Wetlands are ecosystems that critically depend on water. They are important for people, not only because they benefit from their direct resources (e.g. harvest of vegetation, fish & game), but also indirectly because of the multiple functions and services they offer daily such as protection against floods and droughts, recharge of water-tables, and water purification. They also support a rich biodiversity, much of which is endemic to the region. Unfortunately, in spite of significant progress in recent decades, wetlands are still too often considered as “wastelands” instead of being seen as rich and essential areas for human survival, and they have continued to disappear more rapidly than other ecosystems. This disappearance is largely the result of a widespread, utilitarian, and short-term vision of natural resources, such as wetlands. However, if managed well and used efficiently, freshwater in the Mediterranean could be sufficient for both people and wetlands ecosystems.

In addition, the knowledge we have of their multiple values and the services they provide to humankind is lacking and fragmented. Even when it does exist, it is not easily accessible to those who need it, and poor transfer leads to limited use of relevant information on wetlands. The Mediterranean Wetlands Observatory (MWO) was therefore created in the framework of the MedWet initiative, under the Ramsar Convention for Wetlands, to bridge the knowledge gap mentioned above, i.e., to assess the status and trends of wetland ecosystems in the region, and to develop awareness on their multiple values. Its ultimate goal is to improve wetland conservation and management by providing information to a broad audience, especially decision makers and the public at large.

The MWO has three inter-related objectives, which will be gradually achieved through the regular calculation of indicators:

1. Provide timely and quality information on Mediterranean wetlands status and trends.
2. Track threats to Mediterranean wetlands and identify actions to promote their conservation, wise use, and restoration.
3. Assess wetlands’ role in the context of sustainable development in the Mediterranean.

More detailed information on the background and history of the MWO can be found on its website: [www.medwetlands-obs.org](http://www.medwetlands-obs.org); its recently released 1st assessment of these ecosystems is on: [http://medwetlands-obs.org/en/content/mwo-presents-its-first-report-mediterranean-wetlands](http://medwetlands-obs.org/en/content/mwo-presents-its-first-report-mediterranean-wetlands)
The MWO has selected a small set (25) of indicators it intends to monitor in the long term, several of which are related to water. A few results from these are presented below.

- **Mediterranean river flows**

  Overall, the total freshwater brought by all rivers flowing to the Mediterranean Sea has declined by c. 45% in less than a century. This basin-scale trend is due to individual river discharges that are generally declining. The Nile is an emblematic case, where annual discharge to the sea has decreased from 84 to 6 km³ (-93%), largely as a result of the Aswan dam. The only significant exceptions are two large rivers which largely depend on melting snow / ice from the Alps at some time of the year, (i.e., the Rhone and Po). Both have maintained a stable long-term discharge. As a result, today they account together for one third of all freshwater discharge to the Mediterranean Sea.

  Because of the link highlighted earlier between river flows and wetlands, these results strongly suggest that overall, the water resources available for wetlands in general is diminishing throughout the Mediterranean, except perhaps in south-east France/ northern Italy (Rhône/ Po/ Têt watersheds). Reduced river flows means, for instance, that riparian wetlands further downstream will be less regularly flooded - or even no longer at all - leading in the latter case to effective wetland loss.

  The main causes of the overall declining river discharges are water abstraction (especially for irrigated agriculture) and climate change.

  Improving environmental flows of Mediterranean rivers is possible, however, as the IUCN showed on the basis of best-practice experiments from around the world (Dyson et al. 2003). This may include reserving ecological flows based upon downstream ecosystem needs, removing dams that have become of limited use (e.g. due to siltation), using new dam designs that allow sediment flow, and providing specific devices such as fish-ladders for migratory fish.

- **Water Quality**

  The quality of water is important for the functioning of the wetland ecosystem itself, for the conservation of biodiversity, and for human water consumption. Conversely, wetlands contribute to the natural depuration of water, and their drainage leads to decreasing water quality through the loss of this natural process.

  In the northern Mediterranean, water quality degraded significantly in the 1950-60’s, as in the rest of the developed world. Since the 1980’s however, it has been improving in some respects, e.g. with regard to some nutrients (phosphorous), and locally some heavy metals. Progress has been occurring at a quite variable pace, depending on ecosystem type (lake, river, coastal water, or aquifer), parameter, and country.

  Only a tiny fraction of what makes up “water quality” is usually measured, i.e., mainly nutrients. Many other elements that are known to influence water quality (e.g. pesticides,
PCBs, PAHs, hormone-like substances, medicines, and nano-pollutants) are inadequately or not monitored, in the whole region.

- **Extent of wetlands: still a downward trend**

With its 15-22 million ha, the Mediterranean hosts c. 1.5% of global wetlands. Wetlands are under-represented in the region, compared to global averages. This is partly due to various Mediterranean countries (North Africa, Middle-East) lying mainly in desertic or semi-desertic bioclimates.

The Mediterranean region has followed the global trend in experiencing probably around 50% loss during the same period. Major losses occurred mainly between the 1950’s and 1970’s in most countries.

Two separate human needs ultimately drive the disappearance of Mediterranean wetlands: the need for land and for water. In the first case, wetlands are intentionally taken over to be converted into agriculture, residential, or industrial land. In the second case, water over-abstraction in the catchment upstream of wetlands, or from the underlying water-table (in the case of ground-fed wetlands), leads to their gradual drying-up. In a second step only, dried-up areas may then be converted to other human uses. In many areas these two drivers (need for land and for water) have acted in conjunction. In the past, a third driver prevailed too: sanitary reasons (e.g. eradication of malaria and other diseases)

Over the 20th century, the creation of many artificial wetlands took place, partly over former natural wetlands. They now represent almost one quarter of the total surface area of Mediterranean wetlands.

