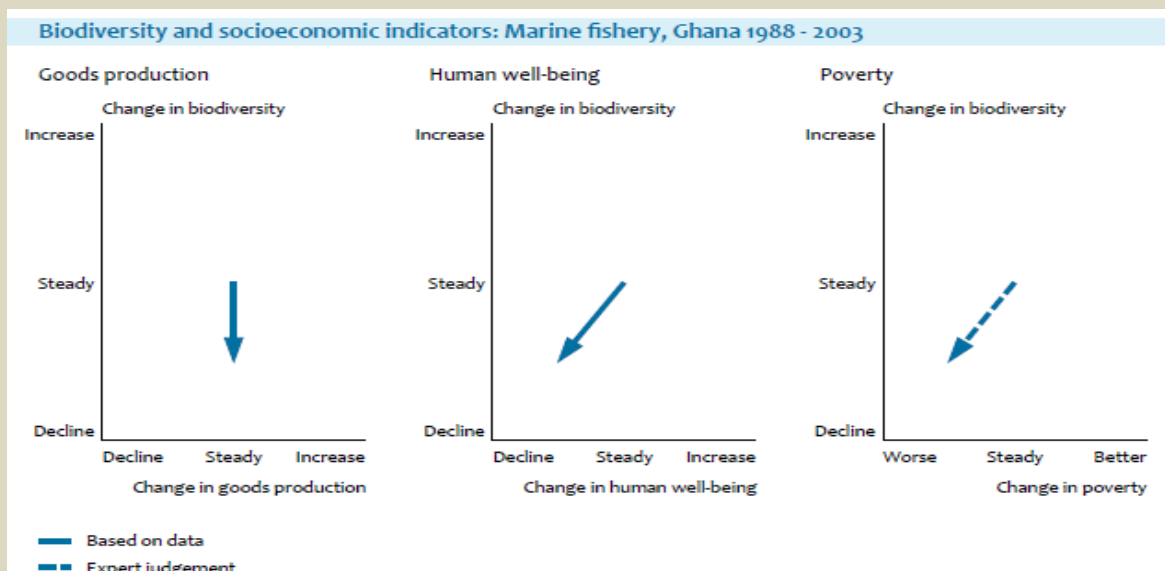
Source: Tekelenburg et al. 2009.

5. CONCLUSIONS AND RECOMMENDATIONS

Even as a first step, defining poverty is a challenge and can be subject to a range of concerns that may be spatial, temporal or cultural. While conventional international concepts have been developed, such as monetary income thresholds, some have been recognised as inappropriate for addressing the linkages between poverty and biodiversity. Instead elements such as health status, freedom of access, equity of benefits, and security in tenure are seen as being fundamental in considering whether local communities are impoverished.

While the definition of biodiversity may be more straightforward and readily agreed upon, the linkages between biodiversity and poverty alleviation are not. There exists a non-linear relationship between poverty and biodiversity, whereby while elements of biodiversity may be essential for the well-being of some communities, such as the use of traditional medicines or the trade of non-timber forest products (NTFPs) in local markets, there also exist examples of how major transformation of natural ecosystems into intensively managed agricultural land have led to huge improvements in the health and economic status of communities, at least in the short term. The development of the ecosystem services concept allows us to consider some of the direct and indirect benefits provided by natural landscapes. These would include carbon sequestration by forests, coastal erosion protection by mangroves, and spiritual well-being by natural vistas.

The development of an indicator framework on poverty-biodiversity linkages can only be as good as the underlying data upon which it is based. Unfortunately, there is likely to be a paucity of good data that clearly demonstrate such a relationship in a number of areas around the world, and in particular at coarser scales, and any effort to develop a suite of appropriate poverty-biodiversity indicators, and certainly to initiate the collection of any new data, is an expensive and time-consuming process. However, datasets do exist that can be used as starting points for indicator development, with refinement possible at a later stage as required. Equally, there are a number of institutions focusing on this area who have developed methodologies and are accumulating data that can be used in the formulation of a poverty-biodiversity indicator suite. As such, there is a need to ensure that such institutions are working collaboratively in order to avoid conflicting approaches or duplication of effort. It may therefore be a role for the CBD Secretariat to bring such stakeholders together at an early stage to encourage dialogue and synergy.

