DELEGATION OF THE EUROPEAN COMMISSION TO SYRIA

Syrian Arab Republic

Country Environmental Profile for the Syrian Arab Republic

Contract N° 2008/171432
Framework Contract Beneficiaries – Lot 6

Final Report

April 2009

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LOT 6

Multiple Framework Contract - Environment

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List of Abbreviations

AFESD	Arab Fund for Economic and Social Development
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Ministry for Economic Cooperation and Development)
CDM	Clean Development Mechanism
CEP	Country Environmental Profile
CIM	Centrum für Internationale Migration und Entwicklung
CSP	Country Strategy Paper (by EC)
DAC	Development Assistance Committee
DED	Deutscher Entwicklungsdienst (German Development Service)
EC	European Commission
EC-D	European Commission's Delegation
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMS	Environmental Management System
ESC	Environmental Studies Centre
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
FEMIP	Facility for Euro-Mediterranean Investment and Partnership
FYP	Five-Year Plan
GCEA	General Commission for Environmental Affairs
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
IFAD	International Fund for Agricultural Development
InWEnt	Capacity Building International
IPPC	Integrated Pollution Prevention and Control
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
MAM	Municipal Administration Modernisation (Project funded by the EC)
MAP	Mediterranean Action Plan
MDG	Millennium Development Goal
MEA	Multilateral Environmental Agreement
MeHSIP	Mediterranean Hot Spot Investment Programme
MoAAR	Ministry of Agriculture and Agrarian Reform
MoLAE	Ministry of Local Administration and Environment
MoI	Ministry for Irrigation
NBSAP	National Biodiversity Strategy and Action Plan
NEAP	National Environmental Action Plan
NERC	National Energy Research Centre
NGO	Non-governmental organisation
NIP	National Indicative Programme (EC instrument)
POP	Persistent Organic Pollutant
RD&D	Research, Development & Dissemination
RE	Renewable Energy
REU	Rational Energy Use
REMP	Renewable Energy Master Plan
SDC	Swiss Development Cooperation
SEA	Strategic Environmental Assessments
SIDA	Swedish International Development Cooperation Agency
SPC	State Planning Commission
SWAP	Sector Wide Approach
SYP	Syrian Pound
TA	Technical Assistance
TOE	Tonnes of Oil Equivalent
ToR	Terms of Reference
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WB	World Bank
WHO	World Health Organisation

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Executive Summary

Syria faces serious natural and man-made environmental problems that need to be urgently addressed. The most pressing ones are related to water scarcity and contamination, soil degradation, air pollution, inappropriate solid waste treatment and disposal, biodiversity loss and coastal and maritime pollution. Environmental degradation is now affecting the health and economic productivity of the population. The incidence of environment-related disease is high and a recent World Bank study came to the conclusion that the annual costs of environmental degradation are at 2.3 percent of GDP. Undesirable environmental changes are driven by many factors including economic growth, population growth, urbanisation, intensification of agriculture, rising energy use and transportation, but importantly with a better understanding and management there is scope to improve the current situation. Poverty still remains a problem at the root of several environmental problems. The fact that environmental issues ranked low in state planning over a long period is a major reason for today's relatively weak performance of Syria in terms of environmental issues. Syria is now in the phase of catching up with regional and international environmental standards.

State of the Environment

Air: Syria faces serious air pollution problems, mainly in industrial areas in the coastal zone (Tartous, Banyas, Latakia), the midlands (Hama, Homs) as well as in big cities like Aleppo and Damascus. Main sources of air pollution include significant industrial emissions from the Fertilizer Complex, cement plants, power stations and refineries, low efficiency of domestic heaters, a relatively old transportation fleet (despite considerable efforts in recent years to renew the fleet), and fuel quality. Syrian crude oil contains high concentrations of sulphur and a large number of vehicles operate on diesel. The total number of vehicles has increased from 960,000 to 1.2 million in the period 2002-2006, leading to further pollution. The lack of enforced emissions standards compounds the problem. Air quality monitoring stations have been established recently in some major cities, but the system is still at an early stage and the results have not yet been translated into action.

