

Indicators for Environmental Monitoring in International Development Cooperation

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Indicators for Environmental Monitoring in International Development Cooperation

Including examples for sectors
covered by the Sida EIA guidelines

This report is produced in cooperation between Sida's Environmental Policy Division and the Swedish EIA Centre at the Swedish University of Agricultural Sciences in Uppsala. The text has been produced by Lisa Segnestam, at Stockholm Environment Institute (SEI), with contributions by Ann Jennervik, Gun Lövblad and Markus Åhman at the Swedish Environmental Research Institute Ltd. The development of indicators is a work in progress and therefore this publication will be a living document

Table of Contents

| | |
|---|-----------|
| Introduction..... | 1 |
| Sida, the counterpart and local stakeholders..... | 1 |
| Selecting indicators for project monitoring..... | 3 |
| Considering cause and effect links..... | 3 |
| Necessary indicator features..... | 4 |
| <i>Direct link to potential environmental impacts.....</i> | <i>4</i> |
| <i>Relevance to the whole project cycle.....</i> | <i>5</i> |
| <i>Clear definitions.....</i> | <i>7</i> |
| <i>Realistic collection or development costs.....</i> | <i>8</i> |
| <i>Focus on indicator developer and user.....</i> | <i>8</i> |
| Data collection..... | 9 |
| Interpreting the results..... | 10 |
| Indicators according to sectors..... | 12 |
| Agriculture (including livestock farming) and forestry..... | 12 |
| Water-related activities..... | 14 |
| Dams..... | 16 |
| Activities related to coastal zones..... | 18 |
| Transport and communication..... | 21 |
| Waste management..... | 23 |
| Mining activities..... | 24 |
| Energy..... | 26 |
| Industry..... | 27 |
| Tourism..... | 29 |
| Health and medical care..... | 30 |
| Humanitarian assistance..... | 32 |
| Education sector..... | 33 |
| Institutional development and capacity building..... | 35 |
| Research..... | 35 |
| Private sector development..... | 36 |
| | |
| Annex 1. Projects reviewed in the selection of indicators..... | 38 |
| Annex 2. Additional environmental indicator information..... | 39 |
| References..... | 40 |

List of figures, boxes, examples and tables

| | |
|---|----|
| Example 1. Environmental performance monitoring..... | 1 |
| Example 2. Efficient data collection..... | 9 |
| Example 3. Interpreting monitoring results | 10 |
| Figure 1. Elements of an environmental issue..... | 3 |
| Figure 2. Monitoring environmental impacts of a project – a framework..... | 6 |
| Box 1. Indicators and the EIA process..... | 7 |
| Box 2. Sector activities with potentially high impact on the coastal environment..... | 19 |
| Table 1. Proposed indicators – agriculture and forestry | 13 |
| Table 2. Proposed indicators – water-related activities..... | 15 |
| Table 3. Proposed indicators – dams | 17 |
| Table 4. Proposed indicators – activities related to coastal zones..... | 19 |
| Table 5. Proposed indicators – transport and communication..... | 22 |
| Table 6. Proposed indicators – waste management..... | 23 |
| Table 7. Proposed indicators – mining activities..... | 25 |
| Table 8. Proposed indicators – energy | 26 |
| Table 9. Proposed indicators – industry..... | 28 |
| Table 10. Proposed indicators – tourism | 29 |
| Table 11. Proposed indicators – health and medical care | 31 |
| Table 12. Proposed indicators – humanitarian assistance | 32 |
| Table 13. Proposed indicators – education | 34 |
| Table 14. Proposed indicators – institutional development and capacity building | 35 |
| Table 15. Proposed indicators – research | 36 |
| Table 16. Proposed indicators – private sector development | 37 |

Acronyms and abbreviations

EIA – Environmental Impact Assessment

LFA – Logical Framework Approach

Introduction

According to Sida's *Guidelines for Environmental Impact Assessments in International Development Cooperation* (Sida, 1998), "Sida requires monitoring of the actual environmental impact of the project and that planned measures have really been taken." To be able to fulfill this requirement, it is necessary to work with indicators of environmental change. Indicators are bits of information that summarize the characteristics of systems or highlight what is happening in a system. They simplify complex phenomena, and make it possible to gauge the general status of a system. It is important to note that *indicators are only supposed to indicate various trends, not reveal the whole truth*. An indicator is thus seldom "perfect" in the sense of it revealing all information needed for decisions to be taken. Rather it provides signals for further investigations.

In the project context, environmental indicators are used as a management tool to help the project manager predict environmental change, mitigate or promote those changes, and follow the development in order to be able to manage the project in an optimal way from an environmental perspective. For that reason, the indicators chosen need to be project specific. The "method" to identify and develop indicators is therefore more important in the project context since generalized indicators are difficult to establish. These guidelines do include examples of indicators, however, in order to give some ideas about relevant indicators.

The overall objective of environmental performance monitoring is to identify predicted and unanticipated changes to the environment brought about by a project. Example 1 presents a number of elements that an environmental performance monitoring program should consist of in order to be effective.

Example 1. Environmental performance monitoring

An effective environmental performance-monitoring program should consist of the following elements:

- Monitoring objectives;
- Description of performance indicators, which provide linkages to impacts and mitigation measures identified in the EIA;
- Description of parameters to be measured, methods to be employed, sampling locations, frequency of measurements, and definition of targets to aim for or thresholds that will signal the need for remedial actions (where appropriate);
- Institutional responsibilities, timing and timescales for monitoring; and
- Reporting arrangements (to the regulatory authorities, Sida, and the implementing party).

Source: Adapted from World Bank (1996)

These guidelines are a revised version of the guidelines first set out in (Segnestam, 2002). The principal revision is an inclusion of examples of indicators for all sectors covered in the new Sida EIA guidelines (Sida, 2002).

Sida, the counterpart and local stakeholders

In the case of Sida projects, the project owner is, in large, responsible for identifying indicators and developing a monitoring scheme. However, since Sida is responsible for making sure an Environmental Impact Assessment (EIA) is part of the project

proposal, and the indicators should be part of that process, a collaboration between Sida and the project owner is preferable¹. The role of Sida staff could then be kept to one of quality assurance (similar to their overall responsibility in the performance of an EIA). To ensure this quality assurance, Sida staff could ask for either the compiled indicators or the monitoring results that forms each indicator to be reported first in relation to the EIA, and then, for example, semi-annually or annually as a general follow-up of the project. In the ordinary project cycle, the indicators should be monitored in each external evaluation, like pre-assessments, the mid term review, project completion report, and also in thematic reviews of a cross cutting theme of several projects. More details on the linkage between indicators and the project cycle, and on data collection are provided in the sections below.

In practice institutional support will be needed in most cases to be able to fulfill the monitoring tasks. The need for financial assistance to achieve this has to be assessed case by case. Nevertheless, it is important that the counterpart is taking on a central role and responsibility in the project monitoring. It has happened more than once that recipient authorities are totally unaware of a donor financed project, for which they have supervisory tasks, and that the donor organization instead has established monitoring groups mainly manned by international consultants. In addition to this, the counterpart capacity for environmental monitoring in general, and relevant and appropriate indicators in particular, will gradually be developed, which will further the possibilities of achieving a sustainable development.

In addition to the roles and responsibilities of Sida and the counterpart, there is a need for local input when indicators are being chosen. *The selected indicators should be easy to understand and use for all parties involved.* Local stakeholders should be consulted during the first local hearing and scoping phase of the EIA. This consultation is also a good opportunity to identify existing monitoring initiatives (relating to other projects or activities), and to discuss the division of monitoring responsibilities. Local stakeholders should, furthermore, be continuously informed (and involved in the monitoring when relevant) about monitoring results as well as any proposed changes in project design as a result of the monitoring.

These guidelines provide practical guidance on how indicators are to be used in Sida project planning, implementation and evaluation. They consist of two parts: the first part provides a background on the purpose, timing, structure and design of the monitoring and indicators. It also provides the reader with a practical guidance on how to identify and develop indicators for a specific sector. The second part offers a limited set of indicators divided by five categories – agriculture, water-related activities, health, education, and institutional development and capacity building. These lists of indicators are not meant to be exhaustive, but do strive to be relevant for the majority of projects within respective sector. However, if the indicators are felt to be irrelevant for a specific project, the guidance provided in the following section works as a basis in identifying and selecting other indicators that may be more appropriate.

¹ Definitions of parties involved are according to those used in Sida (1997).

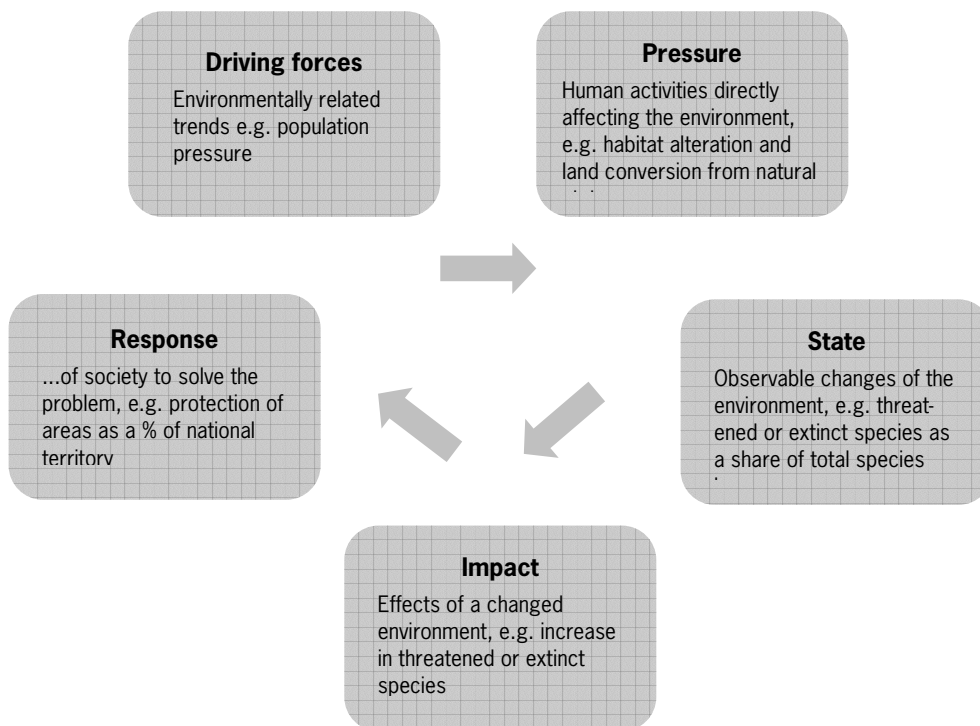
Selecting indicators for project monitoring

Before presenting the lists of proposed indicators, a few introductory words on the process surrounding the identification, development and use of indicators are necessary in order to put the proposed indicators in the right context. This section introduces the task manager to the most fundamental “rules” in selecting indicators for project monitoring and assessment. These steps should be followed in the identification of more, other or new indicators for the sectors that Sida is actively working with. The next section looks at the design and implementation of data collection, and the interpretation of monitoring results, which are also vital parts in a well-functioning monitoring system.

