

STEP 1: DEFINITION OF THE PROBLEM

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A necessary first step in undertaking a climate impact assessment is to define precisely the nature and scope of the problem to be investigated. This usually involves identifying the goals of the assessment, the exposure unit of interest, the spatial and temporal scope of the study, the data needs, and the wider context of the work.

3.1 Goals of the Assessment

Some general reasons for conducting an assessment were outlined in Section 2.1. Once the general objectives are defined, the specific goals of the study may be addressed, as these will affect the conduct of the investigation. To illustrate, an assessment of the future hydrological impacts of climatic change in a river catchment has quite different requirements for data and expertise if the goal is to estimate the capacity for power generation, than if it is to predict changes in agricultural income as a result of changes in the availability of water for irrigation.

3.2 Exposure Unit to be Studied

The exposure unit to be assessed is likely to determine, to a large degree, the type of researchers who will conduct the assessment, the methods that can be employed and the data required. The choice of exposure unit should reflect the goal of the assessment and the region, group or activity at risk. Studies can focus on a single sector of activity (e.g., agriculture, forestry, energy production or water resources), several sectors in parallel but separately, or several sectors interactively. Alternatively, the exposure unit may be non-sectoral in character (e.g., an ecosystem, a distinct regional unit such as an island, or a specific population cohort).

3.3 Study Area

The selection of a study area is likely to be guided by the goals of the study and by the constraints on available data. Options include:

- Administrative units (e.g., district, town, province, nation), for which most economic and social data are available and at which level most policy decisions are made.
- Geographical units (e.g., river catchment, plain, mountain range, lake region), which are useful integrating units for considering multi-sectoral impacts of climate change.
- Ecological zones (e.g., moorland, savannah, forest, wetland), which are often selected for considering issues of conservation or land resource evaluation.
- Climatic zones (e.g., desert, monsoon zone, rain shadow area), which are sometimes selected because of the unique features and activities associated with the climatic regime.
- Sensitive regions (e.g., ecotones, tree lines, coastal zones, ecological niches, marginal communities), where changes in climate are likely to be felt first and with the greatest effect.
- Representative units, which may be chosen according to any of the above criteria, but in addition are selected to be representative of that regional type and thus amenable to generalization. For instance, a single river catchment may serve as a useful integrating unit for considering impacts of climate on water resources, agriculture, forestry, fisheries, recreation, natural vegetation, soil erosion and hydroelectric power

generation. Information from this type of study may then be applicable to other similar catchments in a region.

3.4 Time Frame

The selection of a time horizon for study is also governed, in the main, by the goals of the assessment. For example, in studies of industrial impacts the planning horizons may be 5–10 years, investigations of tree growth may require a 100-year perspective, while considerations of nuclear waste disposal must accommodate time spans of well over 1000 years. However, as the time horizon increases, so the ability to project future trends declines rapidly. Many climate projections rely on general circulation models, and are subject to uncertainties over all projection periods. The only prediction horizon of proven reliability is that provided by weather forecast models extending for days or, at most, a few weeks into the future (Lorenz, 1968). In general, few accurate projections of rates of change in socio-economic factors such as population, economic development and technological change can be made for periods beyond 15–20 years into the future.

3.5 Data Needs

The availability of data is a limitation in many impact studies. The collection of new data is an important element of some studies, but most rely on existing sources (an important source of bias in some studies). Thus, before embarking on a detailed assessment, it is important to identify the main features of the data requirements, namely:

- Types of data required.
- Time period, spatial coverage and resolution.
- Sources and format of the data.
- Quantity and quality of the data.
- Availability, cost and delivery time of the data.
- Licensing and copyright restrictions on data distribution.

There is of course, a close interdependency between the identification of data needs and the selection of methods of analysis. *In practice the two procedures operate simultaneously, but they are treated consecutively here for ease of presentation.*

3.6 Wider Context of the Work

Although the goals of the research may be quite specific, it is still important to place the study in context, with respect to:

- Similar or parallel studies that have been completed or are in progress.
- The political, economic and social system of the study region.
- Other social, economic and environmental changes occurring in the study region.
- Issues of scale, where studies conducted at one scale should recognize and take advantage of related information or studies at a larger scale.
- Multiple effects of changes in other sectors, in markets or in population.
- The study's policy context.

Consideration of these aspects may assist policy makers in evaluating the wider significance of individual studies.