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# Environmental and Climate Change Indicators

Guidance at country and sector level



# Environmental and Climate Change Indicators

The work on production of this Guidance was led by Sida's Environment and Climate Change Team. The text has been developed with main in-puts from Sida's External Expert Advice Function (Helpdesk) for Environmental Economics, University of Gothenburg with inputs from Sida's External Expert Advice for Environmental Assessment, SwedBio and a number of Sida staff.

The development of indicators is a work in progress and this document is intended to be a living document. Sida's Environment and Climate Change Team would therefore like to receive comments and suggestions for improvement.

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# Foreword

Provisioning of sufficient food, energy, and water from ecosystems to meet essential livelihood needs are the fundament of human development. The “natural capital” contributes directly to income generation, employment and tax revenues thereby providing opportunities for a diversified and sustainable growth and improved well-being. Poverty reduction and sustainable pro-poor growth will hence only be possible in the long term if consideration is given to the natural resources and the environment that people are dependent and base their livelihoods on.

All MDGs have strong links to environmental and climate change variables. In fact most human activities have an effect on and are influenced by environmental and climate change factors. The combined effects of ecosystem degradation and other environmental risks – with climate change serving as a multiplier to already serious degradation processes – also affect poor communities and nations proportionally more adversely, thereby undermining for example the possibilities to achieve the MDGs.

In recent years the development community – partner countries and donors alike – has been increasing the focus on managing for development results. This entails an increased focus on measuring effects and changes in partner countries as a result of donor contributions. It is an approach to management that systematically focuses on results at all stages of the development process, from design and appraisal to follow-up and reporting.

A crucial part of this agenda is the identification of relevant and measurable indicators relating to environment and climate change at country and sector level. This guidance is hence a part of Sida’s ongoing effort to focus on development results related to environmental sustainability. Given the cross cutting character of environment and climate change the guide provide indicators for a range of different sectors and areas relevant for donor agencies and collaboration partners alike.

Maria Berlekom

Head, Sida’s Environment and Climate Change Team



# List of Acronyms

ANS	Adjusted Net Savings
CDM	Clean Development Mechanism
CIRI	Cingranelli-Richards Human Rights Dataset
CPI	Corruption Perception Index
CPIA	Country Policy and Institutional Assessment
CSD	Commission for Sustainable Development
DALY	Disability Adjusted Life Year
DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
EITI	Extractive Industries Transparency Initiative
EPI	Environmental Performance Index
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GHG	Green House Gas
GWP	Global Water Partnership
HIHK	Heidelberg Institute for International Conflict Research
IDA	International Development Association
IDP	Internationally Displaced People
ISDR	International Strategy for Disaster Reduction
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
JMP	Joint Monitoring Programme (WHO and UNICEF)
MDG	Millennium Development Goals
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Programme of Action
HDI	Human Development Index
OECD	Organisation for Economic Co-operation and Development
PAF	Performance Assessment Framework
RBM	Results Based Management
REDD	Reducing Emissions from Deforestation and Forest Degradation
SEA	Strategic Environmental Assessment
Sida	Swedish International Development Cooperation Agency

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TI	Transparency International
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
UNICEF	United Nations Children's Fund
WB	the World Bank
WSSD	World Summit on Sustainable Development
WHO	World Health Organization

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# 1 Introduction

## 1.1 BACKGROUND

Sida's overall objective is to contribute to an environment supportive of poor people's own efforts to improve their quality of life. The perspective of the poor and the rights perspective prevail. The Swedish government has for the period 2008–2010 identified three thematic priorities for development cooperation: (i) democracy and human rights; (ii) gender equality and women's role in development; and (iii) environment and climate change. These thematic priorities should be considered in Swedish cooperation strategies and mainstreamed into all Sida's activities.

'Environment' is a broad development issue encompassing challenges such as climate risks, securing ecosystem services and biodiversity, mitigating natural disasters, and chemical load. Environmental challenges need to be addressed through a deliberate and focused approach on mainstreaming environmental concerns into all development cooperation.

International commitments, such as the Paris Declaration, the Millennium Declaration, and the Accra Agenda for Action, emphasise among other things that development cooperation need to be designed in a way that respects partner countries' priorities. It also needs to be managed and implemented with focus on the desired results. Indicators provide vital input to managers when monitoring progress toward expected results. Identifying, monitoring and communicating suitable environmental and climate change indicators is a work in progress at many bilateral and multilateral development cooperation agencies, including Sida.

Most of the information required to develop the results matrix, which is accompanying the cooperation strategy, already exists in the national/regional strategies/plans of the partner country and in programme/project documents. Only in very special cases should it be necessary for Sida to articulate own indicators in the process of developing the results matrix. The main challenge is usually to make the strategic choice of indicators that reflect the cooperation strategy objectives and the Swedish thematic priorities.

## 1.2 PURPOSE

This document *aims at giving guidance on how to identify and use environmental and climate change indicators at country and sector level, including indicators of relevance for the cooperation strategies and the accompanying results matrix, while considering alignment and harmonisation.*

According to the Government's "Guidelines for development cooperation strategies" (UF2009/90457/USTYR) Sida shall develop a re-

sults matrix covering the whole of the cooperation strategy period. The results matrix shall serve as a tool for the continuous follow up of the cooperation strategy and guides the compilation of results data used as input for cooperation strategy analysis and reporting. The results matrix shall consist of two parts, one overarching and one for sectors and corresponding contributions. The largest contributions in each sector – as well as other strategically important contributions – shall be included.

Environment and climate change related objectives formulated in the Swedish cooperation strategy with a country or region a) can form part of the overall objective of the strategy, b) can constitute a part of the objective of other sectors as a cross-cutting issue, for example as part of the agricultural, water or health sector, and c) is the main objective when environment has been identified as a sector choice. For all these different cases it is important to be able to measure result and monitor progress and therefore related environmental and climate change indicators must be identified. The purpose of this paper is to facilitate and give guidance to the identification of these indicators.

### 1.3 STRUCTURE OF DOCUMENT AND INSTRUCTIONS TO USERS

This guide consist of: (i) general considerations when identifying environmental and climate change indicators (Section 2); (ii) a brief description of environmental and climate change indicators (Section 3); and (iii) three Appendices, the first and second include lists of indicators internationally used, which can be sources of inspiration. The third Appendix presents a brief overview of other actors' work on environmental and climate change indicators. Examples from country-cases are given throughout to illustrate how identification of indicators can be done practically.

Section 3, where examples of environmental and climate change indicators are given for each of Sida's main sectors, can be read in parts depending on the reader's interests. It is recommended that the reader reads the specific sector/sectors of interest and use Section 3, in conjunction with Appendices 1 and 2, as a source of inspiration. If one indicator is relevant to more than one sector (for instance is 'access to water' relevant for health, education, and sustainable infrastructure and services), the indicator is listed under each sector heading. Therefore, some indicators are repeated in the document and in the appendices.

## 2 General considerations when identifying environmental and climate change indicators

It is critical to as far as possible identify and select indicators already in use and prioritised by the partner country/region, such as suitable indicators in key national/regional planning documents such as national or regional development plans, Poverty Reduction Strategy Papers, key sector plans, and National Adaptation Programmes of Action (NAPAs) and National Environment Strategies and Action Plans (NEAPs).

It is also useful to compare the partner country's indicators with internationally agreed ones. Appendices 1 and 2 list many internationally agreed and accepted environmental and climate change indicators, from the Millennium Development Goals (MDG), the Commission on Sustainable Development (CSD), the OECD, the World Bank, etc. The lists should of course only be used as examples, given the need to consider alignment, harmonisation, and country-specificity. If the partner country uses indicators that are similar to those in the lists but formulated differently, consider using the formulation that the partner country uses.

It can be noted that there are different types of indicators. Some measure the state of the environment<sup>1</sup>, for instance *air or water quality*, or *forest coverage*. Other indicators measure the political or administrative response to problems, such as *environmental legislation (yes/no; year)*; *environmental/climate change strategy/action plan (yes/no; year)*; *number of Environmental Assessments carried out by the partner*. A combination of indicators that can capture environmental trends and changes, and indicators relating to Government (political and administrative) responses is often most useful.

There are also instances where a specific indicator could be well suited to measure several aspects of development, where environment (including climate change) is one of many aspects. Likewise, it is possible that it is not enough to improve environmental aspects only, to reach the expected results. For instance, the indicator *under-five mortality* provide information on access to healthcare, but it is also linked to education and research, gender and access to nutrition, and can be used as a proxy for access to clean water and adequate sanitation. To reduce under-five mortality it is not enough to improve access to water and sanitation, but all aspects must work in conjunction towards the goal, in this example to reduce under-five mortality.

Finally, lack of information in general, and of reliable, updated data specifically, is a common problem when attempting to identify useful indicators. This applies also to environment and climate change related indicators. Data quality should be discussed with partner institutions, and perhaps also with statistical offices.

In the case of Ukraine's 2009 results matrix several indicators related to Government responses were selected, of which one is "Existence of a formally adopted Environmental Strategy and Action Plan".

<sup>1</sup> And can, when followed over several years, provide information on environmental trends.

# 3 Examples of indicators

If the environment (including climate, ecosystems and natural resources, pollution and disasters) is mentioned in the cooperation strategy (as an objective, dialogue issue, or specific sector) this should be reflected in the choice of indicators. Besides being a sector, environment is a cross-cutting issue that should be mainstreamed into all sectors. Environmental, climate change and disaster risk reduction (DRR) indicators should, when relevant and realistic, be identified for all results hierarchies, i.e., for impact, outcome, and output levels. The desired overall development objective (in the cooperation strategy) is often at the impact level, while sectoral goals are often at the outcome and output level.

The next section 3.1 briefly describes environmental and climate change indicators relevant at the impact level, and should be read in conjunction with Appendix 1, where examples of impact-level indicators are summarised and described. The following section 3.2 describes indicators relevant at output and outcome levels, and should be read in conjunction with Appendix 2, where sector-level indicators are summarised and described.

## 3.1 IMPACT LEVEL ENVIRONMENTAL SUSTAINABILITY INDICATORS

This section gives an overview of selected impact-level indicators (spelled out further in Appendix 1) that (i) describe the linkages between poverty and environment, and economic growth and environment, and (ii) other indices relevant for environmentally sustainable development.

### Poverty

The ability to achieve sustainable development and poverty reduction is closely linked to the availability, quality and management of ecosystem services, and *vice-versa*: degraded natural resources and poor access to ecosystem services can enhance poverty and vulnerability to external shocks, and jeopardise the attainment of most MDGs.<sup>2</sup> Poverty can in itself be a driver of overexploitation of natural resources due to lack of alternatives, for instance local deforestation caused by fuel wood collection. Furthermore, major inequalities obstruct human development and affects economic growth negatively<sup>3</sup>. Likewise, there is much evidence that increasing inequality tends to increase poverty<sup>4</sup>. Therefore, the levels of poverty and inequality are relevant to environment and climate change. Examples of poverty and inequality indicators are *proportion of population living below \$1/day*; the *Gini coefficient*; and the *ratio of share*

<sup>2</sup> Poverty Environment Partnership: <http://www.povertyenvironment.net/pep/>

<sup>3</sup> Eicher and Turnovsky (eds.), 2003; Sen, 2000.

<sup>4</sup> Bourguignon, 2004.

in national income of highest to lowest quintile. Indicators not directly connected to income are *proportion of population using improved facilities for water/sanitation; share of households without electricity or other modern services; percentage of population using solid fuels for cooking; and proportion of urban population living in slums.*

The *Human Development Index (HDI)*<sup>5</sup> combines several country-level indicators (for example life expectancy, educational attainment, and income) into one. As adaptation<sup>6</sup> capacity often is related to the level of human development, HDI can sometimes be used as a proxy for climate change adaptation capacity. HDI scores and ranks are updated annually and easily accessible. However, as with all indices where data is “hyper-aggregated”, lack of transparency makes it difficult to understand the reasons for score-changes over the years. It is also very important not to base a HDI trend analysis on data from different editions of the Report, as both methods, countries included and data (ie historical data may be updated) can change.

### Economic Growth

Swedish development cooperation aims to reduce poverty. There is a strong correlation between poverty reduction and sustainable economic growth; economic growth has been the main driver of poverty reduction for many countries, and reduction of absolute poverty necessarily calls for highly country-specific combinations of growth and distribution policies.<sup>7</sup> Ecosystems play several key roles in relation to economic growth. First, they provide natural resources, as inputs to production of economic goods and services. Furthermore, they absorb pollutants which are generated by production and consumption patterns, regulate climate and water, provide natural barriers against storms and tsunamis, and other vital services such as nutrient recycling and pollination. Unless adequate policies are in place economic growth thus often goes hand-in-hand with depletion of natural resources and increased pollution. If the functions of the ecosystem are seriously impaired, economic production can slow down, or even be negative.<sup>8</sup> For example, the costs of environmental degradation have been estimated to be equivalent to four to eight percent of GDP for some less developed countries, with most of the effects falling on the poor.<sup>9</sup> Natural resource abundance can be a “blessing” or a “curse”. Some resource rich countries with weak institutional capacity and/or inadequate policies have shown to have lower economic growth than neighbouring, resource scarce countries, especially if there are low rates of adjusted net savings<sup>10</sup>.

While national savings are important for a country’s economic growth current measures do not include costs of natural resource depletion or environmental degradation. *Adjusted Net Savings (ANS)*<sup>11</sup> attempts

For the 2008 Namibia results matrix, the HDI was not used as a proxy for climate change adaptation capacity, as the aggregated level hides the large income differences within the country and therefore underestimates vulnerability.