Land resources: Syria is severely affected by land degradation and desertification: it was estimated that approximately 10.9 million hectares equivalent to 59 percent of the country area is affected in one way or the other by desertification, and approximately 3.16 million hectares of land or about 18 percent have seriously suffered from degradation.

A decrease of soil productivity is observed in particular in irrigated land through the overuse of water for irrigation, inadequate irrigation systems, and improper use of agrochemicals. This happens mainly along the large rivers and in the coastal lowlands. Many agricultural fields are today no longer cultivated because of high salinisation. A country-wide assessment came to the conclusion that 3000-5000 ha of formerly irrigated land have to be taken out of agricultural use every year due to extreme salinisation. As a result, more recent work has focused on installing better drainage and restoring existing areas, rather than expanding into new ones. The government of Syria through the *Ministry of Irrigation* (MoI) and with considerable national funds started in 2001 an ambitious plan on the rehabilitation and modernisation of old irrigation projects to improve conveyance efficiency and minimise distribution losses. However, the level of adoption of these techniques is still low, not least because of a lack of confidence amongst farmers of the expected financial return. Agrochemicals are widely applied in Syria, with frequent inappropriate applications.

Soil erosion is severe in particular in the *badia* drylands, which is the vast semi-desert region in the central-eastern part of the country with its large herds of livestock, caused by inappropriate seasonal and spatial use, cultivation of marginal land, damage of the upper soil layer by vehicles, and further accelerated by climate change. The number of livestock in the Syrian *badia* has constantly increased over recent decades, and the present level clearly exceeds the carrying capacity of this fragile ecosystem. The phenomenon of overgrazing is observed throughout the *badia*, and is partly due to the availability of subsidised animal feed, supporting high levels of livestock. An increasing sedentarisation of the Bedouin population has lead to certain concentrations of live-

stock around settlements, with serious consequences for land degradation there. The cultivation of the *badia* with field crops such as barley has exacerbated the situation, as ploughing makes the soils highly vulnerable to wind erosion. There is no land ownership among the Bedouin which would create incentives not to overuse the land. Climate change with more frequent periods of drought constitutes an additional threat to the *badia* land.

Water resources: The renewable water resources of Syria are estimated at 10-18 billion m³/year (depending on the kind of assessment), with about 33 percent stemming from groundwater, 24 percent from surface water resources, 36 percent from the Euphrates and about 7 percent from Tigris River. These resources are now nearly fully exploited. Estimates suggest annual growth in demand of around 2 percent over the next 20 years, which will result in deficits over large areas of the country. Syria's 500,000 ha large irrigation network accounts for 89 percent of the water use. Only 7 percent is used for domestic purposes and 4 percent for industrial, commercial and tourist purposes. Potable water consumption per capita ranges between 82 litres/day in rural areas and 176 litres/day in urban areas. Falling groundwater levels in various regions are evidence of groundwater depletion (Homs: 12-35 m/year; Aleppo sub-basin: 2-5 m/year, Damascus Rif: more than 6 m/year). The main reason is the excessive extraction of groundwater for irrigation. In the season 2001-2002, for example, groundwater use in agriculture exceeded 150 percent renewable resources. Water shortage is exacerbated by poor water quality, particularly in areas with high economic activities. Surface and groundwater pollution by pathogens, nitrate, ammonia or heavy metals is evident in some of the water basins due to inappropriate waste water collection and treatment as well as the wide and often uncontrolled application of agricultural chemicals. Serious steps have been undertaken such as endorsement of water and environmental laws, introducing management boards and legalising the establishment of water users associations. A national water master plan defining a long-term framework for sustainable water sector development is needed but currently does not exist. The Syrian water sector is one of the priority sectors that require fundamental reform at the national level.

