

# Applying the approach — Central American case studies

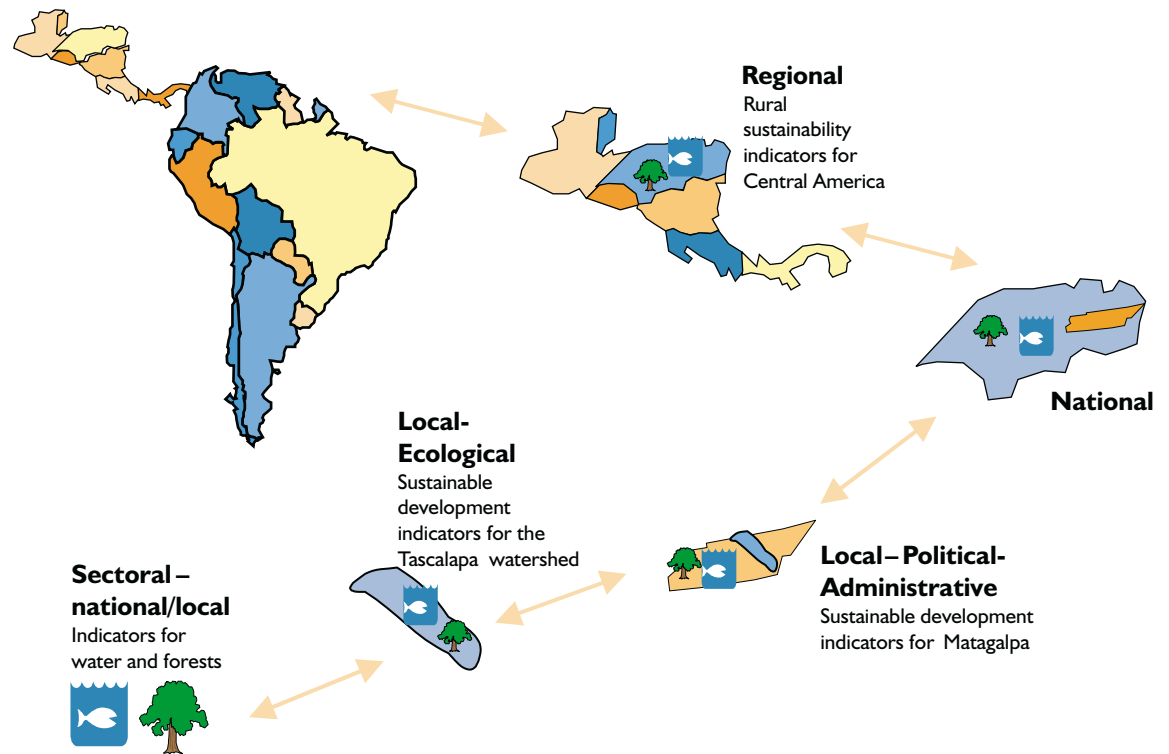
To test the usefulness of the CA project in improving environmental management, a number of case studies were carried out after completing the surveys of databases and institutions, the development of indicators, indices, maps, and the land-use model. The case studies were developed at different levels—local and sectoral—to capture eventual weaknesses, as well as to provide examples of how information generated by the project can be used. Two different dimensions—political/administrative and ecological—were also studied. Figure 9 shows the different levels and dimensions covered by the case studies.

## Local studies

The use of ecological and political/ administrative frontiers as work units to monitor rural development and decisionmaking is essential for analysis and for determining the interactions between environmental, economic, and social components. Two case studies were therefore developed at the local level:

- A study of the *political/administrative* dimension, focusing on Matagalpa Province in Nicaragua
- A study of the *ecological* dimension focusing on the Tascalapa watershed in Honduras.

