1. Introduction

In this book, we focus on one aspect of the many processes leading to sustainable
development—support for decision-making. A vision for sustainable development
implies a long-term process, in which decisions on economic, ecological, and com-
munity development are based on the best available information and coordinated at
the local, regional, and global levels.

Any discussion on technical support for decision-making in different domains
should consider a holistic approach to human problem-solving, the concrete environ-
ments in which decision support systems (DSSs) will be used, and the acceptance of
the system by the user. The ultimate goal is a system under which international or-
ganizations, governments, local authorities, and individuals are able to conduct nego-
tiations as well as coordinate and evaluate their own independent decisions.

A discussion on a global system is beyond the scope of this book, which describes
decision support technologies and selected applications. The implementation or even
the design of a global system to protect our planet is perhaps beyond our present
abilities. However, well-defined components like river basin management or health
care support systems can and should be both designed and implemented. Such initial
modules then can be further developed, integrated, and refined in the future.

2. The concept of sustainable development

No single term or definition can define the concept of sustainable development pre-
cisely. There are many operational definitions. The concept is not new: it can be
traced back 2 000 years to the time of the ancient Greeks. The idea of sustainability
probably appeared first in the Greek vision of ‘Ge’ or ‘Gaia’, the goddess of the Earth,
the mother figure of natural replenishment (O'Riordan, 1993). Under her guidance,
Greeks practised a system of sustainability under which local governors were rewarded or punished according to whether the fields looked well-tended or neglected. Later, concern about the limited productivity of land and natural resources can be seen in Malthus’ essay on population in 1789 and Ricardo’s *Principles of Political Economy and Taxation* in 1817. Their concern was that economic growth might be constrained by population growth and limited available resources.

Toward the end of the 19th and the beginning of the 20th century, the prosperity of the Western economy created an optimistic view of the future. Natural resources were no longer seen as posing severe restrictions on economic growth, as new technologies made far more efficient use of both old and new resources. The fragility of this economic growth was revealed, however, by the world oil crisis and economic recession of the 1970s. Neo-Malthusians began to have doubts about unlimited growth, stressing once again the importance of conserving natural resources by setting limits to economic growth.

In April 1968, the Club of Rome gathered to discuss the present and future predicament of the Earth and its finite resources. The results of its deliberations were published in *The Limits to Growth* (Meadows et al., 1972). The book predicted that the limits of growth on Earth would be reached sometime within the next 100 years if the economy continued to expand at the current rate. The sorry state of our finite resources was the result of exponential growth in global population, resource depletion, and industrial pollution. In 1992, 20 years after this controversial book was published, the same authors published its successor, *Beyond the Limits*, which re-examined the situation of the Earth (Meadows et al., 1992).

With new evidence from global data, the book shows that the exponential growth in the global population, economy, resource consumption, and pollution emissions continues unabated. In 1971, they had concluded that the physical limits to human use of materials and energy would be reached within decades. In 1991, after re-running the computer model with newly compiled data and analyzing the latest development pattern, they realized that in spite of improved sustainable development policies throughout the world, the world might well be approaching its limits even faster than they had thought.

Another sustainability concept can be found in the 1960s notion of carrying capacity in resource management. This concept can be described in wildlife management as "the maximum number of animals of a given species and quality that can, in a given ecosystem, survive the least favourable conditions within a stated time period"; in fisheries management as "the maximum biomass of fish that various water bodies can support"; and in recreation management as "the maximum number of people that a recreational site can support without diminishing the recreational experience that attracted people to it in the first place" (Edwards and Fowle, 1955; Dasmann, 1964; DHUD, 1978).

The most recent concept of sustainable development is a modified derivative of the concepts of growth limits and carrying capacity. It not only stresses the importance of resources in setting limits to economic growth but also draws attention to the need to develop methods that emphasize the potential complementarity between economic development and environmental improvement (Markandya and Richardson, 1992).

In the Brundtland report, sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations