



FOREST ECOSYSTEMS

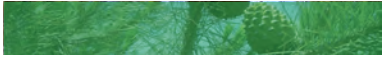
AT THE SERVICE OF DEVELOPMENT AND ADAPTATION TO CLIMATE CHANGE

Forest Ecosystem-based Adaptation
Case of the Seyhan watershed in Turkey





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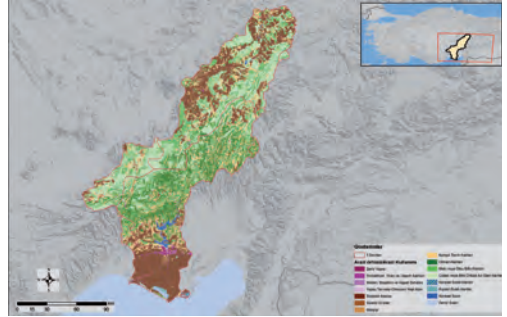
Seyhan Watershed

Seyhan watershed is located in the east of the Mediterranean Region of southern Turkey. It consists of some parts of Adana, Kayseri, Niğde, Mersin, Sivas and Kahramanmaraş provinces. The total area of the watershed is 21.741 km² and total population is 2.4 million. Three quarters of the population lives in cities close to the sea shore.

Being the second largest river basin after the Nile in the Eastern Mediterranean, the Seyhan river basin, in agricultural terms, is one of the most important regions in Turkey and in Europe. People's livelihoods in the watershed mainly rely on agricultural activities. The main agricultural crops are wheat, corn, barley, oat, cotton, fruits and vegetable. In terms of geographical structure, the Seyhan River Basin consists of high steps, mountainous areas, transition zones, low planes and the Cukurova Delta where most of the agriculture is located.

Due to the change in altitude and topography various climates are dominant in the Seyhan River Basin. While winters are warm and rainy and summers are arid and hot in the lower parts of the basin, continental climate with cold winters and hot summers and with low rates of precipitation is observed in the upper parts of the basin.

Vegetation cover differs in great extend in south-north direction according to climate and biogeographic regions. Natural areas of the southern part of the Basin are dominated by maquis formation. Aladağlar Mountains is dominated by coniferous forests. Northern parts are mainly dry steppe with scattered patches of oak shrublands (Zeydanlı & Ulgen, 2009).



Current signs of climate change in Seyhan Watershed

There are several climate related indicators that show a gradual change in the climate of the watershed. The highest temperatures reported in each month from the years 1970–2011 show that 9 out of 12 of these highest recorded temperatures were observed in last 20 years. On the other hand, mean annual temperatures in Adana meteorological station shows a gradual uptrend during the last 40 years period, while annual precipitation data show a decreasing downtrend in the same period. Annual discharge data of the Seyhan river also indicates a decrease in river flow during the last decades. The largest decrease in monthly flow is being observed in February. In addition, the total number of forest fires in Adana Forest Regional District shows an increase in the last years.

According to the climate projections for Seyhan watershed for the year 2070 the air temperature is expected to rise by 2–3.5 °C, precipitation is expected to decrease by 25–35%, mountain snow packs are expected to melt earlier, irrigation water is expected to decrease, dry and irrigated farming regions are expected to be affected. Meanwhile demand for the use of groundwater will increase and a risk of water pollution is prominent. Finally it is also expected that in coastal regions salt water from the sea will mix with inland ground water up to 10 km inshore (Ref.: <http://www.iklim.mdgf-tr.org>).



Forests and Climate Change Adaptation

Due to their role in carbon sequestration forests are already recognized as important factor in climate change mitigation. Today more and more attention is given to the role of forests in adaptation to climate change. The goods and services that forest ecosystems provide deliver essential direct and indirect economic benefits on local and national levels, but also for the human well-being. In order to maintain forests' resilience to climate change and to contribute to increased resilience of territories a twofold approach should be followed :

- 1) Fostering the adaptation of forests through adopting adaptation strategies in sustainable forest management (so-called "Adaptation of Forests").
- 2) Integrating Forest Goods and Services in programmes and development policies in order to promote the role of forests for sustainable development and adaptation of territories and people to climate change (so-called Forest Ecosystem-based Adaptation or "Forests for Adaptation", see figure 1).

