Chapter 2

Contemporary sustainable development issues overview

Chapter 2
Contemporary sustainable development issues overview

2.1 Introduction – Environmental problems and consequences

Environmental problems are not as new as most of us think - they have been an integral part of human society since antiquity. What is new about the environmental problems in our times, are their size, intensity and form.

Archaeological data shows that environmental pollution has been with us for quite some time. The role played by the environment in significant historic events, such as wars, has been largely unacknowledged. However, this role is beginning to be increasingly examined. Examples include the following:

• Saws, 2 - 2.5 metres long used for logging dense forests can be found in the museum of Iraklion, Crete. These forests provided all the wood needed for the construction of the Minoan fleet, and as a result, these forests never grew again in Crete. Similarly in Cyprus, forests in ancient times were cut down to be used as fuel for copper metallurgy. Although this practice led to technical advances contributing to the island's prehistoric development, the destruction of these natural resources ultimately led to the fall of the Cypriot civilization.

• The Hanging Gardens of Babylon were terraced gardens with vegetation growing on various levels, covered by imported soil and irrigated by an extensive system of hydraulic lifts. The methods of garden cultivation and preservation were a well-kept secret of the priesthood. With time, this precious knowledge and experience were lost. Proper drainage techniques were no longer implemented and the soil became increasingly salinated, and thus infertile.

• A common example of humanity's destructive impact upon large areas is overgrazing. Overgrazing forced thriving societies to change their main occupation of animal farming to different vocations or to move. One such case is that of Turkey, where people had to move from the interior of Asia to the coastal regions of Asia Minor.

Constraints imposed by the environment have also influenced human development. For example, rising sea levels, flooding, the creation of the Aegean and the volcanic eruption in Santorini with the destruction of Minoan Civilization. Another example is the short glacial period of the 11th century AD that prevented migration from Scandinavia to Canada and, in turn, the delayed discovery of America. Such examples demonstrate that already since antiquity certain developments in societal progress on the planet were due to either human intervention or natural environmental causes.

The Mediterranean basin has experienced intensive human activities and impact on its ecosystems for thousands of years. Various types of settlement have existed in the area for at least 8,000 years. The greatest impacts of human civilization have been deforestation, overgrazing, fires, and infrastructure development, especially on the coast. Historically, Mediterranean forests were burned to create agricultural lands and intensification has especially affected the European side. The agricultural lands, evergreen woodlands and maquis habitats that dominate the region today are the result of these anthropogenic disturbances over several millennia.

The main characteristics of the environmental circumstances described above indicate that they were regional in nature and restricted to a small area. In contrast, **the environmental problems we face today present widespread concerns on a planetary level**.

The **root causes** of environmental degradation today are:

• Overpopulation. The population explosion has gone far beyond any known population increase on Earth. It is worth noting, that the great civilizations of the past (i.e. Egyptian, Assyrian, Hellenic, Chinese, Maya) up to the era of renaissance and the Industrial Revolution were all developed within a world population of far fewer than 1 billion. By 1830, world population was about 1 billion and by 1930 it grew to 2 billion. This resulted in the growth of migration (due to unemployment and economic crises); the peak of colonialism which subsequently led to overexploitation of natural resources; and in mass departures to new and unexploited areas. In just 30 years the population reached 3 billion, while, by the year 2000, the world population reached 6 billion. This explosion of population growth and the increased demand for food, water, shelter, transport, education etc., put extreme pressure on space, materials and natural resources on an unprecedented scale of our planet's recent history.

Even if most of the environmental problems are interlinked on a global scale, for many of them, a lot can be done by active citizens at local level. That is reflected in the well known phrase "think globally act locally" that has prevailed in many campaigns to sensitise and empower citizens during the last decades.

1

1. Crops and meadows, *El Fehoul*, Algeria
© Olivier Brestin

2. Landscape with low stone walls on the edge of the Mediterranean Sea, *Honaine* region, Algeria
© Olivier Brestin

2

3. Rainwater harvesting cistern used for irrigation of crops and cattle, *Fotegandros Island*, Greece
© MIO-ECSDE / V. Psallidas

3

4

5

6

7

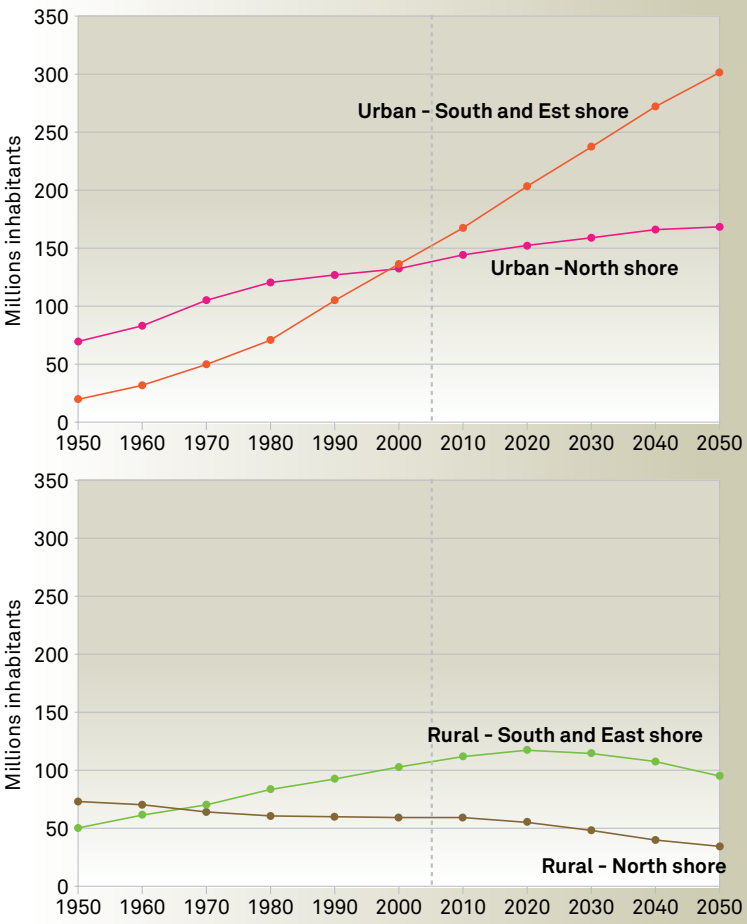
4. Young girl from the Roma community, *Les-Saintes-Maries-de-la-Mer*, France
© Olivier Brestin

5. Young boy, *El Fehoul*, Algeria
© Olivier Brestin

6. Little girls in *Algiers*, Algeria
© Olivier Brestin

7. Inhabitant of *Noratous*, Armenia
© Olivier Brestin

Figure 7
The urban and rural populations on the two shores of the Mediterranean



Source : United Nations Population Division -World Population Prospects: The 2006 Revision et World Urbanisation Prospects : The 2007 Revision

Currently there are roughly 300 million people living around the Mediterranean coasts, a human pressure for the fragile ecosystems that is aggravated by the rapid population growth of the South as well as the 110 million visitors per year, placing a significant pressure particularly on the coastal ecosystems.

• Overconsumption: The significant changes in the life-style models of the developed and the developing world, combined with the unsustainable patterns of production and consumption of goods have contributed decisively to the increasing pressure put on the planet.
For example, one would guess that a population which has doubled in size (e.g. between 1960 and 2000) would consume double the energy as well. In fact, energy consumption has increased fivefold. Gender inequalities, child labour, animal cruelty on animal farms, animal testing, even to endangered species are just a few side effects of today's overconsumption habits.
• The problem is exacerbated by false growth rate indicators that fail to integrate environmental parameters, like the unpriced ecosystem services and social ones, such as volunteer work, unpaid domestic work. In recent years in an attempt to define an indicator that measures quality of life or social progress in more holistic and psychological terms than gross domestic product (GDP) several other indicators have been proposed like the UN Human Development Index (HDI).
• The lack of public awareness, proper education of our individual and collective responsibility is yet another root cause of environmental degradation.