5 Source: <http://hdr.undp.org/en/statistics/>

6 Adaptation is in this document referring to climate change adaptation, which is changes in policies and practices designed to deal with climate threats and risks.

7 Collier, 2007; Bourguignon, 2004.

8 Millenium Ecosystem Assessment, 2005

9 World Bank, 2007

10 Atkinson and Hamilton, 2003; OECD DAC, 2008.

11 Adjusted Net Savings (ANS), also known as ‘Genuine Savings’, is developed by the World Bank. <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTDATASTA/0,,contentMDK:21061847~menuPK:2935543~pagePK:64168445~piPK:64168309~theSitePK:2875751,00.html>

to adjust this by subtracting costs of natural resource depletion for some resources (timber, minerals, oil, natural gas and coal), and costs associated with both local air pollution and CO<sub>2</sub> emissions (an estimate of global damage), while adding the value of investments in human capital to the country's net savings. ANS thus attempts to measure the true rate of savings in an economy. Negative ANS indicates unsustainable development, as it implies that the costs of natural resource depletion and cumulative pollution exceeds the national investment in produced and human capital. This is a very useful measure, though hampered by exclusion of some key environmental issues and their impacts on natural capital, such as loss of ecosystem services including soil erosion and land degradation, over-fishing, over-grazing, increases in water scarcity, and water pollution.

'Decoupling' indicators show the links between environmental degradation and economic growth for example, *emissions diminish while GDP increases* or *emissions rise faster than GDP*. However, decoupling indicators do not capture problems with cumulative effects, such as high concentration of a certain pollutant. Relative decoupling might also mean for example, a drop in emissions of CO<sub>2</sub> relative to GDP but an absolute increase of CO<sub>2</sub> and thus rising concentration of greenhouse gases in the atmosphere.

Furthermore, *taxes on, or subsidies to, fossil fuels for transportation* is relevant to include. Fuel taxation is a potent instrument for the management of emissions from the transport sector, while fuel subsidies, besides being very costly, generally provide perverse economic incentives that promote unsustainable development. Furthermore, it has been shown that, in a developing country context, fuel subsidies are regressive, i.e. they benefit the rich more than the poor, increasing inequality.<sup>12</sup>

Often, 'environment' or 'sustainable development' is stated as a priority in development strategies and sector plans. Here, it is interesting to look at the policy-budget linkages, i.e. whether or not the country gives priority to the environment also in practice, through budget allocation. Relevant indicators include *environmental expenditure as share of GDP*<sup>13</sup> or *as a share of total public expenditure (%)*. Information is not always easily available but can sometimes be extracted from Public Environmental Expenditure Reviews or the national budget. Besides expenditures it is also interesting to look at the revenues in the budget. Some of the internally generated revenues originate from granting of concessions and licenses for the exploitation of natural resources, such as land, mining, oil, and forestry. These revenues are quite substantial for some countries and ought to be transparent in the budget. Here, it is interesting to see whether or not *natural resource based revenues are transparent* in the budget, as well as if the budget is subject to *public disclosure*.

Other indices relevant for environmentally sustainable development: The *Environmental Performance Index (EPI)*<sup>14</sup> takes several areas of environmental issues into account (policies, emissions, energy use, etc.) and measures a country's environmental performance both by score and ranking easily accessible. This promotes one standardised environmen-

<sup>12</sup> Robinson and Sterner, 2009

<sup>13</sup> These proportions can then be compared with levels for similar countries or benchmarks such as the World Bank's recommendation for environmental expenditure in developing countries at between 1.4% and 2.5% of GDP.

<sup>14</sup> Source: <http://epi.yale.edu/Home>

tal assessment framework for all countries, but it has the same aggregation-problems as the HDI and other indices.

The Transparency International *Corruption Perception Index (CPI)*<sup>15</sup> measures the degree of perceived corruption in a country. Corruption is relevant for natural resources, as for example illegal logging, fish poaching and extraction of minerals (diamonds, gold, coal etc.) and associated illegal trade are almost always intertwined with corruption. Corruption then results in a loss of government revenue that could be invested in sustainable natural resource management or general economic development. Corruption levels are also relevant for concessions and for (poor people's) access to land. CPI scores and ranks are updated annually and easily accessible. CPI is associated with the same kind of difficulties as other indices, but is also problematic in that it measures perceived (not real) corruption.

An indicator for *Policies and Institutions for Environmental Sustainability* is included in the World Bank's *Country Policy and Institutional Assessment (CPIA)*<sup>16</sup>, measuring the extent to which a country's policy and institutional framework supports sustainable growth and poverty reduction, and consequently the effective use of development assistance. The indicator, which builds on perceptions of World Bank staff, is only available for IDA<sup>17</sup> countries.

## 3.2 ENVIRONMENT AND CLIMATE CHANGE MAINSTREAMING: OUTPUT AND OUTCOME-LEVEL ENVIRONMENTAL INDICATORS FOR EACH SECTOR

This section describes linkages between environment and climate change and Sida's main sectors<sup>18</sup>: (i) Health; (ii) Education; (iii) Research; (iv) Democracy, Human Rights and Gender Equality; (v) Conflict, Peace and Security; (vi) Humanitarian Aid; (vii) Sustainable Infrastructure and Services; (viii) Market Development; (ix) Environment; (x) Agriculture and Forestry; (xi) General Budget Support for Poverty Reduction; and (xii) Other.

This section gives a brief overview of useful indicators, that link environment and climate change with sectors 1–10. The indicators are also summarised and described in Appendix 2. The aim is to use sector relevant indicators and describe in what way they are relevant for environmental management. When possible, indicators should be gender disaggregated. If relevant indicators are not currently measured by the partner country, that can be included as a dialogue issue. In the cases where one indicator is relevant for more than one sector, the indicator is repeated under each sector heading for easy reference.

15 Source: [http://www.transparency.org/policy\\_research/surveys\\_indices/cpi/2008](http://www.transparency.org/policy_research/surveys_indices/cpi/2008)

16 Source: <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTDATASTA/0,,contentMDK:21115900~menuPK:2935553~pagePK:64168445~piPK:64168309~theSitePK:2875751,00.html>

17 The International Development Association (IDA) is a part of the World Bank that helps the world's poorest countries. IDA countries are those that had a per capita income in 2008 of less than \$1,135.

18 Sida Director General Decision, 24 August 2009. *New Sida specific main sectors*.

“Environment” is one of Sida’s main sectors and include support to *Environmental policy and administrative management, Biosphere protection, Biodiversity and Site preservation (according to DAC subsector codes)*. However, environment should not only be looked upon as a sector but *environmental issues should be mainstreamed into all sectors*. Climate change issues are in this document presented under the sector Environment, with the intention to give a clear overview of the subject. However, climate change is not a sector; rather, *climate change issues should also be mainstreamed into all sectors*. Disaster risk reduction is presented under Humanitarian aid but, as for climate change, it is not in itself a specific sector but should be seen as a mainstreaming issue. The examples of indicators presented for each of Sida’s main sectors in Appendix 2, are all relevant from an environmental, climate change and disaster risk reduction perspective.

### 3.2.1 Health

Poor environmental quality, low access to ecosystem services (such as clean water), and climate change impacts enhance poverty, cause diseases, and affect living standards, food security, and livelihood opportunities negatively. Environmental risk factors play a role in more than 80% of the major diseases and injuries around the world. More than one third of diseases in children under five is caused by environmental exposure. The top killers of children under five are acute respiratory infections (from indoor and outdoor air pollution), diarrheal diseases (mostly from poor water, sanitation and hygiene), and malaria (from inadequate environmental management and vector control). More than two million people globally are estimated to die prematurely each year due to indoor and outdoor air pollution. Environmental degradation and climate change, which is expected to affect precipitation and hydrological balances, may reduce access to water and crop yields, and results in malnutrition and poor health. Climate change may also affect public health through destruction of important infrastructure and health facilities. Access to good nutrition, water and sanitation is critical to improve public health, reduce poverty, and for achieving many of the MDGs, but these inputs are all vulnerable to climate change and disasters. They are especially important for vulnerable groups including pregnant women, children, the elderly and people living with HIV. Relevant indicators include: *proportion of population with using improved facilities for water/sanitation; under-five mortality*; and the *Disability Adjusted Life Year (DALYs)*<sup>19</sup> (measuring environmental risk factors to human health, due to lack of safe water and sanitation and air pollution). Climate change is expected to increase the incidence of waterborne and vector borne diseases including cholera and malaria, so it could be interesting to measure *deaths among children under five years of age due to malaria*. Disasters, such as storms and landslides, can complicate distribution of medicine to vulnerable groups, including people living with HIV. Therefore it is relevant to find out whether or not a *contingency plan for distribution of medicine in case of natural disasters exists*.

### 3.2.2 Education

Education is crucial for poverty reduction. However, when environmental resources are scarce, many children (especially girls) spend more time helping with household tasks (e.g., collecting water and fuel wood for cooking) and often miss school. Access to clean water and improved sanitation are especially important to students’ (especially girls’) attendance as well as to students’ and teachers’ health, why *access to water/sanitation* is relevant to measure also from an education point of view. Climate change may affect the education sector directly (for instance through damaged key infrastructure) or indirectly (more days out of school when children or teachers spend more time with household tasks because of decreasing access to natural resources, malnutrition, or other). Hence, climate change can result in temporary or long-lasting disruption of the provision of educational services.

<sup>19</sup> Statistics on estimated deaths & DALYs attributable to selected environmental risk factors (WHO member countries, 2002) available at: [http://www.who.int/quantifying\\_chimpacts/countryprofilesebd.xls](http://www.who.int/quantifying_chimpacts/countryprofilesebd.xls). Information and statistics related to DALYs in general available at: [http://www.who.int/healthinfo/global\\_burden\\_disease/en/index.html](http://www.who.int/healthinfo/global_burden_disease/en/index.html)

Education can provide people with knowledge about hygiene, ecosystem services, environmental impacts, climate change, disaster risks, and other information that helps improve public health and environmental management. The indicators *proportion of teachers trained in environmental/climate change/disaster risk reduction education*; and *education policies include environmental/climate change/disaster risk reduction issues in the curriculum* could be relevant.

### 3.2.3 Research

With environmental issues high on the international agenda there are many research questions that need answers. As environmental and climate change impacts often hit the poor hardest, they are most pressing for less developed countries. Research programs may lead to new knowledge and technologies on which sustainable development depends. Possible indicators include *number of publications*; and *number of MSc/PhD students/graduates* in environmental fields (including climate change). It is also important that policy-makers, as well as business leaders and ordinary citizens, be informed of research results. Possible indicators include *number of policy briefs* written/communicated. As face-to-face communication is often effective, a possible indicator is *number of meetings with policy-makers* related to environment, climate change and disaster risk reduction. If there is a demand for evidence-based policy-making environmental researchers may be invited to participate in national strategy or policy processes, so *participation by environmental researchers in policy processes* is interesting to measure. The input of low income countries scientists in the international climate change arena is also important thus *the number of low income country scientists actively involved in climate change discussions at the international level* is of importance to measure. Furthermore, it could be relevant to measure *national policies, plans and strategies improved on basis of environment and climate change research*, for example by using hydrological/meteorological information or climate projections when developing urban plans. Another possible indicator is *national institutions with strengthened research capacities to deal with environmental problems* which measure the capacity at institutions, other than universities, for (applied) research.

### 3.2.4 Democracy, Human Rights, and Gender Equality<sup>20</sup>

Lack of good governance lie behind many environmental problems, so improved governance can lead to improved management of the environment and access to ecosystem services. Environmental management can even be an effective entry-point for wider governance reform. Corruption, the essence of poor governance, is a major driving force in natural resource depletion and environmental degradation, while reducing revenues that could be used for improved environmental management. Lack of transparency and accountability is another aspect of poor governance linked with environmental degradation, concessions and natural resource use. Based on the above, relevant indicators include the *Corruption Perception Index (CPI)*; *press freedom index*<sup>21</sup>; *environmental spending share*

<sup>20</sup> For more indicators related to Democracy and Human Rights see the Sida document: "Indicators in the field of democracy and human rights" (Dibbets et al., 2010).

<sup>21</sup> Reporters without Borders compiles the Press Freedom index annually on the basis of questionnaires that are completed by hundreds of journalists and media experts around the world. See website <http://en.rsf.org/>.

of total public spending; and availability of environmental, climate change or disaster risk reduction legislation/strategies. There are a number of links between human rights and “environmental security” (see section 3.2.5 on conflict, peace and security). The human rights to food, work, shelter, health, and implicitly to water, entitle everyone to adequate nutrition, livelihood opportunities such as secure tenure, and sufficient, safe, accessible and affordable water for personal and domestic uses. Fulfilment of these rights is challenged by climate change. Related to human rights it is interesting to measure *percentage of population undernourished; proportion of households with access to secure tenure*. Related to accountability, it is also interesting to know of the *existence of a national human rights institution mandated with environmental and climate change issues* (such as an ombudsman, human rights commission, or similar), and if such an institution is functioning.

### Gender

Environmental degradation, climate change and disaster risks have important gender implications. It is important to analyse and address the gender-based division of labour and responsibilities as well as differential norms, rights, knowledge and skills, and access to resources. Gender disparities influence both needs and possibilities to participate in development processes. Vulnerability and poverty are strictly connected to gender inequality.