Figure 9. Working at different levels



**Political-administrative dimensions.** In the study of Matagalpa Province, carried out in collaboration with the Nicaraguan Ministry of Agriculture and Livestock (MAG-FOR), the overall framework was more or less applied. However, since the need for information at the local level differed from that of the overall study, only issues similar to the ones mentioned above were analyzed—as opposed to both issues *and* the three components (social,

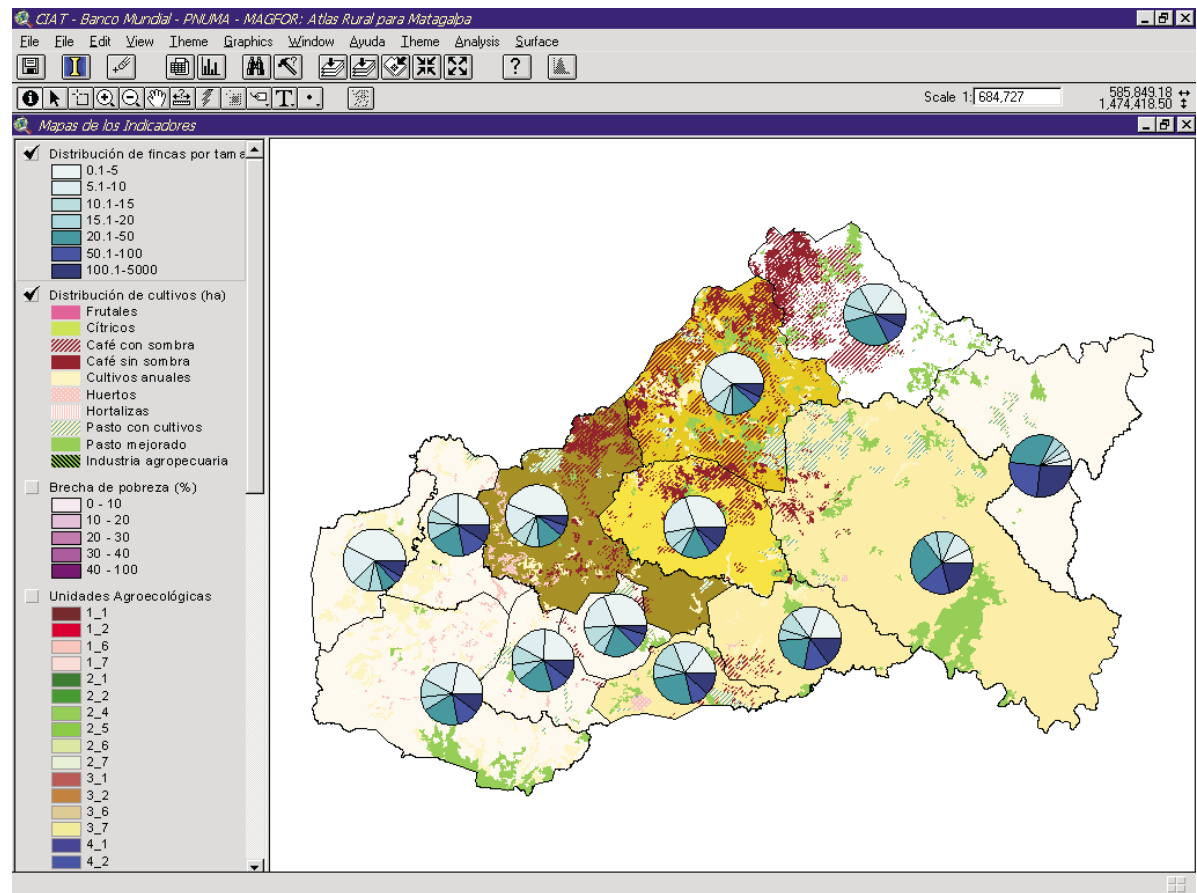
economic and environmental). Relevant issues and data availability also differed from the overall study, so other indicators, indices, and maps were developed for the Matagalpa case study. For example, the accessibility index was developed to show access to markets, schools, and health centers; something that was not possible at the regional or national levels due to lack of data.