5.1 *Recommendations*

The authors of this report offer the following recommendations to the CBD in its consideration of poverty-biodiversity indicators:

- **Consider the scale**.
  The role of biodiversity in alleviating poverty can be highly context specific, and attempts to aggregate up specific metrics to a broader scale or the generalization of the attribute of poverty may weaken the resultant message. Indicators developed should be specific to both the situation under consideration and to the audience.

- **Simplify the linkages**.
  The roles of biodiversity in exacerbating or alleviating poverty, and similarly the role of communities in achieving or hindering biodiversity goals, combine to produce potentially highly complex interactions between the two. Since an indicator can be defined as a "measure based on verifiable data that conveys information about more than itself" (BIP 2011), it is key to keep the linkages simple in order to ensure that the resulting information is clear and easily

understood by the desired audience. A focus on the key questions that result from reviewing the objectives and the conceptual model help to keep the approach simple.

- **Develop a conceptual framework**.
  A conceptual framework allows for the linkages between biodiversity conservation and poverty alleviation to be considered and elaborated. By taking this step, the identification of appropriate indicators and datasets will be more straightforward, and the messages that will ultimately emerge will be clearer.

- **Collaborate.**
  It is also encouraged that the implementing agency, in seeking to elaborate such a suite of indicators, utilise existing indicator frameworks and datasets, and work with the range of institutions identified to maximise the potential offered by their collective expertise.

- **Role of the COP**.
  The authors support the recommendation 4/4 of WGRI to the Conference of the Parties with regards to biodiversity for poverty eradication and development, that the COP encourages Parties and other organizations to consider the causes of poverty, to recognize traditional cultural practices with respect to the use of biodiversity, to facilitate the continued efforts of the Expert Group on Biodiversity for Poverty Eradication and Development, and to work with UNDP and other agencies in a collaborative manner to see that approaches which support the mutual benefit of both biodiversity conservation and poverty alleviation are implemented.

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ANNEXES

Annex 1.   Summary findings of existing poverty-biodiversity indicators and metrics

For more detailed information see appended excel sheet titled "Existing initiatives and indicators for poverty-biodiversity".

