

Ecosystem sustainability

Introduction

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Ecosystems

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 fertilisers. 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.

Desert

Desertification

According to the figures reported by the United Nations Environment Programme (UNEP), 25% of the earth's land is threatened by desertification. The lives of over one billion people in over 100 countries are at risk since farming and cattle breeding become less productive.

Desertification does not mean the deserts are still expanding or taking over the neighbouring lands. As defined by the UN Conference on "Environment and Development" held in Rio de Janeiro in 1992, desertification is a process of "deterioration of the arable land into dry, medium dry and sub-humid dry areas as a consequence of many factors, including climatic changes and human activities". A common element shared by the areas threatened by desertification

is the relentless reduction of the surface layer of the soil and its productive capacity. This is a serious phenomenon since it determines other ecological disasters, such as the loss of biodiversity and the increase of the temperature all over the world.

Areas of degraded land may be found hundred of kilometres from the closest desert. But they can expand and join each other into something that may resemble a desert. The most serious reasons underlying this phenomenon are drought and human activities: intensive farming exhausts the soil; cattle breeding removes the vegetation, which would otherwise

Fighting against desertification

The 1992 Rio conference produced the Agenda 21, an agreement containing a set of measures for the 21st century, locally applicable and aiming at addressing a global issue that could only be solved by combining economic development, the protection of the environment and social growth.

On December 26th 1996, a UN Agreement came into effect, proposing a partnership-based approach to be implemented through initiatives involving international co-operation; the common purpose is to improve the productivity of the farmland, to reclaim and preserve it and to manage water and soil in a sustainable manner. The measures taken tend to give priority to those projects that have been expressly developed for specific areas, by emphasising the involvement of the local communities, the restoration of precious traditional customs and the reappraisal of the role played by the rural communities to prevent the deterioration of the land. In addition, while in the past more emphasis was laid on technical solutions, now problems are addressed as global issues, in view of the relentless population increase and a number of political and socio-economic factors.

A number of UN organisations are addressing the desertification issue world-wide, such as the FAO (Food and Agriculture Organisation), the IFAD (International Fund for Agricultural Development), the UN Development Program (UNDP), the World Meteorological Organisation, the UNEP (United Nations Environment Programme) and the UNESCO (United Nations Educational, Scientific and Cultural Organisation).

Savannah

Natural parks of the savannah

It's not by chance that a high number of national parks are in savannah areas. Generally speaking, a nature reserve is a protected area of remarkable naturalistic value: flora, fauna, geomorphological features of the territory. The savannah is home to the largest animals of any ecosystem; their presence at first, then their preservation led many countries to establish national parks. They are protected by special laws, providing for protection of the area and the species that live in it.

One of the best-known parks established in a savannah is instead the Serengeti National Park in Tanzania. It was founded in 1941 and declared one of the jewels of human heritage. It is one of the largest reserves in Africa, occupying 1,500,000 hectares. It has been calculated that over one million game animals live there: gnus, zebras, gazelles, lions, elephants, buffaloes, ostriches and black rhinoceroses

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Rhinoceros hunting

However, in many countries even the establishment of reserves no longer offers good protection to many animals species, because of population increases political and ethnic conflicts (for instance in Mozambique), increasing poverty; there are many people who kill protected animals to sell parts of them to survive. Poachers have caused some species, such as black rhinoceroses, white rhinoceroses and elephants, to disappear. In particular, rhinoceroses are at risk because of their horns, which are much sought-after for medical purposes and to make daggers which in Yemen are symbols of manhood and strength. In the Seventies, this was all the rage and so this fashion played its part in the killing of 90% of the rhinoceroses of Kenya, Tanzania and Zambia, and in their disappearance in another 7 countries. In 1977, the CITES listed all the species whose trade is forbidden, including both whole animals and animal parts and by-products. These bans and stricter and stricter inspections caused the value of horns to increase, making smuggling more and more remunerative and, in poor countries which are endlessly threatened by famines and wars, this often pushes people to infringe the ban. Poachers have therefore got on with their jobs undisturbed and the populations have dropped to critical levels. Since the late Eighties, Namibia first, then Zimbabwe have begun to cut the horns off rhinoceroses under anaesthetic. This has proven to be a deterrent against poaching, but unfortunately the horns re-grow by a few cm a year (they are made of keratin just like nails and hairs) and the operation has to be repeated every 2-3 years at the cost of approximately 1,000 dollars per animal and funds are not always available. At the latest CITES Conference at Fort Lauderdale, Florida, in November 1994, the countries in which rhinoceroses and product consumers live decided to strengthen the laws on protection and the inspections on their enforcement as well as to promote alternatives to horn-based drugs. At the same Conference, South-Africa was granted authorisation to export live white rhinoceroses (the only increasing species) to other protected areas and the trophies made by selective killing to fund protection projects. After these last changes, it seems the importation of rhinoceros horns has decreased over the last few years.