Rivers and wetlands: Many wetlands have been degraded or even destroyed by drainage for agriculture and diversion of water supplies for irrigation purposes, and by heavy pollution. Until the late 1960s, there was for example a large area of small lakes and permanent marshes along the meandering course of the Orontes River in the Al-Ghab depression. Nowadays, the river is heavily utilised for irrigation purposes, and virtually dry and non-existent in summer. When there is some water in the river bed in winter, it is heavily polluted from industrial and agricultural sources. Syria's largest wetland is Sabkhat al Jabboul, a shallow salt lake near Aleppo, renowned for its greater flamingos and other biodiversity. Recent changes in the hydrology of the lake have resulted in ecological changes. 10,000 ha of the lake were designated as *Wetland of International Importance* under the Ramsar Convention in 1998.

Marine Resources: The marine environment along the Mediterranean coastline is home to natural habitats and several threatened species of animals and plants. The beaches near Latakia, for example, are important nesting areas for two species of threatened marine turtles, green turtles and loggerhead turtles. The government has established a few protected areas to conserve the natural features of the Mediterranean coast. With an annual catch of marine fish of 2,581 metric tons (based on figures from the year 2000), the marine fishery is quite limited. Although the coastal area covers only two percent of the national territory, it accounts for 11 percent of the population and is an area with intensive economic activities. Four major population centres, Latakia, Tartous, Jableh, and Banyas discharge untreated domestic and industrial sewage into the sea, causing serious pollution. The severity of the municipal sewage problem is manifested by the drifting of raw sewage along the shoreline, and the eutrophication and bacteriological contamination of the coastal seawater at the points of discharge sites. The problem becomes particularly acute during summer months.

Mineral resources and industry. Syria has rich mineral resources including petroleum, phosphates, chrome and manganese ores, asphalt, iron ore, rock salt, marble, and gypsum. Their exploitation and processing is often linked with serious environmental problems such as land degradation and pollution. Most light industry is concentrated around Damascus and Aleppo, whilst the

heavier industry is around the cities of Homs and Hama in central Syria and Tartous and Banyas at the Syrian coast. Oil and gas meanwhile are produced in the east of the country near Deir ez-Zor.

Energy. Syria produces oil and gas, but oil output and production has decreased by 30 percent between 1996 and 2005, due to a depletion of reserves and an outdated infrastructure. It is expected that Syria will become a net oil importer within the next 5-15 years. The government is attempting to further develop the gas sector e.g. by substituting natural gas for oil in power generation to free up oil for exports. Syria has a considerable potential for the use of renewable energy sources – wind and solar – as well as for improved energy efficiency and energy savings. Syria began to promote renewable energy already in the 1990s. Today, photovoltaic systems with a total capacity of 80,000 V are installed in rural areas, and 15-20,000 solar heaters are available throughout the country. Two small wind parks with a capacity of altogether 18.5 MW are expected to become operational in 2009 (the overall current installed capacity in Syria is about 7019 MW). Several barriers exist currently to the path of renewable energy developments in Syria: subsidies to the conventional energy sector, dominance of the public sector, limited awareness of the benefits, lack of favourable policies, tariffs and incentives, underdeveloped human resources, inadequate governmental assistance and limited interface between the RD&D institutions. The implementation of the "Renewable Energy Master Plan" (REMP), launched by the Syrian government in 2002, is therefore slow.

Biodiversity: Syria is rich in biodiversity, although several animal and plant species have become extinct in the last decades due to over-use. These include in particular large mammals (mountain gazelle, goitered gazelle, wild goat, Syrian brown bear, Syrian onager, etc.) which suffer a lot from hunting pressure in addition to habitat loss. There are 26 protected areas, including five wetlands, one wildlife reserve, a special Bald Ibis protected area, three coastal and marine protected areas, one biosphere reserve and sixteen forest areas. In addition to these, there are over 60 rangeland protected areas. There are no national parks in Syria, and most protected areas are not fully in line with international standards and criteria. The *National Biodiversity Strategy and Action Plan* (NBSAP) recommends the establishment of a network of national protected areas covering all ecosystems in the country. Integrating local communities into the efforts for establishing and maintaining protected areas have only recently started to become government policy.