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
Drivers	World Bank	World Bank Indicators Catalogue	Rural population	4
	World Bank	World Bank Indicators Catalogue	Rural population (% of total population)	
	World Bank	World Bank Indicators Catalogue	Agricultural methane emissions (% of total)	
	World Bank	World Bank Indicators Catalogue	Agricultural nitrous oxide emissions (% of total)	
Drivers / Pressures	Yale University	Environmental Performance Index	CO_2 emissions per capita	1
Pressures	World Bank	World Bank Indicators Catalogue	Agricultural machinery, tractors per 100 sq. km of arable land	6
	World Bank	World Bank Indicators Catalogue	Organic water pollutant emissions (kg per day)	
	United Nations	Millennium Development Goals	Proportion of total water resources used	
	Yale University	Environmental Performance Index	Coastal shelf fishing pressure	
	United Nations Commission on Sustainable Development (CSD)	Indicators Of Sustainable Development	Water use intensity by economic activity	
	United Nations Commission on Sustainable Development (CSD)	Indicators Of Sustainable Development	Biochemical oxygen demand in water bodies	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Ecological Footprint	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Forest fragmentation	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	River fragmentation and flow regulation	
Pressures / State	World Bank	World Bank Indicators Catalogue	Agricultural land (% of land area)	12
	World Bank	World Bank Indicators Catalogue	Land under cereal production (hectares)	
	World Bank	World Bank Indicators Catalogue	Employment in agriculture (% of total employment)	
	United Nations	Millennium Development Goals	Proportion of fish stocks within safe biological limits	
	United Nations Convention to Combat Desertification	UNCCD	GLADIS "Soil Health Status"	
	United Nations Convention to Combat Desertification	UNCCD	Land Productivity	
	United Nations Convention to Combat Desertification	UNCCD	Number of crop and animal varieties endangered	
	The Economics Of Ecosystems and Biodiversity	GDP For The Poor	Percentage contribution of agriculture, forestry and fishing to GDP (US$ millions)	
	World Bank	World Bank Indicators Catalogue	Agricultural land (% of land area)	
	World Bank	World Bank Indicators Catalogue	Land under cereal production (hectares)	
	World Bank	World Bank Indicators Catalogue	Employment in agriculture (% of total employment)	
	United Nations	Millennium Development Goals	Proportion of fish stocks within safe biological limits	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Status of species in trade	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Trends in Invasive Alien Species	
Pressures / Responses	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Wastewater treatment	1
State	World Bank	Poverty-Environment Indicators	Percentage of rural population below poverty line	74
	World Bank	Poverty-Environment Indicators	Time spent by household members to collect water and fuel wood	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
	World Bank	Poverty-Environment Indicators	Distance walked by household members to collect water and fuel wood	
	World Bank	Poverty-Environment Indicators	Percentage of irrigated area in total cultivated area by wealth/income categories	
	World Bank	Poverty-Environment Indicators	Rural per capita cereal production	
	World Bank	Poverty-Environment Indicators	Quantity of household consumption that is derived from forest products and fisheries.	
	World Bank	Poverty-Environment Indicators	Percentage of rural children under five who are underweight.	
	World Bank	Poverty-Environment Indicators	Percentage of rural children under five who are stunted.	
	World Bank	Poverty-Environment Indicators	Percentage of rural children under five who are wasted.	
	World Bank	Poverty-Environment Indicators	Percentage of rural children under five who are wasted.	
	World Bank	World Bank Indicators Catalogue	Agricultural irrigated land (% of total agricultural land)	
	World Bank	World Bank Indicators Catalogue	Forest area (% of land area)	
	World Bank	World Bank Indicators Catalogue	Forest area (sq. km)	
	World Bank	World Bank Indicators Catalogue	Improved water source, rural (% of rural population with access)	
	World Bank	World Bank Indicators Catalogue	Agriculture, value added (% of GDP)	
	World Bank	World Bank Indicators Catalogue	Agriculture value added per worker (constant 2000 US$)	
	World Bank	World Bank Indicators Catalogue	Arable land (hectares per person)	
	World Bank	World Bank Indicators Catalogue	Livestock production index (2004-2006 = 100)	
	World Bank	World Bank Indicators Catalogue	Arable land (% of land area)	
	World Bank	World Bank Indicators Catalogue	Permanent cropland (% of land area)	
	World Bank	World Bank Indicators	Cereal yield (kg per hectare)	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
		Catalogue		
	World Bank	World Bank Indicators Catalogue	Poverty gap at rural poverty line (%)	
	World Bank	World Bank Indicators Catalogue	Poverty headcount ratio at rural poverty line (% of rural population)	
	World Bank	World Bank Indicators Catalogue	Malnutrition prevalence, weight for age (% of children under 5)	
	World Bank	World Bank Indicators Catalogue	Mortality rate, under-5 (per 1,000 live births)	
	World Bank	World Bank Indicators Catalogue	Malnutrition prevalence, weight for age (% of children under 5)	
	World Bank	World Bank Indicators Catalogue	Poverty gap at $1.25 a day (PPP) (%)	
	World Bank	World Bank Indicators Catalogue	Poverty gap at $2 a day (PPP) (%)	
	World Bank	World Bank Indicators Catalogue	Poverty gap at national poverty line (%)	
	World Bank	World Bank Indicators Catalogue	Poverty gap at rural poverty line (%)	
	World Bank	World Bank Indicators Catalogue	Poverty gap at urban poverty line (%)	
	World Bank	World Bank Indicators Catalogue	Poverty headcount ratio at $1.25 a day (PPP) (% of population)	
	World Bank	World Bank Indicators Catalogue	Poverty headcount ratio at $2 a day (PPP) (% of population)	
	World Bank	World Bank Indicators Catalogue	Poverty headcount ratio at national/rural/urban poverty line (% of population)	
	United Nations	Millennium Development Goals	Proportion of population below $1 purchasing power parity per day.	
	United Nations	Millennium Development Goals	Poverty gap ratio (incidence x depth of poverty)	
	United Nations	Millennium Development Goals	Share of poorest quintile in national consumption.	
	United Nations	Millennium Development Goals	Proportion of employed people living below $1 (PPP) per day	
	United Nations	Millennium Development Goals	Prevalence of underweight children under five years of age	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
	United Nations	Millennium Development Goals	Proportion of population below minimum level of dietary energy consumption.	
	United Nations	Millennium Development Goals	Infant mortality rate.	
	United Nations	Millennium Development Goals	Proportion of land area covered by forest.	
	United Nations	Millennium Development Goals	Proportion of species threatened with extinction	
	United Nations	Millennium Development Goals	Proportion of population using an improved drinking water source	
	Oxford poverty and Human Development Initiative	Multidimensional Poverty Index	Nutrition	
	Oxford poverty and Human Development Initiative	Multidimensional Poverty Index	Drinking water	
	United Nations Development Program	Human Poverty Index	A decent standard of living - Lack of access to overall economic provisioning. Population without sustainable access to an improved water source. Children underweight for age. Population below income poverty line	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Extent of forests and forest types	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Extent of marine habitats	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Living Planet Index	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Global Wild Bird Index	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	IUCN Red List Index	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	*Ex-situ* crop collections	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Genetic diversity of terrestrial domesticated animals	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Status of species in trade	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Wild Commodities Index	
	Convention on Biological	2010 Biodiversity	Nitrogen deposition	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
	Diversity	Indicators Partnership		
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Marine Trophic Index	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Water Quality Index for Biodiversity	
	United Nations Convention to Combat Desertification	UNCCD	Percentage of Rural Population with Access to Safe Drinking Water	
	United Nations Convention to Combat Desertification	UNCCD	Proportion of chronically undernourished children under the age of 5 in rural areas	
	United Nations Convention to Combat Desertification	UNCCD	Soil Biodiversity	
	United Nations Convention to Combat Desertification	UNCCD	Number of crop and animal species in agricultural use	
	United Nations Convention to Combat Desertification	UNCCD	Water Availability and Use	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Area of selected key ecosystems	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Fragmentation of habitats	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Abundance of selected key species	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Abundance of invasive alien species	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Marine trophic index	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Proportion of total water resources used	
State / Impacts	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Health and well being of communities directly dependant on ecosystem goods and services	3
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Biodiversity for food and medicine	
	The Economics Of Ecosystems	GDP For The Poor	Per capita agricultural GDP of the poor	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
			and Biodiversity	
Impacts	World Bank	Poverty-Environment Indicators	Rural per capita cereal production	17
	World Bank	Poverty-Environment Indicators	Quantity of annual household consumption derived from common lands	
	World Bank	Poverty-Environment Indicators	Quantity of annual household consumption that is derived from forest products and fisheries	
	World Bank	Poverty-Environment Indicators	Percentage of rural households with adequate water for livestock by wealth/income categories	
	World Bank	Poverty-Environment Indicators	Households rendered homeless from floods/hurricanes/cyclones/landslides per year by income/wealth quintiles	
	World Bank	Poverty-Environment Indicators	Number of deaths from natural disasters by income/ wealth quintiles.	
	World Bank	Poverty-Environment Indicators	Percentage of farmers with land on slopes/ wetlands by income/wealth quintiles.	
	World Bank	World Bank Indicators Catalogue	Crop production index (2004-2006 = 100)	
	World Bank	World Bank Indicators Catalogue	Food production index (2004-2006 = 100)	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Nutritional Status of Biodiversity	
	Yale University	Environmental Performance Index	Change in water quantity	
	Yale University	Environmental Performance Index	Forest loss	
	Yale University	Environmental Performance Index	Forest cover change	
	Yale University	Environmental Performance Index	Fish stocks overexploited	
	The Economics Of Ecosystems and Biodiversity	GDP For The Poor	Contribution of NTFPs to the economy (US$ millions)	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Change in threat status of species	
Responses	World Bank	Poverty-Environment Indicators	Percentage of farmers who grow drought resistant crops by income/wealth categories.	21