Women’s responsibilities for family health, nutrition and sanitation, result in less time to participate in community affairs and decisions, and less time for recreation. Furthermore, household tasks substantially reduce girls’ attendance in school. Failure to give women title to land, control over other natural resources, and adequate agricultural support services, slow adoption of new technologies and improved techniques reduces agricultural productivity and increases environmental degradation. Women have less means to cope, and are therefore more vulnerable to environmental shocks, such as droughts, floods, and cyclones. And in general, for all these reasons the effects of disasters, climate change and other environmental changes are often different for women than men. Environmental degradation, such as indoor air pollution and the burden of carrying water and fuel wood further and further, affects women’s health, and even complicates childbirth. Women are also disproportionately vulnerable to sexual exploitation, abuse, and other forms of violence, and these risks increase in times of disaster.

For both women and men, climate change will require strengthened capacity to adapt, including insight about the necessity of additional activities to counteract further environmental degradation. Considering their different needs, knowledge, experiences, and opportunities, development (including climate change mitigation<sup>22</sup> and adaptation) will have to integrate gender aspects. Some possible indicators interesting from a gender perspective include *maternal mortality ratio, number of victims of natural disasters (women/men)* and if this is rising or falling; *DALYs due to inadequate water and sanitation, outdoor – or indoor air pollution; ratio of girls to boys in education, share of women in wage employment, and percentage of issued land titles held by women*.

It is mainly women and children that are exposed to indoor air pollution from the burning of e.g. fuel wood in combination with inadequate ventilation.

<sup>22</sup> Policies and measures to slow the process of global climate change by lowering the level of greenhouse gases in the atmosphere through reduced emissions, avoided deforestation and/or increased sequestration.

### 3.2.5 Conflict, Peace, and Security

Conflict is incompatible with sustainable development. Environmental degradation and competition over scarce or valuable resources are increasingly important contributing factors to conflict. Environmental factors are rarely the sole reason to conflicts although research shows that environmental stress and the exploitation of natural resources can increase the severity and duration while complicate its resolution. Refugees and internally displaced people (IDPs) are also likely to pose a threat to social and political stability, and are often forced into unsustainable use of nearby natural resources. Climate change is likely to add to already existing stresses, and may exacerbate conflicts or insecurity and increase migration. Conflicts can also be a direct source of environmental degradation. Some possible indicators are *number of refugees/IDPs* and *number of land or natural-resource related disputes* for example as defined in the Conflict Barometer.<sup>23</sup>

Insecurity can also relate to lack of clean water, lack of adequate food supply or even lack of secure land tenure, all of which clearly play a part in poverty, affecting health, education and governance and may be exacerbated by climate change. Environment-related security is manifested in resilient ecosystems, reliable access to food and water, adequate and sustained supply of essential natural resources, gradual accumulation of assets including natural capital, enhanced natural resource management, access to resource-based safety-nets such as goods and services from the natural commons (forests, grazing lands, marine resources, etc), and private and/or communal insurances. Women are disproportionately at risk to environmental degradation, conflicts, and natural disasters, due to gender roles, and historic, cultural and socio-economic reasons. Some possible indicators are *total number of victims (killed or affected) of disasters; scarcity of water; food security; or access to secure tenure*.

### 3.2.6 Humanitarian Aid

#### *Hazards*

Partly as a result of climate change and demographic changes the effects of disasters, such as hurricanes, earthquakes, tsunamis, avalanches, landslides, forest fires, chemical spills, etc., have increased in recent decades, threatening human lives, livelihoods as well as ecosystems and biodiversity. Poor people are often the most vulnerable to such disasters. Disasters have affected over 1.2 billion people over the last decade resulting in serious economic losses and the frequency and intensity of climate-related disasters (floods, fires, etc.) are expected to increase with climate change.<sup>24</sup> Hence, measuring the *share of population living in hazard prone areas*, total numbers of victims (women and men) and economic losses, e.g. *disasters categorised by amount of damages as a percentage of GDP or total number of victims of disasters*, and whether the number is rising or falling, gives an indication of vulnerability to these disasters and changes over time.

The FAO links the conflict in Timor-Leste to food-insecurity, lack of access to basic services, fragile livelihoods and lack of environmental sustainability.

<sup>23</sup> The Conflict Barometer is developed by the Heidelberg Institute for International Conflict Research. <http://hiik.de/en/index.html>

<sup>24</sup> It is important to note that climate change is not the only factor influencing the impacts of natural disasters. Other factors, such as land-use change and infrastructure development, have a remarkable impact on the resilience of the ecosystems and communities to withstand extreme events.

*Disaster Risk Reduction*<sup>25</sup>

Many societies are not well prepared for natural hazard events or the fact that disasters are increasing in scope and impact as a result of the combination of increasing population density and asset stocks, inappropriate and exploitative land use, unplanned settlements, and lack of awareness on risk reduction by authorities and citizens at large.<sup>26</sup> Disaster risk reduction comprises a range of activities undertaken to minimise vulnerabilities and disaster risk throughout a society, to avoid or to limit the adverse impact of hazards, within the broad context of sustainable development. The risk of disasters affect many sectors and issues, amongst others health, education, infrastructure, spatial planning, and gender issues, and should be mainstreamed into other sectors. An important indicator regarding disaster risk reduction is a process indicator indicating if the *Hyogo Framework for Action is integrated into national legislation*.

**3.2.7 Sustainable Infrastructure and Services**

Infrastructure creates opportunities for economic development. Well-designed infrastructure can have positive impacts on the environment, and is a contributing factor to sustainable development. However, many infrastructure investments lead, directly or indirectly, to environmental degradation. Furthermore, infrastructure and services can contribute to, or be vulnerable to effects of, climate change. Thus, one interesting indicator is *number of Strategic Environmental Assessments (SEA) or Environmental Impact Assessments (EIA) performed by partner country*.

*Urban Planning*

More than half of the world's population currently live in urban areas, and the next few decades will see an unprecedented scale of urban growth in the developing world. This will be particularly notable in Africa and Asia where the urban population is likely to double between 2000 and 2030. Poor people will make up a large part of the future urban growth. Urban areas are often associated with environmental problems, exacerbated by inadequate planning and poverty. It is assessed that 80% of global CO<sub>2</sub>-emissions derive from urban areas.<sup>27</sup> However, urban areas are also driving economic development and present an opportunity to improve energy and economic efficiency and reduce poverty. Today's planning will largely determine tomorrow's emissions, resource-use efficiency, and ability to adapt to a changing climate. With this in mind, it is interesting to measure *proportion of total population living in urban areas* and the *urbanisation rate* as the needs of a fast growing urban population can go beyond government's ability to meet them. Other indicators include *share of urban population with access to improved water/sanitation/electricity or other modern energy supply*, and *number of hours/day of available piped water*. It is relevant to measure the *proportion of urban population living in slums*, which will give a proxy of the share of urban population lacking at least one of the following: access to safe water or improved sanitation facilities, sufficient living area of adequate quality, and tenure security. It is furthermore interesting to measure nation-

<sup>25</sup> Disaster risk reduction is briefly described under Humanitarian aid, although it is worth noting that it should be integrated into all other sectors.

<sup>26</sup> UNISDR, 2009

<sup>27</sup> WWF, 2010. "Reinventing the city."

al/urban *policies, plans and strategies improved on basis on environment and climate change research*, for instance by using hydrological /meteorological information or climate projections when developing urban plans. It is also interesting to measure pollution in ambient air in urban areas, or *DALY due to outdoor air pollution*, as air pollution is a risk factor especially in urban areas.

#### *Water Resource Management and Water and Sanitation*

Access to water is key to many, if not all, aspects of life. The quantity and quality of surface and groundwater resources are threatened by changing demographic patterns, rising living standards, and industrial pollution and both water quality (dilution effects) and quantity (affected precipitation and run off) are largely vulnerable to climate change. In addition, the governance of water resources is un-coordinated in many countries, which further aggravates the situation. Poor sanitation and water quality degradation harm humans and ecosystems. Three million people die from water-borne diseases each year in less developed countries, the majority of them children under the age of five. Access to clean water and improved sanitation affects almost all MDGs. Relevant indicators include *population using improved facilities for water/sanitation*; *water quality* for instance through measuring concentration of bacteria, nutrients, salt or other pollutants; *percentage of known water resources checked for quality and quantity*; and *quantity of water used per capita per day*. It strongly correlates with health, gender issues, and poverty reduction, and is also linked to governance issues and service delivery. The indicators *proportion of total water resources used* provide information on whether the abstraction of water is within or exceeds natural limits and can be used as a proxy for sustainability. *National IWRM and water efficiency plan* informs about whether a water management plan exists and correlates with e.g. agricultural, industrial and hydro power production. Hydropower sites, water flow regulation, and irrigation, require dams which may affect downstream access to water or flooding, and it could be interesting to measure *the number of agreements for joint management of a shared water resource* the country has signed/ratified. For wastewater treatment, see section on Waste below.

#### *Waste*

The volumes of solid, liquid, and hazardous waste generated, especially in urban areas, are increasing with changing demographic patterns and rising living standards with important social, economic and environmental consequences. Inadequate management of waste allows pollution to land, air (including greenhouse gases), and water, and is associated with serious sanitary problems and resultant threats to public health. *Wastewater treatment* and *proportion of population connected to sewage* are indicators for pollution to water and proxies for the state of water quality and the country's current capacity to manage its water resources. *Generation of waste* measures the total amount generated, while *waste treatment and disposal* measures the proportion that is properly managed. These are two indicators that can give a signal of unsustainable or sustainable waste management practices. It could also be interesting to see if the country *imports electronic wastes*.

### *Transportation*

New roads may lead to e.g. increased integration and access to markets, but also to increased transportation and emissions as well as land-use changes through new settlements and economic activities along the way, which can contribute directly to deforestation, soil erosion, and losses in biodiversity and ecosystem services, and indirectly to increased risk for diseases such as HIV/AIDS. The indicator *modal split of passenger transport* measures the share of each mode (passenger cars, buses and coaches, and trains) in total inland passenger transport, measured in passenger-km. This is interesting as the use of cars for passenger transportation is generally less energy efficient and has greater environmental and social impacts, such as pollution, global warming as well as a higher accident rate, than mass transit. It is also interesting to see if there are any *taxes on, or national subsidies to, fossil fuel for transportation*. Fuel taxation is a potent instrument for the management of emissions from the transport sector, while fuel subsidies generally provide perverse economic incentives that promote unsustainable development. Another indicator is *use of unleaded petrol*, which informs about government policies and can be used as a proxy for (urban) air pollution.

### *Energy*

Energy is central to sustainable development and poverty reduction and access to electricity is one important input to escape poverty. The energy sector is also a source of pollution and natural resource depletion with major effects on public health. For example, hydropower production is associated with land-use changes and alteration of ecosystems; even apart from the risks of unsafe waste storage or accidents, nuclear power production has major effect on local ecosystems and is linked to global security issues; and the use of fuel wood for cooking fires creates indoor air pollution, primarily threatening the health of women and children. Improving options for poor households, for instance replacing fuel wood with gas, could improve public health.

Globally, the demand for oil and electricity is growing fast. The use of fossil fuels accounts for a majority of human-induced greenhouse gas emissions, the primary cause of climate change, and it is interesting to measure the country's contribution to climate change by measuring *carbon dioxide (CO<sub>2</sub>) emissions per capita or per unit of GDP*. Another relevant indicator is *intensity of energy use/energy efficiency*, which informs about energy efficiency in relation to GDP or to a specific economic activity. It is also interesting to measure *taxes on, or subsidies to, fossil fuel for transportation*, which gives an indication of the sustainability of government policies. Promotion of sustainable practises and renewable sources of electricity production is a high priority for sustainable development. It is interesting to also measure the *share of renewable energy sources; percentage of population using solid fuels for cooking, and the share of households without access to electricity or other modern energy supply*.

Both the transportation and energy sectors are large emitters of pollutants. Indoor and outdoor (especially in urban areas) air pollution are significant health threats, as they for instance exacerbate respiratory diseases. The smallest particulate matter, called PM<sub>10</sub> and PM<sub>2.5</sub>, cause significant health problems. Besides being harmful to human health, pollutants e.g. SO<sub>x</sub> and NO<sub>x</sub> also affect the environment through eutrophication and acid rain, which severely harm vegetation and reduce

crop yields. The indicators *concentration of air pollution* ( $SO_x$ ,  $NO_x$ ,  $PM_{2.5}$  or  $PM_{10}$ ) in ambient air gives an indication of the state of the environment in terms of air quality. The *Disability Adjusted Life Year* or DALY can be used as an indicator for environmental risk factors to human health, such as outdoor and indoor-air pollution.

### 3.2.8 Market Development

Market development, including access to markets, credits, technology and capacity, is critical for economic growth and has both positive and negative effects on the environment and climate change. Increasing the scale of the economy will – everything else equal – increase resource depletion and pollution. Trade and economic growth could exacerbate poor environmental practices, economic and political distortions, as well as contribute to climate change through increased transportation. However, growing economies and trade trigger changes in the technology and composition of production, which can stimulate more efficient use of natural resources, facilitate transfer of environmentally sound technologies and the introduction of improved environmental regulation. Trade generates higher national income, which – combined with good governance, strong institutions and tenure security – could lead to increased demand for better environmental practices. Example of relevant indicators are: *Candidate or compliant status of the Extractive Industries Transparency Initiative (EITE)*<sup>28</sup>, which is a global standard that promotes revenue transparency from oil, gas and minerals and gives an indication of government efforts to promote transparency and accountability; *exports of environmentally sensitive commodities* such as rainforest timber; and *value of fish export/fish export share of total export*<sup>29</sup>, which indicate the dependency of these resources.