Considering cause and effect links

The main purpose of working with indicators is to narrow down a large amount of information to a selected set of parameters that can signal to a project manager that an environmental change is occurring as a result of the project. For the signals transmitted by the indicators to be correct, and not misleading, it is important that the cause and effect links relevant to the project have been well-established. Therefore, a thorough analysis of the causal links within the area that the project is affecting² is an important first step in the identification of indicators.

Figure 1. Elements of an environmental issue



In the analysis of cause and effect links, an environmental aspect can be divided into five different elements (see Figure 1):

² Note that this area may very well extend beyond the direct project area.

- ◆ An underlying trend which is driving the environmental problem (a *driving force*)
- ◆ The underlying trend that causes a change in behavior, which puts a pressure on the environment (a *pressure*)
- ◆ The pressure from the behavioral change that results in a transformed environmental state (a *state*)
- ◆ The changes in the environmental state that result in impacts on the environment and people (an *impact*)
- ◆ The final part of an environmental aspect is the response by people. The response can target any of the above parts, but is preferably aiming for the underlying trend, or at least the pressures those trends are causing (a *response*).

Indicators could be used to monitor all of these parts and in that way ensure that all parts of an environmental aspect are captured in the analysis. In project monitoring and assessment, it is especially the first four, however, that are useful.³ The monitoring of those could aid in understanding the linkages within the project area and thus help establish causal links.

It is important, however, to remember that many causal links have already been established through previous research and experience (for example, the link between intensive agriculture and the potential for soil erosion has been observed on numerous occasions). A number of indicators therefore belong to the category for which the **causal links have already been established**. In order to keep the number of indicators at a manageable level, the indicators that are proposed for the monitoring of projects in the health, education or agricultural sectors belong to this category of indicators. That is, the indicators monitor issues identified in the checklists in the *Guidelines for Environmental Impact Assessments in International Development Cooperation*. Any checklists like these inherently assume certain causal links – otherwise it would not be possible to ask specified questions related to potential environmental impacts of projects.

Necessary indicator features

A limited set of indicators is normally more effective than a large number of indicators. Too many indicators easily becomes overwhelming, both in development and interpretation. It is also not uncommon that indicators are correlated and several of them could therefore most likely be left out (see example to the right). The second important step in indicator selection is therefore to narrow down the set of indicators according to a number of selection criteria, which focus the selection on indicators with the following features.

Direct link to potential environmental impacts

The main purpose of the selected environmental indicators is to enable the monitoring of the project's direct and indirect

Example of indicators capturing the same environmental impact:

- Proportion of households with access to sanitation services (%)
- Infant mortality (%)

A large proportion of the infants dying do so due to diarrhoea, which in turn is commonly a result of lack of sanitation. Therefore, both of these indicators indicate a common trend and problem.

³ The monitoring of the responses is often redundant in project monitoring and assessment since any proposed mitigation measures commonly are of a straightforward design, need to be implemented as soon as possible, and should be recommended by the monitoring agency.

environmental impacts. It is important to remember that such impacts may be both negative and positive. However, the monitoring (and control) of adverse environmental impacts may be considered as more important since they may have a negative effect on people's welfare and livelihoods and, in the worst case, risk becoming irreversible.

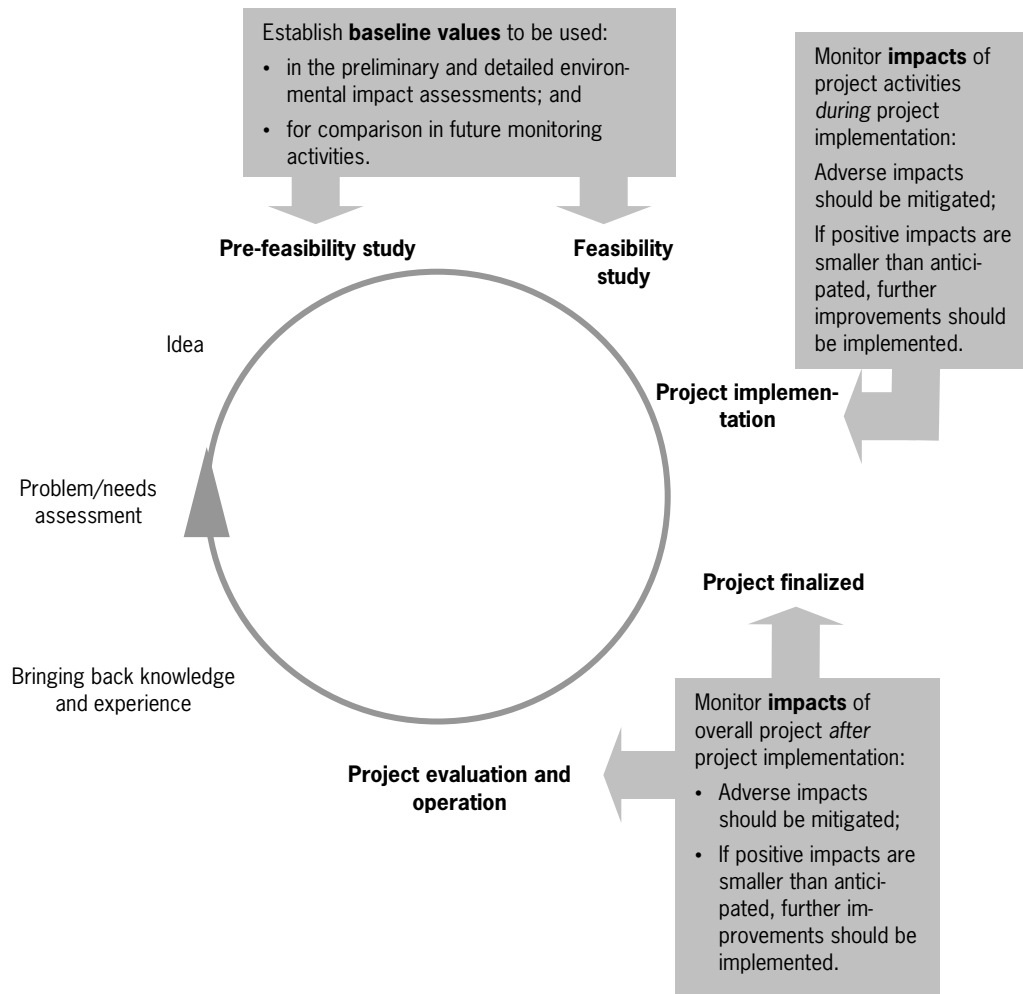
Hence, for an indicator to be purposeful, it has to be able to **capture the potential environmental impacts of the project**. The EIA, and the above discussed analysis of cause and effect links, are therefore vital instruments in defining potential impacts for which indicators can be selected. Note, however, that the indicators do not necessarily have to be impact indicators in order to capture potential impacts of project activities. As long as the cause and effect links are established, it is possible to select either a pressure indicator to monitor the cause behind the observed impact, or an impact indicator to monitor the actual effect. An example of this is the indicator "land use change", which is an indicator of a pressure on the natural system. This pressure can result in several different impacts, such as soil erosion, loss in biodiversity, and migration. By monitoring land use change, one can therefore obtain a first signal (or indication) of a change that should be further analyzed and, perhaps, mitigated.

The checklists in the guidelines could be used as a first guidance on potential environmental impacts of projects within the various sectors since they list a number of aspects to consider in an EIA.

Relevance to the whole project cycle

To enable a comparison of project impacts over time (that is, a comparison between the baseline that is to be established in the initial EIA and coming monitoring results), the **selected indicators should be relevant throughout the entire project cycle**, as defined in the Logical Framework Approach (LFA) analysis (Sida, 1996a). As long as the indicators are relevant throughout the project cycle, they are also hopefully relevant after Sida has withdrawn.

Figure 2. Monitoring environmental impacts of a project – a framework



The timing of the monitoring is thus closely linked to the project’s elements and its development. These elements and the associated monitoring are illustrated in the framework in Figure 2. Note, however, that the last element in the LFA structure – development objectives – is not included in the framework since the potential environmental impacts of that element are expected to be captured in the monitoring of overall project results.

The close link between a project’s elements and development and the monitoring implies that the indicators need to be measured at three different points in time in order to be purposeful:

1. **During project planning.** Before the project starts, it is necessary to establish a **baseline value** for the indicators. Without a baseline value, the indicator values detected as the monitoring continues cannot be compared to anything meaningful; it is not possible to interpret whether things have improved or become worse. The values also play a role in the EIA procedure preceding the implementation of a project (see Box 1)

Box 1. Indicators and the EIA process

Indicators are recognized as a valuable tool in EIA procedures – the use of them will support the performance of EIA's before a project proposal is approved from the environmental perspective. The EIA process can also help to select appropriate environmental indicators through a cause and effect analysis, which can aid in the identification of possible impacts of the project (Danida, 1999).

Currently, the process of performing an EIA is commonly not long enough to collect more than one data point for any of the proposed indicators. While several data points are preferable to enable comparison, to have a baseline value on which the EIA can be partly based is an improvement to the current manner with which the Sida's EIAs are carried out. Considering that the proposed indicators belong to the category of indicators whose relevance is well established for the context, a first monitoring result gives some indication on the state of the environment already before the project is implemented. If that state is assessed to be less than good based on the monitoring value, the project may have to include some measures that can help mitigate those aspects. The basic assumption has to be that any value that future monitoring results in, should not be worse than the baseline value.