Elephants without teeth

Equally important is the problem of elephants, hunted for their ivory tusks. The tusks are the upper incisors, which in old males can reach 2-3 metres long and are used by the pachyderms to strip the bark off trees or dig up roots and in social gatherings are exhibited as a sign of power and used as weapons. Ivory is also used to make jewels and other items, which are much sought-after and sold all over the world. Since the Seventies, the CITES has been successfully protecting Asian elephants and since 1990 African elephants as well. The situation has improved so much that sometimes it causes overpopulation, so that entire families of elephants have to be moved to less crowded areas instead of killing them. Many elephants are moved, for instance, to Angola, whose Government after decades of wars and poaching is trying to reintroduce the Big Five, the five big African mammals: elephants, leopards, buffaloes, lions and rhinoceroses.

Mediterranean Scrubs

Fires

In these regions, where the summer climate is dry and parched, fires are frequent and natural; fires may be caused by spontaneous combustion or by a flash of lightning of a summer storm.

Because of the many fires, the vegetation contains many fire-resistant plants, such as cork oaks, or plants whose germination is even promoted by fires (pyrophitic plants, such as, for instance, plants of the genus *Tuberaria*) or plants that quickly recover after fires, such as holm-oaks. Animals have also adjusted to live in different habitats and can quickly repopulate recently burnt areas.

Nevertheless, fires are becoming more and more frequent because of man's presence. Fires caused by man can be arsons (purposefully set fires) or caused by carelessness (a lit cigarette thrown away, a bonfire not completely extinguished, etc.). Fires destroy entire woodlands and are dangerous to men and animals.

In Italy, there are thousands of fires every year: a total of 8,595 fires took place in 2000, which covered a total surface of 114,648 hectares, 58,234 of which were woodlands; over the last ten years, 700,000 hectares of woodland have been damaged by fires (with a peak of 115,000 hectares in 1993)

Fire, Fire!

The Civil Defence suggests some sustainable behavioural rules to prevent fires:

- do not light fires near wood, flammable liquids in general, fuels, paper and garbage
- pay attention to signs showing danger of fires or prohibiting fires
- If you light a fire in a place where it is allowed, make sure it is out before you go away.

In case of fire:

- when sighting a fire, always inform the people in charge (police, the Fire Brigade, the State Corps of Forest Rangers, the Consortium of Municipalities of the mountain area ...), specifying any useful detail that will be asked
- learn how to use fire extinguishers.

Near a fire:

- move away; don't forget smoke is dangerous for your airways
- cover your nose and mouth with a damp handkerchief
- if in a closed place, keep calm, lie down while covering your mouth.

Over-pasturing

One of the main causes for the drying of the soil is excess pasturing. It occurs when the pressure of the pasturing activity on an area exceeds what that area can bear. The soil, deprived of its vegetal covering, is more sensitive to atmospheric agents. As a consequence, it dries up in the summer and is washed away by winter rains. Unfortunately, people often resort to fire as a quick way to obtain pasturelands. This involves the deterioration of the garrigue and steppe Mediterranean scrub areas.

Desertification

Desertification is a process of degradation with regressive alterations of the water cycle, of the fertility of the soil and of the biodiversity of ecosystems. In Mediterranean scrub areas, especially in the Mediterranean basin, deep economical and social changes have been taking place since the Fifties which led to leave the countryside, to change the use of the soil, to increase the demand for water and to urbanise rural and coastal areas. These territorial exploitation phenomena have increased the gravity of erosive processes and degradation and desertification risks. In particular, deforestation and the loss of the vegetal covering cause the soil to lose much of its ability to retain water, so this impoverished soil is no longer productive.