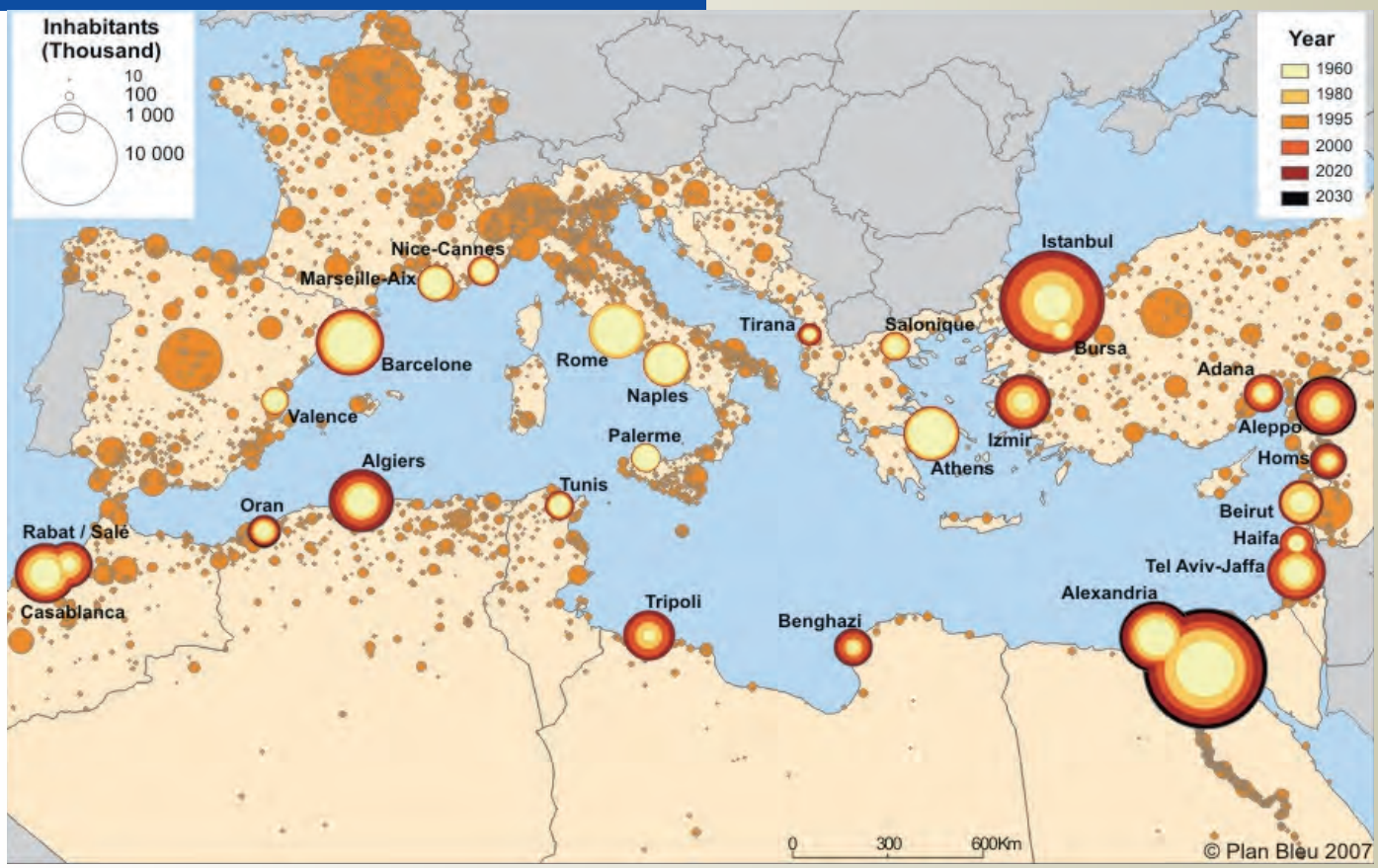
In the 1970's, the growing concern for the environment and the consequences of pollution first emerged alongside the appearance of significant environmental problems; it was a "wake up call" to a society largely based on consumerism. During this time, considerable environmental problems began to appear: a) oil spills with hundreds of dead birds and animals; b) death and paralysis from Minamata-Niigata disease in Japan (due to the release of highly toxic mercury compounds into the food chain); c) the indiscriminate use of DDT for agricultural purposes, causing among others, severely damaged bird populations (it affected calcium deposition and therefore the thickness and fragility of eggshells); d) the surface froth from detergents on lakes (e.g. Lake Iris-Canada/USA) causing fish to die from suffocation.

The publication of "Silent Spring" by the American biologist Rachel Carson, on the impacts of DDT and other pesticides produced a large public outcry and is considered a milestone in the birth of the environmentalist movement. At the same time, some important environmental documentaries were filmed, particularly for the degrading marine environments (such as the documentaries of Cousteau). These films brought biodiversity, species extinction, etc. to the forefront of public attention. This, in turn, contributed to the development of public information and awareness programmes.

As we continue to seek greater economic growth and prosperity, we simultaneously contribute to environmental degradation. However, development is only compatible with progress and prosperity when life's natural foundations are secured and renewed – when future interests are not sacrificed for those of the present. If development and progress continue to be seen solely on a quantitative scale, widespread, global environmental problems will persist and increase.
The following sections (starting p. 42) summarize the major environmental problems facing the Mediterranean region and beyond, today.

UNECE ESD Competences for Educators
In 2009, UNECE established an Expert Group on Competences in ESD with the mandate to prepare:
(a) General **recommendations for policymakers**, so as to provide them with a tool to integrate ESD into relevant policy documents across all education sectors, formal and non formal.
(b) A range of core **competences in ESD for educators**, including their definitions and guidelines for the development of these competences among educators.
The work of the expert group led to the production of a concise document "Learning for the future: Competences in Education for Sustainable Development" (2011).
Read more at (**www.unece.org/env/esd**)

Figure 8
Population changes in some cities in the Mediterranean countries – Projections to 2030



Source : Blue Plan from Geopolis 1998 and United Nations Population Division, World Urbanization Prospects: The 2005 Revision

2.2 Pollution

The term pollution refers to *any adverse change in the physiochemical characteristics of anthropogenic or natural systems causing short term or long term harm to humans and society, to ecosystems, to material and cultural heritage, or to natural resources.* This broad definition is general enough that it covers all forms of pollution including moral and cultural pollution and the overall degradation of life.

A pollutant is a waste material that pollutes air, water or soil. The potency of a pollutant is not determined solely by its type (chemical nature) but also by its concentration, persistence, and the rate of generation. In other words, if the rate of inactivation of a pollutant through natural processes is higher than its rate of release in the environment, then the pollutant may not pose a significant threat to the ecosystem.

Forms of pollution

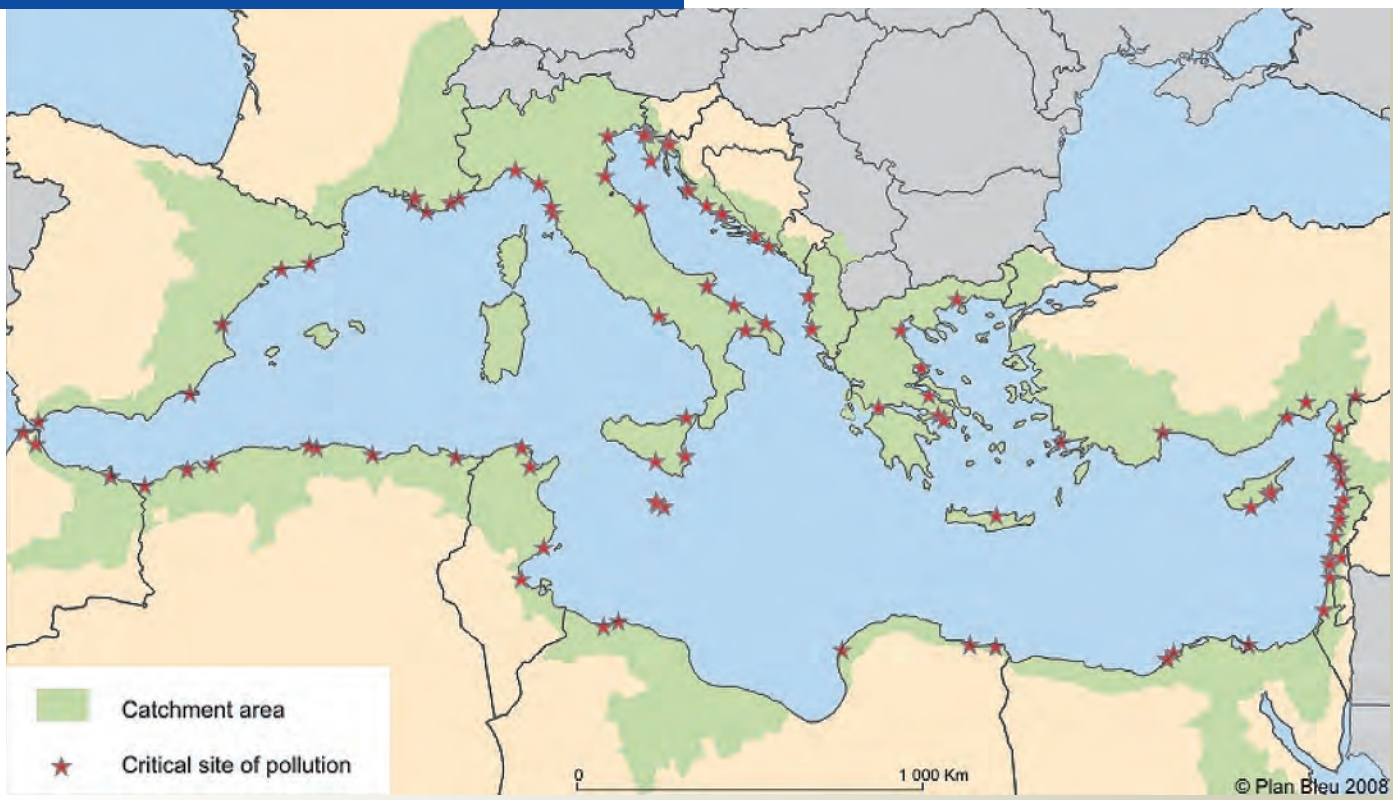
Pollutants can be classified either as natural or anthropogenic: **Natural pollution** includes the volcanic eruptions releasing toxic gases in the atmosphere (e.g. of Santorini island), natural petroleum spews (e.g. in Santa Barbara, USA) or underwater lava spews (e.g. in Hawaii islands); and other phenomena having natural causes.

Pollution Time Bombs refer mainly to phenomena when pollution itself or its impacts become evident with significant time difference from their root causes. The trace metal pollution of soils and ground waters caused e.g. by eroded batteries mixed with urban solid wastes in old uncontrolled landfills is a characteristic case. The same is true for other pollutants included in matrices that require several years to decay and release toxic content.