Many developing countries primarily export agricultural products. In order to improve productivity humans have introduced many chemicals into the environment, from industrial and agricultural processes, many of which are harmful causing environmental degradation and posing major health risks. Chemicals often negatively affect ecosystems and the life-support services they provide for example, building up of toxic algae in rivers, and polluting groundwater. Climate change may worsen pollution problems in places where water resources become scarcer. Some possible indicators are: *fertiliser use efficiency*; *use of agricultural pesticides*; and *ambient concentration of chemical compounds in air, land, or water*.

### 3.2.9 Environment

#### *Natural Resources*<sup>30</sup>

A country's dependence on (renewable and non-renewable) natural resources, and thus how vulnerable it is to natural resource depletion, is indicated by *natural resources (minerals, agriculture, fishery, forestry, tourism, etc.) contribution as a percentage of GDP/ year* or *natural resources export as a per-*

28 <http://eitransparency.org/>

29 Total value of international trade of seven fishery commodity groups, by continent, countries or areas, <ftp://ftp.fao.org/fi/STAT/summary/default.htm#commodities>

30 Some natural resources are included in the mandate of environmental authorities, while other natural resources are under the auspices of other authorities. As this vary from country to country, an assessment has to be made from case to case if environment and climate change aspects are to be mainstreamed into other sectors/ministries or should be dealt with under the principal environmental authority.

*centage of total export/year.* Some renewable natural resources, such as water, fish and forests, are vulnerable to climate change. Another indicator relevant for natural resources is the *Adjusted Net Saving* (explained in section 3.1). All types of natural resources, ranging from high-value minerals and oil to timber and land, are often associated with high commercial value and offer large risks of corruption which undermines governance and environmental security and equality and destroys ecosystems. Therefore indicators related to the *Corruption Perception Index (CPI)* and the *Extractive Industries Transparency Initiative (EITI)* are highly relevant for natural resources.

#### *Biodiversity/Ecosystem Services*

Biodiversity is the source of ecosystem goods and services, ranging from food, building materials, and medicines, to climate and water regulation and clean water supplies. Poor people often depend directly on such goods and services for subsistence or income and are therefore directly affected by environmental degradation and loss of biodiversity and ecosystem services. A high level of biodiversity increases the resilience of ecological, economic and social systems, reducing vulnerabilities to environmental and climate change. For example, a diverse agricultural base, as opposed to mono-cultures, reduces the risk of crop failures caused by pests or diseases that may affect some crops but not all. Biodiversity can help mitigate such risks and provide households with a critical “safety net” during hard times. Ecosystem services play a central role in both adaptation to and mitigation of climate change. Maintenance of high biodiversity in ecosystems is an important factor contributing to higher resilience in regions affected by a changing climate. Therefore indicators measuring trends in the status of biodiversity can also serve as a tool for monitoring climate change. *Total number of known species* gives an indication of current trends in status of biodiversity, while *changes in threat status of species* indicate species that are threatened by extinction. Extinction of species constitutes a major loss of biodiversity, which plays a critical role in overall sustainable development. *Protected areas* are essential for maintaining ecosystem diversity in countries and ecological regions, and can be seen as a global public good. It is also interesting to measure *biodiversity per unit cultivated area*, for instance number of crops, livestock, tree species, etc. per area of agricultural or forested landscapes.

#### *Climate Change – Mitigation and Adaptation*<sup>31</sup>

*Climate change mitigation* is about slowing the process of global climate change by lowering the concentration of greenhouse gases (GHG) in the atmosphere by reduced emissions, avoided deforestation and/or increased sequestration. Increasing GHG emissions lead to global warming and climate change, which is expected to increase the frequency and intensity of extreme weather events and add on to already existing environmental stresses such as water scarcity and land degradation, thus threatening progress in achieving the MDGs. Controlling greenhouse gas emissions will depend on global political as well as economic and technological developments. Most developing countries have very

<sup>31</sup> Climate change mitigation and adaptation is briefly described under Environment, although it is worth noting that it is not a sector but should be integrated into all other sectors.

low levels of greenhouse gas emissions and these are often mainly caused by land use changes, such as deforestation or conversion of forests into agricultural lands. Here, it is interesting to measure the *deforestation rate* and whether it is increasing or decreasing. Measuring *carbon dioxide (CO<sub>2</sub>) emissions per capita* or *per unit of GDP* indicates how a country currently contributes to global warming. One of the central indicators for climate change mitigation is *share of renewable energy sources* measuring wind, solar etc., instead of non-renewable (e.g. petroleum-based) energy sources. It is highly relevant to look at the existence of *taxes on, or subsidies to, fossil fuel for transportation*, which gives an indication of the sustainability of government policies. Furthermore, indicators such as development and implementation of *Nationally Appropriate Mitigation Action plans (NAMA)* or *Low carbon development paths*; or *all-government Climate Change Strategies* (including both mitigation and adaptation) may be relevant. It could be relevant to check if *obligations under the UNFCCC process are being met*, for example national greenhouse gas inventories. It is also interesting to measure the *Number of market based mechanisms for mitigation* (e.g. CDM projects, REDD projects<sup>32</sup>) as a process indicator indicating the awareness and capacity in the country for market-based mitigation mechanisms.

*Climate change adaptation* is about reducing the adverse consequences of climate change. Adaptation is increasingly becoming a priority in many poor and vulnerable less developed countries, which are expected to face the greatest burden of climate change, while having contributed the least to the problem. In order to be able to adapt to climate change, information is needed about current climate variability and risks and long-term climatic trends. Therefore, it is good to measure the *number of hydro-meteorological stations* that are created and maintained. It is also useful to determine whether capacity exists in country to produce and use climate projections, and if a process is in place to train institutions to use these appropriately.

A wide range of interventions can increase the adaptive capacity in partner countries. These include interventions that are particularly targeted towards adaptation (for instance support to build capacity of the climate change office, effective mainstreaming in national or sectoral planning, develop drought-resistant crops, or efforts to make infrastructure climate resilient), those that have major development and adaptation co-benefits (supporting adaptation through sustainable agriculture, integrated water resources management, urban development, land use planning, disaster risk reduction, etc), and those that have a strong vulnerability reduction or resilience building focus (support to local natural resource governance and management, diversification of livelihoods, health, education, etc)<sup>33</sup>. Indicators relevant to these different areas can be found under the specific heading in this document (see section 3 and Appendix 2 “Examples of indicators by sector”).

To identify good overarching adaptation indicators it may be useful to include impacts, vulnerability, and adaptive capacity (where *Human Development Index* can be a proxy, or *proportion of people living in extreme poverty*). Examples of indicators include: *number of people affected by natural disasters* and if it is rising or falling; *have climate vulnerability assessments been*

<sup>32</sup> As REDD projects are still on a pilot-level, gathered statistics for REDD projects are currently not accessible. REDD statistics will most likely be easier to access in the future.

<sup>33</sup> Sida, 2009

carried out to identify vulnerable regions, sectors and populations, and if this information is used in planning; and if *long-term investments are screened for vulnerability to changes in climate*. Related to adaptive capacity it is interesting to look at the *number of sectoral, national or transnational development plans where climate change adaptation is integrated or national policies, plans and strategies improved on basis of environment and climate change research*, for example by using hydrological/meteorological information or climate projections when developing IWRM strategies or urban plans. Furthermore, it is interesting to find out whether a *National Adaptation Program of Action (NAPA) or National Adaptation Plan* has been developed or implemented and to what extent recommendations from these plans are reflected in national and sectoral development plans. Additionally one can assess whether *institutions, budgets and staffing dedicated to climate change adaptation are in place at appropriate levels*, and whether a *mechanism exists for coordination of adaptation efforts between different ministries*.

### 3.2.10 Agriculture and Forestry

#### *Land and agriculture*

The majority of poor people in the developing world depend on agriculture for their livelihood. Agriculture, which can be a driver of poverty reduction and economic growth, is receiving more attention worldwide out of concern about how to feed the growing population.

Transforming land, (for instance, forests into agriculture or grazing land), introducing monocultures, and thus reducing biodiversity may lead to increased food production and more secure livelihoods in the short term, while causing land degradation in the long term. Land degradation, by soil erosion, nutrient depletion, desertification, increased salinity, and disruption of biological cycles is a significant problem as it diminishes productivity, negatively affects food security, biodiversity and related ecosystem services, and may be exacerbated by climate change. *Land degradation* measures the share of land that is no longer able to sustain properly an economic function or the original ecological function, while *land-use change* measures the rate of changes of the distribution of land uses within a country over time. *Land affected by desertification* is especially relevant for the livelihoods of rural people in dry lands, particularly the (female) poor, who depend on livestock, crops and fuel wood. Other relevant indicators are *intensity of use of water in agriculture* and *agriculture share of GDP*). In order to better understand effects of climate change, it is good to also measure *variability in yields or income over a multi-year period*. This variability can be analysed together with other variables, such as rainfall, to improve understanding of vulnerability and adaptive capacity.

In order to improve the agricultural productivity, new technology and chemicals have been introduced, many of which are harmful, causing environmental degradation, polluting groundwater, and posing major health risks. Climate change may worsen pollution problems and food security in places where water resources become scarcer. Here, it is interesting to measure the productive capacity of soils and efficiency in utilisation of soil capital and other associated inputs (water, fertilizers, labour etc.) in agricultural production for a given land area with the indicators *agricultural productivity per hectare*; *fertiliser use efficiency*; and *use of agricultural pesticides*.

### *Forest*

Forests provide life supporting ecosystem services (such as water purification, regulation of climate and of water flow, carbon sequestration, provisioning of food and materials, etc.), supporting countries' economic development and contributing to livelihoods, particularly for the rural poor. Forests around the globe are threatened by economic activities (e.g., agricultural expansion, human settlements, or infrastructure), as well as by climate related and biological events that results in degradation of the forest or in deforestation. As a response, forested areas are being selected for conservation and protection. *Proportion of land covered by forest* and *rate of deforestation* are indicators that can provide information about forest practices. However, they only give information about the quantity of the forests, not the quality. Moreover, it is interesting to measure the *forestry share of GDP or total export* as this gives an indication of the country's dependency on the forestry sector and thus a proxy for vulnerability of resource depletion.

### *Freshwater systems, Oceans, Seas and Coasts*

Aquatic ecosystems continue to be heavily degraded threatening many of their important life-support services, including buffering against storms and tsunamis, provisioning of food, and being a breeding ground for many species. It is therefore interesting to look at the availability of an *integrated coastal zone management plan*, not least from a risk-reduction perspective. Global marine and freshwater fish stocks show large scale declines, caused mostly by persistent overfishing. Freshwater stocks also suffer from habitat degradation and changed thermal regimes related to climate change. Total marine catches are being sustained only by locating the fishery further offshore and deeper into the oceans.<sup>34</sup> *Protected marine areas* are essential for maintaining marine ecosystem diversity and reduce risk of external shocks such as storms; *proportion of fish stocks within safe biological limits* indicates the level of exploitation. In terms of food security this indicator also measures the level of sustainable production from fisheries. It is also interesting to measure the *fishery share of GDP or total export* as this gives an indication of the country's dependency on the fishery sector and thus a proxy for vulnerability of resource depletion.

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# Impact level Environmental Sustainability Indicators

The table below gives a brief overview of proposed environmental and climate change impact-indicators. When one indicator is relevant for more than one sector, the indicator is repeated under each sector heading for easy reference. The indicators should only be used as examples, and it is better to use a few, well chosen indicators than all of them. The decision on which indicators to use should be taken in a dialogue with the partner country and be based on the partner country's priorities and key development documents. When relevant and possible, try to use disaggregated indicators (e.g. for women/men; urban/rural, etc.). For interpretation, please see chapter 3.1 in the main document, and suggested sources.

Indicator	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
<b>Poverty</b>			
Proportion of population living below national poverty line (women/men)	A standard measure of poverty, which provides information on progress towards poverty-alleviation.	CSD MDG	Poverty and inequalities obstruct human development, worsen human security, and limit climate change adaptation capacity; thus obstructing sustainable development.
Proportion of population living below \$1 per day (women/men)	A uniform measure of absolute poverty in the world.	CSD MDG	Poverty and inequalities obstruct human development, worsen human security, and limit climate change adaptation capacity; thus obstructing sustainable development.
Gini coefficient (income)	Measures income inequality, varying between 0, which reflects complete equality, and 1, which indicates complete inequality.	UNDP	Inequality hinders human development and is thus detrimental to long-term economic growth.
Ratio of share in national income of highest to lowest quintile (women/men)	Another measure of income inequality. Shows the extent of inequality in income distribution within a country, comparing the income of the poorest 20% with the richest 20% of the population.	CSD	Inequality hinders human development and is thus detrimental to long-term economic growth.
Proportion of population using an improved water source (urban/rural; women/men)	Measures the actual use of improved drinking-water facilities.	CSD MDG JMP	Related to almost all of the MDGs. Strongly linked to human health, human rights, maternal and child mortality and wider gender issues, primary education, and poverty reduction. Climate change may affect hydrological balances and further limit access to clean water.