Similar proportions of the indicators were possible to develop (100 percent of the indices, 90 percent of the core indicators, and 60 percent of the complementary indicators). However, the quality of the indicators could be assessed more easily because there was generally only one source of data: MAG-FOR. This significantly reduced the problems encountered when working with data from two different sources that only cover parts of the area. For example, it is not uncommon that two different sources report on two separate years, making it difficult to harmonize data to obtain total coverage for an area.

Working with a small, politically well-defined area further simplified data collection and indicator developments. This is especially apparent compared to working with, for example, a watershed, where the political boundaries are less significant and collaboration across boundaries is necessary, but commonly lacking.

A separate CD-ROM was produced for the case study, demonstrating the selected indicators and their corresponding maps. While the CD-ROM for the whole CA project is a closed system (to which new data cannot be added) the CD-ROM for Matagalpa Province is an open system, and data can be updated by the users. Better visualization of the indicators and indices was also possible because the smaller size of the unit under study permitted

Figure 10. Local administrative study: Matagalpa province, Nicaragua



greater detail of analysis (pie charts can be used to show the distribution of farms according to size) (figure 10).

**Ecological dimensions.** The Tascalapa watershed case study was carried out within the CIAT Hillside Project. The overall framework was considered to be unsuitable for a watershed study, partly because the area involved is considerably smaller than any of

the other regional, national, or local test areas, but also because of the requirements of potential users, who are concerned with very specific problems and day-to-day management issues. CIAT had already surveyed the Tascalapa watershed. When the results of the survey were analyzed as part of the preparation for the case study, a number of very practical issues were identified, such as accessibility, health, and vulnerability. As a result, a frame-

**Table 2. Local ecological study: Indicators of condition and vulnerability**

| <i>Indicators of Condition</i>                       | <i>Indicators of Vulnerability</i>               | <i>Index</i>              |
|--|--|---------------------------|
| Land use   | Land-use change                                  | Land Use Index            |
| Land-management practices                            | Land tenure                                      |                           |
| Surface/production of crops                          | Soil degradation                                 |                           |
| Livestock categories (milk, meat, or both)           | Livestock carrying capacity per farm and per ha  |                           |
| Crop varieties (type/species)                        | Pesticide and fertilizer use                     |                           |
| Average farm size                                    | Type of land tenure                              | Forest Risk Index         |
| Natural forest surface                               | Fragmentation of natural forests                 |                           |
| Altered/secondary forest surface                     | Restored/rehabilitated areas                     |                           |
| Protected areas                                      | Deforestation                                    |                           |
| Wood production                                      | Exploitable volumes of forests                   | Water Vulnerability Index |
| Water consumption per capita                         | Water availability per capita                    |                           |
| Energy distribution coverage                         | Hydropower potential                             |                           |
| Firewood consumption per capita                      | Population with deficit of wood and fuelwood     |                           |
| Water withdrawal sources (rivers, reservoirs, wells) | People affected by diarrheic diseases            | Human Development Index   |
| Population distribution/density (rural, urban)       | Migration/projected population change            |                           |
| Medical doctors per inhabitant                       | Malnourished children                            |                           |
| Population with access to sanitation services        | Poverty rates                                    |                           |
| Informal/stationary employment                       | Women/children as % of labor force               | Accessibility Index       |
| Structure of production                              | Destination of production                        |                           |
| Employment structure                                 | Unemployment rate                                |                           |
| Infrastructure distribution                          | Average distance to infrastructure               |                           |
| People with savings accounts                         | Rural credits granted                            |                           |
| Prices of crops/products                             | Net income per farm/rate of return               | Climatic Risk Index       |
| Natural disaster frequency                           | Areas susceptible to natural disasters           |                           |
| Population affected by natural disasters             | Economic and human loss due to natural disasters |                           |
| Population in risk zones                             | Mitigation/prevention plans                      |                           |
| Fire incidents                                       | Months/days with heat wave                       |                           |

work with two categories – condition and vulnerability – was developed. The framework is quite basic, involving two steps:

1. Identify the condition/state of the watershed
2. Given the condition, identify the vulnerability and risks the area is facing.