2. **During project implementation.** The project's contribution to a change in environmental performance, both directly and indirectly, compared to the established baseline values must be measured when the project is ongoing so that there is time to modify the project design if the contribution is negative or not as positive as anticipated. Monitoring during the implementation phase should thus trigger corrective actions, which makes it into a dynamic activity as opposed to passive collection of data (World Bank, 1996b).

On occasions, it may be possible to identify **thresholds** or **intermediate targets** against which monitoring values can be compared. The thresholds would determine the highest level of negative impact acceptable within the ecosystem and could be expressed as a percentage, an absolute number, or as "any negative change" depending on the context. Targets are, in comparison, used to improve the state of environment. (Segnestam, forthcoming)

3. **After project implementation.** After the implementation phase is over, monitoring should be carried out for evaluation of project success or to certify that the overall project does not have any adverse environmental impacts.

There may be **lags in time** before project effects are felt and noticed. Where feasible, it is therefore highly desirable that the monitoring continues until direct or indirect impacts of the project are not expected any longer. The fulfilment of project objectives may also have an impact **beyond the area** in which the project is active. It is therefore also desirable, when feasible and appropriate, to monitor impacts outside of the project area. (Segnestam, 1999)

The indicators used in the three steps above could also be used by the project owner as the project continues to operate after Sida's involvement has ended.

Clear definitions

The message conveyed by the selected indicators should be unambiguous to avoid confusion in their development or interpretation. The selected indicators should therefore be clearly defined. Note that indicators do not necessarily need to be quantitative in nature, but relatively simple qualitative indicators can also track and communicate a certain development.

Realistic collection or development costs

In order to be practical and realistic, the selection of indicators has to consider the cost of collection and development of the indicators. If two indicators indicate the same thing, it is quite natural that the least expensive should be chosen. It is, however, not only important to consider the costs of collection or development of an indicator, but also the benefit of having the information provided by the indicator. The corresponding benefit of collecting or developing the indicators should therefore also be considered in order to put the cost aspect in a correct perspective. As long as the benefit of measuring an indicator exceeds the cost, the collection or development of the indicator can be considered realistic and is probably motivated. The benefit of monitoring an indicator would preferably be put into perspective through an economic analysis of the potential environmental impact the indicator would monitor – how much would it cost the project if the environmental impact occurred?

Focus on indicator developer and user

The audience and its capacities have to be considered in order for the proposed indicators to be meaningful and the development to be as sustainable as possible.

Using these features as a way of identifying appropriate indicators, a useful set of indicators can now be selected and used. Considering that a task manager has far more knowledge about the project at hand than most other people, to be creative within the limits of the above features is often a good method. However, one can also turn to existing lists of indicators and use those as “shopping lists”, that is select those indicators in the list that are most appropriate for the project. A selected number of sources of indicator lists can be found in ‘Annex 2. Additional environmental indicator information’.

Knowing ‘what’ and ‘when’ to focus the selection of indicators on, it is now time to introduce the ‘how’ – how to collect data and interpret the monitoring results.

Data collection⁴

Collection of data can be arranged in many different ways. For the monitoring of a project, the data collection component is best built into the project design. The implementing party may be the best data collector (or supervisor of the data collection) – they are already in place, and the data relevant for the particular project are not likely to exist already. How often to collect the data depends entirely on the individual indicators, and the purpose of monitoring and is therefore impossible to talk about in a generalized way. Aspects such as credibility, cost efficiency, and incentives are important, and determine not only the quality of the monitoring system, but also its sustainability and the possibilities to integrate it into relevant decision-making processes:

- **Credibility.** There are two aspects to credibility that are of importance for the data collection component – **trustworthiness** and **capacity**. It is important that other stakeholders can trust the results of the monitoring. At the same time, the monitoring may be carried out by a trustworthy organization, or company, but if they do not have the proper capacity to develop and analyse the indicators, the results may be skewed or even wrong.
- **Cost effectiveness.** If the indicators are already being collected by trustworthy and capable organizations, there is no reason to start developing the same indicators within a different organization. Already developed data collection tools and methods should also be examined and used to the greatest extent possible in order to keep the collection costs down, and to achieve buy-in from locally active players.
- **Incentives.** Most monitoring or data collection implies various costs for the collector. If the monitoring agency is to agree to bear these costs, the proper incentives need to be established. These can be created through regulations (Sida requiring monitoring of projects if money is to be granted the project owner) and through economic benefits (it can be costly for the project owner if it is heading in the wrong direction and it is detected).

Example 2. Efficient data collection

The Arenal-Tempisque watershed in Costa Rica faces a number of classic land use and water quality problems that are endemic to most watersheds that are subject to intense agricultural and settlement activities. For example, water users downstream depend on the sustainable management of the upstream areas, but also on how much water is released by the hydropower company active upstream from them. To monitor this problem would ideally require monitoring the amount of water entering key parts of the downstream watershed during periods of their greatest need. But this would not be easy. For example, there is no specific entry point through which water enters the downstream areas, and neither does an unambiguous monitoring station for water supply exist for those areas. A practical and low-cost indicator is therefore the amount of water released by the hydropower company to the irrigation canals, since these releases provide the lion's share of the water received in the downstream areas. This information is, furthermore, already recorded by the hydropower company on a routine basis, so no new data collection is necessary.

Source: Segnestam (2001)

⁴ This section is adapted from Segnestam, L. (forthcoming-b).

Interpreting the results

After the indicators have been developed and the data collected, it is still necessary to interpret the monitoring results. It is in this stage that the earlier establishment of a **baseline value** becomes vital – without a baseline value, the monitoring results cannot be interpreted as showing an improved or deteriorated situation. Various established **thresholds** or **targets** can also be used in the interpretation (see examples to the right). This can be especially valuable in cases where an increasing (or decreasing) trend does not always equal something negative. An increased use of fertilizers does not, for example, need to be something very negative if the baseline value is very low to begin with.

Examples of thresholds and targets:

- **Threshold:** the World Health Organization's standards for safe drinking water;
- **Target:** The World Conservation Union's goal of having 10 percent of a country's surface protected.

The appropriate comparison, however, is generally not only to the pre-project situation but to the counterfactual situation of what would have happened in the absence of the project (Segnestam, 1999). In Sida's *Guidelines for Environmental Impact Assessments in International Development Cooperation* (Sida, 1998), this scenario is called the '**zero-alternative**' – the expected changes in the environment caused by present and expected human activity without the project.⁵

One common problem in the interpretation of impact indicators is to know exactly whose impact that is being observed. The project owner, with its access to information on other ongoing development initiatives within the area, is commonly in a better position to determine the cause and effect links between the various initiatives and the observed impacts. A clearly defined activity plan for the individual projects also simplifies the assessment.

Example 3. Interpreting monitoring results

The spawning stock of Baltic herring combined with fishing mortality as an indicator of exploitation of Baltic fish resources, show that the fish stocks in the Baltic Sea are being exploited at a non-sustainable rate. This conclusion can be drawn when the results of the monitoring of this indicator is interpreted in relation to predetermined thresholds – the annual Total Allowable Catch and a recommended limit value for the spawning stock. Since the spawning stock has declined long-term while the impact of the fishing has steadily increased, both these recommended limit values were exceeded already a long time ago.

Source: Statistics Sweden and Swedish EPA (2001)

To simplify the interpretation and minimize the risk of mistakes in the interpretation, Sida should thus demand three things from the project owner:

1. The **plan of activities** for the proposed project needs to be as clearly defined as possible. The more specific the activities are, the easier it will be to link an observed impact to the project. In addition, it could facilitate the design of mitigating measures since those need to complement already existing project activities.
2. The project proposal should, to the largest extent possible, clearly identify **eventual environmental impacts** (positive and negative) of the project. Vague or

⁵ Note that the zero-alternative is not a scenario of an unchanged environment. The state of the environment is expected to change with or without the project – the zero-alternative describes what that change looks like, without the project in place.

overly broad problem descriptions such as “adversely affected biodiversity” are of little assistance in selecting indicators.

3. The **zero-alternative** should be well developed and carefully thought through. Without a zero-alternative, the interpretation of the indicators is made more difficult since one of the important comparators is missing.

After having introduced a number of background aspects relevant to indicator work, it is now time to move to more practical aspects – the indicators that are proposed to be included in Sida’s monitoring programs at project level.

Indicators according to sectors

Below are examples of indicators for each of the sectors covered by the Sida EIA guidelines (Sida, 2002). For all sectors, the checklists in the EIA guidelines have been used as a starting point for the identification of indicators. Indicator proposals for some of the sectors have been based on an analysis of a number of, for each sector, representative projects (see Annex 1).

The lists of proposed indicators are not meant to be exhaustive. It may be necessary to identify other (or more) indicators to be able to properly monitor the environmental impacts of a project. The discussion in previous sections gives a more detailed help on how to select other indicators than those proposed below. An obvious reason why there is sometimes a need to adapt the set of indicators to the specific project is that within a sector, projects can have different scope and orientation. Another important reason is that many environmental impacts are site-dependent, that is the impact depends both on the activity or event *and* on the receiving environment. It is therefore difficult to find a generic set of indicators to suit all different parts of the world and different types of ecosystems.

The collection of data necessary for a particular indicator can often be adjusted to the local conditions and the resources available. For each sector, different kinds of indicators have therefore been proposed, some more data-intensive than others. Different methods for data collection are also suggested. For some indicators, references are made to existing indicator sets. These sources can provide, if not data to be directly used, useful methodological information and data for comparison.

Agriculture (including livestock farming) and forestry

Sida's work within the agriculture sector is generally in the context of broad-based rural development programs, which take a sustainable livelihoods approach with a strong poverty focus (Sida, 1999b). There are especially four areas, with their respective sub-areas, that Sida focuses on, that may have both direct and indirect environmental impacts:

- **Natural resources management:** high-potential vs. low-potential lands, land husbandry, biodiversity, land tenure, and water resources management. Support to any of these areas could have both direct and indirect environmental impacts.
- **Capacity building⁶:** strengthening of capacities within, for example, institutions most relevant to agriculture, local authorities, universities, and farmers commonly have mostly indirect environmental impacts, and not seldom positive if environmental considerations are integrated.
- **Innovations and farm inputs:** agricultural research, agricultural extension services, seeds, soil fertility, and rural finance. Support to any of these areas could have both direct and indirect environmental impacts.