Coral reef

Fishing with cyanide

In the south-east of Asia, people live mainly on fishing, but the systems used are often very harmful to the reef, since cyanide and explosive are used to produce easier money. It has been calculated that between 1986 and 1991, 50% of the reefs of the Philippines was destroyed in this manner. Fishing with cyanide began in the Philippines in the early Sixties and supplies a market of one billion two hundred million dollars a year. In the beginning, this fishing method was used to take live fish for aquariums, then specialised in taking live fish, especially groupers, to be sold to restaurants. Selected and taken alive from the aquarium tank of the restaurant, some fish can cost up to 300 dollars a dish, sometimes becoming real status symbols, to be displayed at parties or important receptions. Even if fishing with cyanide is illegal in all Asian Pacific countries, it is still practised, above all in still untouched reef areas. The fishermen crumble up a cyanide tablet in a plastic bottle containing seawater, then plunge. When they find a prey, mostly hidden amidst the corals, they soak it with enough solution to stun it. The powerful poison is also dangerous for the fishermen who risk making contact with it during the operation. The stunned fish often ends up in hidden clefts and so the fishermen have to use hammers to break up pieces of coral. Dynamite is also used on reefs to break up coral blocks and rouse fish. This fishing method is not selective and also damages organisms that have no commercial value. Only in the Philippines are concrete measures beginning to be taken to discourage this fishing method: for instance, the Government is implementing courses to train fishermen on alternative fishing systems that are not harmful to the environment. In

addition, inspections have been increased: a network of laboratories tries to find traces of cyanide on the fish sold. They are also trying to enforce the obligation to inspect the live fish that has to be sold and to hold environmental education courses in schools to raise the children's awareness on the damages caused by this fishing method.

Bleaching: whitening of coral

"Bleaching" is the term now commonly used to define the "whitening" of corals. In case of environmental stresses (for instance a temperature increase), coral polyps throw out the algae which live in symbiosis with them, the zooxanthellae, that give colour to the corals with their photosynthetic pigment. The consequence of such phenomenon is the coral colony losing its colour, sometimes becoming totally white. When like this, the coral is not dead; as soon as the conditions that caused this phenomenon cease, the algae re-colonise the polyps and the situation gets back as it was before. Otherwise, the coral will die. The main cause of the destruction of the reefs seems to be the increasingly high temperature of the oceans. In 1998, the "bleaching" phenomenon reached catastrophic proportions due to the passage of the Niño (a phenomenon which involves abnormal displacements of water in the oceans) which caused the mean temperature to increase by 2°C, thus making 90% of the coral die in some areas in the Indian Ocean. It is as if all of a sudden a millenary forest caught fire, thus causing an almost irreparable ecological damage. In addition, the damage is not just ecological or biological, reducing biodiversity, but it is also a socio-economic one for all those communities whose survival depends on the reef.

Sustainable Turism

Tourism has often been regarded as the most important economical resource in the Tropics. The climate and the reef of the Tropical countries are a nice change of sight for winter visitors coming from higher latitudes. An example are the Hawaii islands, where tourism makes up 35% of the gross domestic product and the number of visitors exceeds 7 million a year. Here, as in many other countries, the spreading of tourism has involved new problems as well: new buildings along scenic beaches, use of farmland for golf courses, increased water requirements in islands where water is a limited resource, increased waste disposal, including sewage waste, resulting in the proliferation of seaweed. But there is also another type of tourism that involves a different way of travelling: sustainable tourism. The purpose of this type of tourism is to organise tours that respect the needs of the destination peoples and countries. Tourism should therefore be planned by consulting the locals, so that it is fair and equitable for the host community, economically sustainable in the long term, does not damage the tourist attractions and the natural environment. Even if it involves great planning efforts and substantial investments, it is absolutely necessary to protect tourism itself.