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
	Development Assistance Committee	Rio Markers	Trends in mobilization of financial resources to biodiversity focused activities	
	Development Assistance Committee	Rio Markers	Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for biodiversity	
	Development Assistance Committee	Rio Markers	Trends in the number of activities reported scoring significant objective (A objective of the activity was to aid biodiversity) for biodiversity	
	Development Assistance Committee	Rio Markers	Trends in mobilization of financial resources to climate change adaptation focused activities	
	Development Assistance Committee	Rio Markers	Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for climate change adaptation	
	Development Assistance Committee	Rio Markers	Trends in the number of activities reported scoring significant objective (A objective of the activity was to aid biodiversity) for climate change adaptation	
	Development Assistance Committee	Rio Markers	Trends in mobilization of financial resources to climate change mitigation focused activities	
	Development Assistance Committee	Rio Markers	Trends in the number of activities reported scoring principle objective (Main objective of the activity was to aid biodiversity) for climate change mitigation	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Coverage of protected areas	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Area of forest under sustainable management: certification	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Area of forest under sustainable management: degradation and deforestation	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Area of agricultural ecosystems under sustainable management	
	Yale University	Environmental Performance Index	Biome protection	
	Yale University	Environmental Performance Index	Marine protection	
	Yale University	Environmental Performance Index	Critical habitat protection	
	Yale University	Environmental Performance Index	Pesticide regulation	
	Yale University	Environmental	Renewable electricity	