⁶ Capacity building is defined as the creation of an enabling environment, institutional development and human resource development. (Sida, 1999a)

Table 1. Proposed indicators – agriculture and forestry

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|---|--|
| <p><i>Support given to capacity building and agricultural research:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and research? (yes/no) • Number of policy-makers, farmers and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as farmers, students and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to physical agricultural activities:</i></p> <ul style="list-style-type: none"> • Condition of benthic macro-invertebrates in water channels • Waste and chemical generation, collection and treatment (tons; % of generation; description) • Water use intensity (% use of total available resources) • Land use change (hectares; description) • Soil erosion rates (kg/ha/month or ton/ha/year) | <p>Benthic macro-invertebrates are a large group of organisms, individual members of which are sensitive to different types of contamination (e.g. from pesticides or fertilizers). They can be divided into groups according to how sensitive they are to pollution – very sensitive, sensitive, regular, tolerant, and very tolerant. When the “sensitive” benthic macro-invertebrates constitute less than 15% of the total community, the threshold for a healthy environment has been reached. The indicator also captures impacts on health, soils, and species.</p> <p><i>Data collection:</i> water sampling, field studies.</p> <p>When the project specific waste and chemicals have been identified, the proposed indicator can be further developed to focus on those substances. Through a description of the collection and treatment procedures, work environment and health related aspects can be captured.</p> <p><i>Data collection:</i> statistics from waste management facilities, interviews and questionnaires.</p> <p><i>For information and reference data, see UN (1996).</i></p> <p>This indicator is likely to be a proxy (data on water availability in the project area may be difficult to find). It does, however, give an indication of the intensity of use.</p> <p><i>Data collection:</i> local statistics, field studies, interviews and questionnaires.</p> <p><i>For information and reference data, see World Resources Institute (2000).</i></p> <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> <p>Indicates the pressure on soil as well as the conditions for future rural livelihoods.</p> <p><i>Data collection:</i> Can be monitored with the help of erosion pins that are driven</p> |

| | |
|--|--|
| <ul style="list-style-type: none"> • Electrical conductivity of the water (microsiemens/cm) | <p>into the soil so that the top of the pin gives a baseline from which changes in the soil surface level can be compared.</p> <p>Indicates whether soil salinity levels are becoming too high due to irrigation.</p> <p><i>Data collection:</i> field studies.</p> |
| <ul style="list-style-type: none"> • Number of animals per hectare (number) | <p>Overstocking of land contributes with the main environmental impacts of livestock production (for example, overgrazing leading to soil erosion, and deterioration of soil fertility and soil structure; impacts on wildlife populations; vegetation depletion around water points; pollution due to fertilization of pasture or chemical use for pest and disease control). What the specific impacts will be is, however, heavily dependent on site- and project-specific features, and the indicator should therefore be linked to project specific thresholds or targets identified in pre-feasibility/feasibility stage.</p> <p><i>Data collection:</i> field studies, interviews and questionnaires.</p> |
| <ul style="list-style-type: none"> • Levels of air pollutants | <p>The type of pollutant monitored needs to be defined within each project.</p> |

Further reading and sources of indicators and reference data

- Effects of agricultural and forestry projects on the environment – World Bank (1991b) and FAO (www.fao.org)
- Indicators for food supply, agricultural production and production factors – FAO (www.fao.org), reported in World Bank (2001) and World Resources Institute (2000)
- Indicators for agri-environmental issues – UN (1996), OECD (2000) and European Environment Agency (2001a)

Water-related activities

Sida's support to water-related activities has a number of priority areas (Sida, 1999a):

- Promote increased participation and improved Integrated Water Resources Management (IWRM) planning and management through institutional strengthening and appropriate awareness-creation and capacity-building interventions and research;
- Promote national and international IWRM policy and legislation;
- Cooperation on share water resources to prevent conflicts and promote security internationally, regionally and locally between different water use sectors;
- Application of demand management principles including economic and legal aspects to promote efficient allocation, use, saving and recycling of water;
- Measures to prevent and control pollution of water resources;
- Rural and urban water supply integrated with health perspectives and environmental sanitation to meet basic human needs;
- Ecological sanitation in rural and peri-urban areas based on zero pollution, water conservation and recycling, e.g. compost latrines;
- Measures to conserve water in agriculture;

- Conservation and sustainable use of wetlands and coastal environments threatened by high population growth, development pressure and accumulations of pollutants from inland activities.

In addition to these higher priority interventions, Sida has three lower priority interventions – large-scale irrigation projects, large-scale dam projects (indicators proposed below), and large-scale water transfer schemes – all of which may have both direct and indirect adverse environmental impacts. There is also a lot of potential for positive environmental impacts within the water area since many projects aim to promote a sustainable management and equitable use of water resources, as well as to improve the water quality and sanitation facilities provided in the countries.

Table 2. Proposed indicators – water-related activities

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|--|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as the local population, water management authority staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to water quality or access improvements:</i></p> <ul style="list-style-type: none"> • Annual freshwater withdrawals for different activities (domestic, agriculture, industry, hydropower production, mining) (m³, % of total renewable resources per activity) • Recommended (needed) water use per activity (domestic, agriculture, industry, hydropower production, mining) (m³) • People with access to safe drinking water (%) | <p>Having identified the different uses of water, potential conflicting demands can be identified and costs for different options for achieving a sustainable water use can be assessed.</p> <p><i>Data collection:</i> project area statistics (e.g. municipality data).</p> <p><i>For information and reference data, see World Resources Institute (2000).</i></p> <p>For water planning purposes, the current water use per activity could be compared to the recommended (or needed) water use for each activity. This comparison would reveal any potential inefficiencies in the use of water within the project area.</p> <p><i>Data collection:</i> national and international research studies and guidelines.</p> <p>Especially water use for domestic purposes is dependent not only on availability but also on quality of the water. The proposed indicator could therefore be used to complement the first indicator in order to capture both the health of ecosystems and the health of people. A further analysis of the pollutants (e.g. PCB, DDT, ammonia, faecal e-coli) in the water can be used as a basis for management of polluting activities, whether they are agricultural, industrial or domestic. WHO’s guidelines on water quality could be used as a definition of “safe” drinking water.</p> <p><i>Data collection:</i> local statistics, field studies, water sampling.</p> <p><i>For information and reference data, see World Bank (2001) (WHO).</i></p> |

| | |
|---|---|
| <ul style="list-style-type: none"> • Generation, collection, treatment and recycling of sludge, nutritive salts or other waste products (kg; % of generation, description) | <p>When the project specific wastes have been identified, the proposed indicator can be further developed to focus on those substances. This indicator also functions as a proxy indicator of potential impacts on soil and water. Through a description of the collection and treatment procedures, health related aspects can be captured.</p> <p><i>Data collection:</i> field studies, interviews and questionnaires.</p> |
| <p><i>Support to watershed management:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) | <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <ul style="list-style-type: none"> • Soil erosion rates (ton/ha/year) | <p>Indicates the pressure on soil as well as the conditions for future rural livelihoods.</p> <p><i>Data collection:</i> Can be monitored with the help of erosion pins that are driven into the soil so that the top of the pin gives a baseline from which changes in the soil surface level can be compared.</p> |
| <ul style="list-style-type: none"> • Planned water diversions, regulations or conduits (description) | <p>Changes in waterways risk having impacts on the area's biodiversity (introduction of new species, spreading of plant and animal diseases, or spreading of transgenic organisms or genes from such organisms). The indicator needs to be complemented by an analysis of the impacts of such plans.</p> <p><i>Data collection:</i> project documents and maps, studies of the area's biodiversity, interviews.</p> |
| <ul style="list-style-type: none"> • Levels of air pollutants | <p>The type of pollutant monitored needs to be defined within each project.</p> |

Further reading and sources of indicators and reference data

- Effects of projects in the water sector on the environment – World Bank (1991b)
- Indicators for water use, water-environment linkages and water management – Gleick (2000).

Dams

A dam can be built for different purposes, for example irrigation, generation of electricity, control of water supply or a combination of these (World Commission on Dams, 2000). This, as well as the local geography and demography, should be considered when choosing indicators.

The geographical scale relevant for monitoring can also vary. A smaller dam in a less important watercourse may have mostly local effects of significance, for example increased difficulties for a species that is dependent on the habitats created by a periodic flood. A larger dam in a watercourse that is critical for the downstream water supply can on the other hand make regional developments important to monitor. Finally, if the dam will have a major impact on the national energy supply it is important to monitor environmental impacts on the national or global levels such as greenhouse gas emissions. According to Sida's policy on water management (Sida, 1999a), large-scale dams should be a low-priority intervention.