How to protect the coral reefs

There are really hundreds of thousands of tourists going on holiday in places with reefs ever year and a large part of them could further damage this fragile ecosystem, mostly without realising it. Here's then a list of do's and don'ts to avoid further damages to the reefs, according to environmentalist groups:

- never buy anything made of tortoiseshell, shark teeth, shells and coral in any country whatsoever
- never eat any dish containing turtle meat, eggs or fat, such as the famous "turtle soup". In particular, avoid doing this in Indonesia and Bali, where sales of this lovely dying species to tourists is unfortunately still very common
- never eat shark-based dishes, such as the well-known "shark fin soup". All tropical and subtropical species of sharks risk disappearing because of the indiscriminate fishing carried out to supply Chinese restaurants all over the world
- do not overeat crayfish just because it is cheaper at the Tropics. European and American tourists have caused these shellfish to remarkably decrease in many Tropical seas
- never buy any Chinese drugs made with reef organisms. Not only are these drugs unlikely to be effective, this trade is also threatening many species of fish, from sharks to seahorses
- never walk on the reef, not even with rubber shoes or fins. Every step could damage the slow work that thousands of living beings have accomplished over hundreds of years
- never touch corals or other inhabitants of this ecosystem. Not only could you hurt yourselves, but you could also kill thousands of coral polyps. In addition, watch what you tread on with your fins and how you move at sea near the reef

- never take away any live or dead organisms belonging to the reef. Corals, shells and starfish are much more beautiful alive and left in their habitat than among your ornaments back home.

Saving the reef

Everyone's proper behaviour is the first step for the protection of any ecosystem, but this must necessarily be followed by political efforts world-wide. 60% of the world's reefs have been classed as "at risk" by the UNEP (United Nations Environment Programme). Among the main causes of the destruction of corals are the over-exploitation of fishing, tourist developments and a massive use of fertilisers. In 2001, the UN Environmental Agency launched a multibillionaire project for the protection of reefs all over the world. The initiative is called International Coral Reef Action Network, has obtained 10 million dollars' funds from the United Nations and expects to raise another 20 for the management of the 10 most "critical" areas. This will include the mapping and monitoring of reefs, financial assistance to fishermen, improvements of tourist facilities, training and educational programs for local communities. The main areas selected for this first stage of the project are: the coasts of Kenya, Madagascar and Seychelles, Indonesia, Jamaica, Mexico and the Solomon Islands.

Rain forest

Deforestation

Deforestation seriously threatens the survival of forests because as well as felling trees it also involves building roads and people migrating to the deforested areas. The proportions of this environmental disaster are really impressive, especially in Africa. Over the last thirty years, Africa has lost two thirds of its tropical forests and its ancient forests now cover just 8% of the original surface. 85% of the forests has gone lost in the Congo basin, and the remaining 15% is now threatened by the timber industry.

The main causes of deforestation are:

- replacement of forest areas with crops and farms: after taking the most valuable trees for the timber trade, the forest is burnt down, thus killing animals and plants. In September 1991, the most disastrous year ever recorded in the Amazonian forest, over 50,000 fires were recorded both by air and by satellite
- timber: ancient trees are felled to make timber or cellulose for furniture or paper industries. Whatever system is used to fell the trees, it seriously damages the ecosystem and is aggravated by the construction of roads for the access of vehicles and for the transport of the logs. In this way, many trees of poor economic value are felled as well, which have however a remarkable biological and ecological value
- firewood: this activity is mainly carried out by the indigenous people who, due to the recent population increase, have to look for energy sources for their sustenance. This phenomenon aggravates therefore the more massive industrial problem
- constructions of roads (for the above activities), dams and industrial exploitation of mines also involve massive deforestation.

Consequences of deforestation

Since the forest is vital for the rain cycle, deforestation involves climatic imbalances at a local level and because of the proportions of this phenomenon also on a global scale, since it affects the composition of the atmosphere and consequently the greenhouse effect. They are the greatest natural purifiers of the earth: to fell forests means to get rid of a "pool" of carbon dioxide, leaving more of this gas in the air, which could affect the heating of the Earth.

What will save forests?