- **Exploitation Index of Freshwater Renewable Resources**

The total demand for water in the Mediterranean is still accelerating, but here again different sub-regional trends are observed. Whilst the demand is tending to increase less rapidly in the north, it is accelerating in the south and east. Overall, countries use almost one-quarter of their renewable resources, and almost half of their really exploitable, renewable resources. About 80% of this renewable water used comes from surface sources (rivers, lakes, and dams), the rest from aquifers

A high percentage of the national renewable water resource is used in countries of NE Africa, the Middle East, and Mediterranean Spain, but less so in most of southern Europe, where resources are more abundant. As the recent UN report on the Millennium Development Goals shows (United Nations 2011), North Africa and West Asia (including the eastern Mediterranean) are the only two regions in the world that have exceeded the sustainability limits so far, with exploitation indexes reaching 92% and 166%, respectively. Conversely, the Balkan countries show the lowest exploitation index. All this clearly identifies the areas in the Mediterranean basin where wetlands will increasingly suffer from a shortage of water. In other words, a much higher proportion of water resources remains in the environment in northern Mediterranean countries than in southern and eastern ones. A high “Exploitation index of freshwater resources” is usually not a favourable sign for Mediterranean wetlands. The growing exploitation of surface waters affects wetlands, many of which have largely dried up in recent decades, following upstream water abstraction

Prospective studies by the European Environment Agency have shown that with mounting pressure on water resources combined with climatic changes, large parts of southern Europe will face increasingly severe water stress. In the Mediterranean overall, the water-poorest territories may be the most heavily affected.
Water demand per sector

At the Mediterranean scale, agriculture is the major consumer of water throughout the second half of the 20th century, accounting for 64% of all freshwater used. It is followed by industry (including the energy sector) at 22%, and the domestic sector with 14%. The total irrigated area has doubled between 1965 and 2005, reaching 26 million hectares. It now exceeds 20% of total land under cultivation. On average, irrigated crops require almost twice as much water in the south and east of the basin (9600 m³/ha/year) than in the north (5000 m³/ha/year), due to both irrigation techniques and climate.

It should be noted that not all the water taken (and counted in statistics) is actually consumed: usually, a fraction returns to the environment. The proportion varies between sectors. Typically, the fraction going back to the environment is very high for the energy sector (e.g. cooling power stations), but less so for agriculture or domestic use.

Water demand is likely to increase in the coming decades for all sectors. Prospective studies show that the total water demand between 1995 and 2025 should increase by 5% in the northern Mediterranean, by 51% in the south, and by 97% in the east, giving an overall rate of +35% for the whole region for 1995-2025 (+19% for 2005-2025).

Wetlands and Millennium Development Goals (MDGs)

Most of the countries (75%) have achieved significant results towards Goal 7, wetland-related MDG indicators. During the 1990-2011 period, the indicators for the Goal 7 “Ensuring environmental sustainability” showed the following trends which may potentially impact wetlands:

Possible negative impact on wetlands
- Increased drinking water supply efforts in countries that have a deficit of access to water, creating further water abstraction (through pumping, water transfer), especially in the coastal zone and in river valleys where most of the population lives: Morocco, Algeria, Egypt, Libya, Tunisia.
- Efforts to reduce slums and provide adequate housing: major national housing programmes are destroying natural or semi-natural habitats, especially along the coasts of Algeria, Egypt, Libya and Morocco.

Possible positive impact on wetlands
- Important efforts in providing proper sanitation facilities to households and communities reduce soil and water pollution, especially in coastal areas and in river valleys, where most people live.
- Increased water supply efforts are also being made through seawater desalination systems which decrease pressure on freshwater sources and ecosystems: Algeria, Libya, Israel, Spain, Cyprus and Malta. (However it should be noted that this technique has other environmental impacts and increase energy consumption)
- Stabilizing or even increasing the forest cover in some countries is likely to have, already or in the future, positive impacts on watershed protection and water retention. This is partly due to the higher relative availability of alternative sources of energy (gas, electricity and fuel), compared e.g. to sub-Saharan Africa and South-East Asia, which rely on firewood. Conversely, two factors affect Mediterranean forests: wild fires (mostly in northern Mediterranean countries) and overgrazing, in many parts of North Africa, the Middle East and the Balkans.
Conclusion: Wise wetland management is necessary to secure a sound and sustainable water supply in the Mediterranean countries

All these changes in both wetland extent and water quality have consequences on the hydrological functions of the wetlands and their central role in the hydrological cycle. The related ecosystem services are degrading; especially the role of wetlands in water supply and the role of wetlands in water purification (see corresponding indicators). Generally, in the Mediterranean, both the quantity and quality of water available for humans are decreasing. Consequently, costs for making water drinkable are increasing and rapidly depleting aquifers increase the extraction costs - when extraction is still possible.

But responses are possible. More efficient coordination of the water policies and governance arrangements at the national or watershed level (see e.g. indicator “National Wetland Policy and Committee”) and the shift from “supply” to “demand” water policies should speed-up the improvement of the water management situation. The EU directives, and especially the Water Framework Directive, are very demanding in regard to ecological requirements. To reach these objectives would imply new governance modes, e.g. large-scale application of Integrated Water Basin Management. The directives can show the way towards a real cross-sector coordination of water issues.

A major step for reducing and rationalizing water exploitation would be to reduce the huge water losses and to further adopt water-saving technologies and practices. Finally, restoring wetlands and taking into account water needs for the ecosystems would be a way to ensure aquifer recharge, water purification and sustainable use. For this reason, wetlands located in floodplains or rivers are of special importance.