Table 3. Proposed indicators – dams

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as the local population and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to development, construction and modification of dams:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) • Water quality of the watercourse (relevant parameters could be BOD, faecal e-coli, phosphorus, nitrogen, and sediments and flow) (various units) • Number of cases of typhoid, cholera, dysentery, bilharzia, and/or malaria (number) • Annual freshwater withdrawals from the watercourse for different activities (domestic, agriculture, industry, etc.) (m³, % of total renewable resources per activity) | <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. In the case of large-scale dams, this indicator could also monitor effects of any evacuation of people. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> <p>The number of and which specific parameters chosen for monitoring should be adapted to the local situation and anticipated impacts (e.g. intensified agriculture, changes in settlements, changes in water treatment systems). It is preferable if the parameters can reflect both human health issues and impacts on aquatic ecosystems.</p> <p><i>Data collection:</i> regular water sampling at a number of stations, including places downstream. The stations should be selected to reflect developments in places where different groups (women and men, age groups, social and ethnical groups) get their freshwater. A simpler method to measure the concentration of sediments and plankton is to measure underwater visibility.</p> <p><i>For information and reference data on BOD, faecal coliform and number of people with access to safe drinking water, see UN (1996) (WHO)</i></p> <p>Depending on existing health care and geographical factors, the most important potential illness/es as a result of poor water quality and dam-related pests should be monitored. Thus, this indicator can be a proxy for the indicator proposed above.</p> <p><i>Data collection:</i> local health care statistics, interviews with local population.</p> <p><i>For information and reference data, see WHO (www.who.int).</i></p> <p>By changing the flow and supply of water through a dam, the supply for different users and purposes is affected.</p> <p><i>Data collection:</i> local statistics (if they exist), field studies at selected sites, including downstream sites. A simpler method is to ask different users through interviews or questionnaires how they perceive the supply (e.g. adequate,</p> |

| | |
|---|--|
| <ul style="list-style-type: none"> • Population development of a sensitive species (number; %) | <p>inadequate, periodically inadequate).</p> <p><i>For information and reference data, see World Resources Institute (2000).</i></p> <p>Depending on the geographical circumstances and the biotope of the area, the choice of species should be locally adapted. In order to apply the precautionary principle a sensitive species should be selected.</p> <p><i>Data collection: regular inventories (can be undertaken at different levels of precision and ambition).</i></p> <p><i>For information and reference data, see World Conservation Union (IUCN) (http://iucn.org/themes/ssc/index.htm).</i></p> |
| <p><i>Support to dams where hydropower is a principal purpose:</i></p> <ul style="list-style-type: none"> • National or regional share of renewable energy production (% of total energy production) | <p>It should be considered whether the development of hydropower energy sources replace energy sources associated with larger greenhouse gas emissions. Dams cause greenhouse gas emissions through rotting vegetation and carbon inflow from the catchment.</p> <p><i>Data collection: national statistics or statistics from energy producers.</i></p> <p><i>For information and reference data, see World Resources Institute (2000) (International Energy Agency, IEA).</i></p> |

Further reading and sources of indicators and reference data

- Effects of dams on an ecologically and socially sustainable development – World Commission on Dams (2000) and World Bank (1991c)
- Indicators for water quality – WHO, some are reported in UN (1996) and World Bank (2001)
- Water flow over national borders, water supply and withdrawals – World Resources Institute (2000)

Activities related to coastal zones

Sida's priorities for action in relation to environmental pressures from activities in coastal zones should be based on the following (source: www.sida.se):

- Integrated Coastal Zone Management (ICZM) provides a framework for approaching the complex set of social, economic and environmental issues which traditional sectoral approaches to development have proven unable to address.
- A clear division of responsibilities between the different sections of Sida, in order to facilitate the collaboration in the development of new initiatives, as well as the implementation of projects.
- A focus on a set of new coastal management initiatives in East Africa and South-east Asia, based on the experiences from ongoing programmes and projects.

Project effects in coastal zones depend partly on the type of activities and partly on the local physical and ecological environment. The World Bank has identified sector activities that can have a potentially high impact on the coastal environment (see Box 2) (World Bank, 1994a). Depending on the specific project it can thus be necessary to find indicators for these activities and some suggestions can be found under the relevant sectors in this document (e.g. agriculture, industry and tourism). General indicators for the conditions in the coastal zone are proposed in Table 4.

Since the relevance of indicators also depends on the local physical and ecological environment, it can be useful to distinguish between a few typical coastal ecosystems. The World Bank identifies the following and discusses the most important environmental aspects of each one; coral reefs, coastal wetlands (e.g. river deltas, mangrove swamps), seagrasses, muddy and sandy bottoms, and rocky coasts (World Bank, 1994a).

| Box 2. Sector activities with potentially high impact on the coastal environment | |
|---|---|
| Agriculture | Coastal and upland cultivation; conversion of coastal wetlands; large irrigation schemes |
| Aquaculture | Fish farming; shrimp production |
| Fisheries | Coastal and deep-sea fisheries |
| Forestry | Mangrove forest products harvesting; large-scale upland forestry |
| | Coastal and offshore oil and gas exploration and operation; coastal power generation; large inland hydroelectric dams |
| | Ports and harbors; channel construction and maintenance dredging; dredge spoil disposal; coastal roads; railroads and bridges |
| | Shoreline modification; waste disposal (e.g. landfills); water and sewerage development; urbanization of coastal areas in natural or semi-natural state and of upland watersheds; filling (reclamation) |
| | Coastal industrial plants; coastal and marine mining (e.g. sand); salt extraction; industrial waste disposal |
| | Coastal hotels and recreation facilities; sewage and waste disposal |
| <i>Source: World Bank (1994a)</i> | |

Some types of coastal pollution, as a result of marine sewerage disposal, are more serious than others and therefore more critical to monitor. Microbiological water quality, floatable substances including oil and grease and toxic persistent organic and inorganic pollutants belong to this category (World Bank, 1996a).

Table 4. Proposed indicators – activities related to coastal zones

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|---|--|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) <p><i>General indicators for support to coastal zone related activities:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as local people and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for</p> |

| | |
|--|--|
| | <p>example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. Finally, this indicator will monitor erosion and shoreline movements. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <ul style="list-style-type: none"> • Population change in the coastal zone (%; number of people) | <p>Population growth can indicate likely developments of several environmental issues in the area, e.g. increased waste and wastewater, increased pressure on natural resources such as fish and arable land, and increased transports.</p> <p><i>Data collection:</i> censuses (if they exist), or field studies.</p> <p><i>For information and reference data, see World Resources Institute (2000) (CIESIN Gridded Population of the World).</i></p> |
| <ul style="list-style-type: none"> • Wastewater treatment coverage (%) | <p>This indicator measures the proportion of wastewater that is treated to an acceptable level before discharged. It thus indicates the pollution pressure on coastal seas and watercourses.</p> <p><i>Data collection:</i> national or local water treatment authorities.</p> <p><i>For information and reference data, see UN (1996) (WHO).</i></p> |
| <ul style="list-style-type: none"> • Population development of a sensitive species (number; %) | <p>Depending on the geographical circumstances and the biotope of the area, the choice of species should be locally adapted. In order to apply the precautionary principle a sensitive species should be selected. Within the UN it has been proposed that different algae species can be relevant indicators.</p> <p><i>Data collection:</i> regular inventories (can be undertaken at different levels of precision and ambition).</p> <p><i>For information and reference data, see World Conservation Union (IUCN) (http://iucn.org/themes/ssc/index.htm) and World Resources Institute (2000).</i></p> |
| <p><i>Support to projects that affect the fishery sector:</i></p> <ul style="list-style-type: none"> • Total catch in relation to maximum sustained yield (%) | <p>This indicator shows directly if overfishing is real or potential problem. Calculating maximum sustained yield demands a relatively large amount of work if this information does not exist already. The indicator also needs to be related to the project area in some way.</p> <p><i>Data collection:</i> national statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <p><i>Support to projects that affect the agriculture sector:</i></p> <ul style="list-style-type: none"> • Coastal discharges of nitrogen and phosphorus (tones/year) | <p>Increased agriculture can lead to higher (or re-localized) consumption of fertilizer. These emissions also reflect other human activities, which together increase the risk of eutrophication.</p> <p><i>Data collection:</i> national or local statistics, statistics from fertilizer retailers.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <p><i>Support to projects that affect the industry, transport and energy sector:</i></p> <ul style="list-style-type: none"> • Discharges of oil in coastal water (metric tonnes/year) | <p>The risk of accidents and unintended emissions can increase due to activities in these sectors and should be monitored. Alternatively, chemicals more relevant with consideration to the specific activities should be monitored. Within the UN, this has been suggested as an important indicator to assess the health of coastal ecosystems.</p> <p><i>Data collection:</i> national or local statistics, regular sampling at selected stations.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <p><i>Support to projects within the tourist sector:</i></p> <p>See indicators proposed under Tourism.</p> | |

Further reading and sources of indicators and reference data

- General information about typical environmental impacts in coastal zones – World Bank (1994a) and World Bank (1996a)
- Indicators for different aspects of fishery and biodiversity in coastal zones – World Resources Institute (2000)
- Indicators for wastewater treatment, algae, land use, oil discharges and nitrogen emissions – see data sources in UN (1996)

Transport and communication

Sida prioritizes support to the transport sector in the following areas (source: www.sida.se):

- Organisation and restructuring within the transport sector
- Rehabilitation and maintenance of roads
- Infrastructure and management for railways, ports and shipping
- Developing transport companies
- Traffic safety

Furthermore, specific priority areas in the field of urban transports have been identified. At the national level these are development of regulatory frameworks and institutions. At the city level they are development of bus transport systems, institutional development for traffic management, investments in infrastructure for public transport and programmes for traffic safety and reduction of vehicle emissions. At the community level, awareness creation and small-scale improvements for non-motorised traffic and pedestrians are prioritised areas. (Sida, 1999c)

The environmental impacts of transport and communication projects can be divided into those that are directly site-dependent and those that occur at the local, regional or global scale. The first type of impacts relate primarily to biodiversity and habitats (for example deforestation, barrier effects and access to previously unexploited land), while the latter group includes for example noise, urban air pollution and greenhouse gas emissions. In Table 5 indicators for these impacts are proposed. The type of impacts will also depend on what transport mode will dominate as a result of the project as well as the magnitude of changes in traffic volume.

Table 5. Proposed indicators – transport and communication

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|--|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as planners and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to modification or expansion of transport systems and to projects that affect the traffic volume:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) • Ambient concentrations of air pollutants in urban areas (can include the parameters ground-level ozone, carbon monoxide, particulates, sulphur dioxide and nitrous oxides) (fg/m³ or mg/m³) • Total and proportion of greenhouse gas emissions from the transport sector (tonnes/year; %) • Share of total number of person kilometers traveled with public transportation in the project area (%; person kilometers) | <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. Finally, this indicator will monitor the potential development of barriers and access to previously unexploited land. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> <p>An increase in transport can cause deteriorating urban air quality (depending on dominating mode of transport, previous air quality and magnitude of the increase), which is associated with health problems.</p> <p><i>Data collection:</i> local statistics, or simpler tests.</p> <p><i>For information and reference data, see UN (1996) (WHO).</i></p> <p>Transport is an increasingly significant cause of higher concentrations of greenhouse gases in the atmosphere. However, the relevance of this indicator should be determined in light of the type and size of the specific project.</p> <p><i>Data collection:</i> national and local statistics. If statistics are missing, or if they need to be more strongly linked to the particular project, the values of this indicator can be estimated by calculating the fuel consumption and relevant emission factors, or by calculating the change in number of person kilometers per transport mode and relevant emission factors.</p> <p><i>For information and reference data, see UN (1996) (UN Framework Convention on Climate Change, FCCC).</i></p> <p>It is often seen as positive from an environmental point of view that the use of public transports (e.g. buses and trains) increases. It can therefore be relevant to examine how the project has affected people’s choice of transport, in terms of private and public.</p> <p><i>Data collection:</i> statistics from authorities or companies dealing with public transport, interviews and questionnaires.</p> <p><i>For information and reference data, see World Bank (2001) (International Road Federation, IRF).</i></p> |

Further reading and sources of indicators and reference data

- Environmental effects from projects in the transport sector – World Bank (1991b)
- Indicators for environmental impacts from transport – OECD (1999) and European Environment Agency (2001b)
- Indicators for urban air quality – WHO, reported in UN (1996) and World Bank (2001)
- Indicators for traffic, roads and railroads – IRF, reported in World Bank (2001)

Waste management

Potential social and environmental impacts from inadequate waste management are many, including health problems, land contamination, discharges and leakage of toxic chemicals and metals, air pollution, water pollution, public nuisance and diminishing landscape aesthetics, as well as social and cultural issues associated with methods for waste collection (World Bank, 1991b). Waste management is an important issue in growing urban environments, and it is also an area where Sweden and Sida has considerable experience.