DPSIR framework	Name of organisation	Name of initiative	Name of indicators	Number of indicators
		Performance Index		
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Proportion of terrestrial area protected, total and by ecological region	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Management effectiveness of protected areas	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Proportion of marine area protected	
	United Nations Commission on Sustainable Development (CSD)	Indicators of Sustainable Development	Area of coral reef ecosystems and percentage live cover	
	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Management effectiveness of protected areas	
Responses / Impacts	Convention on Biological Diversity	2010 Biodiversity Indicators Partnership	Protected area overlays with biodiversity	1

Annex 2.   Building composite poverty-biodiversity indicators

What are composite indicators?

"Composite indicators are based on sub-indicators that have no common meaningful unit of measurement and there is no obvious way of weighting these sub-indicators (OECD 2008)."

Why aggregate poverty-biodiversity indicators?

The inter-linkages between poverty and biodiversity are multi-dimensional, often not apparent and therefore difficult to measure with stand-alone indicators. For example, a pressure-state indicator, such as the World Bank Poverty-Environment indicator (Shyamsundar 2002) "distance travelled / time spent on collecting fuel wood", falls short of measuring the relation or influence of poverty on biodiversity and vice-versa. Therefore, the following methodology to develop composite poverty-biodiversity indicators is suggested.

How to use poverty-biodiversity composite indicators?

Within a given framework of indicators, it may not be necessary to develop a set of only composite indicators. On the other hand, a combination of composite and stand-alone indicators may be better suited for measuring multi-dimensional phenomena such as poverty-biodiversity linkages.

An example of how composite & stand-alone indicators can be used for poverty-biodiversity:

Composite Indicator	Fuel wood collection
	Percent Forest Cover
Composite Indicator	Water resources used
	Status of wetlands
Stand-alone Indicator	Consumption of wild foods
Incomplete Indicator	Fish stocks used
Composite Indicator	Coverage of PAs
	Income from tourism

Scale
DPSIR
Policy relevance
Indicator Group /
Category

POVERTY

BIODIVERSITY

```
┌─────────────────────────┐
│   Develop a Conceptual / │
│   Theoretical Framework  │
└─────────────────────────┘
            ▼
┌─────────────────────────┐
│  Select Data: assess     │
│  existing                │
│  indicators & data sets  │
└─────────────────────────┘
            ▼
┌─────────────────────────┐
│  Assess Data gaps & needs│
└─────────────────────────┘
            ▼
┌─────────────────────────┐
│  Identify "groups of     │
│  indicators" that are    │
│  statistically similar   │
└─────────────────────────┘
            ▼
┌─────────────────────────┐
│  Normalization: make scale│
│  adjustments if necessary.│
│  Respect data properties. │
└─────────────────────────┘
            ▼
┌─────────────────────────┐
│  Weighting & Aggregation │
└─────────────────────────┘
```

How to build composite indicators?

The following procedure, which is a modification of a methodology from the Handbook on Composite Indicators (OECD 2008), may be used for developing poverty-biodiversity indicators.