Forest Ecosystem-based adaptation (FEbA)

Forests provide vital goods and services that contribute to vulnerability reduction of territories and people :

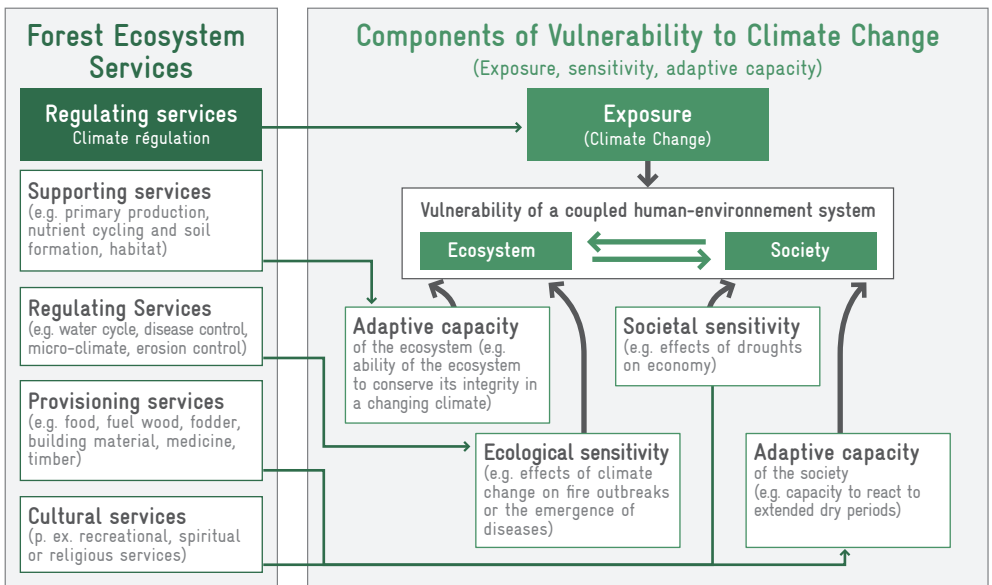


Figure 1 : Relationship between forest ecosystem services and the different components of vulnerability to climate change (Adapted from: CIFOR, World Agroforestry Centre and USAID (2009), Locatelli & al.)

Forests provide lots of services to the other sectors of the economy. These services are called ecosystem services, e.g. erosion control, oxygen production, carbon sequestration, protection of biodiversity, stabilization of water flow, soil protection, food for livestock, and additional income for forest villagers through ecotourism, honey forest establishments etc. Non-wood forest products that provide important source of income for forest service and villagers are peanuts of umbrella pine, laurel (bay leaves), resin production and rosemary production. Forest goods and services also strengthen other sectors to overcome the negative impacts of climate change and to improve their adaptive capacity to cope with climate change, e.g. through additional income for villagers. Forest ecosystems of the Seyhan Watershed have similar functions, too.

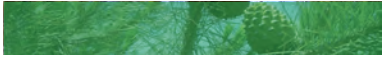
Total Economic Value of Turkish forests amounts in average 63 USD / Ha / year (Merlo & Croitoru, 2005, updated in 2010 prices)

Continuity of services provided by forest ecosystems depends on health of forest ecosystems against biotic and abiotic stresses. Climate change is one of the main stressors for the forest ecosystems in Seyhan Watershed. Climate change will negatively affect forest goods and services and it will reduce the magnitude of benefits they provide to the other sectors in the watershed (e.g. water purification, erosion and flood control, non-wood forest products etc.). It is projected that climate change will significantly reduce timber production, carbon sequestration, water quality, soil stabilization, erosion control, the forest potential for recreation, ecotourism, non-wood forest products (laurel, sage, pine nuts, thyme, mushroom, honey, etc.) and biodiversity functions of forests of Seyhan watershed. To overcome these negative effects of climate change, adaptation measures need to be carefully implemented in the watershed.

Economic sectors' vulnerabilities should be reduced and their adaptive capacities should be strengthened. In this sense, changes are needed at the policy level to strengthen cooperation among sectors (forest, agriculture, tourism, water, energy, etc.). As mentioned before, the forest sector has a lot to offer to address these challenges.