There are two categories of adverse impacts from waste. Firstly, generation of waste that is not managed and disposed of can lead to local impacts on amenity and health. Secondly, inadequate or inappropriate waste management can lead to environmental impacts, such as air pollution from waste combustion. The first category of impacts can be mitigated in two ways; decreasing the amount of waste and decreasing the hazardous components of waste. The latter type of action should be aimed at an earlier stage of the consumption process than at the waste management stage. Depending on the project profile – if the activities are aimed at preventing large quantities of waste or hazardous waste or if the project is about support to waste management facilities – different indicators may be needed, see Table 6.

Table 6. Proposed indicators – waste management

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as planners and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |

Support to preventive actions for less and less hazardous waste:

- Generation and disposal of household waste per capita (kg/person/year)

If the project is aimed at or has a large potential impact on the amount of household wastes generated and disposed of in the waste management system, this is a relevant indicator. It says something about how much waste is generated (comparisons can be made for different types of households), but also something about how much waste is disposed of in the system and how much is disposed of elsewhere.

Data collection: statistics from the waste management authority or company, interviews and questionnaires with a sample of households.

For information and reference data, see UN (1996) (UN-Habitat).

- Generation, treatment and disposal of industrial waste (tonnes/year)

If the project instead is aimed at industrial waste this indicator should be monitored. Potentially the indicator could be limited to tracking a certain significant or hazardous type of waste.

Data collection: statistics from the waste management authority or company, or statistics from relevant industry.

For information and reference data, see UN (1996) (UN-Habitat).

- Recycling and reuse of waste per person (% of total weight waste)

Increased recycling and reuse can be a direct objective of the project but can also be affected by altered incentives. Often an estimate of total amount of waste is necessary.

Data collection: statistics from the waste management authority or company, supplemented by field studies for estimation of total amount of waste produced before recycling and reuse.

For information and reference data, see UN (1996) (UN-Habitat).

Support to waste management systems:

- Number of people exposed to nuisances, e.g. noise or odour (number)

The perception of a nuisance in relation to waste can exist before a management system is in place, e.g. through disposal of waste in public places or near residential areas. But also after a system is in place some people can perceive nuisances, e.g. through inappropriate siting of facilities or nearby waste transportation roads. The design of this indicators – which nuisances that are relevant – should be done for individual projects.

Data collection: interviews and questionnaires.

- Emissions of air pollutants (can include the parameters carbon dioxide, sulphur dioxide, nitrous oxides, carbon monoxide, heavy metals, dioxins, PAH, dust) (various units)

Emissions of relevant pollutants from any combustion facilities that the project may affect can be measured directly at the site if there resources exist.

Data collection: statistics from the waste management authority or company.

Further reading and sources of indicators and reference data

- General information about typical effects from solid waste management – World Bank (1991b)
- Indicators for waste and waste management in cities – UN-Habitat (www.unchs.org)

Mining activities

Potential impacts of mining activities are not only those that occur when the surface or underground mine is in operation. Impacts like land use change and air pollution can also be identified when the area is cleared and prepared, when facilities and

access roads are built, if work camps are set up and when energy and transports are used. Therefore, it can be appropriate to use indicators proposed for other sectors.

Table 7. Proposed indicators – mining activities

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|---|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, mining company staff, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as mining company staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to start-up, development and modification of mining activities:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) • Emissions of air pollutants (can include the parameters carbon dioxide, sulphur dioxide, nitrous oxides) (tonnes/year) • Groundwater quality (can include the parameters oil, metals, pH-level) (various units) • Number of people exposed to nuisances, e.g. noise or dust (number) | <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. This indicator can monitor the potential development of barriers and access to previously unexploited land. It can also be related to studies of changes in land ownership, evacuation issues and potential conflicts. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> <p>This indicator can be relevant in order to indicate the energy consumption and industrial processes associated with the activities.</p> <p><i>Data collection:</i> statistics from the mine authority or company.</p> <p>Leakage and spillage of substances hazardous to human health and ecosystems negatively affect groundwater quality.</p> <p><i>Data collection:</i> local statistics or regular sampling at selected stations.</p> <p>The perception of nuisances by the local population such as noise or dust, but also social factors such as conflicts with the mining company or staff, is an indicator of the overall sustainability of the project.</p> <p><i>Data collection:</i> interviews and questionnaires.</p> |

Further reading and sources of indicators and reference data

- General information about typical effects from mining – World Bank (1991b)

Energy

According to Sida, the Swedish development cooperation related to energy should promote economically and environmentally sound energy systems. Each activity should be seen holistically and be placed in the context of the total and long term energy supply in a country. The following areas are prioritized (Sida, 1996c):

- Development of laws and other regulatory systems, as well as capacity building for decision-makers and administrators.
- Development of organizations – utilities, environmental agencies, environmental organizations, etc. – through capacity building. In addition, Sida supports the development of institutions that commission, participate in and review environmental impact assessments, and supports research collaboration in the energy sector.
- Energy efficiency improvements at all levels, from energy production to end use, through, among other methods, demand side management. A survey of energy efficiency options shall comprise part of the basis of decisions regarding aid within the energy sector.
- Support, of different kinds, to the introduction and application of renewable-energy technologies and can contribute to technological development.
- Support efforts directly aimed at specific target groups.

The significance of various impacts depends on whether the project is aimed at energy production, distribution or efficiency in consumption. In general, however, improvement or deterioration of air quality is an important aspect of projects within an energy system. Furthermore, one can focus on either consequences for the energy system at regional or national level or on local impacts due to land use changes and some types of air pollution. Some indicators of general relevance are proposed below, but for particular projects they should be adapted to the type of support and the energy source/s that will increase or decrease in use (Table 8). If the project supports hydropower and dams in some way, the indicators proposed for dams should be studied (Table 3).

Table 8. Proposed indicators – energy

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as planners and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> |

| | |
|---|--|
| <p>Support to projects that affect the composition of the energy system:</p> | <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <ul style="list-style-type: none"> • Land use change (hectares; description) | <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. This indicator can monitor the potential development of barriers and access to previously unexploited land. Deforestation is particularly important to monitor if the use of biofuels is affected. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <ul style="list-style-type: none"> • Emissions of sulphur dioxide and nitrous oxides (tonnes/year) | <p>In regions where acidification of land and waters is a problem this is an important indicator. If emissions data do not exist the indicator values can be estimated by calculating fuel consumption and emission factors.</p> <p><i>Data collection:</i> national statistics, statistics from the energy authority or company.</p> <p><i>For information and reference data, see UN (1996) (Organisation for Economic Cooperation and Development, OECD).</i></p> |
| <ul style="list-style-type: none"> • Emissions of greenhouse gases (tonnes/year) | <p>This indicator should be included in those cases use of fossil fuels in the energy system is affected. If emissions data do not exist the indicator values can be estimated by calculating fuel consumption and emission factors.</p> <p><i>Data collection:</i> national statistics, statistics from the energy authority or company.</p> <p><i>For information and reference data, see UN (1996) (UN Framework Convention on Climate Change, FCCC).</i></p> |

Further reading and sources of indicators and reference data

- General information about typical effects from projects in the energy sector – World Bank (1991c)
- Indicators of energy production and consumption – International Energy Agency (IEA), reported in World Bank (2001) and World Resources Institute (2000)

Industry

Impacts from, and indicators for, the industrial sector depend largely on the specific raw materials and processes that are used in the industry receiving support. Industries with a potentially large environmental impact include those where manufacturing and processing occur of cement, chemicals and petrochemicals, fertilizer, food products, iron and steel, other metals, oil refineries, pulp and paper, and minerals (World Bank, 1991c). On the other hand, some indicators for water and air pollution are common for several types of industries (see Table 9).