A strategy to develop the poverty-biodiversity indicators, which will include:
- The advantages and disadvantages of the chosen strategy;
- The estimated cost of the indicator development strategy, including details about which stakeholders will be responsible for paying specific costs;
- The source of the data the strategy will use to develop the poverty-biodiversity indicators (with preference towards using existing data); and
- An inventory of all necessary partners and stakeholders with whom the CBD should collaborate in order to generate the indicators.

Annex 3.   Testing Poverty-Biodiversity Indicatorsng Poverty-Biodiversity Indicators
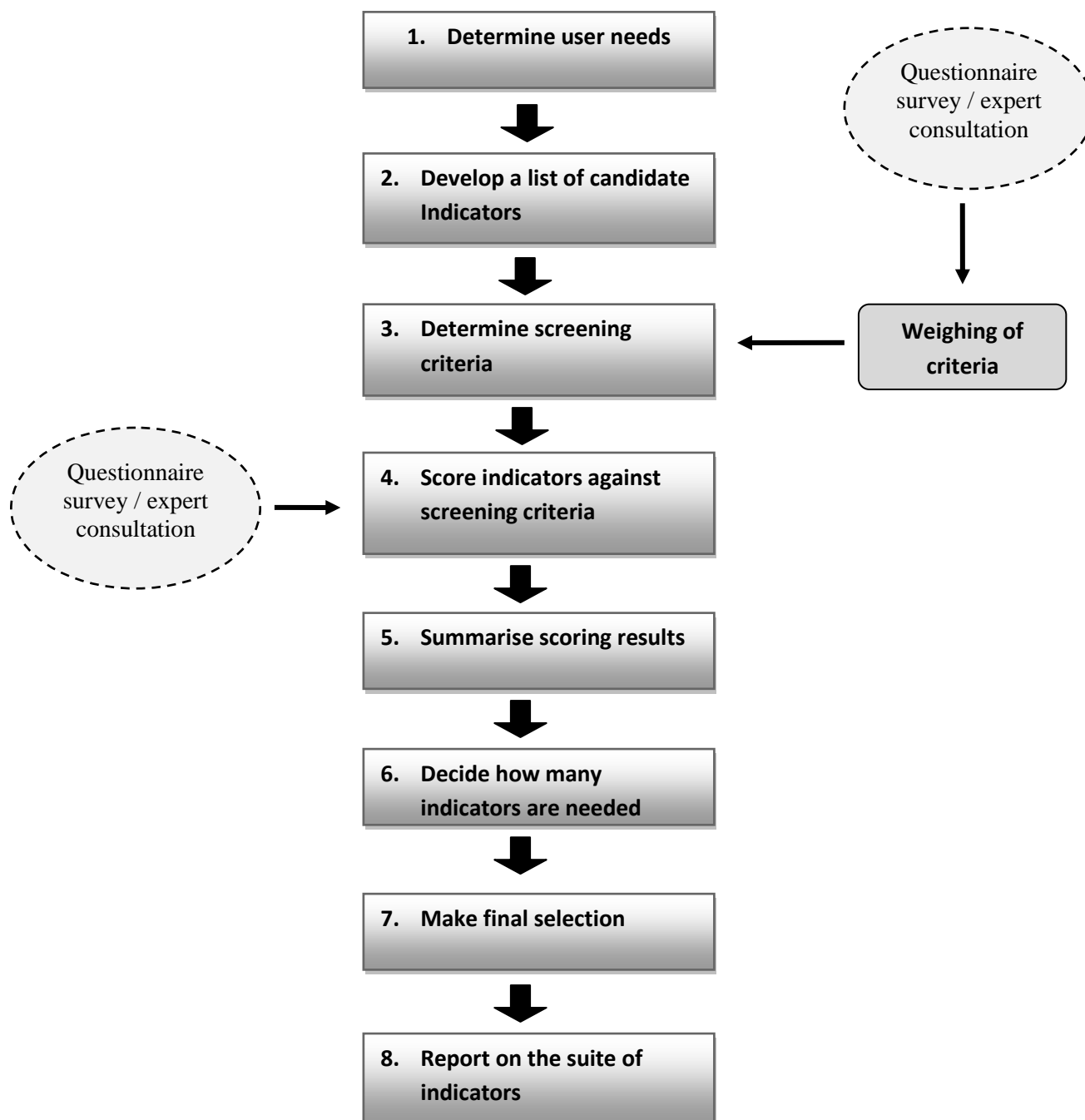
The selection or testing of indicators is an important step in the indicator development process. This step involves defining criteria and using them to evaluate potential indicators. The following section discusses an indicator selection process, which can be applied in the development and testing of poverty-biodiversity indicators. An indicator selection framework now widely applied in ecosystem-based management (EBM) of marine resources (Rice & Rochet 2005) has been adapted here, and criteria previously used for the selection of poverty-biodiversity indicators (Tekelenburg *et al*. 2009) and sustainability indicators are incorporated into the screening process.