Anthropogenic pollution, as a result of human activity, may be classified depending on the source as (i) urban, generated by biological or other activities linked to settlements (e.g. urban waste); (ii) industrial and commercial as the result of increased industrial production, consumption and transportation; and (iii) agricultural pollution attributed mainly to the excessive use of fertilizers, pesticides and growth regulators in plant, fish and animal farming. In some cases its impact is direct and immediate, in other cases it is indirect and becomes evident or acute much later (time bombs).

In addition to these types, there are a series of human activities including the construction works (i.e. of ports, dams, road networks, etc.), that affect the environment, usually indirectly, yet in many ways. A typical example is a poorly designed port which may cause accumulation of organic material, and induce anoxic conditions, sedimentary changes, coastal erosion and other unfavorable phenomena of a chemical, physical, or biological nature, even without a direct generation of chemicals.

Figure 9
Pollution «hot spots» around the Mediterranean coasts



Source : MAP/MEDPOL, Blue Plan

8. Pollution of the coastal marsh, *Port of Huelva*, Spain

Another helpful classification is one based on the **nature of pollutants** (substance or radiation). Energy pollution, for instance, includes noise, light and thermal pollution, as well as radioactive contamination (this requires a radioactive emitter, and is usually classified as chemical pollution). Finally, **microbiological contamination** refers to contaminants (organisms), and should not be confused with chemical pollution that refers to substances.

In general, pollution can be **local** (referring to specific sites and ecosystems, e.g. a river polluted by a nearby dumpsite); **trans-boundary**, affecting more than one country (e.g. acid rain), or at **global** scale referring to the entire planet (e.g. climate change and ozone depletion). Larger scale pollution is more significant because of its greater impact, however, local pollution is easier to understand and study.

The most commonly used classification is based on **the recipient of the pollution** or where it occurs. Therefore, we can distinguish these types of pollution:
- *Air pollution* - pollutants released into the atmosphere
- *Soil pollution* - pollutants deposited into the soil
- *Water pollution* - pollutants released into bodies of water.

Water pollution can be subdivided into surface pollution (rivers and lakes), underground water pollution or even into contamination when caused by bacteria or germs (contaminated sewage tanks, wells, etc.). Marine pollution is not a sub-classification of water pollution, but rather a "recipient" of other types of pollution.

Transfer of pollutants

Pollutants enter the environment and circulate in the same way as other non-hazardous substances. Gaseous pollutants enter the atmosphere directly, whereas solid pollutants are released as dust and particle matter, by combustion (soot), stationary or mobile sources (e.g. factories, construction sites, vehicles, etc.) or through evaporation.

Particle matter from the atmosphere settles on the ground, on surface water or in the sea. Liquid matter may be deposited on solid surfaces (absorbed) or dissolved in water bodies (vapour, rain, surface water, sea), or be condensed to solids (dust). When deposited on the ground, substances may remain there for some time, or dissolve and be transported to rivers, lakes and the sea through the water cycle.

In addition to the water cycle, pollutants can enter water and soil by other modes of transport such as by air and wind. Examples include mechanical and chemical erosion, biological and biochemical processes where organisms are active (nekton) or passive (seston, plankton) mobile or immobile (e.g. benthic organisms) and through a series of human activities such as rejection of sewage from cities, factories, ships, etc.

Those pollutants released into upper layers of the atmosphere move very rapidly. In fact, it takes just three weeks for emissions released between 30° north latitude and 30° south latitude, to reach both hemispheres. When released outside this latitude margin, they are confined to the hemisphere of their source.

Rivers transport vast quantities of substances either dissolved or in colloidal or particulate form. In order to determine the level of a river's pollution, it is helpful to examine various ratios of elements found in it, e.g. sulphur to chloride (S:Cl). Chloride concentrations are less vulnerable to change than sulphuric concentrations. The more mineral fuels (without having been desulphurised)

are used in the area, the more sulphur dioxide there is and the higher the above ratio is. Radioactive isotopes usually help us indicate how much time it takes for pollutants to disperse. Urban and industrial waste has significant impacts. In such sewage, there are extremely high concentrations of almost every type of pollutant, including heavy metals, chlorinated hydrocarbons, organic matter and nutrients. Finally, ships are another significant source considering they are responsible for, among other things, approx. 42% of total oil pollutants in seas. Due to intense maritime activities some 200 000 crossings of the Mediterranean are made per year, meaning: 2 000 ships can be spotted at anytime (300 of which are tankers).

Air pollution and related problems

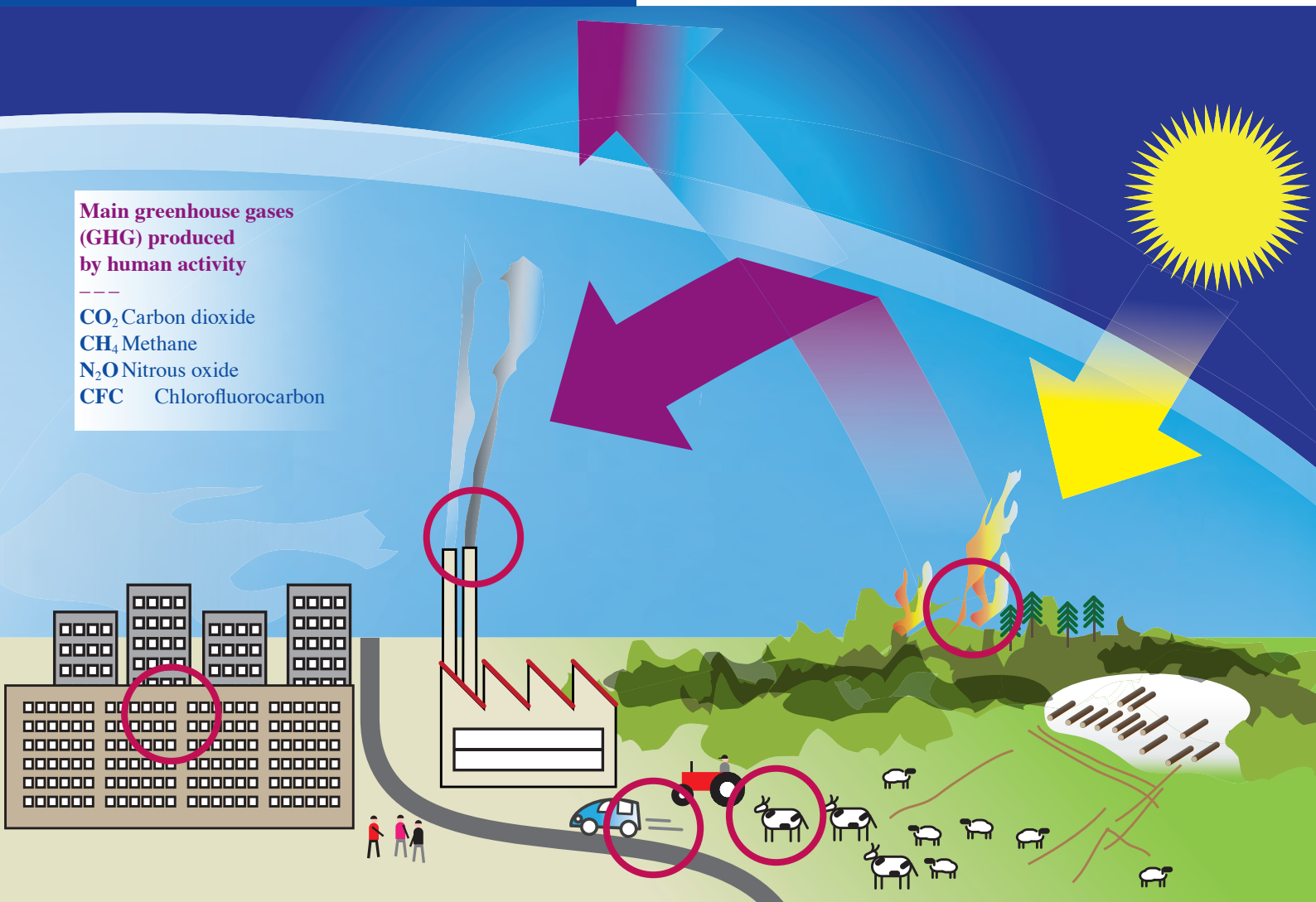
Air pollution first became a serious environmental issue following the Industrial Revolution with the intensive use of fossil fuels (coal, petroleum). This problem is being exacerbated by high concentrations of populations in cities (car use, residential heating) and the dramatic development of industrial units. Many of today's pressing environmental issues such as the greenhouse effect, ozone depletion and acid rain have been caused by the release of gas emissions from fossil fuels such as carbon dioxide, sulphur dioxide, nitrogen oxide, chlorofluorocarbons (CFCs) etc.

The greenhouse effect

The greenhouse effect is the most important process through which heat balances are controlled and consequently it has been critical for the development and functioning of the vegetal biosphere. It was first discovered in 1824 by the French mathematician and physicist, Joseph Fourier, and then studied analytically by Svante Arrhenius in 1896. Today, when talking about the greenhouse effect, in most cases we do not refer to the natural process, but rather to the increased recent warming of the Earth's surface and atmosphere which is believed to be the result of human activities that have increased the atmospheric greenhouse gases.