Operations ever made against tropical nature, from dams to roads to mining. Nevertheless, in a document signed in July 1991, the Bank undertook to stop funding any project involving tropical deforestation, giving priority instead to projects for reforestation and for the development and protection of forests. In addition, since when public opinion has become aware of the importance of tropical forests and of how dangerous it is to deforest relentlessly, the timber trade has come out

with an ecological wood certificate to meet the requirements of those consumers who are more sensitive to environmental issues. The FSC (Forest Stewardship Council) international certificate is the most common in the world and is supported by the leading environmental associations; FSC wood has reached Italy as well. This certificate distinguishes products made with raw materials from sustainable forests according to well-defined and verifiable criteria. In addition, it keeps track of the forest from which each lot of wood comes, despite the long way it has travelled, from the wood to the shop. This certificate has already been granted to 10 million hectares of forest in 26 countries. The timber market is also related to the paper industry. It has been calculated that, in Italy, each individual uses on average 200 kg of paper a year, which means a class of 30 pupils consumes as much paper as the weight of an adult elephant in one school year, and the source of the raw material cannot be easily tracked. If we want to save the forests, we have first of all to reduce waste and accurately separate waste for recycling. In addition, we have to choose recycled paper in lieu of "white" paper, making sure the recycled paper has been produced without ecologically harmful substances: it must therefore bear a "chlorine free" tag. In Germany there is, instead, a symbol that identifies pure recycled paper with certainty: "The blue angel". The paper that bears this tag is 100% recycled with a poorly polluting process and has certainly not damaged any endangered forest.

Extinction of species

Worst problem of the degradation of the earth certainly is the decrease in biodiversity, i.e. the disappearance of thousands of animal and vegetal species, which are fragile ecosystems. Biodiversity is our basic natural resource, our biological wealth, and the human species depends on it for survival; the disappearance of a species is an irreversible phenomenon, so that once it has disappeared it has disappeared forever. Researchers argue that the destruction of tropical forests will be the main reason for the extinction of thousands of species over the next decades. Some think that between 5 and 15% of the species that exist today will be dead by 2020. Others believe that over 15,000 species will die every year in tropical forests only. These figures only concern the fast extinction resulting from the destruction of habitats, not to mention the long-term ones due to the reduction and fragmentation of habitats. The future certainly does not look rosy: 98% of the species that are doomed to disappear live in tropical forests. Many species are so well adapted to live in small geographical areas as to be threatened with extinction if their habitats are damaged. For instance, the golden toad (*Bufo periglamus*), discovered as late as 1964, lives on the top of the Monteverde in Costa Rica. After about one hour's cutting of the forest to produce timber, its only habitat would be fatally damaged and it would die.

Endangered species

The species most at risk of extinction are as follows:

- predatory species, especially those at the highest levels of the food chain of an ecosystem, which consist of few individuals and are spread on large surfaces (such as the jaguar);
- large-size animals with a low birth rate (such as the gorilla);
- species living in specific areas only, such as the endemisms of islands or secluded mountains, where habitats can be quickly and easily destroyed (such as the lemurs of Madagascar);
- very specialised species with poor adaptability, colonisation and spreading (such as the Amazonian hummingbird, whose beak is specialised to reach the nectar of the flowers of some passionflowers).

Trade of tropical animals

The cause of the decline of one half of all vertebrates at risk of extinction is man. The disappearance of these animals has very often to do with the trade of their bodies or parts of them. Young monkeys, for instance, especially small South-American monkeys, are sold as pets in the West and their capture often involves the killing of their mothers or both parents. Bizarre fashions boost the trade of large reptiles, such as pythons and boas, crocodiles and felines. Less evident but equally disastrous is the trade of tropical birds, especially parrots, imported in dozens of thousands every year and often dying during transportation, which is often surreptitious and illegal.

"Hamburger connection"

At first sight it's not easy to relate hamburgers and steaks to the disappearance of animal and vegetal species and the

deforestation of the Tropics. In Panama, Costa Rica, Guatemala and other countries of Central and Latin America, tropical forests are burnt down to make space for cattle breeding. In 1980, it was calculated that 72% of the Amazonian region of Brazil was deforested to obtain cattle pastures. The United States import 33% of all the beef of the world's market and therefore almost all the meat produced by Tropical pastures; Europe also imports meat from Tropical America and Africa. To produce the meat of just two hamburgers in a tropical forest involves an area of approximately 24 square metres, which is as much as the surface of your classroom. This area, that produces 100 g of minced meat, accommodates on average over 500 kg of living matter, plants, flowers, butterflies, birds, monkeys. It has been calculated that a primary tropical forest takes 600 to 1,000 years to re-form. In addition, burning or destroying a tropical forest to use the land as pasture or farmland makes the soil sterile in few years, because of the rains washing away the few nutrients contained in the tropical soil.

Let's protect the forest!