The authors of the EBM study argue that the selection of indicators in governance processes is often through the consultation of experts and stakeholders rather than the use of complex methods and algorithms. Although modelling methods and robustness assessments have been used to test indicators for fisheries management (Fulton *et al.* 2005) and to some extent to test environmental indices and biodiversity indicators (Nicholson *et al.* 2012) such methods fall beyond the scope of this report and are often restricted to the scientific sphere (Shin 2010). Therefore, a widely applied and flexible framework for testing poverty-biodiversity indicators is suggested here.

The indicator selection process used here consists of eight steps (see Flowchart below). Since, this report advocates applying existing indicator frameworks, robust screening and testing is required and therefore the focus is on steps 3 and 4. Suites of indicators should have clear policy relevance, be context-specific and should be an appropriate set and number so as to ensure cost-effectiveness. Therefore, indicators that are to be used must meet a set of desirable properties or criteria. For the purpose of testing poverty-biodiversity indicators, the nine general criteria and twenty sub-criteria widely used in selecting indicators for EBM of marine resources (Rice & Rochet 2005) were adapted and combined with ten criteria previously used in defining poverty-biodiversity indicators. In addition, a "weakest link approach" has been used to select indicators that reveal critical interdependences within social and natural systems (Bossel 2001). Such indicators are of particular importance in understanding poverty-biodiversity relationships.

Learning from an example where this selection framework has been applied (Piet 2008), questionnaire surveys may be sent out to experts and advisory groups so that the relative importance of each criteria can be weighed (1=least important, 5=most important). Having done so, potential indicators can then be scored against each criteria (1=worst, 5=best). The final selection of indicators can be done by using graphic methods such as radar plots or grouping indicators according to similar scores. Either way, the final selection of indicators has its challenges.

Flowchart: The Indicator selection Framework (adapted from Rice & Rochet 2005)

```
┌─────────────────────────────┐                    ╭ ─ ─ ─ ─ ─ ─ ─ ╮
│ 1.  Determine user needs    │                   Questionnaire
└─────────────────────────────┘                   survey / expert
              │                                    consultation
              ▼                                     ╰ ─ ─ ─ ─ ─ ─ ╯
┌─────────────────────────────┐                          │
│ 2.  Develop a list of       │                          ▼
│     candidate Indicators    │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐        ┌──────────────────┐
│ 3.  Determine screening     │◄───────│  Weighing of     │
│     criteria                │        │  criteria        │
└─────────────────────────────┘        └──────────────────┘
              │
              ▼
╭ ─ ─ ─ ─ ─ ╮   ┌─────────────────────────────┐
Questionnaire──►│ 4.  Score indicators against │
survey / expert │     screening criteria       │
consultation    └─────────────────────────────┘
╰ ─ ─ ─ ─ ─ ╯                │
                             ▼
                ┌─────────────────────────────┐
                │ 5.  Summarise scoring results│
                └─────────────────────────────┘
                             │
                             ▼
                ┌─────────────────────────────┐
                │ 6.  Decide how many          │
                │     indicators are needed    │
                └─────────────────────────────┘
                             │
                             ▼
                ┌─────────────────────────────┐
                │ 7.  Make final selection     │
                └─────────────────────────────┘
                             │
                             ▼
                ┌─────────────────────────────┐
                │ 8.  Report on the suite of   │
                │     indicators               │
                └─────────────────────────────┘
```

Example Questionnaire for Weighing of Criteria

(To be filled in by experts, SCBD, end-users and members of the advisory group)

What should be the desired properties of poverty-biodiversity indicators? As an expert and end-user of poverty-biodiversity indicators, please assign scores of relative importance (1=less important, 5=very important) for each of the following criteria / questions that will help in selecting appropriate poverty-biodiversity indicators.