The Earth's atmosphere absorbs only a small amount of sunlight received by the planet. The remaining is released back into space. About 30% of incoming sunlight (shortwave) is reflected, while the remaining 70% is absorbed; 16% by the atmosphere, 3% by clouds and 51% by land surfaces and oceans.
By absorbing sunlight, the Earth is heated and in turn reflects infrared radiation. A portion of this radiation is released into space, but most of it is absorbed by the

Figure 10
The greenhouse effect



atmosphere's **greenhouse gases**. These gases begin to transmit infrared radiation in every direction. But 90% goes into the ground which is warmed and radiates back infrared heat. The end result is an increase in average surface temperatures, making our planet progressively uninhabitable. Without the naturally occurring greenhouse effect, the Earth's average surface temperature would be about -18°C.

The greenhouse effect has been augmented in recent decades by **human activity** (use of fossil fuels by industry, transport means, etc.) contributing decisively to the increase in concentration of greenhouse gases, which under normal conditions would be no more than 1% of the atmosphere's total volume. Any fluctuation in the concentration of these gases disturbs the energy equilibrium and affects temperature and climate. Despite the fact that water vapour absorbs 60% of infrared radiation, they seem to not have been directly affected by human activities. On the contrary, concentrations of all other greenhouse gases have increased significantly, particularly CO_2, the gas released during combustion of fossil fuels. Strengthening of the greenhouse effect through human activities is known as the enhanced (or anthropogenic) greenhouse effect, leading to global warming, or climate change.

The range of human activities that enhance the greenhouse effect do not concern only the CO_2 and other greenhouse gas emissions, but also the systematic deforestation which reduces the forest's natural ability to absorb CO_2 and incorporate it into the natural cycles of energy and matter.
During the past 100 years, the average atmospheric temperature of the planet's surface increased by 0.74°C worldwide and almost by 1°C in Europe, which is an unusually rapid rise. In fact, the 20th century was the warmest century in history, while the 10 warmest years on record have all occurred since 1998 (WMO, 2011). The Intergovernmental Panel for Climate Change (IPCC), a UN initiative that brings together hundreds of experts on the climate from around the world, predicts that by 2100 the average world temperature is very likely to increase by 1.8 to 4°C. The worst case scenario predicts a rise of more than 6.4°C unless humans take action on restricting greenhouse gas emissions.
(www.europa.eu/environment/climate)

9

10

11

12

9. Mount *Sainte Victoire* seen from the East, from Highway A8 between *Aix* and *Le Tholonet*
© Hélène Gille

10. Car park in the Biosphere Reserve, *Cuenta Alta del Río Manzanares BR*, Spain
© UNESCO / O. Brestin

11. Bridge over *el Río Cicados*, *Valles del Jubera*, *Leza*, *Cicados y Alhama BR*, Spain
© UNESCO / O. Brestin

12. Tourists fishing at the dike, *Marismas del Odiel BR*, Spain
© UNESCO / O. Brestin

By order of contribution to the greenhouse effect on earth the major gases are water vapour and carbon dioxide. Clouds are the major non-gas contributor to the greenhouse effect. These three are responsible for 86% of absorbed radiation. Other influential greenhouse gases are Methane (CH_4), Ozone (O_3) and nitrogen dioxide (NO_2).

Is there a solution?

In order to deal with this serious issue and to control negative consequences already seriously affecting the planet's climate, immediate measures should be taken on a global scale, such as:

- Promoting systematically renewable energy sources (solar, wind and geothermal power, etc.).
- Improving technologies of existing industrial production processes so as to reduce emissions and save energy and natural resources.
- Providing information, promoting public awareness and education and encouraging a shift in mentality from overconsumption to sustainability.

The greenhouse effect and climate change

The greenhouse effect is closely linked to climate change and can be observed across the planet in the form of extreme weather conditions (storms, floods, prolonged drought, etc.). According to the vast majority of scientific studies and evaluations, world climate change is affecting today the environment, the economy and society in general, with significant impacts for health, biodiversity, food production, natural resources, and coastal settlements. According to IPCC depending on the temperature rise, up to 30% of species on the planet will be at high risk of extinction, 30% of wetlands in coastal regions will be lost due to floods and erosion, etc. For the Mediterranean basin there is a high probability that it will suffer a decrease in water resources (IPCC, 2007).

Climate change in the Mediterranean region

Water shortages and poor harvests during the droughts of the early 1990s exposed the acute vulnerability of the region to climatic extremes. Since then, several studies have examined the potential implications of global climate change for the Mediterranean.

It is foreseen that climate change will add to and worsen existing problems of the region such as desertification, water scarcity and food production, while also introducing new threats to human health and ecosystems that will in turn disrupt a whole series of essential economic activities within the region and countries' economies. According to UNEP/MAP (2009), future major changes to the climate in the Mediterranean region are set first and foremost to affect temperature (air and sea), rainfall systems and sea level rise. While there is some scope for adaptation, ensuring the long-term sustainability of the region requires urgent action to cut GHG emissions by all countries.

In order to deal with climate change, the average increase of the planet's temperature must not exceed 2°C in relation to pre-industrial levels. According to the EU Council, in order to achieve these goals, CO_2 emissions must decrease by 60-80% in industrial countries by 2050.

According to WMO, the year 2010 was characterized by a high number of extreme weather events, worldwide. (Source: WMO, 2011):

- **Extreme summer monsoon in Asia:** Pakistan experienced the worst flooding in its history, causing more than 1500 lost lives lost, and displacement of over 20 million people. Other countries of the region like India, and China experienced devastating floods as well.
- **Extreme summer heatwaves in Russia:** Just in Moscow, July mean temperatures were 7.6°C above normal, reaching 30°C or above on 33 consecutive days. The heat was accompanied by destructive forest fires, while severe drought led to widespread crop failures.
- **An abnormal winter in the Northern hemisphere:** Many parts of northern and central Europe, like Ireland and Scotland had their coldest winter for decades. At the same time for southern Europe, it was a very wet winter, with precipitation 100% or more above normal over Spain, Portugal, Italy and SE Europe, while northern Africa experienced a rather warm winter.
- **Heavy rains and flooding all around the world:** Australia, Indonesia, Thailand and Vietnam, were severely affected by rainfalls and floods. Many countries of West African Sahel, Central Europe, South America experienced extreme -far from average- rainfalls and floods.
- **Drought in the Amazon:** Parts of the Amazon basin were badly affected by drought during late 2010.
- **Polar Regions:** In Arctic 2010 the third-lowest summer sea ice minimum was recorded. In contrast, Antarctic sea ice extent was generally slightly above normal in 2010.

The ozone depletion

The **ozone layer** (or Chapman layer) is a layer in Earth's atmosphere which contains relatively high concentrations of ozone (O_3). Ozone is mostly present in the stratosphere, between about 19km and 30km above the surface. At this altitude it is formed by ultraviolet (UV) rays reacting with oxygen molecules. The overall amount of ozone in the stratosphere is determined by the ozone-oxygen cycle that balances production and removal.

The layer absorbs most of the sun biologically harmful UV radiation. Actually, it protects the health of every living organism to the point where survival would not be possible without it. Serving as an invisible filter, it absorbs the UVB radiation which would cause serious damage to plants, animals and humans, including skin cancers and skin damage, cataracts, weakened immune systems, and destruction of phytoplankton and fish larvae if it reached the ground.

The "paradox" is when ozone is present in low altitudes it has adverse effects on human health; it contributes to air pollution by playing a key role in the creation of photochemical smog.

In recent decades it has become widely recognized that certain gas compounds (chlorofluorocarbons, or CFCs) generated by human activity, disrupt the equilibrium between the natural formation and removal of ozone, in favour of the latter. Ozone depletion has been noticeably greater in the stratosphere over Antarctica (especially in the autumn months of September to November when lower temperatures prevail), where its reduction has created a "hole" (or rather a thinning) of the ozone layer. As a result the harmful UV radiation penetrates the ozonesphere and reaches the surface.

Ozone depletion was first observed in 1975 using satellite pictures. In the years to follow, its dramatic decrease began. In October 1994, the ozone layer was reduced by half and the "hole" more than covered Antarctica. In winter 2000, it grew to triple the size of the USA and reached many cities in southern Chile and Argentina.

Overtime, both governments and the scientific community alike became increasingly aware of the dangers that were involved. This led to the adoption of the Montreal Protocol in 1987 introducing restrictions on the production of CFCs, encouraging the development of safer alternatives to replace them. Since 1994, there has been a promising reduction of CFCs, low in the troposphere. Improvement is expected after decades if, of course, no other unforeseen parameters change the status quo (full compliance with the Montreal Protocol by all industrial countries is a prerequisite). According to a recent IPCC report the global average amount of ozone depletion has, at least, approximately stabilized (IPCC, 2005).