Everyone's correct behaviour is the first step for the protection of any ecosystem. Few rules of conduct may be important at the source, to protect rainforests.

Here is a short list of recommendations suggested by many associations dealing with this issue, that should be adhered to protect the tropical nature and environment.

- Do not buy things made of tropical wood (parquet floors, furniture, boats, etc.) and ask for the certification if possible.
- Check where the meat comes from; it's better to eat meat from your own country or make sure it does not come from Tropical areas
- Do not eat frozen tropical fish or shellfish.

Do not buy items made of hides or integument or other materials of tropical animal origin (ivory, feline fur, crocodile, snake or lizard skin, tortoiseshell items , etc.).

- Do not buy live animals (monkeys, felines, turtles, parrots, etc.) or dead animals (butterflies, insects, spiders, shells, trophies, stuffed animals, etc.) of Tropical origins.
- Do not visit reptile, fish or live insect shows. The mortality rate of these animals is often extremely high and they are replaced with specimens taken from nature
- Do not buy Tropical plants unless they are from European nurseries
- Support nationally- and internationally-recognised associations or foundations fighting for the protection of Tropical nature.

Temperate Forest

The forest, a disappearing resource

Healthy forests mean a healthy planet, because forests protect the catchment basins needed to supply freshwater and the soil from water and wind erosion, help to re-oxygenate air, provide shelter to plants and animals, food and fodder to mountain people, are a source of timber and other products. Despite this, forests are endangered. As early as the Middle Ages wood was a resource of primary importance since it was the only source of energy along with water. Later on, after the Industrial Revolution, forests remarkably dwindled, since this resource began to be used in many different ways: wood as a source of energy for forges (equipment where metal parts are hot-forged) and glassworks, to make railway sleepers at a time the railway network was extended for thousands of kilometres, to make new houses to cater for the increased population. The only ancient forests left are in eastern countries and in Russia. They are called "primary" and have never been exploited since they have always belonged to rich people who used them for hunting as well as often being hardly accessible. Today, the authorities are trying to control the forests that have been left in a way that enhances

and protects their value. Many parks have been set up for this purpose, in which getting to know and appreciating forests helps the spreading of a more “environment-friendly” culture. In addition, the FAO has established a plan for the assessment of global forest resources. To put it in place, they had to resort to remote sensing and geographical mapping to monitor the conditions of the Planet’s ecosystems

The reintroduction of the deer

The areas where deer used to live must have covered a large part of mainland Italy and Sardinia. Since the 17th century, environmental changes, the increase in population and hunting have caused this species to slowly disappear from larger and larger areas of Italy. In the late 19th century, only a small population remained in the Bosco della Mesola (near the Po delta) and another one in Sardinia. This situation essentially continued until after World War II, apart from some more or less occasional specimens migrated from Switzerland. This expansion of deer populations from Switzerland, Austria and Slovenia to the southern side of the Alps increased and became more consistent in the Fifties and has been responsible for the restocking of the central and eastern parts of the Italian Alps. Quite a different matter is the deer of western Alps, northern and central Apennines, which have been brought back there in the late Sixties. In Sardinia, deer disappeared instead from the central-northern area in the Forties and it was only in the mid-Eighties that it began to be proactively controlled to increase its number and distribution area. At present, the deer population all over Italy can be estimated to make up approximately 32,000 heads.

Eco-tourism

Tourism-related activities are the largest economical sector in the world, since they contribute either directly and indirectly to approximately 7% of the world’s production and offer thousands of jobs worldwide. For many countries, tourism is one of the greatest sources of work and income.

It is important, therefore, to raise people’s awareness of the disturbance tourists inevitably cause to the environment with which they interact, and to promote conscientious tourism, or eco-tourism. It can actually protect the natural wealth by finding how to minimise negative effects. The World Tourism Organisation, the United Nations and other international agencies have identified the main conditions that an ecotourism project has to fulfil:

- making sure it furthers the preservation and sustainable development of territories and neighbouring communities;
- ensuring the involvement of local communities in all stages of an ecotourism project;
- minimising the negative impact that accommodation, transport and any organised tourist activity may have on the natural and cultural environment;
- making sure a reasonable part of the income generated by tourism-related activities goes back to local communities and to the preservation of natural assets;
- raising awareness that tourism may be practised in different ways, that are more respectful of the environment and socially responsible.