Table 9. Proposed indicators – industry

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as industrial managers and staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to development of specific industries:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) • Emissions of air pollutants (can include the parameters sulphur dioxide, nitrous oxides, carbon monoxide, heavy metals, dioxins, PAH, dust) (various units) • Emissions of greenhouse gases (tonnes/year) • Discharge of water pollutants (can include the parameters heavy metals, toxic chemicals, oil) (various units) • Generation of hazardous waste | <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. This indicator can monitor the potential development of barriers and access to previously unexploited land. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> <p>Relevant parameters to monitor should be chosen based on project activities and to indicate both pollution with local health effects and local and regional environmental impacts. If emissions data do not exist estimation can be done by considering inputs, process types and emission factors.</p> <p><i>Data collection:</i> statistics from the industrial company or local permit authorities.</p> <p>This indicator should be included in those cases the project can lead to a significant increase in the consumption of fossil fuels. If data do not exist the indicator values can be estimated by calculating fuel consumption and emission factors.</p> <p><i>Data collection:</i> national statistics, or statistics from the industrial company or local authorities.</p> <p><i>For information and reference data, see UN (1996) (UN Framework Convention on Climate Change, FCCC).</i></p> <p>Relevant parameters to monitor should be chosen based on project activities and to indicate both pollution with local health effects and local and regional environmental impacts. It should also be decided if groundwater quality in the project area should be monitored. If emissions data do not exist estimation can be done by considering inputs, process types and emission factors.</p> <p><i>Data collection:</i> statistics from the industrial company or local permit authorities.</p> <p>Relevant parameters to monitor should be chosen based on project activities</p> |

| | |
|---|--|
| (tonnes/year) | and the type of waste classified as hazardous in the Basel Convention. <i>Data collection:</i> statistics from the industrial company, or local permit or waste management authorities. <i>For information and reference data, see UN (1996) (United Nations Environment Programme, UNEP).</i> |
| <ul style="list-style-type: none"> Number of people exposed to nuisances, e.g. noise or odour (number) | The perception of nuisances by the local population such as noise or odour is an indicator of the overall sustainability of the project. <i>Data collection:</i> interviews and questionnaires. |

Further reading and sources of indicators and reference data

- General information about effects from different types of industries – World Bank (1991c)

Tourism

Tourism should be considered from a cross-sectoral perspective since activities within this sector can be very different. In general, tourism will lead to an increase in food consumption and use of infrastructure, which can lead to a pressure on the environment and natural resources. It is thus necessary to look beyond the immediate tourist sector. Therefore, indicators proposed for other sectors can be useful, for example transport and communication and energy. Since tourism often takes place in coastal zones, the indicators suggested for this sector can be relevant (see Table 4). Tourism promotion in itself can also have different profiles, from large-scale mass-tourism to small-scale eco-tourism.

Table 10. Proposed indicators – tourism

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> Are environmental considerations integrated in the capacity building and policy development? (yes/no) Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as tourist facility operators and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to development of specific industries:</i></p> <ul style="list-style-type: none"> Number of tourists per year (number; % of permanent population) | <p>It can be expected that large-scale tourism aggravates many of the existing environmental problems, through increased use of energy and transports, increased pressure on waste management and sewage systems, and increased pressure on sensitive and significant ecosystems. If the carrying capacity of the area for tourists has been estimated this is a natural comparison figure. The</p> |

| | |
|---|---|
| <ul style="list-style-type: none"> • Land use change (hectares; description) | <p>indicator can also be related to the development of the number of local inhabitants, in order to understand whether they are being displaced by tourists.</p> <p><i>Data collection:</i> national and local statistics, interviews and questionnaires with tourist facilities.</p> <p><i>For information and reference data, see World Bank (2001) (World Tourism Organisation).</i></p> <p>By a classification system, it is possible to track the development of residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. This indicator can monitor the potential development of barriers and access to previously unexploited land. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <ul style="list-style-type: none"> • Transport use (person kilometres per year per mode of transport) | <p>Since transports can cause several negative environmental impacts it is relevant to measure whether it is affected by tourism. Of highest relevance are perhaps the local transports causing local impacts, but international transports can also be examined in order to estimate global impacts.</p> <p><i>Data collection:</i> statistics from the local public transport authority and private companies, interviews, field studies.</p> <p><i>For information and reference data, see World Bank (2001) (IRF).</i></p> |
| <ul style="list-style-type: none"> • Wastewater treatment coverage (%) • Have measures been taken to protect sensitive and significant ecosystems? (yes/no; number; ha) | <p>See Activities related to coastal zones.</p> <p>In developing the tourist sector it can be justified to take special protective action for valuable ecosystems, for example establish nature reserves and restrict access to an area during sensitive periods. If such problems and protective actions are relevant for the specific project, a simple indicator can consist of the number and type of measures that are taken during the course of the project and how large areas they protect.</p> <p><i>Data collection:</i> study of documents, interviews and questionnaires. (Data on share of protected areas in (World Resources Institute, 2000).)</p> |

Further reading and sources of indicators and reference data

- General information about effects from projects in the tourist sector – World Bank (1991b)
- General indicators for tourism – World Tourism Organization, reported in World Bank (2001)

Health and medical care

Sida's support to the sector of health and medical care focuses on three areas, with respective sub-areas (Sida, 1999d). Both indirect and direct environmental impacts can be a result of this support:

- **Health sector reforms:** There are two sub-areas that Sida focuses on within the area of health sector reforms. The first – health system development – is mainly likely to have indirect environmental impacts if environmental training is integrated in the support. The second – support related pharmaceutical policies,

education, and disbursement – could have both indirect and direct environmental impacts (for example, direct impacts from disposal of expired drugs).

- **Sexual and reproductive health and rights, and children’s health and rights:** The environmental impacts of this support are most likely to be indirect, and not seldom positive if environmental aspects are integrated in the capacity building. However, some direct impacts related to disposal of risk waste (for example, needles) could be relevant to monitor.
- **Public health:** The area of public health entails both capacity building and information dissemination, and more physical activities, and the environmental impacts could therefore be both direct and indirect.

Table 11. Proposed indicators – health and medical care

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|---|--|
| <p><i>Support given to capacity building, policy development and methodology development:</i></p> <ul style="list-style-type: none"> • Is training on risk waste handling, collection and treatment a component in the initiative? (yes/no) • Are environmental considerations integrated in the initiative (e.g. in training, policies, plans)? (yes/no) • Number of people and policy makers who take environmental aspects into consideration in their daily activities (number; %) | <p>It is not only the links to environmental aspects such as clean air and water that is important in the health sector. From a work environment perspective, the handling, collection and treatment of risk waste is also vital to monitor. This indicator does not say anything about the effectiveness of the training.</p> <p><i>Data collection:</i> study of project documents, interviews and questionnaires.</p> <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as health staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to the use and dissemination of pharmaceuticals, construction and rehabilitation of buildings, vector control, and health care:</i></p> <ul style="list-style-type: none"> • Waste and chemical generation, collection and treatment (kg; % of generation, description) <hr/> <ul style="list-style-type: none"> • Levels of air pollutants | <p>When the project specific waste and chemicals have been identified, the proposed indicator can be further developed to focus on those substances. This indicator also functions as a proxy indicator of potential impacts on soil and water. Through a description of the collection and treatment procedures, work environment and health related aspects can be captured.</p> <hr/> <p>The type of pollutant monitored needs to be defined within each project.</p> |

Further reading and sources of indicators and reference data

- General information about the linkages between health and the environment - World Bank (1991b) and World Bank (1997)
- Indicators of public health and the health sector – World Health Organization (2001)

Humanitarian assistance

Sida’s work in the area of humanitarian assistance includes (source: www.sida.se):

- following conflicts in a large number of countries, even outside Sida’s partner countries, in order to be prepared to assess needs for humanitarian assistance should they arise
- prepare, follow up and evaluate projects financed by the appropriation for humanitarian assistance as well as humanitarian projects financed by other appropriations
- maintain a constant dialogue with other parties involved in the field of humanitarian assistance, in Sweden and internationally
- take the initiative to ensure that strategic resources are available, for example for mine clearance, through a dialogue with different organisations.

Since the checklist developed for this sector in the Sida EIA guidelines is directed towards refugee support, the proposed indicators in Table 12 also have this focus.

Table 12. Proposed indicators – humanitarian assistance

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <p><i>Support given to capacity building and policy development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the capacity building and policy development? (yes/no) • Number of policy-makers, local population and other stakeholders who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as refugee camp staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p><i>Support to development of specific industries:</i></p> <ul style="list-style-type: none"> • Land use change (hectares; description) | <p>By a classification system, it is possible to track the development of refugee camp area and residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description</p> |

| | |
|--|---|
| | <p>can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. This indicator can monitor the potential development of barriers and access to previously unexploited land. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, local statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <ul style="list-style-type: none"> • People with access to safe drinking water (%) | <p>Especially water use for domestic purposes is dependent not only on availability but also on quality of the water. The proposed indicator could therefore be used to complement the first indicator in order to capture both the health of ecosystems and the health of people. A further analysis of the pollutants (e.g. PCB, DDT, ammonia, faecal e-coli) in the water can be used as a basis for management of polluting activities, whether they are agricultural, industrial or domestic. WHO's guidelines on water quality could be used as a definition of "safe" drinking water.</p> <p><i>Data collection:</i> local statistics, field studies, water sampling.</p> <p><i>For information and reference data, see World Bank (2001) (WHO).</i></p> |
| <ul style="list-style-type: none"> • Generation, treatment and disposal of solid waste (tonnes; kg per person per year) | <p>Like freshwater, the pressure on systems for waste management can increase drastically. This indicator indicates the pressure, which allows for interpretation of impacts such as land use, pollution, etc.</p> <p><i>Data collection:</i> statistics from the waste management authority or company, interviews and questionnaires.</p> |

Further reading and sources of indicators and reference data

- General information about environmental issues in refugee camps – UNHCR (1996)

Education sector

Support to the education sector can have both indirect and direct environmental impacts. Sida's support to the education sector focuses on three broad areas: education reform, basic education, and sub-sector programs in basic education. Within each area, various activities are implemented, each with their different potential environmental impacts:

- **Education reform:** Education reform (policy reform, financing of education and institutional development) is mainly concerned with systemic change, which includes policies and structure as well as the content and methods of education (Sida, 1996b). The environmental impacts of this type of activities are commonly indirect, and not seldom positive if environmental training is a promoted component.
- **Basic education:** The support to basic education goes both to the general qualitative improvement of education, and to particularly under-privileged groups (Sida, 1996b). Considering these strategies mainly consist of increased training of various groups, the expected environmental impacts are mainly indirect. However, components of increased provision of educational material as well as the construction of school buildings may imply direct environmental impacts.
- **Sub-sector programs in basic education:** The main areas for Sida's support to basic education are the production and distribution of educational materials, curriculum development, teacher education, adult/non-formal education,

school construction, and educational planning and management (Sida, 1996b). Both direct and indirect environmental impacts can thus be expected from this support.