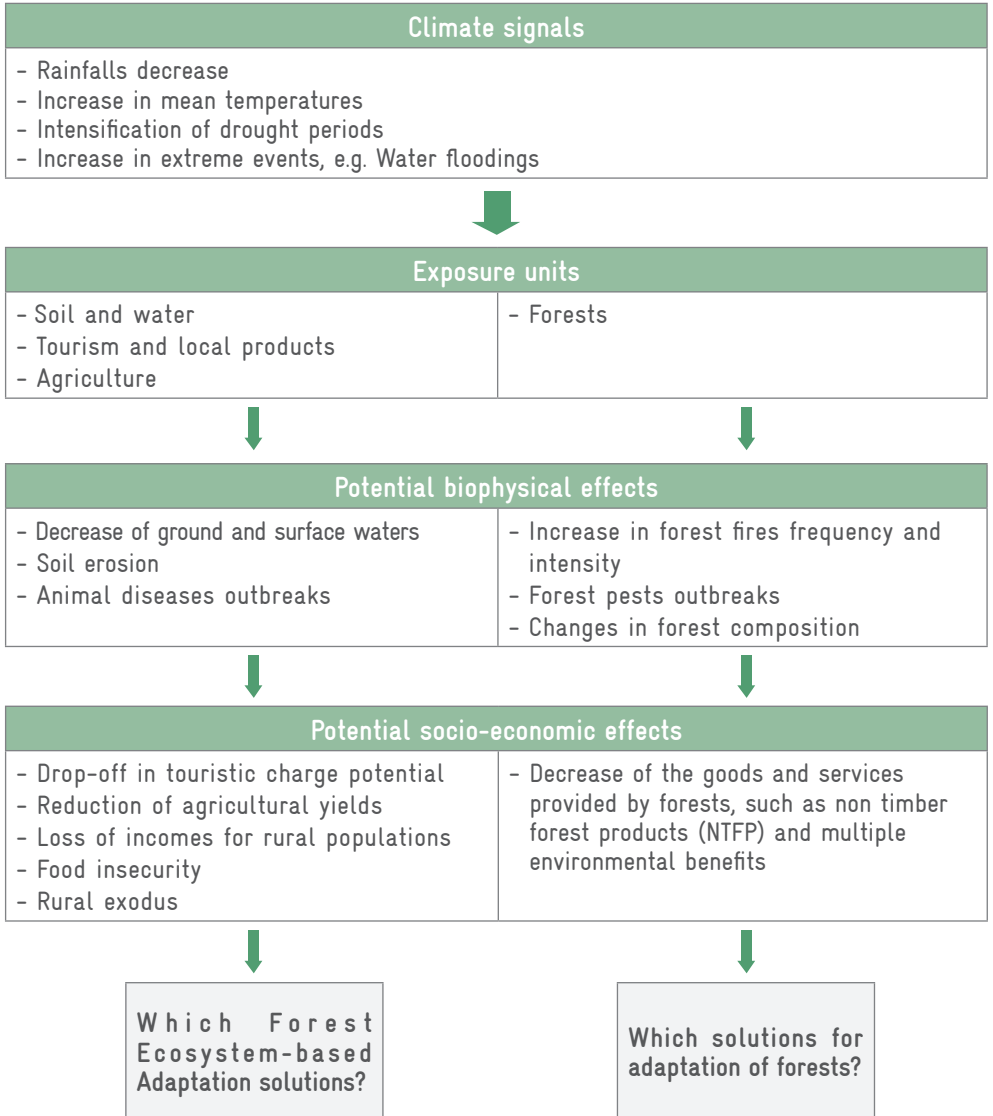
A training workshop has been organized in Adana, between 13-16 November 2012, to raise awareness and to provide local and national managers from a variety of sectors (forest, agriculture, tourism, water, energy, etc.) tools and methods on how to plan for climate change adaptation. The training, based on OECD guidelines⁽¹⁾, and applied to the Seyhan watershed as an example, emphasized the need for cooperation among sectors and advocated for the use of Forest Ecosystem-based Adaptation (FEbA) measures. One output of the training workshop has been a framework of orientation for Forest Ecosystem-based Adaptation for the Seyhan watershed (some FEbA options are listed in the table, page 7).