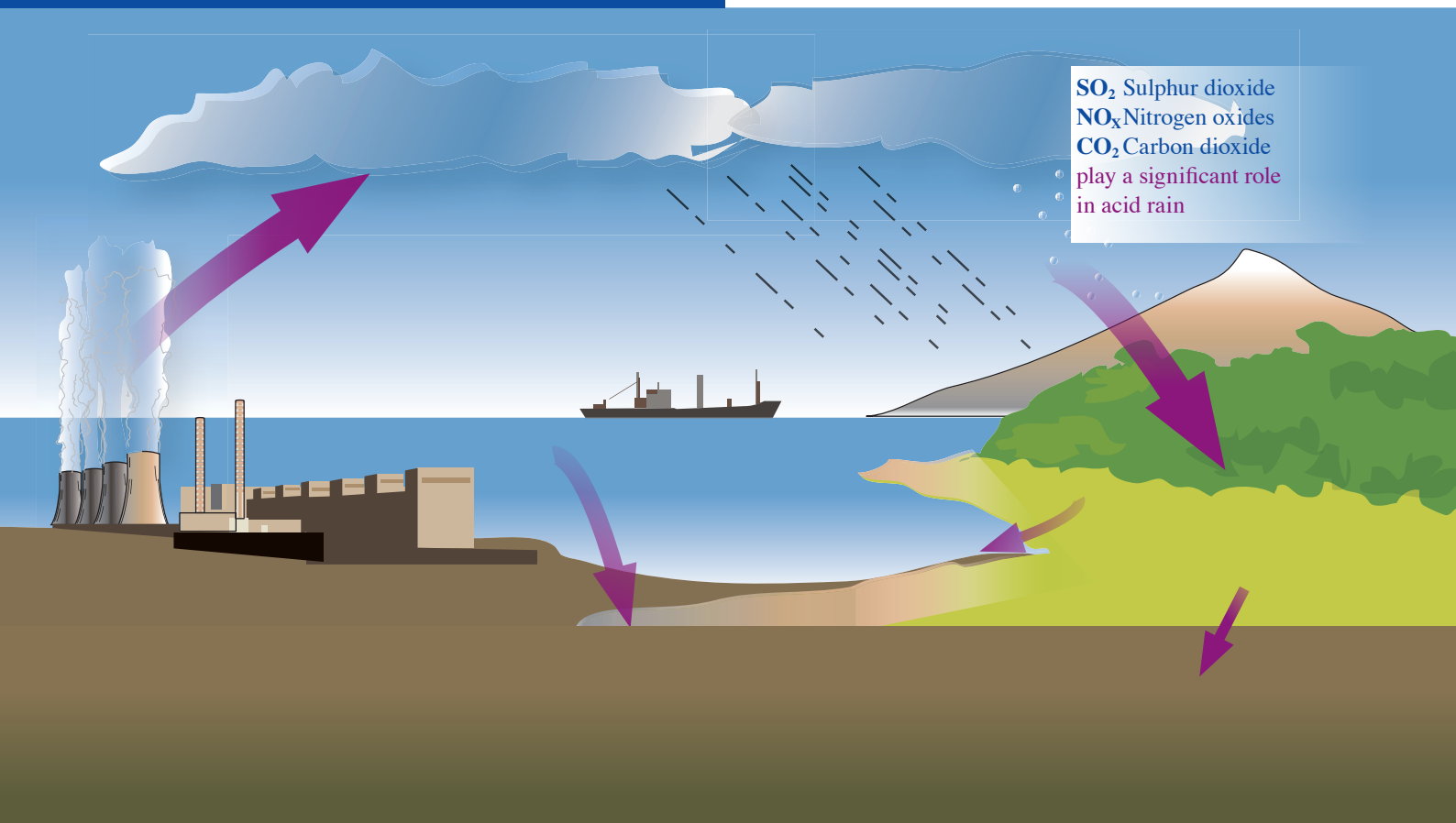
The main ozone-depleting substances are nitrogen oxides (NO_2) and carbon monoxide (CO) from car and aircraft exhaust and chlorofluorocarbons (CFCs). The latter were widely used as coolants in refrigeration (*freon*), in air conditioning, in aerosol spray cans as propellants (deodorants, insect repellents, etc.) and in insulation products. These gaseous compounds once they reach the stratosphere, with the help of solar radiation, release chlorine atoms which act as a catalyst that break down ozone and release oxygen atoms.

Acid rain

The term "acid rain" was first used by Robert Smith in 1870 to describe the corrosive effect of rain in Manchester, UK, during the industrial revolution.

The main causes of acid rain formation are sulphur dioxide (SO_2) emitted by industries using fossil fuels and nitrogen oxides (NO_X) primarily from car exhaust. These compounds react with oxygen and water vapours in the atmosphere and create sulphuric acid (H_2SO_4) and nitric acid (HNO_3). They are then dissolved in rain water or in fog droplets and are deposited into soil, water, plants, animals, monuments and building materials. The wind can also transport SO_2 and NO_X over vast distances forming acid rain kilometres away from the emission's site of origin.

Figure 11
Acid rain



13 -14. Phosphate fertilizer plant on the coastal marsh, *Marismas del Odiel BR*, Spain

14

In 1999, according to a study by the European Committee, 25% of forests in the EU had been affected by acid rain. The countries most seriously affected were Britain, Poland and the Czech Republic. Equally acute problems were found in forests of the north-eastern USA and in eastern Canada.

Acid rain also has destructive effects on surface waters, primarily lakes and small rivers. Increased concentrations of acids destroy plankton, aquatic flora, and the eggs. Acid rain has often been cited as being responsible for mass fish deaths as occurred in Scandinavian lakes during the early 1970's and in small rivers in Germany during the late 1980's. There are also particularly high levels of acid rain in lakes and rivers during springtime due to ice thaws.

Acid rain damages buildings and monuments constructed from marble or limestone. When the acids of acid rain react with the calcite in marble and limestone, the calcite dissolves and is washed out (as soluble ions). This becomes obvious in exposed areas of buildings and statues that gradually lose their carved details and their surfaces are roughened. Even sheltered areas are affected, as, calcium carbonate ($CaCO_3$) in reaction with water, and sulfuric acid produces gypsum crystals ($CaSO_4 \times 2H_2O$). Although gypsum is white, its crystals may trap particles of dirt and pollutants, giving a black look in the crust. Eventually if gypsum is washed out, as it is soluble in water, crumbling stone is revealed.

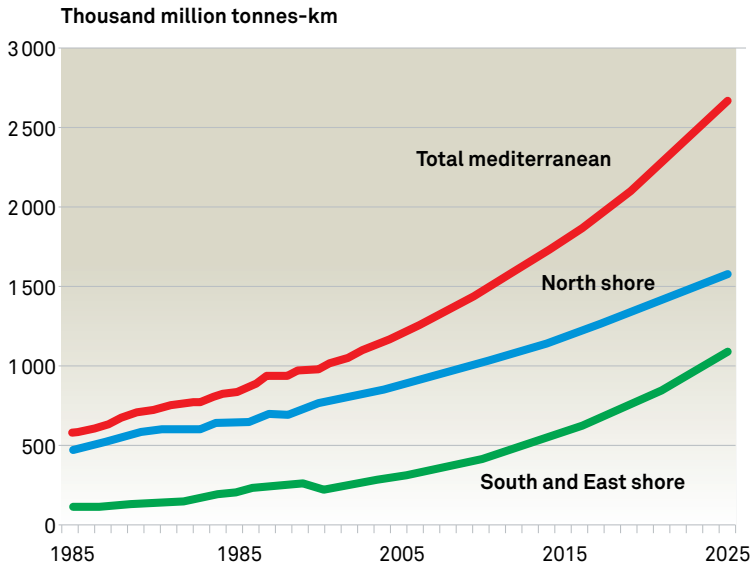
In order to deal with acid rain, it is necessary to restrict sulphur dioxide and nitrogen oxide. The most important measures that must be taken include the reduction of sulphur in industrial emissions and the introduction of catalytic converters in cars.

Air quality monitoring in the Mediterranean
Air quality monitoring networks on the northern shores of the Mediterranean (France, Greece, Italy, Spain and Slovenia) assess air quality changes in large cities systematically. Regularly published statistics show decreasing concentrations of some pollutants over a decade (1991-2001) especially for SO_2 and NO_2. In general, the European Mediterranean countries have gradually set up policies to reduce polluting emissions from various sources (cars, heating, some industrial processes, etc.) while motorized transport emerged as a major source of urban air pollution. In the south and east coast of the region, concentrations of pollutants as occasionally measured on a piecemeal basis have been stable for the last 20 years; sometimes above the recommended norms. For instance, SO_2 concentration in central Cairo between 1985-2005 shows variations from 100 to 300µg/m^3 depending on the season and the measuring points. (Benoit & Comeau, 2005).

15-16. Oil refinery on the coastal marsh, *Marismas del Odiel BR*, Spain

16

Figure 12
Freight traffic (road, air and rail): growth and trend scenario up to 2025



Source : CEMT, Ministries for transport, national statistical institutes, Blue Plan, prospective analysis

Soil pollution and contamination

Soil is critical for humankind's survival: it supports 90% of food production and other raw materials, holds and filters rain water and transports it to underground reservoirs on which millions of people depend for their water supply.
Today, the soil and its ecological services are seriously threatened by various causes such as the excessive use of fertilizers and pesticides, solid waste and sewage from animal farming, industrial waste including chemical, oil and tyre industry, urban and medical waste transported to landfills, waste from mining and quarrying and purification processes, as well as heavy metals. When this toxic and chemical waste is deposited into the soil, depending on its geomorphology and on other external factors, it may cause pollution locally, be transferred to groundwater, or be washed into aquatic systems. Air pollution also makes its way into the soil at rates dependant on the area's conditions and geomorphology.

The **fertilizers** (ammonium nitrate and sulphate, urea, phosphate, potassium) enrich the soil with nutrients for plants, but do not help in enriching the humic and other necessary soil substances. This results in the loss of the major organic constituents of soil, the alteration of its porous texture and a decreased ability to retain water. Consequently, the decrease of water and nutrients means a decrease in the soil's fertility. In order to increase production, farmers increase the use of fertilizers which leads to a vicious circle of poor management.