To monitor the issues identified, a number of indicators and indices were selected at the local level, and several common national-level indicators were redefined at the local level. For example, the study looked at net income per farm as the local equivalent to GNP. A complete list of indicators and indices identified for the watershed is presented in table 2.

Since the indicators were mainly meant for use in planning at the municipal level and by technicians at that level, the goal of the case study was to concentrate on identifying issues, refining the framework, and developing the indicators. During these steps there was a good level of feedback and interaction with the end-users. However, for the final step, the task of creating maps and putting them into use, aspects such as absence of good data, a lack of capacity among end-users to develop maps from the defined indicators, and a limited amount of resources within the project, resulted in a case study that was more concentrated on the indicators than the development of maps.

## LESSONS LEARNED

### Local case studies

- ▶ The regional framework gives the user a useful platform for the development of more “custom-made” frameworks at a local level.
- ▶ For “practical areas,” where day-to-day management is of concern, a practical framework, such as the condition-vulnerability framework, is preferable.
- ▶ The indicators and indices selected should be redefined to become appropriate at the level analyzed.
- ▶ Having a single source of data simplifies assessment of the indicator quality and the process of collecting and visualizing the data, indicators, and indices (although it does not guarantee high data quality).
- ▶ Although environmental issues do not confine themselves to political/ administrative boundaries, indicator development processes are simplified when confined to such boundaries.

### Sectoral studies

Two case studies were also undertaken at the sectoral level—one of the forest sector and one of the water sector.

**Forest sector study.** The forest sector study looks at both the regional and national level (using Honduras as a case study). This is due

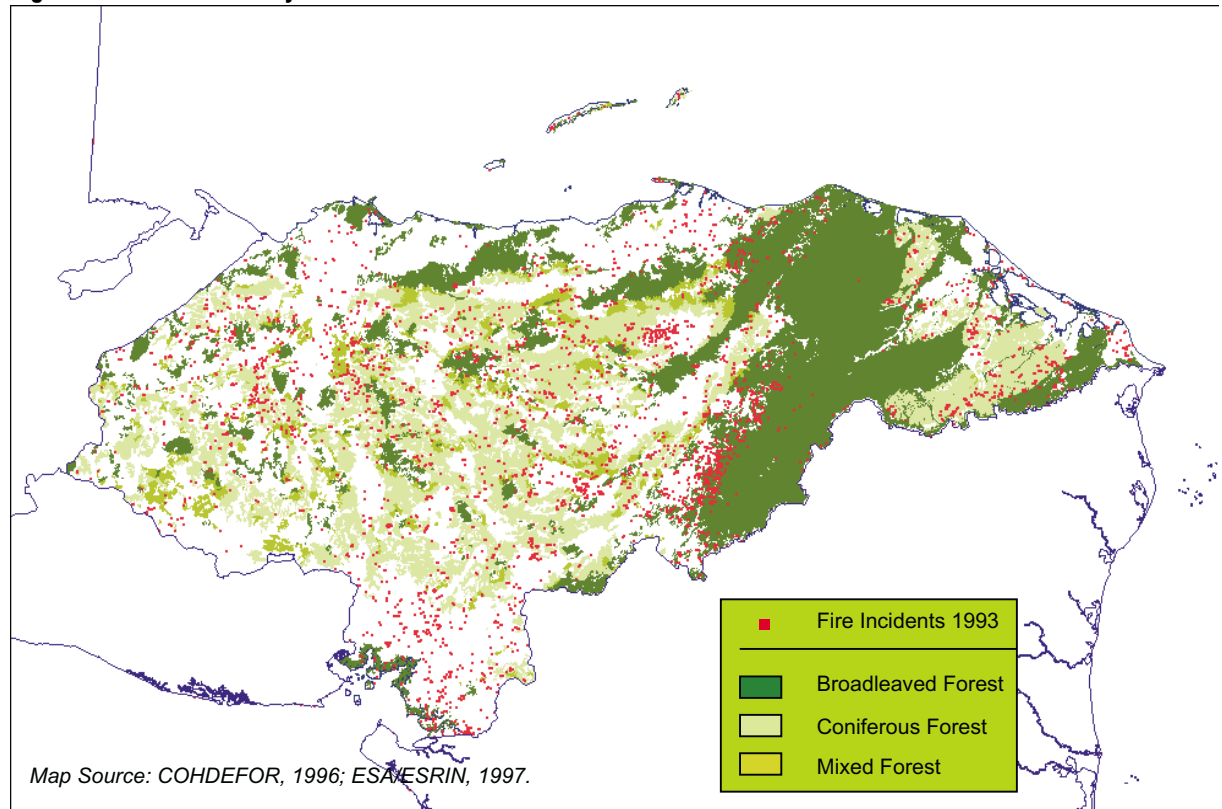
**Case studies permit identification of weaknesses and strengths in the proposed framework**