Forest resources: Today, forests make up only 3.2 percent of the country's surface area. The enlargement of human settlements, including land clearings for the construction of summer houses and infrastructure, is still a major threat to the forest areas in the coastal region. Forest fires impose further threat to this ecosystem. According to the World Bank and UNDP, more than 20,000 ha of coastal forests have burnt in north-western Syria since the 1970s. Reforestation programmes began in the early 1950s and show considerable achievements. The FAO supports the Syrian government in forest fire management and in developing a coherent forestry policy.

Waste water: In 2002, the total waste water produced throughout the country was estimated 1.4 billion m³. Most Syrian towns and cities have sufficient sewage collecting networks, but only some of them are connected to sewage treatment plants. There are about 20 treatment facilities in operation, including four main plants in Damascus, Aleppo, Homs, Hama and Salamieh. The treatment processes, however, do not always meet international standards. Also many waste water pipes are leaking, so contributing to environmental pollution and threatening drinking water resources. There is no treatment at all of discharged waste water in rural areas. All treated waste water is reused in agriculture and the amount of reused waste water was approximately 500 million m³ in the early 2000s. The 10th five-year-plan foresees the establishment of 200 new treatment plants, so that 50 percent of the population will be covered. 22 treatment plants are currently under construction, 30 plants are being contracted, 24 plants are in the biding process and 41 plants are under study. The rest is in the planning phase.

Solid waste: Refuse collection is done in all Syrian towns, normally organised by the municipal "Cleanliness Departments". The majority of waste, however, does not have any particular treatment and the practice of sanitary landfilling is still in its infancy in Syria. There are only three

composting plants in operation in Syria: in Damascus, Latakia, and Salamieh. An official recycling system does not exist, but an informal private sector participates through scavenging recyclable materials. Practically none of the dumping sites is engineered to appropriate standards and none of them was engineered to specifically manage bulky and inert waste. Dumping sites in Syria are rough, simple and badly operated because of lack of material, knowledge and financial means. One of the bottlenecks for establishing proper solid waste management systems in Syria is insufficient cost recovery, which is mostly below 10 percent and thus not economically viable. A master plan for municipal waste management was completed in 2004 and makes detailed recommendation for the improvement of collection, transportation, treatment, and disposal. The necessary total costs for the initial investments (without operation) are estimated at 1.7 billion SYP (approximately €28m). Preparations are made to introduce garbage incineration as an element of integrated waste management and energy production.

Chemical substances and hazardous waste: Hazardous household waste is estimated at 0.9 kg per inhabitant per year, that is, approximately 16,000 tonnes/year. This ratio is half the European generation of hazardous household waste. It is not collected and treated separately. FAO financed and provided technical support for a project in Syria to complete a national inventory and safeguard all obsolete pesticides. In 2004/2005 a total of 600 tonnes of obsolete pesticides from over 100 locations were logged, repackaged in compliance with international regulations and transported to two secure depots. Medical waste is collected separately and treated only in Damascus. There is only little information available on the amounts of industrial hazardous waste and the treatment processes. Moreover, there are no designated landfill sites for receiving hazardous wastes.

Urbanisation: Syria has experienced a process of rapid urban development since the 1980s, when the annual growth rates were as high as five percent; the current rate of two to three percent is lower, but still considerably high according to world standards. About 55 percent of the total population lives in urban areas. The urban population is expected to increase from 9.6 (2005) to 18.3 million people (2030). The environmental impacts resulting from rapid urban development are escalating: air pollution, water contamination, energy shortage, etc. Other land issues as urban sprawl also constitute a major environmental problem.

Environmental Policy, Legislative and Institutional Framework

The *Council for Environmental Protection and Sustainable Development* is the overall environmental authority in Syria and has the responsibility of setting national policy and coordinating environmental activities and the adoption of environmental legislation, regulations and action plans. It is composed of representatives from all sectoral ministries as well as representatives from important non-governmental stakeholders. The *Ministry of Local Administration and Environment* (MoLAE) is assisted by a number of technical consultative and secondary committees, and operates through two executive agencies:

- The *General Commission for Environmental Affairs* (GCEA), which is the technical arm of the ministry and advises the ministry on policy and technical issues at both the central and local levels. GCEA works through several central directorates, including those on biodiversity, water safety, land safety, climate change, atmospheric safety, chemical safety, Environmental Impact Assessment (EIA), public awareness, etc.
- The *Environmental Studies Centre* (ESC), which is the scientific arm of the ministry and has the authority to conduct pollution control, monitoring and research and to coordinate with national and international research organisations.