Indicator	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Proportion of population using an improved sanitation facility (urban/rural; women/men)	Measures the actual use of improved sanitation facilities.	CSD MDG JMP	Related to almost all of the MDGs. Strongly linked to human health, human rights, gender issues, primary education, environmental sustainability, and poverty reduction. Correlates with peoples' vulnerability and ability to adapt to climate change.
Share of households without electricity or other modern energy service	Measure of the share of households, without access to electricity, using 'traditional' non-commercial energy options, such as fuel wood, crop wastes, and dung, as primary fuel for cooking and heating.	CSD	Limits economic development and climate change adaptive capacity, thus maintaining poverty. Linked to gender issues, education as it affects studying opportunities, and poverty.
Percentage of population using solid fuels for cooking	Measures access to modern energy services. Solid fuels include biomass fuels, such as wood, charcoal, crops or other agricultural waste, dung, shrubs and straw, and coal. A proxy for indoor air pollution.	CSD	Associated with health issues, increased mortality, deforestation, and land degradation; is central to poverty alleviation and has strong gender linkages.
Proportion of urban population living in slums	Measure of the share of urban population lacking at least one of the following: Access to safe water; access to improved sanitation facilities; sufficient, not overcrowded, living area; structural quality/durability of dwellings; security of tenure.	CSD MDG	Strongly linked to health, poverty, human right, and vulnerability to climate change.
Human Development Index (HDI)	Measures social and economic development, which combines indicators of life expectancy, educational attainment, and income.	UNDP	Measures of both social and economic human development. Strongly linked to poverty alleviation. Can be used as a proxy for climate change adaptation capacity.
<b>Economic Growth</b>			
Adjusted Net Savings (ANS)	ANS is a proxy sustainability-indicator, building on the concept of green national accounts, which measures the true rate of savings in an economy after taking into account investments in human capital, depletion of natural resources, and pollution damages.	CSD WB	Relates to natural resource dependence, economic development, and poverty reduction.
Decoupling – (example): ratio of % change in CO <sub>2</sub> emissions compared to % change GDP growth per year	Measure of economic growth and efficiency (of, for instance, energy/water use or environmental policies). Decoupling typically give a clear message on growth-environment links, such as "emissions diminish while GDP increases" or "emissions rise faster, slower, or at the same pace as GDP".	OECD	Links to governance efficiency and the environmental sustainability of government policies.

Indicator	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
National taxes on, or subsidies to, fossil fuel for transportation (yes/no; trend)	A process indicator indicating if a country is using policy instruments to promote sustainable development. Fuel taxation is an instrument for the management of emissions from the transport sector, while fuel subsidies generally promotes unsustainable development.	n/a	Linked with governance, evidence-based policy making and use of policy instruments. Closely linked to climate change mitigation, (urban) air pollution, and health.
Environmental expenditure as share of GDP, or Environmental expenditure as share of total public expenditure (%)	An indicator of the policy-budget linkages, indicating the willingness and ability of the government to implement its environmental and climate change policies. Measures how much of the total government spending that is allocated to the main environmental and/or climate change agency or to main environmental or sectors. As responsibility for environmental and climate change issues vary from country to country, it is difficult to use this indicator to compare across countries. The indicator could rather be used to compare public environmental spending within one country over time.	WB	Linked with governance, sustainable development, health, poverty and human rights. Proxy of general environmental and climate change awareness of the government, the sustainability of its policies, and indirectly to vulnerability to climate change and disaster risks.
Budget transparency of internally generated revenue from natural resource concessions and licenses (yes/no; trend)	Indication of transparency of internally generated revenues, originating from granting of concessions and licenses for the exploitation of natural resources.	n/a	Linked with governance issues including transparency, accountability and corruption, sustainable development and natural resource extraction, poverty, human rights, and livelihood opportunities,
Public disclosure of budget (yes/no; trend)	Informs about if and to what extent the national budget is subject to public disclosure.	n/a	Linked with governance issues including transparency, public participation and corruption.
<b>Other relevant indices</b>			
Environmental Performance Index (EPI)	EPI combines several areas of environmental issues (policies, emissions, energy use, etc.). It includes indicators for climate change, production of natural resources (forestry, fishery, and agriculture), biodiversity and habitat, water, water and air pollution, and environmental burden of disease. Allows comparative ranking of countries' environmental performance.	Yale and Columbia University	Measure of sustainable development, including livelihood opportunities, linked to health issues.
Corruption Perception Index (CPI)	The CPI ranks more than 150 countries in terms of perceived levels of corruption, as determined by expert assessments and opinion surveys. Corruption is a major driving force of environmental and natural resource degradation.	TI	Strongly linked with bad governance, slow democratic development, lack of human rights, and poor business environment.

Indicator	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Country Policy and Institutional Assessment (CPIA)	The CPIA rates countries against a set of 16 criteria grouped in four clusters: (a) economic management; (b) structural policies; (c) policies for social inclusion and equity; and (d) public sector management and institutions. The environment criterion assesses the extent to which environmental policies foster the protection and sustainable use of natural resources and the management of pollution.	WB	Measure of sustainable development. Linked to good governance, democratic development, human development and human rights, economic growth, and poverty reduction.

CSD: Commission on Sustainable Development:

MDG: Millennium Development Goals

JMP: Joint Monitoring Programme (WHO and UNICEF)