largely to the importance of the forest sector in *environmental* terms at the regional level and in *economic* terms at the national level. The objective of the study was to demonstrate how sector-relevant policy issues can be addressed through the use of existing data sources at the sectoral level.

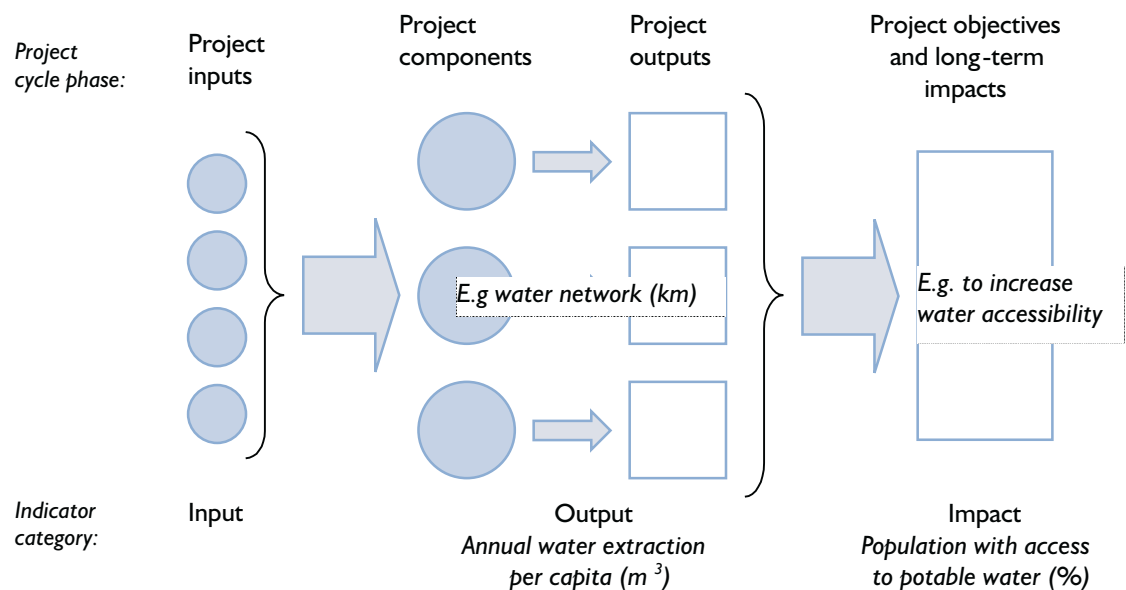
The study introduces users to a supply and demand based framework for forest sector indicators, where the discrepancy between expressed *needs* for information and the *availability* of that information is in focus. In addition the study discusses several of the practical considerations commonly faced by forest indicator developers, including:

- Forest sector characteristics (diversity of resources and goods provided by the forests, irreversibility of alterations of forest ecosystems, and multiple stakeholders)

Figure 11. Sectoral study: Forested areas and fire incidents in Honduras



**Figure 12. A project-based framework — An example for water use**



- Difficulties with data quality assurance
- Lack of data on related issues, such as biodiversity and environmental services
- Diversity in typologies, and indicators proposed and used.