17

18

19

20

21

17 - **18.** Corn crops near the *Almonda River*, *Paúl do Boquilobo BR*, Portugal
© UNESCO / O. Brestin

19 - **20.** Pollution of the *Almonda River*, *Paúl do Boquilobo BR*, Portugal
© UNESCO / O. Brestin

21. *Almonda River*, *Paúl do Boquilobo BR*, Portugal
© UNESCO / O. Brestin

Similar problems are caused by certain widely-used **pesticides** and their metabolites in the soil. Accumulation of pesticide residues in agricultural areas results in the development of toxins in land organisms, earthworms, roundworms and other microorganisms. This then leads to the degradation of soil texture and quality. Particular problems are caused by pesticides that biodegrade at a slow rate or by those that produce toxic metabolites during the division process.

Heavy metals are also very important factors in soil pollution. Although in low concentrations heavy metals are acceptable in some plants without causing toxic damage, higher concentrations may suspend the enzyme functioning in plants, animals and microorganisms found in the soil.

Soil pollution has serious effects on human life and other plant and animal organisms by ultimately polluting the ecosystem's underground and surface water with toxic substances and other pollutants. Furthermore, plants used as food for humans and other animal organisms do not completely metabolize some of the toxic substances (fertilizers, pesticides, chemical substances, insecticides, etc.) causing an increased concentration in the physical mass (bioaccumulation) and subsequently along the food chain (biomagnification).

Water pollution

The term water pollution refers to all physical, chemical or biological change in the composition of bodies of water (seas, lakes or rivers) which make it increasingly unsuitable and/or dangerous for organisms to live in it or that depend on it for survival, as well as or for humans and human activity.

This type of pollution is caused by substances released into receiving waters, from urban, industrial and agricultural wastes, as well as radioactive and toxic waste that either dissolve in the water or settle on the bottom as sediment. Water bodies may be affected also by thermal pollution, caused, usually, by the release of water used as a coolant by industries. The rise in water temperature decreases the dissolved oxygen concentration and disturbs the ecosystem (e.g. anoxic conditions for fish, invasion of thermophilic species, etc.).

The most serious form of water pollution is caused by chemicals from urban wastewater, agricultural runoffs and industrial wastes:

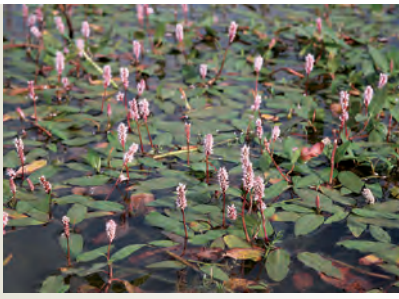
• **Urban wastewater (sewage)**: It is characterised by its large content of organic substances. Sewage may be discharged into drain tanks, reaching the soil and groundwater, or in some cases directly into lakes, rivers or the sea. It contains bacteria which cause various infections, including typhoid fever, dysentery, gastrointestinal diseases and cholera. Viruses found in the water and their strains can cause polio and hepatitis. Furthermore, the eggs and larvae of some parasites (roundworms, etc.) found in unclean water can also cause disease. Different types of pathogenic microorganisms can be identified in both urban and agricultural wastewater.

• **Agricultural pollution**: It is caused primarily by agricultural activity and the excessive use of fertilizers (eutrophication) as well as by the use of pesticides. This type of pollution reaches surface water through surface runoffs from rain water or by coming into contact with groundwater which has also been polluted by water drainage during field irrigation.

• **Industrial pollution**: The industrial effluents of the Mediterranean waters refer to: (a) organic load (released by e.g. food and dairy industry, slaughterhouses, etc.) resulting in water oxygen depletion; (b) nutrients (caused by e.g. fertilizer industry and urban waste) resulting in eutrophication; (c) heavy metals (caused by e.g. chemical industry, tanneries); and (d) thermal pollution (by e.g. cooling towers).

• **Oil Pollution**: Pollution from oil and its by-products is caused primarily by mining, cleaning oil tankers and by accidents during the transport of petroleum by oil tankers. Oil spills cause serious problems to the aquatic environment and its ecosystems. Oil has the ability to disperse and spread across great expanses because it forms monomolecular layers that cover the water's surface, preventing the exchange of gases between air and water, which harms aquatic organisms. Furthermore, oil pollutes food sources found low on the trophic pyramid, deters reproduction of marine life and reduces organisms' natural resistance. Luckily, certain types of bacteria that live in oil have the ability to break it down.

22 (detail) - **23.** Water knotweed (*Polygonum amphibium*) becoming invasive, *Lake Santillana, Cuenta Alta del Río Manzanares BR*, Spain
© UNESCO / O. Brestin



22

23

• **Toxic chemical substances**: Toxic substances for aquatic ecosystems are heavy metals including iron (Fe), chromium (Cr), lead (Pb), mercury (Hg), cadmium (Cd), zinc (Zn), manganese (Mn), copper (Cu), nickel (Ni), arsenic (As), etc.

Beyond certain levels, pesticides, insecticides, herbicides, polychlorinated biphenyls (PCBs), organotin compounds (TBTs), endocrine disruptors (chlorophenols), and acids can cause poisoning, halt development and photosynthesis and trigger selective accumulation and absorption in some species.

Eutrophication

Nutrients such as nitrogen and phosphorus are essential to maintaining primary production and thus the healthy structure and functioning of aquatic ecosystems. Eutrophication, however, is defined as the overload of nutrients (nitrates and phosphates) in water bodies (mostly in lakes and shallow bays) causing an accelerated growth of planktonic algae and higher plant forms.

Such high concentrations may be the result of natural factors (e.g. geomorphology and climate) or human activity (urban waste, detergents, waste from animal farming, industrial waste, fertilizers, etc.).

Increased concentrations of nutrients activate the excessive growth of primary production, i.e. of vegetative biomass such as phytoplankton, algae, and other aquatic plants and vegetation in both surface and deeper waters. The result is the gradual reduction in concentrations of dissolved oxygen in water. In long-term this creates anoxic conditions that can alter aquatic flora and fauna, and, in can even result in massive dieoffs in populations of marine invertebrates and fish. Furthermore, eutrophication causes the gradual deterioration of water quality and a decline in its aesthetic and recreational value.

24. View of *Lake Pamvotida* at dawn, *Ioannina*, Greece

25. Professional fisherman mending nets, *Lake Pamvotida*, *Ioannina*, Greece

Fishing is a traditional activity in Lake of Ioannina, Greece. However, excessive cultivation has led to a decline in the number of "tsima" fish, an endemic species of the lake, almost to extinction. Today, the number of professional fishermen has also dropped drastically.

The Mediterranean basin is generally characterised by low primary production and low phytoplankton biomass, resulting to high transparency and deep light penetration into the water column. Eutrophication is common in sheltered water bodies near coastal towns. Its most eutrophic waters are found along the northern coastline such as in the Adriatic Sea which has large riverine nutrient inputs, mainly from the Po (EEA, 2007), but areas, such as the Nile Delta are also eutrophic and this problem has been increasing gradually over the last decades (UNEP/MAP, 2009).

26. Fossil sand dunes, *Acantilado del Asperillo*, *Doñana BR*, Spain
© UNESCO / Olivier Brestin

27. Fossil sand dunes (detail), *Doñana BR*, Spain
© UNESCO / Olivier Brestin

2.3 Erosion, desertification, deforestation

Erosion is one of the most common threats to soil. Even though it is a natural process (caused by water and air) and therefore it is not negative per se, it is aggravated by human activities such as the construction of harbours, and the «cementation» of the coastline, sand extraction and the building of dams. Rising sea levels and increasingly frequent storms and floods are likely to exacerbate this problem, particularly in coastal areas.

In recent decades, European coasts have continued to be increasingly threatened by erosion. Studies show that 1/5 of coasts of the 25 EU member states have already been seriously affected, with coastlines receding by 0.5 to 2 metres every year and in some more serious instances, by as much as 15 metres.

Coastal erosion has serious consequences on the environment and on human activity. The natural coastal ecosystems and the safety of those who live in its vicinity are threatened (destruction of houses, roads, etc.) but there are also significant economic repercussions (e.g. on tourism).

The results of erosion vary from region to region. Italy suffers from high levels of erosion of up to 23% due to the rapid urbanization of coasts and coastal zones. Greece has an even higher level of erosion, 28.6%, the fourth highest in the EU (EEA, 2005). This is caused by steep inclines, forest fires, overgrazing and poor agricultural practices such as intensive ploughing parallel to the ground's incline and the complete absence of proper management.

The term **desertification** refers to ecosystems where human activities have caused soil degradation to such a degree that agriculture, animal farming and forestry can no longer occur. Its main causes include overgrazing of susceptible areas, land clearing and excessive farming parallel to land inclines, forest fires, excessive irrigation (with unsuitable waters that lead to soil salinization), changes in land use (from rural to urban), intense rainfall and mass tourism that stresses the natural environment and ecosystems. Desertification results in less soil productivity, the weakening of the soil's ability to retain water and eventually the abandonment of the area by its inhabitants with whatever that implies for the society and the economy of the area.