OECD: Organisation for Economic Co-operation and Development,

TI: Transparency International,

WB: World Bank,

UNDP: United Nations Development Program

# List of Indicators for Mainstreaming Environment and Climate Change

The table below gives a brief overview of proposed outcome and output indicators on environment and climate change. When one indicator is relevant for more than one sector, the indicator is repeated under each sector heading for easy reference. The indicators should only be used as examples, and it is better to use a few, well chosen indicators than all of them. The decision on which indicators to use should be taken in a dialogue with the partner country and be based on the partner country's priorities and key development documents. When relevant and possible, try to use disaggregated indicators (e.g. for women/men; urban/rural, etc.). For interpretation, please see chapter 3.2 in the main document, and suggested sources.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
<b>Health</b>			
Proportion of population using an improved water source (urban/rural; women/men)	Measures use of improved drinking water facilities as a share of total population.	CSD MDG JMP	Links to most of the MDGs. Strongly linked to human health, maternal and child mortality, other gender issues and human rights, primary education, poverty reduction, security and disasters. Climate change may affect hydrological balances and further limit access to clean water.
Proportion of population using an improved sanitation facility (urban/rural; women/men)	Measures use of improved sanitation facilities as a share of total population.	CSD MDG JMP	Strongly linked to human health, primary education, environmental sustainability, human rights and gender issues, poverty reduction, also to peoples' vulnerability and ability to adapt to climate change, and most of the other MDGs as well.
Under five mortality rate	The probability of dying before age 5 (expressed as deaths per 1,000 live births). Measures the risk of dying in infancy and early childhood.	CSD MDG OECD WB WHO	Links to human rights, and availability, accessibility, acceptability, and quality of health care and services. Also linked to education, particularly of mothers, access to safe water and sanitation, food security, and poverty. May increase with climate change.
Disability-adjusted life years (DALYs) due to lack of water, sanitation and hygiene, indoor air pollution or outdoor air pollution (women/men)	Measuring the overall disease burden. DALY is the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability. The DALY can be used as an indicator for environmental risk factors, e.g. water/sanitation/hygiene and indoor/outdoor air pollution, to human health.	WHO	Links to health including respiratory disease, diarrhoea, and other illnesses, human rights including gender issues. Relevant also after disasters, where access to potable water often is a problem. Environmental risk factors may increase with climate change.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Deaths among children under five years of age due to malaria (%) (girls/boys)	Measures the share of children under five years of age that die, where malaria is the underlying cause of death. Underlying cause-of-death information is needed.	WHO	Linked with water resource management and access to health facilities. Malaria incidences are likely to be affected by climate change. Also linked with behaviour, such as the use of mosquito nets, and access to treatment.
Contingency plan for distribution of medicine in case of natural disasters (yes/no)	Indicator of risk reduction preparedness, i.e. the ability of the government to provide people with the medicine they need for their survival in case of natural disasters.	n/a	Linked with human rights, mortality and health, and poverty. As number of natural disasters may increase with climate change, also linked to climate change adaptation and disaster risk reduction.
<b>Education</b>			
Proportion of population using an improved water source (urban/rural; women/men)	Measures use of improved drinking water facilities as a share of total population.	MDG CSD JMP	Links to most of the MDGs. Strongly linked to human health, maternal and child mortality, other gender issues and human rights, primary education, poverty reduction, security and disasters. Climate change may affect hydrological balances and further limit access to clean water.
Proportion of population using improved sanitation facilities (urban/rural; women/men)	Measures use of improved sanitation facilities as a share of total population.	MDG CSD JMP	Strongly linked to human health, primary education, environmental sustainability, human rights and gender issues, poverty reduction, also to peoples' vulnerability and ability to adapt to climate change, and most of the other MDGs as well.
Proportion of teachers trained in environmental, climate change, and disaster risk reduction education (percent)	Measures of the share of teachers that have been trained in environmental and climate change education.	EU	Improved environmental, climate change and disaster risk reduction education will increase pupils' knowledge on health, nutrition, sanitation and disease prevention, disaster preparedness, and sustainable agriculture and forestry, and may have positive effects on parents' awareness as well.
Education policies include environmental, climate change, and disaster risk reduction issues in the curriculum (yes/no)	Indicator of the environmental and risk awareness of government agencies and institutions.	n/a	Linked to governance. Improved environmental and climate change education will increase pupils' knowledge on health, nutrition, sanitation and disease prevention, disaster preparedness, and sustainable agriculture and forestry, and may have positive effects on parents' awareness as well.
<b>Research</b>			
Number of peer reviewed academic publications related to environment or climate change	Measure of academic quality and level of concern for environmental issues of the researcher and research institution.	n/a	Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risk reduction, security, etc.
Number of MSc/PhD students/graduates in environment or climate change related fields (women/men)	Measure of number of students or number of graduates in post graduate education related to environment or climate change fields.	n/a	Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risk reduction, security, etc.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Number of environmental/climate change policy briefs written/communicated by researchers (women/men)	Measure of policy outreach of environmental and climate change researchers	n/a	Policy outreach is important to communicate environmental research results to decision makers and opinion leaders and is linked to issues of governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), and also with conflict, peace, disaster risk reduction, security, etc.
Number of meetings with policy makers related to environment, climate change and disaster risk reduction.	Measure of face-to-face communication of research results from environmental, climate change or disaster risk related research.	n/a	Policy outreach is important to communicate research results to decision makers and opinion leaders and is linked to issues of governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risk reduction, security, etc.
Participation by environmental researcher in policy processes (yes/no; number of participating researchers)	A process indicator that measures the demand for evidence-based policy-making, the demand to apply scientific research results in policy making and be informed about risks.	n/a	Linked to governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risk reduction, security, etc.
Number of low income country scientists actively involved in climate change discussions at the international level	Measure of involvement of scientists from low-income countries in the international climate change arena. Low income countries are often more vulnerable to climate change than high-income countries. Informs about capacity and equality.	n/a	Linked with national capacity to deal with climate change issues (adaptation and mitigation), vulnerability, poverty, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risk reduction, security, etc.
National policies, plans and strategies improved on basis of environment and climate change research	A process indicator that measures the demand for evidence-based policy-making, the demand to apply scientific research results in policy making and be informed about risks.	n/a	Linked to governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risks reduction, security, etc.
National institutions with strengthened research capacities to deal with environmental problems	Measure of capacity for (applied) research at institutions.	n/a	Linked to governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risk reduction, security, etc.
<b>Democracy, Human rights and Gender Equality</b>			
Corruption perception index (CPI)	Corruption is the essence of bad governance. The CPI ranks more than 150 countries in terms of perceived levels of corruption, as determined by expert assessments and opinion surveys.	TI	Corruption is a major driving force of environmental and natural resource depletion thereby aggravating poverty and health problems, hindering sustainable development.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Press Freedom index	Reflects the degree of freedom that journalists and news organisations enjoy in each country, and the efforts made by the authorities to respect and ensure respect for this freedom. A score and a position is assigned to each country in the final ranking. The index includes every kind of violation directly affecting journalists and news media; the degree of impunity enjoyed by those responsible for these press freedom violation; measures the level of self-censorship in each country and the ability of the media to investigate and criticise. It also reflects violations of the free flow of information on the Internet.	Reporters without Borders	Press freedom is closely linked to aspects of democracy, human rights and good governance; transparency of decisions of tenure rights and concessions, access to information related to environment, risks, early warning, weather and climate, extension services, etc.
Environmental expenditure as share of GDP, or Environmental expenditure as share of total public expenditure (%)	An indicator of the policy-budget linkages, indicating the willingness and ability of the government to implement its environmental and climate change policies. Measures how much of the total government spending that is allocated to the main environmental and/or climate change agency or to main environmental sectors. As responsibility for environmental and climate change issues vary from country to country, it is difficult to use this indicator to compare across countries. The indicator should rather be used to compare public environmental spending within one country over time.	WB	Linked with governance, sustainable development, health, poverty and human rights. Proxy of general environmental and climate change awareness of the government, the sustainability of its policies, and indirectly to vulnerability to climate change and disaster risks.
Environmental legislation (yes/no; year)	A process indicator indicating if a certain law is adopted or not.	WB	Linked to health, and poverty reduction, governance, and democracy. A proxy of the government's general environmental awareness and capacity.
Environmental strategy/action plan (yes/no; year)	A process indicator indicating if a certain strategy or action plan is adopted or not.	WB	Proxy of general environmental awareness and capacity of the government, and is linked to governance and democracy, health, and poverty reduction.
Climate change strategies or plans (yes/no; year)	A process indicator of general awareness and capacity of government, giving information about if climate change strategies or plans (such as the National Adaptation Program of Action (NAPA), Nationally Appropriate Mitigation Actions (NAMA) or National Communications to UNFCCC) are adopted or implemented.	n/a	Proxy of general climate change awareness and capacity of the government, and is linked to governance and democracy, health, and poverty reduction.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Hyogo Framework for Action integrated into legislation (yes/no; year)	A process indicator indicating if the Hyogo Framework is integrated into national legislation. The Hyogo framework aims to reduce vulnerabilities to hazards, and assists the efforts of nations and communities to become more resilient to, and cope better with the hazards that threaten their development gains.	IDRS	Proxy of general risk awareness and capacity of the government, and is linked to climate change adaptation, governance and democracy, health, and poverty reduction.
Percentage of population undernourished	A measure of food security. The percentage of population undernourished provides information on the number of people within a population whose dietary energy intake lies below their minimum requirements.	FAO WRI	Direct links to human rights, health, poverty, economic growth, education, environmental degradation and climate change, conflicts, security and disasters.
Proportion of households with access to secure tenure (female-/ male headed)	Measurement of proportion of households with access to secure tenure.	EU	Links to governance and human rights and gender, conflict and security, and environmental sustainability, and food security.
National human rights institution with mandate to monitor environmental and climate change issues (yes/no)	A process indicator indicating if the state has mandated a human rights institution (such as an ombudsman or human rights commission) to monitor environment and climate change issues.	CIRI TI	Links to governance, accountability and general human rights, conflict and security, and environmental sustainability.
<i>Gender</i>			
Maternal mortality ratio	The percent of women dying as a result of pregnancy.	MDG	Links to access to health facilities and functioning of health systems, poverty, education, environmental issues (including water and sanitation), and nutrition, Also relevant to conflicts and security, and disaster risks (including climate change).
Total number of victims (killed or affected) of natural disasters (women/men)	Measures total numbers of victims killed or affected by natural disaster and is thus an indicator for vulnerability to natural disasters, including geophysical, hydrological meteorological, climatological, and biological disasters. In case of limited disaster preparedness and weak resilience more people will be affected.	EM-DAT	Climate change is expected to increase hydrological, meteorological, climatological, and biological disasters. Percentage of population killed/affected by natural disasters can be an impact indicator of climate change adaptation. Links to poverty, health, security and human rights, and economic losses.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Disability-adjusted life years (DALYs) due to lack of water, sanitation and hygiene, indoor air pollution or outdoor air pollution (women/men)	DALY is the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability. The DALY can be used as an indicator for environmental risk factors, e.g. water/sanitation/hygiene and indoor/outdoor air pollution, to human health. It is often to woman's duty to care for sick household members, why it is interesting to measure the overall disease burden. Indoor air-pollution contributes to respiratory disease and mostly affecting women and children.	WHO	Links to poverty, education and health (respiratory disease, diarrhoea, and other illnesses), and has a strong gender implication. Relevant also after disasters, where access to potable water often is a problem. Environmental risk factors may increase with climate change.
Ratio of girls to boys in education (primary, secondary, tertiary)	A measure comparing girls and boys attendance in school.	MDG	Links to poverty, health, education, democracy and human rights, and environmental issues.
Share of women in wage employment in the non-agricultural sector	The share of female workers in wage employment in the non-agricultural sector (industry and services) expressed as a percentage of total wage employment in that same sector. Wage employment has often been the preserve of men in less developed countries, except in agriculture.	CSD	Links to poverty, sustainable economic development and business trade and financial systems, democracy and human rights.
Share of issued land titles held by women (%)	Measurement of proportion of issued land titles that are held by women. In some countries or cases, land titles are more difficult for women to obtain or inherit.	n/a	Links to governance, human rights and gender, security, and environmental degradation.
<b>Conflict, Peace, Security</b>			
Number or density of refugees/IDPs (women/men)	Measures the number of people living as refugees or internally displaced people (IDP).	UNHCR EU	Links to health, human rights and gender, education, governance, and environmental degradation
Number of land or natural resources related disputes	Measures number of land or natural resource related disputes. Conflict items include: territory, secession, decolonisation, autonomy, system/ideology, national power, regional predominance, international power, resources, and other.	EU HIIK	Links to poverty, human rights and gender, education, governance, natural resources, environment and climate change.
Total number of victims (killed or affected) of disasters (women/men)	Measures total numbers of victims killed or affected by natural disaster and is thus an indicator for vulnerability to natural disasters, including geophysical, hydrological meteorological, climatological, and biological disasters. In case of limited disaster preparedness and weak resilience more people will be affected.	EM-DAT	Climate change is expected to increase hydrological, meteorological, climatological, and biological disasters. Percentage of population killed/affected by natural disasters can be an impact indicator of climate change adaptation. Links to poverty, health, security and human rights, and economic losses.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Scarcity of water (m <sup>3</sup> /person/year)	Measures scarcity of water which can become the focus of tensions, potentially spilling over into conflict, within or between states.	WRI	Affect achievement of most of MDGs, economic growth, direct impact on poverty, food security and health issues and closely linked to human rights and gender as well as climate change.
Percentage of population undernourished (urban/rural; women/men)	A measure of food security. The percentage of population undernourished provides information on the number of people within a population whose dietary energy intake lies below their minimum requirements. Besides being a consequence of conflict (and environmental degradation), food insecurity can also lead to conflict.	FAO WRI	Direct links to health, poverty, economic growth, education, human rights and gender, environmental degradation and climate change, conflicts, security and disasters.
Proportion of households with access to secure tenure (female-headed/ male – headed)	Measurement of proportion of households with access to secure tenure.	EU	Links to governance, human rights and gender, and environmental degradation.
<b>Humanitarian Aid</b>			
<i>Natural hazards – Vulnerability to disasters</i>			
Percentage of population living in hazard prone areas	Measures the share of national population living in areas subject to significant risk of prominent hazards: cyclones, drought, floods, earthquakes, volcanoes and landslides. The indicator may be calculated separately for each relevant prominent hazard. The risk of death in a disaster caused by natural hazards is a function of physical exposure to a hazardous event and vulnerability to the hazard.	CSD	Informs about the level of vulnerability to natural hazards. It is linked to disaster risk reduction, poverty, human rights, and economic development.
Disasters categorized by amount of damages as a percentage of GDP (or total economic damage costs in US\$)	Provides estimate of the economic impact of disasters, including direct (e.g. damage to infrastructure, crops, housing) and indirect (e.g. loss of revenues, unemployment, market destabilisation) consequences on the local economy.	EM-DAT	Climate change is expected to increase natural disasters, which have a large negative effect on poverty and economic growth, affecting health, human rights and security, education, governance, and the environment.
Total number of victims (killed or affected) of disasters (women/men)	Measure total numbers of victims killed or affected by natural disaster and is thus an indicator for vulnerability to natural disasters, including geophysical, hydrological meteorological, climatological, and biological disasters. In case of limited disaster preparedness and weak resilience more people will be affected.	EM-DAT	Climate change is expected to increase hydrological, meteorological, climatological, and biological disasters, which have a large negative effect on poverty and economic growth, affecting health, human rights and security, education, governance, and the environment.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Hyogo Framework for Action integrated into legislation (yes/no; year)	A process indicator indicating if the Hyogo Framework is integrated into national legislation. The Hyogo framework aims to reduce vulnerabilities to hazards, and assists the efforts of nations and communities to become more resilient to, and cope better with the hazards that threaten their development gains.	ISDR	Proxy of general risk awareness and capacity of the government, and is linked to climate change adaptation, governance and democracy, health, and poverty reduction.
<b>Sustainable Infrastructure and Services</b>			
Number of SEAs or EIAs performed by partner country	A process indicator measuring the number of Strategic Environmental Assessments (SEA) or Environmental Impact Assessments (EIA) performed by the partner country for infrastructure projects.	n/a	Infrastructure development is linked to environment and climate change, governance, economic development, poverty, health, security, and the overall awareness and capacity of the government for environmental management.
<i>Urban Planning</i>			
Proportion of population living in urban areas	Proportion of total population that lives in urban areas.	WB	Linked to land-use change, tenure security, water withdrawal, waste generation, and urban service provision.
Rate of growth of urban population (percent)	Measure of how fast the size of urban population is changing. It aggregates impacts of natural increase in urban population, net rural-to-urban migration, and increased land area with urban characteristics	CSD WB	This indicator has close linkages with other socioeconomic variables, including percentage of population in urban areas, growth in school age population, and overall population growth. It is also linked to many environmental indicators, such as land use change, water withdrawals, and generation of municipal waste.
Proportion of urban population using an improved water source (women/men)	Proportion of the population in urban areas with access to improved water source.	MDG CSD	Strongly linked to human health, maternal and child mortality, human rights and wider gender issues, security and disasters, poverty reduction, and most of the other MDGs as well. Climate change may affect hydrological balances and further limit access to clean water.
Proportion of urban population using improved sanitation facility (women/men)	Proportion of the population in urban areas with access to improved sanitation.	MDG CSD	Access to sanitation has an impact on almost all of the MDGs. Strongly linked to environment, poverty reduction, education, security, health and gender issues Lack of access to sanitation also correlates with people's vulnerability and availability to adapt to climate change.
Share of urban households without electricity or other modern energy service	Measure of the share of urban households, without access to electricity, using 'traditional' non-commercial energy options, such as fuel wood, crop wastes, and dung, as primary fuel for cooking and heating.	CSD	Limits economic and human development and climate change adaptive capacity, thus maintaining poverty. Linked to gender issues, education as it affects studying opportunities, and poverty.
Number of hours per day of available piped water.	Measure of number of hours per day of piped water available in rainy and dry seasons.	WB	Links to most of the MDGs. Strongly linked to human health, maternal and child mortality, other gender issues and human rights, primary education, poverty reduction, security and disasters. Climate change may affect hydrological balances and further limit access to clean water.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Proportion of urban population living in slums	Measure of the share of urban population lacking at least one of the following: Access to safe water; access to improved sanitation facilities; sufficient, not overcrowded, living area; structural quality/durability of dwellings; security of tenure.	CSD MDG	Strongly linked to health, poverty, human right, and vulnerability to climate change.
National/urban policies, plans and strategies improved on basis of environment and climate change research	A process indicator that measures the demand for evidence-based policy-making, the demand to apply scientific research results in policy making and be informed about risks.	n/a	Linked to governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, spatial planning, and also with conflict, peace, disaster risks reduction, security, etc.
Disability-adjusted life years (DALYs) due to outdoor air pollution (women/men)	Measuring the overall disease burden of outdoor air pollution. DALY is the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability. The DALY can be used as an indicator for environmental risk factors. Outdoor air pollution is a risk especially in urban areas.	WHO	Links to respiratory diseases and other health issues, education, and human development.
<i>Water resource management and Water &amp; Sanitation</i>			
Proportion of population using an improved water source (percent) (women/men)	Proportion of the population in urban or rural areas using improved drinking-water sources.	MDG CSD JMP	Links to most of the MDGs. Strongly linked to human health, maternal and child mortality, other gender issues and human rights, primary education, poverty reduction, security and disasters. Climate change may affect hydrological balances and further limit access to clean water.
Proportion of population using an improved sanitation facility (percent) (women/men)	Proportion of the population in urban or rural areas using improved sanitation facilities.	MDG CSD JMP	Access to sanitation has an impact on almost all of the MDGs. Strongly linked to environmental sustainability, poverty reduction, primary education, security, health and gender issues. Lack of access to sanitation also correlates with people's vulnerability and availability to adapt to climate change.
Concentration of pollutants in surface and/or ground water.	Measure state of environment in terms of water quality by the concentration of bacteria, nutrients, human or animal waste, pesticides, salt, or other pollutants. Water quality can be determined by availability/concentration of different compounds including coliform, salt, nutrients, arsenic, suspended matters, etc. Other measures include pH and biological or chemical oxygen demand (BOD or COD) which is an indirect measure of organic compounds in the water.	UNESCO	Strong links to public health, poverty reduction, economic development and human rights, also to environmental sustainability and governance, including capacity to monitor state of environment, education, and security. Linked to most of the MDGs. Climate change may worsen the water quality.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Percentage of known water resources checked for quality and quantity	Indication of the capacity of the government to monitor quality and quantity of the water resources.	Rwanda	Strong links to public health, poverty reduction, economic development and human rights, also to environmental sustainability and governance, including capacity to monitor state of environment, education, and security. Linked to most of the MDGs. Climate change may worsen the water quality.
Quantity of water used per capita per day (urban/rural)	Volume of water collected by or delivered to the household and used there for drinking, cooking, bathing, personal and household hygiene and sanitation divided by number of persons in sample households.	WB	Links to most of the MDGs. Strongly linked to human health, maternal and child mortality, equality, other gender issues and human rights, primary education, poverty reduction, security and disasters. Climate change may affect hydrological balances and further limit access to clean water.
Proportion of total water resources used	Total annual volume of groundwater and surface water withdrawn from its sources for human use (including for agriculture, industry), expressed as a percentage of the total volume of renewable water resources available annually. This is a measure of sustainability, water scarcity and vulnerability to water shortage.	CSD	Links to sustainable development, governance and human rights, conflict, migration and humanitarian aid, environmental degradation and poverty.
National plan for IWRM and Water Efficiency (yes/no; year)	A process indicator indicating if an Integrated Water Resources Management (IWRM) and Water Efficiency plan is developed and/or adopted.	GWP WSSD	A proxy for sustainable water management. Linked with climate change, governance, human rights and gender, health, poverty, food security, and transboundary cooperation. Linked to general awareness and capacity of government for IWRM.
Number of agreements for joint management of share water resources (signed/ratified)	A process indicator measuring if and how many international agreements the country has signed with neighbouring countries, related to joint management of shared water resources.	n/a	Linked to conflict and security, human rights and gender, governance, and access to water for power generation, household needs and agriculture. Related to climate change and environment.
<b>Waste</b>			
Proportion of population and industrial facilities with adequate wastewater treatment	Measures level of pollution from domestic and industrial point sources entering the aquatic environment.	EU CSD	Links to poverty, health, and environment, fisheries and tourism, as well as climate change adaptation.
Proportion of population connected to sewage	Measures the proportion of population connected to public sewage treatment plants.	OECD	Links to poverty, health, education, and environment, fisheries and tourism, as well as climate change adaptation.
Generation of waste (kg/capita/year)	The amount of waste, hazardous and non-hazardous, generated by industries or sectors of the economy.	CSD OECD	Links to health issues, poverty, governance and environment.
Share of total amount of generated waste with adequate treatment and disposal (%)	Percentage of waste which is recycled, composted, incinerated, or land-filled on a controlled site.	CSD	Links to health, poverty, governance, climate change, business and trade and environment.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Import of electronic waste (yes/no; amount)	Process indicator indicating if and how much electronic waste is important. Electronic waste import can generate income but is associated with pollution, especially by chemicals.	n/a	Linked with health, especially for the people who live on or close to dump sites, non-degradable chemicals to water, air and land. General awareness of the government of waste management and pollution.
<i>Transportation</i>			
Modal split of passenger transport	The indicator measures the share of each mode (passenger cars, buses and coaches, and trains) in total inland passenger transport, measured in passenger-km. Provides information on the relative importance of different modes for passenger transport.	CSD	The use of cars for passenger transportation is generally less energy efficient and has greater environmental and social impacts, such as pollution, global warming as well as a higher accident rate, than mass transit.
National taxes on, or subsidies to, fossil fuel for transportation (yes/no; trend)	A process indicator indicating if a country is using policy instruments to promote sustainable development. Fuel taxation is an instrument for the management of emissions from the transport sector, while fuel subsidies generally promotes unsustainable development	n/a	Linked with governance, evidence-based policy making and use of policy instruments. Closely linked to climate change mitigation, (urban) air pollution, and health.
Use of unleaded petrol (yes/no)	A process indicator measuring the use of unleaded petrol.	EU	Linked with governance and policy instruments, (urban) air pollution, health and the environment.
<i>Energy</i>			
Carbon dioxide emissions (CO <sub>2</sub> ) metric tons of CO <sub>2</sub> per capita or CO <sub>2</sub> emissions per unit of GDP (kg/2000 PPP \$ GDP)	Measures carbon dioxide emissions due to human activity per capita or per unit of gross domestic product (GDP).	MDG OECD	CO <sub>2</sub> emissions contribute to climate change and have negative effects on economic, social, and environmental conditions in most countries of the world.
Energy efficiency: Intensity of energy use, total and by economic activity	The indicator is defined as energy use divided by gross domestic product.	CSD EU MDG	Strong links to economic development, climate change mitigation, poverty reduction, security, governance and efficiency of policy instruments.
National taxes on, or subsidies to, fossil fuel for transportation (yes/no; trend)	A process indicator indicating if a country is using policy instruments to promote sustainable development. Fuel taxation is an instrument for the management of emissions from the transport sector, while fuel subsidies generally promotes unsustainable development	n/a	Linked with governance, evidence-based policy making and use of policy instruments. Closely linked to climate change mitigation, (urban) air pollution, and health.
Share of renewable energy sources in total energy use	The share of renewable sources in total primary energy supply or total energy consumption.	CSD UNDP	Strong links to economic development, poverty reduction, climate change mitigation, governance and efficiency of policy instruments.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Percentage of population using solid fuels for cooking	Measures access to modern energy services. Solid fuels include biomass fuels, such as wood, charcoal, crops or other agricultural waste, dung, shrubs and straw, and coal. A proxy for indoor air pollution.	CSD	Associated with health issues, increased mortality, deforestation, and land degradation; is central to poverty alleviation and has strong gender linkages.
Share of households without electricity or other modern energy service	Measure of the share of households (urban and rural), without access to electricity, using 'traditional' non-commercial energy options, such as fuel wood, crop wastes, and dung, as primary fuel for cooking and heating.	CSD	Limits economic and human development and climate change adaptive capacity, thus maintaining poverty. Linked to gender issues, education as it affects studying opportunities, and poverty.
Concentration of SO <sub>x</sub> /NO <sub>x</sub> /PM <sub>10</sub> /PM <sub>2.5</sub> in ambient air	Measure state of environment in terms of air quality by the concentration of SO <sub>x</sub> /NO <sub>x</sub> /Particulate Matters in the air.	OECD CSD	Affects health causing e.g. respiratory diseases. Links to environment, and business and trade, and is generally more of a risk factor in urban areas.
Disability-adjusted life years (DALYs) due to indoor air pollution or outdoor air pollution (women/men)	The DALY can be used as an indicator for environmental risk factors e.g. indoor air pollution to human health. DALY measures the overall disease burden, and is the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability.	WHO	Links to respiratory diseases and other health issues, education, and gender issues.
<b>Market Development</b>			
Candidate or compliant status of the Extractive Industries Transparency Initiative, EITI (yes/no; year),	Process indicator indicating the political will and capacity to improve transparency of revenues from oil, gas and minerals. To become a candidate country, the country must meet specified criteria. To achieve compliant status, the country must be validated according to a global standard, including making EITI report publicly available.	EITI	Linked with governance and corruption, security, human rights, international trade, natural resource depletion, environment and climate change.
Exports of environmentally sensitive commodities	Measures the amount of export of environmentally sensitive commodities (such as timber from rainforest) or as a share of total export.	EU	Links to natural resource depletion, environmental degradation and climate change, as well as poverty, human rights and governance.
Value of fish export (US\$/year) or share of fish export of total export (%)	Measures the value of a country's fish export in monetary terms or as a share of total export. Indicates the country's dependency on fishery resources.	FAO	Linked with natural resources, economic development, governance, efficiency of policy instruments, poverty reduction and food security, and can be affected by climate change, and pollution. Also linked to regional issues as the fish stocks are dependent on other countries fishing yields.
Fertilizer use efficiency	Measures the extent of fertilizer use recovery in agriculture per crop unit, revealing the environmental pressure from inappropriate fertilizer application.	CSD	Links to health, food security, environmental degradation, and climate change