Table 13. Proposed indicators – education

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|---|---|
| <p>Support given to educational reform, primary and secondary schooling, adult education, vocational training and higher education:</p> <ul style="list-style-type: none"> • Is environmental training a component in the education/ policy/curriculum/plan? (yes/no) • Number of students and teachers who take environmental aspects into consideration in their daily activities (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as school staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <p>Support to the printing of textbooks, the production of teaching aids and the construction of buildings:</p> <ul style="list-style-type: none"> • Waste and chemical generation, collection and treatment (tonnes; % of generation, description) | <p>When the project specific waste and chemicals have been identified, the proposed indicator can be further developed to focus on those substances. This indicator also functions as a proxy indicator of potential impacts on soil and water. Through a description of the collection and treatment procedures, work environment and health related aspects can be captured.</p> <p><i>Data collection:</i> statistics from the producing/construction company, field studies, interviews and questionnaires.</p> |
| <ul style="list-style-type: none"> • Water use intensity (% use of total available resources) | <p>This indicator is likely to be a proxy (data on water availability in the project area may be difficult to find). It does, however, give an indication of the intensity of use.</p> <p><i>Data collection:</i> local statistics, field studies, interviews and questionnaires.</p> <p><i>For information and reference data, see World Resources Institute (2000).</i></p> |
| <ul style="list-style-type: none"> • Land use change (hectares; description) | <p>By a classification system, it is possible to track the development of building area and residential areas, agricultural areas, forests, plains, wetlands and environments of cultural value. This indicator becomes more meaningful if a qualitative description of the land use change is included. Such a description can capture whether, for example, sensitive ecosystems, untouched areas, cultural assets or traditional land uses are changed. This indicator could also function as a proxy for environmental changes that occur due to migration. This indicator can monitor the potential development of barriers and access to previously unexploited land. The geographical resolution of the data should reflect the size of the project area.</p> <p><i>Data collection:</i> field studies, national statistics (if they exist), satellite pictures.</p> <p><i>For information and reference data, see UN (1996) (FAO).</i></p> |
| <hr style="border-top: 1px dashed #000;"/> <ul style="list-style-type: none"> • Levels of air pollutants | <hr style="border-top: 1px dashed #000;"/> <p>The type of pollutant monitored needs to be defined within each project.</p> |

Institutional development and capacity building

The development of indicators for institutional development or capacity building is a complex activity. The organization responsible for the monitoring has to consider what the newly developed institutions and built capacity are used for, and combine the indicator list below with indicators relevant to the specific field or issue that the institutions and capacities are to affect.

Note that the indicators below do not include indicators relevant to the construction of buildings or production of materials used in developing institutions or building capacity.

Table 14. Proposed indicators – institutional development and capacity building

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|--|
| <p><i>Support given to capacity building, policy development and methodology development:</i></p> <ul style="list-style-type: none"> • Are environmental considerations integrated in the initiative (e.g. in training, policies, plans, methodologies, research)? (yes/no) • Number of people and policy makers who take environmental aspects into consideration in their daily activities (number; %) • Number and share of local actors involved in the project (number; %) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as administrators and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> <p>The involvement of local actors is of central importance to any project aiming at institutional development or capacity building. The indicator should not, however, be interpreted without analysis - there are no golden rules to how many local actors that should be involved. In that way, the indicator may work more as a reminder to maximize the involvement of local actors rather than as a performance indicator. In addition, one has to consider HOW and FOR WHAT the local actors are involved.</p> <p><i>Data collection:</i> study of project documents, interviews and questionnaires</p> |

Further reading and sources of indicators and reference data

- General information on how to strengthen environmental capabilities – World Bank (1991a) and OECD/DAC (1999)

Research

According to the Sida EIA guidelines, research support in itself does not involve significant direct environmental impacts and the role of EIA is therefore to examine if the project’s profile and strategy is in line with the overall objectives for an ecologically sustainable development. There is a distinction between direct environmental consequences, due to physical activities, and indirect environmental consequences,

which concern the way in which the project fundamentally is convergent with sustainable development. (Sida, 2002) In the indicator proposal below (see Table 15) the focus is on environmental impacts of an indirect character. If the project is clearly connected to a particular sector it can be relevant to look at the indicators proposed for this sector.

Table 15. Proposed indicators – research

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|--|
| <ul style="list-style-type: none"> • Are environmental considerations integrated in the initiative (e.g. in training, policies, plans, methodologies, research)? (yes/no) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as researchers and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> |
| <ul style="list-style-type: none"> • Are there environmentally strategic components in the research project and are they executed? (yes/no) | <p>In many research areas it is possible to combine an aspiration to improve a product, activity or condition with an aspiration to improve the environment. Through monitoring such environmentally strategic components throughout the project and after the results have been disseminated it is possible to assess whether they were successful and proportionate in relation to the project.</p> <p><i>Data collection:</i> study of project documents, interviews and questionnaires.</p> |
| <p><i>Support to research of local or regional relevance:</i></p> <ul style="list-style-type: none"> • Number of occasions when local knowledge about the phenomenon and participation has been sought (number) | <p>Local knowledge about aspects of sustainable development can be very valuable and should be made use of. In addition, local support can make the results more relevant and applicable. Note, however, that the indicator does not say anything about the effectiveness of the integration.</p> <p><i>Data collection:</i> study of project documents, interviews and questionnaires</p> |

Private sector development

Private sector development contains of the following working areas for Sida (source: www.sida.se):

- Development of the institutional framework, support to the organisations of industry and commerce, legislation, quality infrastructure, capital supply and public administration.
- Trade related projects, exporting, promoting business contacts, import guarantees, cooperation with international organisations.
- Restructuring of state-owned companies, incorporation, privatisation, changes to ownership structure.
- Training for business people, in areas such as management, quality assurance, industrial environment and export know-how.
- Alliances between companies in Sweden and the partner countries, creating contacts, the Start-South programme.
- Economic Cooperation

As with research activities (see above) it is difficult to identify direct environmental impacts due to the nature of projects. Where such impacts can be found, indicators proposed for other sector can be relevant. The indicators proposed in Table 16 instead refer to issues that can indirectly lead to changes in the environment.

Table 16. Proposed indicators – private sector development

Note that these are only examples of indicators. Other or additional indicators will depend on the individual project.

| Examples of indicators | Comments on the indicators |
|--|---|
| <ul style="list-style-type: none"> Are environmental considerations integrated in the initiative (e.g. in training, policies, plans, methodologies, research)? (yes/no) | <p>The integration of environmental considerations in the creation of an enabling environment, institutional development, and human resource development indicates that there is a possibility for increased environmental awareness among groups such as entrepreneurs, staff and policy-makers. Note, however, that the indicator does not say anything about the effectiveness of the integration. What environmental considerations the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> project document study and interviews with involved parties.</p> |
| <ul style="list-style-type: none"> Number of people and policy makers who take environmental aspects into consideration in their daily activities (number; %) | <p>This indicator is included to be able to monitor any changes in the “effectiveness of the awareness”. Different groups can be distinguished between in reporting this indicator, e.g. women and men, youth and elderly. What environmental aspects the indicator should capture need to be identified from project to project.</p> <p><i>Data collection:</i> interviews, questionnaires, and assessments of plans and policies.</p> |
| <ul style="list-style-type: none"> Are there environmentally strategic components in the project and are they executed? (yes/no) | <p>In many business and trade areas it is possible to combine an aspiration to enhance entrepreneurship, productivity and management with an aspiration to improve the environment. Through monitoring such environmentally strategic components throughout the project and after the results have been disseminated it is possible to assess whether they were successful and proportionate in relation to the project.</p> <p><i>Data collection:</i> study of project documents, interviews and questionnaires.</p> |
| <p><i>Support to capacity development for entrepreneurs (if relevant):</i></p> | |
| <ul style="list-style-type: none"> Number of and share of environmentally certified companies in the project area (number; %) | <p>If the project is about capacity development within management and environmental awareness this can be a relevant indicator. A prerequisite is that there should be realistic opportunities for the companies to gain certification.</p> <p><i>Data collection:</i> interviews and questionnaires.</p> <p><i>For information and reference data, see International Organization for Standardization (ISO) (2000)</i></p> |
| <p><i>Support to privatization projects:</i></p> | |
| <ul style="list-style-type: none"> Changes in emission levels per output/weight/volume (relevant parameters can be carbon dioxide, heavy metals) (various units) | <p>Private or state ownership and management can affect the incentives for a resource efficient production. In cases where the emission levels are positively related to the amount of inputs and energy consumption this can be a useful indicator to measure changes in efficiency.</p> <p><i>Data collection:</i> statistics from companies, interviews and questionnaires.</p> |

Further reading and sources of indicators and reference data

- Potential environmental impacts of privatization of companies – World Bank (1994b)

Annex 1. Projects reviewed in the selection of indicators

The following projects were reviewed in order to select environmental indicators that are relevant to a majority of the projects in each sector portfolio.

Agriculture

1. Sustainable Agriculture in Zambia
2. The Amhara National Regional State

Water related activities

1. Integrated Watershed Rehabilitation and Environmental Development Project, Batangari Watershed, Jambi Province

Health and medical care

1. Action Environmental Health Education Programme
2. Pre-study for a Tri-regional Programme on Work Environment and Health in Southern Africa, Central America and the Nordic
3. Co-operation with the World Bank on Health Policy Issues
4. International course in Injury Prevention
5. Safe Community Project in Bangladesh
6. Health and Reform in Central America Program, 1999-2002
7. Health Sector in Kenya

Education

1. Action Environmental Health Education Programme
2. Education Sector Programme Support to Namibia
3. Quality Improvements of Primary School in Bangladesh

Institutional development and capacity building

1. Environmental Monitoring Programme for Zambezi River Authority

Annex 2. Additional environmental indicator information

Most of the following indicator sources have information on indicators at a more aggregate level than the project level. Many of the discussed indicators, however, can be adapted and used at the project level if one considers the aspects discussed in the above section on how to select indicators for project monitoring.

| Source | Web site: |
|---|---|
| World Bank – World Development Indicators | http://www.worldbank.org/data/wdi2001/ |
| World Resources Institute – World Resources Report | http://www.wri.org/wr2000/index.html |
| United Nations Commission on Sustainable Development – Working List of Indicators of Sustainable development | http://www.un.org/esa/sustdev/worklist.htm |
| United Nations System-Wide Earthwatch | http://www.unep.ch/earthw/indicat.htm |
| International Institute for Sustainable Development – Compendium of Sustainable Development Indicator Initiatives | http://iisd1.iisd.ca/measure/compindex.asp |
| Organisation for Economic Co-operation and Development – Core Set of Environmental Indicators | |
| Organisation for Economic Co-operation and Development – Environmental Indicators for Agriculture | |

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