1.   Does the indicator reflect a concrete property or dimension of poverty and biodiversity or it is based on an abstract concept? *(Concreteness)*

How important is this criteria in the selection of poverty-biodiversity indicators? *Please select one*.

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

2.   Is the indicator measurable in the real world? Quantifiable and is data generally available? *(Concreteness)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

3.   Does the indicator correspond with UN definitions and the CBD definitions of poverty and biodiversity? *(theoretical basis)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

4.   Does the indicator reveal critical interdependencies between poverty and biodiversity? *(theoretical basis)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

5.   Is the indicator derived from empirical observations? *(theoretical basis)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

6.   Does the indicator have high public relevance? *(public awareness)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

7.   Is its meaning readily understood? *(public awareness)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

8.   Does the indicator have direct policy relevance? *(public awareness)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

9.   Are measurement tools and data widely available and at a low cost? *(cost-effectiveness)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

10.   Are the accuracy and precision of data collection methods known? *(measurement)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

11.   Is the value of the indicator affected by sampling methods? *(measurement)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

12.   Is the value of indicator highly variable seasonally/temporally? Geographically? *(measurement)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

13.   Are historical data available? *(availability of historical data)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

14.   Does the indicator respond smoothly, monotonically, and with high slope? *(sensitivity)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

15.   Does the indicator respond rapidly (e.g., within 1-3 years) of changes, or on longer scales? *(Responsiveness)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

16.   How specific is the indicator to poverty-biodiversity? *(specificity)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

17.   Does indicator differentiate between resource use / actor types? *(specificity)*

| ○ 1 (Less Important) | ○ 2 | ○ 3 | ○ 4 | ○ 5 (Very Important) |

An example of results of the weighing of criteria (from Piet **et al.** *2008)*
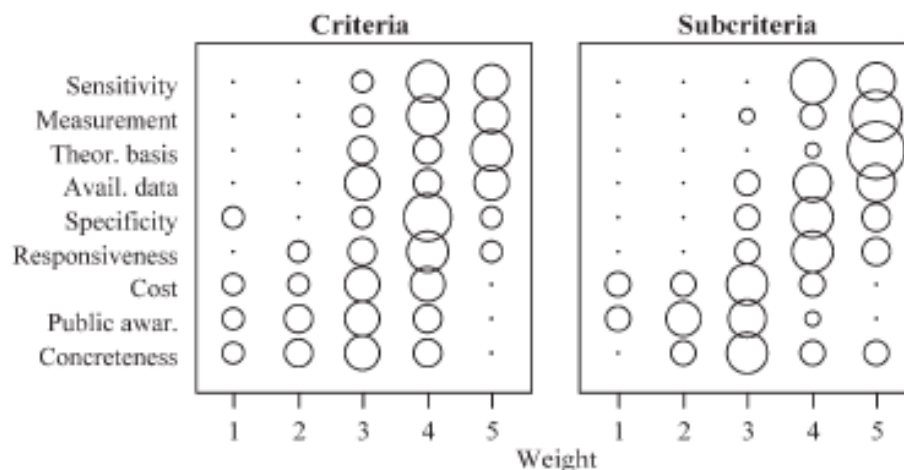
An example of a results table depicting scores for headline poverty-biodiversity indicators (adapted from Piet **et al.** *2008)*

Headline indicator	Concreteness (1=worst, 5=best)	Theoretical basis	Public awareness	Cost-effectiveness	Measurement	Availability of historical data	Sensitivity	Responsiveness	Specificity

An example of a graphic representation of indicator scores (adapted from Shin **et al.** *2010)*

Each of the radar plots shown here depicts the scores for each criterion. The axes ($I_1 - I_5$) represent the criteria and the shaded areas represent scores.

This Indicator is well balanced