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Use of agricultural pesticides	Reflecting the intensification of agriculture	CSD	Links to health, food security, environmental degradation, and climate change.
Ambient concentration of chemical compounds in air, land, or water	Measure of the concentration of chemical compounds, such as lead, mercury, freons, and other toxic or bio-accumulating compounds, in air, land, and water.	CSD	Links to health, environmental degradation and climate change. Could be linked to industrial disasters or chemical spills.
<b>Environment</b>			
Natural resource share of GDP/year; or Natural resource share of total export/year	Measure of a country's dependence on (renewable and non-renewable) natural resources, and thus a proxy for vulnerability if these resources are depleted. Natural resources defined for each country (minerals, crude oil, natural gas, timber, water, fish, and soil, etc.). It is possible to include tourism revenues based on natural resources, however they are seldom included.	WB	Strong link to poverty reduction and economic development, indicates vulnerability to natural resources depletion. Links to governance, conflicts, and market development. Some natural resources are vulnerable to climate change.
Adjusted Net Savings (ANS)	ANS is a proxy sustainability-indicator, building on the concept of green national accounts, which measures the true rate of savings in an economy after taking into account investments in human capital, depletion of natural resources, and pollution damages.	CSD WB	Relates to natural resource dependence, economic development, and poverty reduction.
Corruption perception index (CPI)	The CPI ranks more than 150 countries in terms of perceived levels of corruption, as determined by expert assessments and opinion surveys. Corruption is a major driving force of environmental and natural resource degradation.	TI	Strongly linked with governance, democratic development, human rights, and business environment. Links to poverty.
Candidate or compliant status of the Extractive Industries Transparency Initiative, EITI (yes/no; year),	Process indicator indicating the political will and capacity to improve transparency of revenues from oil, gas and minerals. To become a candidate country the country must meet specified criteria. To achieve compliant status, the country must be validated according to a global standard, including making EITI report publicly available.	EITI	Linked with governance and corruption, security, human rights, international trade, natural resource depletion, environment and climate change.
<b>Biodiversity/Ecosystem Services</b>			
Total number of known species (mammals, amphibians, birds, fish)	Total number of known species (mammals, amphibians, birds, fish). Sustaining ecosystems and biodiversity is crucial for human well being.	WB OECD	Links to poverty reduction, health, , economic development, environmental degradation and climate change.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Changes in threat status of species	Measures the number of species in each category of the IUCN Red List (Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild, Extinct)	MDG OECD CSD IUCN	Sustaining ecosystems and biodiversity is crucial for human well being. Links to governance, resilience to climate change, poverty reduction, health issues, and economic development.
Nationally protected areas (percent of total land area)	Protected areas are essential for maintaining ecosystem diversity in countries and ecological regions.	MDG OECD CSD	Links to poverty reduction and governance.
Number of species per cultivated area	Measure species richness/biodiversity (number of species, crops, trees) per area agricultural or forest land. A low number of species indicates increased vulnerability to external shocks.	CBD	Related to environmental sustainability, poverty reduction, health, economic development and climate change.
<i>Climate change mitigation</i>			
Rate of deforestation (percent; trend)	Measures the rate of deforestation. Fast decreasing forest area indicates unsustainable practices in the forestry and agricultural sector.	WB	Linked to climate change mitigation (and adaptation), poverty reduction, gender, food security, conflict and security, human rights, health, and education.
Carbon dioxide emissions (CO <sub>2</sub> ) metric tons of CO <sub>2</sub> per capita or CO <sub>2</sub> emissions per unit of GDP (kg/2000 PPP \$ GDP)	Measures carbon dioxide emissions due to human activity per capita or per unit of GDP	MDG OECD	CO <sub>2</sub> emissions contribute to climate change and have negative effects on economic, social, and environmental conditions in most countries of the world.
Share of renewable energy sources in total energy use	Measure progress towards energy savings and reducing GHG emissions. The share of renewable energy sources is a central indicator for climate change mitigation.	CSD UNDP	Strong links to economic development, poverty reduction, climate change mitigation, infrastructure, and efficiency of policy instruments.
National subsidies to, or taxes on, fossil fuel for transportation (yes/no; trend)	A process indicator indicating if a country is using policy instruments to promote sustainable development. Fuel taxation is an instrument for the management of emissions from the transport sector, while fuel subsidies generally promotes unsustainable development	n/a	Linked with governance, evidence-based policy making and use of policy instruments. Closely linked to climate change mitigation, (urban) air pollution, and health.
Nationally Appropriate Mitigation Actions (NAMA) developed and/or implemented (yes/no; year); or Low carbon development paths	A process indicator of general climate change mitigation awareness and capacity of government.	UNFCCC	Proxy of general climate change mitigation awareness and capacity of the government, and is linked to governance, infrastructure, health, economic development and (energy) efficiency.
All-government climate change strategies (mitigation and adaptation) (yes/no; year)	A process indicator of general climate change awareness and capacity of government.	n/a	Proxy of general climate change awareness and capacity of the government, and is linked to governance, economic development, poverty, health, education, infrastructure, and disaster risk reduction.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Obligations under the UNFCCC process are met (yes/no; year)	A process indicator of general climate change awareness and capacity of the government to meet its international obligations.	UNFCCC	Proxy of general climate change awareness and capacity of the government, and is linked to governance and international commitments.
Number of market based mechanisms for mitigation (e.g. CDM projects, REDD projects <sup>35</sup> )	A process indicator measuring the amount of market based mechanism projects e.g. Clean Development Mechanism (CDM) or Reduced Emissions from Deforestation and Forest Degradation (REDD) projects in the specific country. CDM stimulates sustainable development and emission reductions.	UNFCCC	Links to poverty reduction, environmental degradation, climate change mitigation with adaptation co-benefits, and market development.
<i>Climate change adaptation</i>			
Number of hydro-meteorological stations	A measure of new or functioning hydro-meteorological stations that can provide climatic and hydrological information, which is a necessary input to adapt to climate variability and change. Increased resilience and adaptive capacity could be advanced by information on current climate variability and long-term climate trends.	WB	Links to climate change adaptation, risk reduction, human and economic development, human rights, food security, health, and general poverty reduction.
Human Development Index, HDI	Measures social and economic development, which combines indicators of life expectancy, educational attainment, and income. HDI encompass health, education and economic aspects all of which are important for reducing vulnerability to environmental and climate changes. HDI can therefore be used as an indicator for adaptation and strengthened resilience.	UNDP	Measures social and economic human development. Strongly linked to poverty alleviation and can in some cases be used as a proxy for climate change adaptation capacity.
Proportion of people living in extreme poverty (women/men)	Measure of poverty in terms of income. Strong links between poverty and climate change vulnerability as poor people are less resourceful and have smaller means to handle climate change impacts and other external shocks.	MDG	Poverty and income inequalities obstruct human development, security, and climate change adaptation capacity; in short it obstructs sustainable development.
Total number of victims (killed or affected) of weather-related disasters (women/men; trend)	Measure total numbers of victims killed or affected by weather-related disaster is thus an indicator for vulnerability to disasters that can be exacerbated by climate change. In case of limited disaster preparedness, weak resilience and inadequate adaptation efforts more people will be affected.	EM-DAT	Climate change is expected to increase hydrological, meteorological, climatological, and biological disasters, which have a large negative effect on poverty and economic growth, affecting health, human rights and security, education, governance, and the environment.