Recognizing the general lack of data on forests in the region—aside from typical economic data—the study suggests a core set of forest-sector indicators relevant for the whole region: forest area, rate of deforestation, annual wood removal, fuelwood share of removals, and trade deficit in forest products. The rationale behind this suggestion is first, that data exist in all of the countries for these indicators, and second, they are all policy relevant.

Although it was recognized that this set is biased toward wood production and a commercial use of the forests, the set could also be viewed as a first step toward more complete indicator sets. Furthermore, many of the ecological, social, and institutional issues that are not overtly represented in the set are captured by the suggested indicators. For example, the more deforestation, the likelier it is that biodiversity and non-timber forest values suffer. Thus deforestation serves as a proxy for the other issues.

Honduras has one of the most developed forest sectors in Central America in terms of economic development and industrialization, which has resulted in greater data availability, and is the reason Honduras was selected to

illustrate how georeferenced indicators can be developed for the forest sector. The study introduces two types of maps for the forest sector: base maps and thematic maps.

The *base maps* (depicting forest area in 1994 and 1985 and forest area already lost in 1985) provide an overview of forest area development in Honduras over a decade. They also give some indication of the forest frontiers. However, they do not necessarily yield enough information for decisionmaking since they do not reveal the underlying cause of deforestation.

Decisionmakers need to understand both the underlying pressures on forests and the potential impact of deforestation on the country. The *thematic maps* provide the user with this information. Three thematic maps are discussed in the forest sector case study: forest accessibility, forest and floods, and forest fires. While the forest accessibility map gives a possible explanation for deforestation rates, the maps of floods and fires illustrate some of the possible impacts deforestation can have. For example, the map of forest fires (figure 11) shows that there has been a strong concentration of fire incidents in the part of the country where forest area maps reveal land-use change resulting from agricultural practices.

The study concludes with some thoughts on possible developments of advanced forest

sector indicators: a wood utilization balance, a carbon account, and a forest asset valuation. The main purpose of developing such indicators would be to reflect a wider range of forest goods and services, including social, environmental, and institutional issues. Without the inclusion of these issues a sustainable development approach to the forest sector is hard to achieve.

**Water sector study.** Like the forest study, the water sector case study was intended to analyze the water sector at both the regional and national levels. However, due to the lack of reliable data it had to be developed as a conceptual study at the national level, discussing different frameworks and factors relevant to the water sector (protection, use, electricity generation, quality, and availability). The lack of data is surprising, especially considering the importance of the water sector in environmental, economic, and social terms for all of the countries in the region.

The water-sector study was developed using two frameworks: P-S-I-R and a project-based framework. In the project-based framework the indicators were developed according to the project cycle (figure 12). This implies that indicators are needed to monitor the inputs used, the outputs of the project components, and, finally, the longer term or more pervasive results of the project, i.e. impacts).<sup>10</sup> The purpose of introducing this framework at the sectoral level was to enable assessments of various detail. For example, a country may want to assess the state of its national water sources and would therefore benefit from using the P-S-I-R framework. If, on the other hand, the country wishes to focus on a specific area (for example a township and its problems) the project-based framework would probably be more useful, since more detailed indicators are included and monitored.

## LESSONS LEARNED

### Sectoral case studies

- ➔ Depending on the level of problem and intervention, different frameworks can be useful.
- ➔ A project-based framework, which permits the monitoring of more detailed aspects, is useful in indicator projects that focus on sub-national project areas.
- ➔ Even individual Central American countries do not have sufficient data available to allow complete sectoral assessments.
- ➔ Environmental data are particularly scarce, which means that selected indicators are often skewed toward economic valuations.