In recent decades **deforestation** has resulted in the substantial loss of forests and the dramatic increase in the rate of their destruction. This is the result of changes in land use (e.g. creation of grazing/farming lands, roads, industrial zones, new settlements, etc.), as well as timber and fuel production. Today, more than 80% of the earth's natural forests have been destroyed. Loss of biodiversity, degradation of the ecosystem, pollution of air and water are some of the subsequent consequences. Simultaneously, deforestation plays a significant role in climate change and in the planet's global warming since forests act as carbon sinks (absorbing carbon dioxide of the atmosphere). Furthermore as deforested lands lose the soil's organic matter and the ability to retain rain water, these areas are subject to floods, erosion, droughts.

According to estimates already since the early 1990s, many areas in the SE Mediterranean countries were affected by desertification, particularly, pasturelands (84%) and rain-fed arable land (74%), but also irrigated lands through salinisation. On the northern side, desertification has affected 63% of the arid land in Spain, Greece and Italy (Benoit & Comeau, 2005).

Forest fires in Mediterranean ecosystems

Every year, vast forest areas around the world are burned at an enormous economic and environmental cost. Fire is an integral part of many ecosystems: Mediterranean ecosystems in particular are conducive to the breakout of forest fires due to high temperatures, droughts and the accumulation of dry organic matter (e.g. leaves, pine needles and other dry brush).

Naturally occurring forest fires in the Mediterranean ecosystems (e.g. those started by lightning), are a part of a forest's natural regenerative and ecological balance. Such fires help to clear the forest of its accumulated organic matter and create conditions for new seeds to germinate and new trees to grow. Vegetation in these ecosystems is adapted to fire and has evolved response mechanisms to cope with it (e.g. regeneration through underground buds and seeds). It is estimated that Mediterranean ecosystems have the ability to regenerate in less than ten years.

However, in recent decades the number and frequency of fires in the Mediterranean has increased spectacularly, due to change in land-use (abandonment of rural areas, fuel accumulation) and climate change (extended droughts reduce fuel humidity and increase fire risk). Especially in cases when the same forest area is re-burned at a short interval, the natural regeneration mechanism cannot work as the young forest has not yet developed seed stocks in the soil.

Satellite photograph over Greece, NASA (25/08/ 2007)
In 2007 Greece witnessed one of the most devastating natural disasters in the country's history that claimed the lives of 63 people: By the end of August, 268,834 hectares were burned (including forests and cultivated land); 1,500 houses were burned; and 6,000 people were homeless. The estimated financial cost of the disaster was estimated at 5 billion euros.

Intensive agriculture - Overgrazing

The intensification of **agriculture** is considered the second most significant threat, after forest depletion, to the extinction of rare and endangered species around the world. Since the enforcement of the **Common Agricultural Policy** in EU countries, it is the primary force behind the decline in farmland biodiversity in Europe.

The rejection of traditional farming methods for a heavily mechanised approach of a single-species crop using machinery and large amounts of fertilizers and pesticides has led to the degradation of agricultural ecosystems. The domination of extensive monocultures and the abandonment of farming lands in mountainous or remote areas have also brought significantly negative impacts on biodiversity.

The destruction of ecological interdependencies in agricultural ecosystems leads to the loss of indigenous species of flora and wild fauna that have adapted to local conditions as well as to a loss of genetic diversity of cultivated plants and animals.

28

29

28. Woodland after a forest fire, near *Lake Aracena*, *Las Dehesas de Sierra Morena BR*, Spain

29. Area of shrubs after a forest fire, near *Lake Aracena*, *Las Dehesas de Sierra Morena BR*, Spain

30

30. Logging area, *Puerto de la Ragua Pass*, *Sierra Nevada BR*, Spain
© UNESCO/O. Brestin

31

31. Goat grazing pressure on trees, cheese dairy, *Les Anglars*, *Luberon-Lure BR*, France
© UNESCO/O. Brestin

Uncontrolled and intensive **grazing** by goats and sheep is yet another important factor in the degradation of the Mediterranean ecosystems. Animals defoliate vegetation and consequently affect plant growth, plant vigour, plant reproduction, plant cover and biomass, thus resulting in bare soil. Grazing animals also trample the soil thus reducing bulk density and infiltration rates thus increasing the risk of floods. In cases of steep slopes soil erosion may result, leading to desertification. Even if several individual plant species are adapted to grazing, overgrazing may eliminate endemic plant species, and cause biodiversity decline. These risks, however, are a real threat only when overgrazing is applied on a continuous basis, namely when too many animals are trying to feed on a limited supply.

2.4 Marine threats

Invasion of species

The deliberate introduction or unintentional migration of a non-native organism in terrestrial or aquatic ecosystems may pose a considerable disrupt to ecosystem balance with considerable ecological environmental and economic impacts. Such organisms are widely known as alien, invasive, or alien species.
In agriculture as well as in reforestation, the intentional introduction of species was widely used in the past, with the aim of increasing production or some other believed benefit. One of the perils of an artificial single-species forest is the restriction or alteration of genetic matter in natural populations, while also there is the risk of conveying pathogenic organisms together with the newly introduced plants.

Regarding marine ecosystems, the introduction and establishment of invasive species is one of the four most significant dangers they face. Most invasive plants are unintentionally transported by ships (through their ballast seawaters or hulls) or even due to aquarium leaks. For the Mediterranean, the main points of entry include the Red Sea (after the Suez Canal was opened) and the Atlantic Ocean (through the Strait of Gibraltar) while the Aegean is colonised by species of the Black Sea introduced through the Bosporus Strait. When the alien species succeed in establishing populations in the Mediterranean sea, they compete with the native species and may and begin to replace them, thus threaten biodiversity.

There are currently 925 alien species recorded in the Mediterranean basin of which 56% (519 species on the 12,000 known) have already established durable populations and are spreading. Most of them are seabed living animals (zoobenthos), plants (phytobenthos) and fish living in the littoral and sub-littoral zones. Among the seabed animals, the dominant group is the molluscs (216 species) followed by crustaceans (106 species) and sea worms (80 species) (UNEP/MAP, 2009).

Threats to fisheries

The global crisis affecting fisheries today is due to a number of reasons such as persistent overfishing, indiscriminate and illegal fishing methods, pollution as well as invasion of species. On top of that, many governments subsidize fisheries, attempting to support an unsustainable problematic industry that depletes fish stocks.

Scientists and international organisations agree that fish populations are currently decreasing at an alarming rate and the future of millions of people who depend on this natural resource is now uncertain.

It is estimated that the EU fleets' fishing capability exceeds permissible levels for sustainable production by 40%. For this reason, the **Common Fisheries Policy** attempts to deal with ongoing negative consequences in the EU's fishing industry, of past strategies and action plans.

In the Mediterranean overfishing severely effects the fish populations and their ability to recover, cause damage to important sea habitats and decrease the diversity of sea life. Destructive fishing methods practiced in the region include drag fishing, the use of dynamite, mechanized fishing in forbidden zone as well the use of inappropriate methods that cause the death of several sea mammals (e.g. dolphins, seals) and turtles.

Some disturbing numbers:
• 300,000 cetaceans (whales, dolphins and seals) are tragically killed every year, trapped in nets
• 12,000 tones of red tuna, 37% over the permitted limits, are fished illegally in the Mediterranean and East Atlantic.
• 90% of large fish, such as tuna, swordfish and cod, are fished beyond the safe limits for their survival.
• 65% to 75% of fish of commercial value are overfished in the Mediterranean Sea (source EEA).
• In 1950, the total world catch was 18 million tons. Today, due to overfishing, it has reached 66.5 million tons!

Industrial fishing activities in the Mediterranean may exploit all fish resources up to 800m depth. However, increased catches are accompanied with a drop in the yield; a sign of stocks quality degradation. This is the case where industrial fishing occurs such as in the Adriatic and around Sardinia which used to be the most productive areas. The total catch has fallen in several countries particularly in Italy, the leading producer in the region. Without strengthening coastal protection and changes in fishery management current trends imply the risk of increasing loss of fish resources and corresponding employment. Only in 2000, 8,000 Italian fishermen lost their jobs (Mediterranean Food, 2007).

2.5 Urbanisation and tourism pressures

Urbanisation is a global multi dimensional process that manifests itself through rapidly changing population densities, in particular migration from rural to urban zones, land cover and resource use regimes and a diversity of associated cultural practices and lifestyles.

Half of the world's population may now be considered urban. Even more so, in the Mediterranean riparian countries, two out of three inhabitants already live in urban settings (UNEP/MAP, 2009). Demographic growth coupled with internal redistribution, prompts urban growth, especially in the SE Mediterranean countries.

The growth prospects of Mediterranean cities forebade an aggravation of the problems currently experienced and, particularly, an excessive land consumption (soil artificialisation, irreversible loss of arable land), accelerated degradation of the cultural heritage sites, stress on water resources, pollution of aquifers, inefficient waste management, and cumulative impacts of these factors on the environment and public health.

32

32. Port of *Bejaïa, Khabylia*, Algeria
© Olivier Brestin

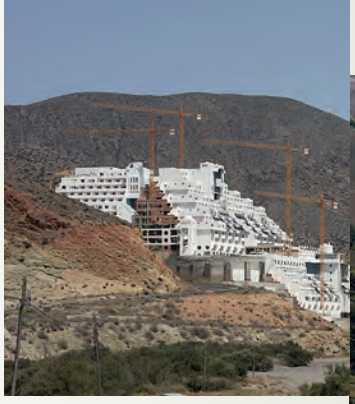
33. Sea breams from the fish farm, *Las Salinas de Astur, Marismas del Odiel BR*, Spain
© UNESCO / O. Brestin

33

34. *Cala Mesquida* village, *Menorca BR*, Spain
©UNESCO / O. Brestin

35. Hotel under construction, *Playa de los Algarrobicos*, *Cabo de Gata-Nijar BR*, Spain
©UNESCO / O. Brestin

36. The city of *Kadjaran*, Armenia
©Olivier Brestin



35

36

34

Generally speaking, slow-spreading urban sprawl along the coastline consumes suburban arable land. This induces at the same time a significant artificialisation of agricultural, semi-natural and natural land, thus a pressure on the natural environment, and air pollution at local level, as well as highly increasing GHGs emissions. This also induces dynamics of fragmentation and of specialization of urban areas giving rise to a greater transit demand and a questioning of social cohesion.