Let’s protect the forest!

A correct personal behaviour is the first step towards the preservation of any ecosystem. Few rules of behaviour may have an impact at the source to preserve forests.

Here are a few tips on how to respect this biome:

- do not light fires
- do not make noise, which could scare animals
- keep to the tracks, to avoid destroying living species and young seeds
- do not pick more flowers that you can hold in your hand and do not pick any protected flower
- inquire about what sporting activities are allowed and stick to the rules
- do not let picnic rubbish around.

The importance of a forest

Woods can be divided into two categories: natural and artificial. The first category includes native, ancient woods or woods that were artificial at first and have then naturalised. The second category includes only artificial woods or woods

that have been planted only to be felled. The essential functions of a wood can be grouped into three categories: productive function, ecological-protective function, aesthetic-recreational function. The first one is essentially aimed at forestry as well as to commercial exploitation for wood products, such as fruits (chestnuts, pine nuts, etc.), bark, resins, rubber, mushrooms and soft fruits (strawberries, blueberries, officinal herbs, etc.) and game. The ecological-protective function is related to physical (keeping low temperatures and high humidity) and biological aspects (air oxygenation, production of organic substances). By collecting rain, reducing its falling speed, making the soil permeable and reducing surface flows, woods control the outflow of water streams. In addition, they almost completely counter the effect of winds and brightness. Another important function of woods has to do with the pedogenesis (birth and growth of soils), since it replenishes the soil and roots of organic substances.

Taiga

The importance of a forest

After heavily exploiting its own natural resources for years, Russia is beginning to understand the ecological importance of its own forests. The about-turn in the management of this heritage over the last decade has now led to many changes: there are now over 140 state natural reserves, whose reproduction plans have in some instances ensured the survival of some animal species, including the European bison.

Scientifically, study missions have been organised; four to Siberia alone (1996, 1998, 1999 and 2000), as part of EU-funded research plans. The areas involved in this plan are located approximately 600 km north of Krasnoyarsk, near the village of Zotino (61°N; 89°E), standing on the banks of the river Jenissey, 160 m above the sea level. The study of the ecology of these forests has involved the installation of stations for monitoring gas exchanges between carbon dioxide and steam as well as studying the energy balance of the different types of forests; the development of transects for studying the composition and structure of the forest, along with analyses of the soil for reconstructing the different stages of after-fire secondary successions.

Forest preservation

Human intervention alters the natural replenishing cycles of the forest and its structure and composition in terms of species. Although the forest surface has increased during the 20th century, natural forests have shrunk. If a forest is used to make timber, pride of place is generally given to one species only (often Scots pine or red fir in Finland), while the others tend to be removed. In addition, the life of the trees is shortened by regular falling and dead wood is removed. This produces a forest, which tends to have one species of trees of the same age, remarkably younger than those of natural forests. Nevertheless, reforestation reduces the impact of the timber-related industries and protects other natural forests, and favourably affects the climate, water system, water cycle and the quality of life in general.

Tourism and wildlife sanctuaries

Tourism offers the beauty of a wild, uncontaminated region of unique beauty and produces employment and services. Many wildlife sanctuaries offer to nature-loving tourists unique sights and uncontaminated places, while a number of sporting facilities scattered all over the world provide winter sports. Finland has 30 national parks that occupy an area of approximately 7000 square kilometres. If we add this figure to other natural reserves, the total surface of protected areas reaches 29000 square kilometres, that is almost 9% of the total surface of Finland. Sweden has 25 national parks that cover approximately 6000 square kilometres and natural reserves that cover 26000 square kilometres. All these protected areas amount to 7% of the total surface of Sweden.

Tundra

Long-distance pollution

Although remote and far away, the tundra is not spared the negative impact of some of man's activities. Its most important problems have to do with the pollution which is caused by mining. The flowrate of the main Siberian rivers, the

Lena and the Yenisey, has dramatically increased lately, despite the reduced rainfall. According to researchers, the water that swells up the rivers comes from the tundra. Recent studies actually showed the permafrost is getting thinner, probably because of the earth's general overheating. In addition, the increased quantity of freshwater flowing into the Arctic Ocean could alter the salinity of the sea and endanger the life of the water ecosystems.