<sup>35</sup> As REDD projects are still on a pilot-level, gathered statistics for REDD projects are currently not accessible. REDD statistics will most likely be easier to access in the future.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Climate vulnerability assessment carried out (yes/no; trend)	Indicating if vulnerability assessments have been carried out to identify vulnerable regions, sectors and populations. Would also be good to assess if vulnerability information is used in planning.	n/a	Linked to climate change vulnerability and adaptive capacity, human rights, poverty, human and economic development, health, disaster risk reduction, and security.
Long-term investments screened for vulnerability to climate change (yes/no)	Indication of general awareness and capacity to adapt to climate change.	n/a	Linked to climate change vulnerability and adaptive capacity, infrastructure and economic development, disaster risk reduction, as well as human rights, poverty, human development, health, and security.
Number of sectoral, national or transnational development plans where climate change adaptation is integrated	A process indicator of general climate change adaptation awareness, and the capacity of government. Key sectors differ between countries but could include water, agriculture, forestry, fishery, urban planning, etc.	n/a	Proxy of general climate change adaptation awareness and capacity of the government, and is linked to governance, economic and human development, poverty, health, education, infrastructure, and disaster risk reduction.
National policies, plans and strategies improved on basis of environment and climate change research	A process indicator that measures the demand for evidence-based policy-making, the demand to apply scientific research results in policy making and be informed about risks.	n/a	Linked to governance, democracy and human rights. Environmental and climate change research can link strongly with poverty reduction, economic development, health, agriculture (including forestry and fishery), spatial planning, and also with conflict, peace, disaster risks reduction, security, etc.
National Adaptation Program of Action (NAPA), or National Adaptation Plans developed and/or implemented (yes/no; year)	A process indicator of general climate change adaptation awareness and capacity of government.	UNFCCC	Proxy of general climate change adaptation awareness and capacity of the government, and is linked to governance and democracy, health, disaster risk reduction, and poverty reduction.
Institutions, budgets and staffing dedicated to climate change adaptation in place at appropriate levels (yes/no; trend)	Indication of institutional capacity to manage the adverse consequences of, and adapt to, climate change.	MRC	Linked to governance issues, and general awareness, capacity and will of the government to improve climate change adaptation. Also linked to environmentally sustainable development, poverty, human rights and security, agriculture, fishery, forestry, and attainment of many of the MDGs.
National coordination mechanism exists for adaptation.	Indication of ability to manage adaptation in a coordinated way and take advantage of synergies between ministries.	Bellagio framew.	Linked to governance issues, and general awareness, capacity and will of the government to improve climate change adaptation
<b>Agriculture and Forestry</b>			
<i>Land and agriculture</i>			
Land degradation (percent; trend)	The share of land which due to natural processes or human activity is no longer able to sustain properly an economic function and/or the original ecological function. Degraded land includes land affected by soil erosion, deterioration of the physical, chemical and biological or economic properties of soil and/or long-term loss of natural vegetation.	CSD	An impediment to sustainable development in general, and to sustainable agriculture in particular. In many developing countries it is a major cause of poverty and further environmental damage due to overuse of national resources. Thus linked to food security, poverty, and human development.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Land-use change	Measures changes in the distribution of land uses within a country over time and provides information on changes in the productive or protective uses of the land resource to facilitate sustainable land use planning and policy development.	OECD CSD	May lead to changes in biodiversity and agricultural productivity, which is linked to employment opportunities, economic development, climate change, disaster risk reduction, gender and poverty reduction.
Land affected by desertification (per cent)	The proportion of land in dry lands that is affected by desertification.	CSD	Links to food security, conflict, climate change, economic development, gender, research, and poverty reduction.
Intensity of use of water in agriculture	Water is crucial for agricultural productivity. Measures volume of water per unit of agricultural value produces.	EU	Links to food security, water stress, climate change economic development, gender, and poverty reduction.
Agriculture share of GDP/year; or Agriculture share of total export/year	Measure of a country's dependence on agriculture and is thus a proxy for vulnerability to land degradation and resource depletion.	WB	Strong link to poverty reduction and economic development, land degradation and environment. Links to gender, human rights, job opportunities, food security as well as governance and market development. Vulnerable to climate change.
Variability in yields or income over a multi-year period.	Measure of how much the agricultural yields, or the income of agriculturalists, change from year to year. Should be analysed in conjunction with other variables, such as rainfall variability, to improve understanding of vulnerability to climate change and adaptive capacity.	WB	Links to climate change adaptation capacity and agricultural productivity, food security, poverty reduction and human development.
Agricultural productivity per hectare	Measures the productive capacity of soils and efficiency in utilisation with other inputs (water, fertilizers, labour etc.).	FAO	Links to food security, climate change, economic development, gender, research, education, and poverty reduction.
Fertilizer use efficiency	Measures the extent of fertilizer use recovery in agriculture per crop unit, revealing the environmental pressure from inappropriate fertilizer application.	CSD	Links to health, food security, environmental degradation, and climate change
Use of agricultural pesticides	Reflecting the intensification of agriculture	CSD	Links to health, food security, environmental degradation, and climate change.
<i>Forest</i>			
Proportion of land covered by forest (percentage)	Measures the share of forested areas of the total land area and allows for monitoring changes over time. Fast decreasing forest area indicates unsustainable practices.	MDG WB OECD CSD	Linked to poverty reduction, gender, food security, conflict and security, human rights, health, climate change, and education.
Rate of deforestation	Measures the rate of deforestation. Fast decreasing forest area indicates unsustainable practices in the forestry and agricultural sector.	WB	Linked to climate change mitigation (and adaptation), poverty reduction, gender, food security, conflict and security, human rights, health, and education.

Examples of Indicators by sector	Definition, description, or purpose	Indicator proposed/ used by	Links with other cross-cutting themes or sectors
Forestry share of GDP/year; or Forestry share of total export/year	Measure of a country's dependence on forestry (timber and non-timber forest products) and is thus a proxy for vulnerability to deforestation and forest degradation.	WB	Strong link to poverty reduction and economic development, land degradation and environment. Links to gender, human rights, job opportunities, food security as well as governance and market development. Vulnerable to climate change.
<i>Freshwater systems, Oceans, Seas and Coasts</i>			
Integrated Coastal Zone Management Plan (yes/no: year)	A process indicator of general awareness and capacity of the government to manage coastal zones in an integrated and sustainable way.	n/a	Linked with food security, environment and climate change, governance and human rights, disaster risk reduction, and regional cooperation.
Protected marine area (percentage of total area)	The share of national marine area that has been reserved by law or other effective means to protect part or the entire enclosed environment. Protected marine areas are essential for maintaining marine ecosystem diversity.	MDG CSD IUCN	Linked to poverty reduction, economic development, empowerment of women, improved health and stronger local governance.
Proportion of fish stocks within safe biological limits	Provides information on the state of exploitation of fishery resources at the global, regional, and national levels, and measures the level of sustainable production from capture fisheries, an important element of food security. If not over-exploited, possible levels are "underexploited", "moderately exploited" or "fully exploited".	CSD	Linked to poverty reduction, food security, health, economic development, and governance.
Fishery share of GDP/year; or Fishery share of total export/year	Measure of a country's dependence on fisheries and is thus a proxy for vulnerability to depletion of fishery resources.	WB	Strong link to poverty reduction and economic development, land degradation and environment. Links to gender, human rights, job opportunities, food security as well as governance and market development. Vulnerable to climate change.

**Bellagio Framework:** World Resources Institute et al.: [http://pdf.wri.org/working\\_papers/bellagio\\_framework\\_for\\_adaptation.pdf](http://pdf.wri.org/working_papers/bellagio_framework_for_adaptation.pdf)

**CIRI:** Cingranelli-Richards (CIRI) Human Rights Dataset: <http://ciri.binghamton.edu/index.asp>

**CBD:** Convention on Biological Diversity: <http://www.cbd.int/indicators/testedindicators.shtml>

**CSD:** Commission on Sustainable Development: [http://www.un.org/esa/dsd/dsd\\_aofw\\_ind/ind\\_index.shtml](http://www.un.org/esa/dsd/dsd_aofw_ind/ind_index.shtml)

**EITI:** Extractive Industries Transparency International: <http://eiti.org/>

**EM-DAT:** The International Disaster Database, Center for research on the epidemiology of disasters (CRED): <http://www.emdat.be/database>

**EU:** European Union: <http://themes.eea.europa.eu/indicators>

**FAO:** Food and Agriculture Organization of the United Nations: <http://www.fao.org/corp/statistics/en/>

- GWP:** Global Water Partnership: <http://www.gwpforum.org/>
- HIK:** Heidelberg Institute for International Conflict Research. Conflict Barometer: <http://hiik.de/en/>
- IUCN:** International Union for Conservation of Nature: [http://www.iucn.org/about/work/programmes/species/red\\_list/](http://www.iucn.org/about/work/programmes/species/red_list/)
- JMP:** Joint Monitoring Programme: <http://www.wssinfo.org/definitions/introduction.html>
- MDG:** Millennium Development Goals: <http://millenniumindicators.un.org/unsd/mdg/Default.aspx>
- MRC:** Mekong River Commission: <http://www.mrcmekong.org/>
- OECD:** Organisation for Economic Co-operation and Development: <http://stats.oecd.org/source/>
- Reporters without Borders:** <http://en.rsf.org/>
- TI:** Transparency International: [http://www.transparency.org/policy\\_research/nis/methodology](http://www.transparency.org/policy_research/nis/methodology) and [http://www.transparency.org/policy\\_research/surveys\\_indices/cpi/2009](http://www.transparency.org/policy_research/surveys_indices/cpi/2009)
- UNDP:** United Nations Development Program: <http://hdr.undp.org/en/statistics/>
- UNFCCC:** United Nations Framework Convention for Climate Change: <http://cdm.unfccc.int/Statistics/index.html>
- UNISDR:** United Nations International Strategy for Disaster Reduction: <http://www.unisdr.org/disaster-statistics/introduction.htm>
- WSSD:** World Summit on Sustainable Development: <http://www.un.org/events/wssd/>
- WB:** World Bank: <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20535285~menuPK:1192694~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html>
- WHO:** World Health Organization: <http://www.who.int/research/en/>

# Examples of other actors and sets of Environment and Climate Change indicators

**Danida:** Danida has a number of brief technical papers on the issue of monitoring and indicators in Danish bilateral aid. The technical papers aim to present some ideas for what could be relevant indicators in various sectors and thematic areas, including environment and natural resources management.

**DFID:** DFID has currently, in collaboration with Sida and other donors, initiated a process to identify project – and programme level climate change adaptation indicators to measure output and outcomes.

**EU:** The forthcoming EU Guidelines on the Integration of Environment and Climate Change in Development Cooperation includes an indicative and non-exhaustive list of general environmental issues in relation to the nine current EC development co-operation areas<sup>36</sup>, including environmental indicators for each co-operation area. EU also uses specific environmental indicators provided and monitored (in Europe) by the European Environmental Agency<sup>37</sup>, indicators provided by OECD<sup>38</sup>, the MDG indicators (with special attention to MDG 7), and the CSD indicators.

**FAO:** The FAO Statistical Database FAOSTAT is an on-line multilingual database covering statistics on agriculture, nutrition, fisheries, forestry, food aid, land use and population for some 200 countries. The national version of FAOSTAT, CountrySTAT, is being developed and implemented in a number of target countries, primarily in sub-Saharan Africa. AQUASTAT is FAO's global information system of water and agriculture which provides users with comprehensive statistics on the state of agricultural water management across the world, with emphasis on developing countries and countries in transition.

**OECD:** Together with its member countries, the OECD has established a common approach and framework for developing, measuring and using environmental indicators: the OECD Core Set and its core environmental indicators (CEI); several sets of sectoral environmental indicators (SEI) (e.g. transport, energy); and a small set of key environmental indicators (KEI). The key indicators are updated every year and are available for free. Furthermore, every year OECD publishes the OECD Factbook, which provides a global overview of today's

36 The nine areas are: (i) Governance, democracy, human rights and support for economic and institutional reforms, (ii) Trade and regional integration, (iii) Infrastructure, communications and transport, (iv) Water and energy, (v) Social cohesion and employment, (vi) Human development (incl. health, education, culture, and gender equality), (vii) Rural development, territorial planning, agriculture and food security, (viii) Environment and sustainable management of natural resources, (ix) Conflict prevention and State fragility.

37 DPSIR system, see <http://themes.eea.europa.eu/indicators>

38 OECD (2004) *OECD Key Environmental Indicators*, OECD Environment Directorate: Paris.

major economic, social and environmental indicators, in a range of user-friendly formats.

**United Nations Division for Sustainable Development:** The United Nations Division for Sustainable Development presented in 2007 a third, revised set of sustainable development indicators prepared for the Commission for Sustainable Development (CSD). The CSD list of indicators contains 96 indicators, including a core set of 50 indicators. A guidelines and a methodology sheet are available as a reference for all countries to develop national indicators of sustainable development.

**United Nation Statistics Division:** The United Nations Statistics Division has a website presenting country specific Millennium Development Goal (MDG) indicators. The site presents the official data, definitions, methodologies and sources for more than 60 indicators to measure progress towards the MDGs. The website also presents links to related sites and documents and give constantly updated news on the ongoing activities on MDG monitoring.

**World Bank:** Every year the World Bank publishes the Little Green Data Book which contains country specific environmental indicators for the sectors agriculture, forest and biodiversity, energy, emissions and pollution, water and sanitation, environment and health, and green accounting. The 2009 Little Green Data Book focuses on urban areas and the environment, exploring how cities and climate change are affecting the way we live and how good public policies can improve prospects for future generations.



Sida works according to directives of the Swedish Parliament and Government to reduce poverty in the world, a task that requires cooperation and persistence. Through development cooperation, Sweden assists countries in Africa, Asia, Europe and Latin America. Each country is responsible for its own development. Sida provides resources and develops knowledge, skills and expertise. This increases the world's prosperity.

Environmental and  
Climate Change Indicators

GLOBAL ISSUES



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