⁽¹⁾ OECD (Organization for Economic Cooperation and Development), Link to the Policy Guidance on integrating climate change adaptation into development cooperation <http://www.oecd.org/dac/environment-development/oecd-policyguidanceonintegratingclimatechangeadaptationintodevelopmentco-operation.htm>



Impact chain

The impact chain enables to identify possible effects of climate change on the priority exposure units in the area of interest. It is not exhaustive and can be precised according to the availability of climatic and sectoral data.

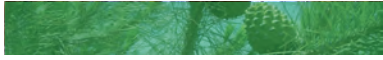




Framework of orientation for the development of Forest Ecosystem-based Adaptation (FEbA) measures in Seyhan Watershed

Overall objective	Optimizing the role of Forests Goods and Services for Climate Change Adaptation and Development in the Seyhan Watershed	
Forest Ecosystem-based Adaptation measures ("Forest for Adaptation")		
Sector concerned/ Exposure unit	Possible measures	Responsibility for implementation
Soil and Water	Increasing afforestation and erosion control programmes	Forest Regional Directorate, Agriculture Department, Regional Water Works Department, NGOs, City Council, Private Sector, Regional Development Agency
	Re-establishing riparian forests that have been destroyed and protection of existing ones	Forest Regional Directorate, Agriculture Department, Regional Water Works Department, NGOs, City Council, Private Sector, Regional Development Agency
Tourism and local products	Promoting ecotouristic activities	Forest Regional Directorate, Tourism Department, NGOs, City Council, Private Sector, Regional Development Agency
	Establishing honey forests	Forest Regional Directorate, Agriculture Department, NGOs, City Council, Private Sector, Regional Development Agency
	Increasing production of non-wood forest products such as resin's of brutian pine, peanuts of umbrella pine, thyme, rosemary, sumac, wild cherry pistachio, carob, cedar mushroom, walnut, laurel leaves, almond, etc.	Forest Regional Directorate, Agriculture Department, NGOs, City Council, Private Sector, Regional Development Agency
Agriculture	Integrating grazing plans into forest district management plans	Forest Regional Directorate, Agriculture Department, NGOs, City Council, Private Sector, Regional Development Agency
Other adaptation solutions necessary to secure FEbA measures		
"Adaptation of Forests" measures		Necessary partners
Prevention of forest fires		Forest Regional Directorate
Giving priority to drought tolerant species in mixtures and promote mixture in stands		Forest Regional Directorate
Measures concerning non CC related pressures on forests		Necessary partners
Preventing conversion of forest land into other uses		Forest Regional Directorate, Agriculture Regional Directorate
Enhancing forest maintenance works		Forest Regional Directorate

N.B. : the following table is based on the outcomes of the workshop in Adana, 13-16 November 2012. It corresponds to a non-exhaustive summary of potential FEbA measures for the Seyhan watershed area.



GI2 regional project Silva Mediterranea-CPMF

Adapting forest policy framework conditions to climate change in the MENA region (Middle East-North Africa)
Website : www.giz-cpmf.org

The GI2 regional project operates in the framework of the Collaborative Partnership on Mediterranean Forests (CPMF) and in support to the Silva Mediterranea committee on Mediterranean forestry issues.

The overall objective of this project is to improve the framework conditions for the sustainable management of forest ecosystems in order to preserve the supply of goods and services in the context of climate change. The project concerns selected countries in the MENA region whose forest resources are significant : Algeria, Lebanon, Morocco, Syria, Tunisia and Turkey.

The project is designed around four components:

- 1) Capacity building of the forest administrations in terms of climate change and valorization of goods and services provided by forests;
- 2) Inter-institutional relations with partner sectors to increase the appreciation and acknowledgement by these sectors for the goods and services provided by forests;
- 3) Communication, information and awareness raising of the general public, particularly as to the expected impacts of climate change and the socio-economic importance of the goods and services provided by forests;
- 4) Mobilization of external support and partnerships.

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Download this booklet under :

<http://www.giz-cpmf.org/thematic-issues/climate-change-adaptation/forest-ecosystem-based-adaptation/>

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