Natural parks of the tundra

The flora of the tundra is damaged by the passage of vehicles or even footfalls. Plants grow slowly, so they take long to recover. In addition, the destruction of bushes leaves the soil underneath more exposed to the sun, which makes it drier. A number of natural reserves, where man's activities are controlled and restrained by law, have been established to preserve the biome of the tundra. One of the most important ones is the National Pallas Ounastunturi reserve, in the north of Finland. This reserve covers a surface of 500 square kilometres and includes two rocky plateaux of glacial origin: the Pallastunturi and the Ounastunturi. The word "tundra" comes from "tunturi", which means "barren land". The reserve is home to elks, wolverines, grizzlies, wolves and lynxes; there are many variable or Arctic or white hares, weasels, lemmings and ermines. One of the oldest reserves in Finland is the Petkeljärvi sanctuary. Established in 1956, it covers approximately 6 square kilometres and since the antiquity this area has been considered one of the most beautiful ones in Finland. It is the ice that, during the latest ice age, has shaped and created such beautiful sights, producing isles, lakes, sandy beaches and isthmuses (strips of land). Water from molten ice left sand and pebbles, that built up into mounds, called eskers. It is a wild landscape of unique beauty, with open moors, small peat-bogs, swampy meadows and lakes covering approximately two thirds of the overall surface of the sanctuary. If, on one hand, its location at the border with Russia allowed it to remain in a wild state, on the other hand the Second World War brought battles here that damaged it. When walking through it, some small trenches and fortifications are still visible and have now been restored and turned into tourist attractions. The sanctuary is the domain of elks, although it is also home to a good number of pine martens, lynxes, beavers and many species of birds.

Steppe

The bison

Even if the American bison, also called buffalo, and the European bison have always been hunted by man, the introduction of thorses and firearms have caused their number to dramatically decrease, seriously endangering the survival of this species. When in Europe the number of heads dropped to six, they began to be protected and their number restarted to grow, putting one herd back together. Today, approximately 2,000 European bison remain, all coming from that original group of six. In America, their natural habitat has been damaged since the seventeenth century by the coming of European people. Buffaloes in particular were hunted by European planters: the legendary Buffalo Bill killed 4,000 in one year. This animal had almost disappeared when reserves and sanctuaries were established to protect the few surviving heads. The operation was successful: 40 thousand heads are now there for everyone to see.

Agricultural exploitation

The agricultural exploitation of these areas has caused a series of inter-linked consequences: the animal and vegetal species of the steppe community are increasingly threatened. Hole diggers, such as moles, damage the crops; larger grazing animals compete with native species, and predators, such as wolves, threaten the survival of cattle. To defend human activities, plans for the extermination of "harmful" species, especially hole diggers, were put forward, but it was soon acknowledged that without the latter the structure of the soil would start deteriorating. In addition, the overexploitation of pastures by farm animals and the habit of leaving the soil without vegetation between one harvesting and the next resulted in the loss of the thin surface layer during storms. This destruction, which slowly leads to desertification, occurred both in the large plains of north-America and in the steppes of central Asia.

Pollution

Kazakhstan has been dramatically damaged. In the Sixties, corn was intensively grown in the country, but this plan

caused many ecological disasters. The course of the rivers Syr-Darya and Amu-Darya, tributaries to Lake Aral, was diverted to irrigate the fields and as a consequence the lake waters dropped down. The port of Aralsk moved away from the lake and the village emptied. Fish died because water became much saltier, rains decreased, sand, salt and dust rose into storms of hundreds of kilometres. Birds and animals left the delta of the river. In the meantime, the chemical residues of farming seeped into the rivers and reached the drinkable waters of Kazakhstan, while the Kazakh steppe died out and got dry and salty because of excess farming. Luckily, since the Sixties environmental awareness has grown all over the world, and now, before a plan is implemented, an "environmental impact assessment" is carried out to assess beforehand all its potential consequences on the different elements of the environment. In addition, the European Community has developed a plan, called "Takis", aimed at boosting economical growth in the perspective of the sustainable development of the new independent States resulting from the collapse of the former Soviet Union (Armenia, Azerbaijan, Belarus, Russian Federation, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Mongolia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan). The plan concerns farming, the environment and nuclear safety, both locally and across borders.