The MoLAE has established environmental directorates in all 14 governorates, as part of the local administration. They are presently being equipped with stationary and mobile laboratories as well as specialised equipment, aimed to implement the environmental policies. Furthermore, the various sectoral ministries have established environmental directorates, which are interlinked with MoLAE through a number of committees, working groups, etc. Environmental civil society is relatively weak according to regional standards. There are about 40 registered environmental

NGOs in Syria, but most of them have only a small membership and do not have the capacity to implement larger projects and campaigns.

The *Environmental Protection Law*, which was adopted as Law No. 50 for the year 2002, is the central legal instrument for safeguarding the environment. It specifies the responsibilities and authorities of the *Ministry of Local Administration and Environment* and the *General Commission for Environmental Affairs* and makes provision for the establishment of an "Environment Protection & Support Fund" to support the ministry's tasks. The *Environmental Protection Law* also makes provisions for establishing *Environmental Impact Assessment* (EIA) as a standard procedure for investment projects. Despite the fact that a good number of sectoral laws, decrees and standards have been issued, the secondary legislation (executive legislation) to implement Law No. 50 is still far from being complete. For example, the prosecution of violations of the law is often impossible, as secondary legislation including a penal system (fines) is absent or insufficient.

Syria is party to most multilateral environmental agreements. It plays a positive and proactive role in several international forums. Syria has prepared most of the strategies and action plans, as well as national reports related to these conventions. Syria still needs to design and adopt executive regulations to meet its international obligations and to accelerate implementation on national level.

The formulation of Syria's *National Environmental Strategy and Action Plan* (NEAP) reflects a multi-sectoral and participatory approach to sustainable development. The strategy describes the state of the environment on a national scale, identifies environment priorities for the country and sets up a general framework for environmental planning until 2010. Launched in 2003, it identifies water issues and land degradation as the most critical environmental problems in Syria.

Syria has adopted a reform agenda, the 10th Five-Year Plan (FYP) for 2006-2010, which stresses the importance of achieving sustainable use of the resources and promotes the use of clean and renewable energies. It summarises problems and challenges faced by the environment as follows:

- Poor sector coordination, and failure to consider the environment an essential approach for formulating the development plans;
- Poor public awareness as regards the environment, and absence of deterrent controls for environment protection;
- Lack of comprehensive environment surveys and lack of data bases;
- Lack of clear-cut sectoral policies aimed to reduce the environmental impact of past planning practices, which led to evident environmental damages.

These observations are fully in line with the results of the analysis made in the course of the CEP preparation.

Climate change implications

Despite uncertainties over exactly how climate variability and extremes will change in the eastern Mediterranean and Syria in particular, the overall picture does suggest an increase in the frequency of extreme weather events and, in particular, of droughts. The most severe effects of climate change in Syria are therefore expected on water availability in general and for the *badia* region in particular. This region consists of semi-deserts and even slight changes of climate may have a strong impact on agricultural activity and livestock husbandry. The region already saw severe droughts in recent years, which are apparently linked to climate change, and the situation in 2009 is likely to become even worse. Interventions by the Syrian authorities and donors are so far focused on disaster management, rather than tackling the long-term consequences of climate change.

Syrian CO_2 emissions relative to GDP and energy consumption are higher than global and middle-eastern levels, and are closely related to the relatively high level of industrial development, in combination with most industries not operating with environmental standards reflecting technical state of the art. These emissions are also expected to increase considerably if the current energy

mix remains predominantly fossil fuel-based. The Syrian cement industry is a major source of CO_2 emission, due to the heavy fuel oil consumption in this industry and the technological processes. The annual emissions from this industry are estimated to be around two million tons. This quantity exceeds the CO_2 emissions from all other industries, such as glass, lime stone and brick industries, etc.