Tourism places an added pressure on the region's coastal ecosystems. The shores of the Mediterranean are the biggest large-scale tourist attraction in the world, with hundreds millions visitors arriving each year. In 2007 alone the Mediterranean countries had 275 million international visitors (UNEP, 2009). The seasonal and spatial concentration of touristic activities strongly amplifies their impacts on the environment, generating pressures on water resources and natural environments, and increasing waste production. The construction of infrastructure and the direct impacts of people using and trampling sensitive dune ecosystems remains a key threat to coastal areas and the Islands.

Hosting, entertaining and supplying the increasing number of tourists along the limited space of the Mediterranean coast will push urban boundaries further inland, most likely destroying the few remaining coastal wetlands and lagoons.

The **EU Integrated Coastal Zone Management (ICZM)** Recommendation has resulted in some beneficial initiatives for the Mediterranean region and should be extended to prevent further conflict of uses.

According to a study of EEA by 2001 ¾ of the coastal sand dunes between Spain and Sicily had disappeared as a result of urbanisation linked to tourism development.

2.6 Possible responses

Even when new technologies have been introduced, increased demand through urbanization, for instance, make them inadequate or obsolete. A mix of instruments, or integrated approaches, are needed which encourage societal changes as well as promoting technical progress and economic development. An ***Ecosystem Approach*** – adopted by the Contracting Parties to the Barcelona Convention in 2008 – seems particularly useful for the Mediterranean and can be cost-effective by addressing environmental and economic considerations, and tackling cross-sectoral problems.

This process strengthens previous commitments in the framework of the Mediterranean Action Plan (MAP), including:
- assessment and control of pollution,
- integrated coastal zone management,
- environment and development,
- biodiversity, marine pollution indicators,
- Environmental Quality Standards.

The improvement of the institutional capabilities of the Mediterranean countries in the sustainable management of their environment and its rational integration in development policies is also a major challenge for the region. The **EU Marine Strategy** provides the framework for fostering strengthened cooperation between North and South Mediterranean countries through the ***Barcelona Convention***. Within this framework, and particularly through its regional implementation, cooperation to protect the Mediterranean marine environment which reflect different socio-economic capacities, is already underway.

The **Union for the Mediterranean (UfM)** and the **EU Neighbourhood Policy** constitute the political base for developing the required multilateral cooperation. The **Mediterranean Strategy for Sustainable Development** (MSSD) also aims to increase the synergies between the various regional bodies, the UfM and the MAP, along with the enhancement of regional cooperation towards capacity building and fund mobilisation. Furthermore, the experience of **UNESCO MAB BRs** should be exploited by the Mediterranean countries.

37

38

39

40

41

37. *Santorini Island*, under pressure due to mass tourism and overconstruction
© Konstantina Toli

38. Traffic jam around the Pyramids, *Cairo*, Egypt
© MIO-ECSDE

39. New stables in *Spitak*, built after the earthquake in 1988, Armenia
© Olivier Brestin

40. Wild flowers in the *Pambak* mountain range, Armenia
© Olivier Brestin

41. Beekeeping in the *Pambak* mountain range, Armenia
© Olivier Brestin

42

43

44

46

42. Fisherman in *Argichi River*, *Martouni* region, Armenia
© Olivier Brestin

43. *Martin Yeretsian*, stringed instrument maker, Armenia
© Olivier Brestin

44. Inhabitant of *Yerevan*, Armenia
© Olivier Brestin

45. The central market in *Yerevan*, Armenia
© Olivier Brestin

45

46. *Argichi River*, *Martouni* region, Armenia
© Olivier Brestin

47. Inhabitant of *Chkalovka*, Armenia
© Olivier Brestin

47

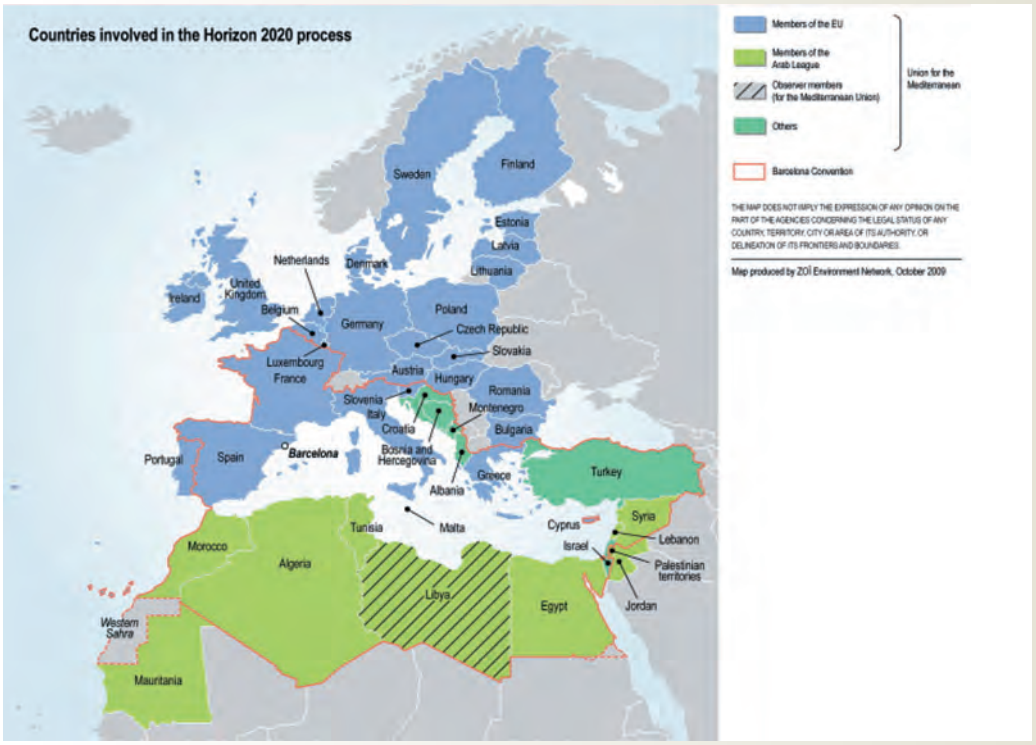
Figure 13
The Horizon 2020 initiative to reduce the pollution of the Mediterranean Sea by 2020

Back in 2005, at the 10th Anniversary Summit of the Euro-Mediterranean Process, leaders of the partnership endorsed the idea of a new push to protect the Mediterranean from the threat of pollution. This initiative has now become known as Horizon 2020. One year later, in November 2006, the Cairo meeting of Euro-Mediterranean Environment Ministers was an important milestone for regional environmental cooperation. The Cairo ministerial agreed on a timetable of concrete actions (Cairo Road-map) covering the period up to 2013. The ministers met in 2009 to review progress.

Horizon 2020[4] is a Union for the Mediterranean initiative that aims at increasing efforts to reduce the pollution of the Mediterranean Sea by 2020.
The main objective of the initiative is to accelerate ongoing activities to de-pollute the Mediterranean and to reduce the most significant pollution sources focusing on industrial emissions, municipal waste and urban waste water, responsible for up to 80% of pollution in the Mediterranean Sea.

A consultative H2020 Steering Group (SG), with a wide membership, was established in 2007. National contact Points were identified from a wide range of other stakeholders, including international organisations, and financial institutions, as well as representative networks of cities, local authorities, NGOs, business organisations, etc.

Within the Steering Group, three thematic sub-groups were established, to oversee the implementation of the initiative in all its pillars:
• Pollution reduction (EIB leader): to support the identification, prioritisation and implementation of the most significant pollution reduction projects tackling major priority sources of pollution;
• Capacity building (DG Environment leader): to support the implementation of the Horizon 2020 Inititiative identifying key gaps and promoting capacity building actions at regional, national and local levels as appropriate;
• Review Monitoring and Research (EEA leader): to monitor progress of the implementation of the Horizon 2020 initiative particularly through appropriate information sharing systems easily accessible to all Mediterranean partners in cooperation with all partner organizations.



The initiative was considerably strengthened in 2008 when the Euro-Mediterranean Partnership, formerly know as the Barcelona Process, was re-launched as the «Union for the Mediterranean», renforcing the political dimension of de-polluting the Mediterranean and facilitating the financial leverage for pollution reduction investments, and capacity building projects.

A considerable improvement was also the expansion of the geographical membership of the Euro-Mediterranean Process to include the coastal states of South East Europe (SEE), giving coherence between the geographical coverage of the Euro-Mediterranean Process, in which Horizon 2020 lies and the key multilateral framework for environmental cooperation in the region, the Barcelona Convention. In line with the expansion to cover South Eastern Europe contact points, have been requested for these additional countries and H2020 meetings can now be held in this region.

Inbox elaborated by the EEA