

## What is an ecosystem

### Sensitive ecosystems

#### Ecosystem and sustainability

In 1987 the World Commission on Environment and Development (WCED) issued its first report, the Brundtland Report (from the name of the Norwegian Prime Minister Gro Harlem Brundtland who at the time was President of the Commission). In 1992 was called the World Conference on Environment and the Earth Summit in Rio de Janeiro; on both occasions, the principle of “sustainable development” was officialized on a global scale. Sustainable development aims not to compromise the possibility of future generations of complying with their own development and counting on the same amount of resources we currently enjoy. This is possible only preserving the quality and quantity of our heritage and natural resources. Agenda 21 is the twenty-first century action plan and the official document approved by all the nations of the world in Rio de Janeiro. Since then, the United Nations “Commission on Sustainable Development” reviewing the implementation of Agenda 21 directives in all countries which have subscribed to the action plan.

Herman E. Dally, economist at the World Bank, in 1991 outlined sustainable development according to three essential aspects regarding the use of natural resources by mankind:

- using renewable resources at rates that do not exceed their capacity to renew themselves
- emitting slag and pollutants in the atmosphere without exceeding the carrying capacity of the environment
- stocking non-renewable resources on a regular basis over time

#### The carrying capacity

The carrying capacity of an ecosystem is its natural capacity of producing regular resources for the species living in it without posing risks for their survival. Every year thousands of species become extinct, ranging from microorganisms to large mammals. The estimated average extinction rate has become from 1000 to 10,000 more rapid over the last 60 million years. Hence, there is reason to believe that another mass extinction could take place, the first ever caused by mankind rather than as a result of a natural process. 9 species out of 10 are endangered especially by the decay and destruction of their habitat.

Men have altered most lands, converting forests and meadows to agricultural use, drying out swamps and overbuilding to create new cities. Every year 16 million hectares of forests are destroyed, mostly in tropical regions, where the highest biodiversity occurs. Other ecosystems as freshwater and terrestrial regions have been polluted by human activities. The loss of a single species affects many other ecosystems. Biodiversity, in fact, provides crucial services as the air we breath, filtering the water we drink as well as food and medicines, etc. When ecosystems lose their biodiversity they also lose their resilience, which is their capacity to adapt and become more sensitive to the impact of climate change or alien species invasions. Men should find a way to live complying with the carrying capacity of ecosystems, whilst currently the excessive consumption of resources is causing their depletion. In the past one hundred years the world population has grown tenfold thanks to technological development. In most countries having a high per capita income there is a steady population growth, but resource consumption continues to grow.

#### Ecological Footprint

Many different calculation models assess the ecological impact of a population. One of them is estimating the ecological footprint: this measurement method evaluates how much biologically productive land is employed to produce the goods consumed and to assimilate the waste generated by an individual, a family, a city, a region, a country or the whole of mankind (WWF definition). In Italy, the ecological footprint is 4,2 hectares per capita (2005 data): this means every Italian needs 4,2 hectares of land for his lifetime consumption. National ecological availability, though, is only 1,4 per capita hectares and therefore the ecological deficit is equivalent to 2,8 per capita hectares!

## Ecosystems at risk: why?

Man has always thought he would be able to alter the environment in which he lives to fulfil his own needs. Often though, he has not considered the consequences of this behaviour, and actually man has acted to obtain a certain effect, achieving instead the absolute opposite. A typical example may be the **destruction of very productive ecosystems**, such as estuaries and swamps, for the sake of reclaiming farmlands that are assumed to be “more” productive. But the special function of estuaries and swamps was not taken into consideration. In these areas, the plentiful production of vegetal species is not directly used as food, but these are however the places in which numerous species of birds and water animals, that have a high nourishing value, prefer to live and grow. The destruction of these areas (and their use in farming or industrial activities) is unfailingly followed by the disappearance of these species and the loss of the associated feeding values.

Another clear contradiction is the **destruction of the tropical forest** to make room for farming. In these areas, the land is fertile because the vegetation brings nourishment to it all the time. The products of the decomposition of the vegetal tissues are trapped and then used by an extremely thick network of roots. The destruction of the tropical forests and therefore of this wide and extremely important network of root apparatuses leaves lands that soon lose their fertility and in which productions can continue only by using huge amounts of fertilizers. Hence the need to burn more and more portions of forests to have fertile land available for just a few years of farming.

## Balance change and consequences

When ecosystems are exploited, their balance is modified. As a consequence, health and productive capacity are compromised. Each human intervention on the environment management should therefore be studied according to the consequences that it might have for the ecosystem well being and its productivity. Such a perspective requires the whole of the ecosystem to be considered. At this respect it is necessary to know the ecosystem in a detailed way and assess its productive capacity and the consequences that the human intervention might have. It is important to assign a value to the goods and services provided by the ecosystem, and it is important to define an action policy. This assessment process has been done in very rare cases. In fact the global or local degradation of ecosystems has not been estimated so far. People do not even know if men will be able to recover a part of this degrade with adequate restoration measures.