According to the *Blue Plan* (2008) Syria was late to engage in Rational Energy Use (REU) and Renewable Energy (RE), but plans to take significant measures. A first national strategy for REU und EE, a "Renewable Energy Master Plan" was completed in 2004, and an *Energy Conservation Law* (ECL), comprising the establishment of a REU and RE dedicated legislative framework, incentive measures and an action plan, is under development. A *National Energy Research Centre* (NERC) was established in 2003 and an "Energy Master Plan" to identify and implement strategies for sustainable energy use is now being prepared. Syria relatively recently started to deal with climate change issues, and is currently preparing its initial national communication for UNFCCC. It is expected that this process will lead to building and strengthening national capacities and will trigger further actions.

EU and other donor co-operation in the field of environment

Compared to regional standards, Syria receives only relatively little donor support in the field of environment. The main donors are the European Union, followed by Germany and Japan as bilateral donors, and UNDP-GEF, IFAD, AFESD, and FAO as multilateral donors. Although donors cover a wide range of activities, most interventions are focused on the water sector (water supply, waste water treatment). Nevertheless, the financial volume of donors contributions is small compared to the investments of the Syrian government in the water sector. The planned investments for the entire Syrian water sector amount to €2.8 billion for the period of the 10th Five-Year Plan. Approximately 50 percent of this budget will be spent on the irrigation sector while the other 50 percent will be spent on drinking water and sewage projects. Other major fields of donor support are solid waste (JICA, GTZ), rangeland management (IFAD), forestry (FAO), biodiversity and protected area management (UNDP-GEF), etc. The State Planning Organisation is planning to strengthen donor coordination.

Conclusions and recommendations

Syria was relatively late to engage with environmental issues. Despite some early efforts, Syria only recently began to build up the full range of capacities for environmental management, and these will still need considerable time to become fully effective. In line with *National Environmental Action Plan* (NEAP) issued in 2003, major environmental challenges and priorities are the depletion and contamination of water resources, soil degradation and land contamination, air pollution, degradation of the urban areas, and loss of natural resources and biodiversity. The highest priority, however, has the creation of conditions conducive to effective environmental management. Among other factors, this includes responding to the following issues:

Institutional Capacities. Syria has an adequate institutional setup for the environment with a well-established environment ministry, provincial environment directorates, an *Environmental Studies Centre* as the scientific arm of the environment ministry, and environment directorates in almost all sectoral ministries. However, the State is often not able to provide attractive conditions for highly qualified expertise and to train staff to the degree necessary.

Public Participation. Environmental protection is still largely understood as a government task, not as task of the entire society. Civil society plays a relatively small role in environmental management. Participation of the various stakeholder groups in environmental decision-making is still at the very beginning. Only the 10th Five-Year Plan covering the period 2006-2010 opened the door for strengthening the civil society, and aims at establishing the civil society as a third power to be added to the government and private sector. It is expected that this will have in the future a great influence on the management of environmental issues.

Legislative Framework. With the Environmental Law (Law No. 50) issued in 2002, the Syrian government laid the foundation for a comprehensive regulatory framework necessary to improve the environmental situation in the country. A number of executive orders, decrees, regulations, environmental standards, by-laws, etc. have been put into place since then, but the process is still far from being complete.

Environmental Monitoring and Knowledge Management. It is often difficult to obtain updated information on the environmental situation. The culture of information-sharing is little developed in Syria's environmental institutions. Environmental information and knowledge are often still regarded as power and as the government's domain, with environmental information not being freely disclosed to the public. Although the situation has changed considerably in recent years, shortages in information-sharing still hamper an effective environmental management. The capacities of institutions such as the *Environmental Studies Centre* (ESC), which is the central institution for collecting and evaluating environmental information and developing concrete policies for implementation by the environment ministry, need to be strengthened.

Awareness for Environmental Issues. The awareness for the environment has increased a lot in recent years, both among decision-makers and in the broader public. Environmental concerns are now taken into consideration in many decisions, and the 10th Five-Year Plan or the introduction of EIAs are good examples for the enhanced role that the environment now plays in Syrian development policy. However, environmental awareness is still in its infancy in Syria, as can be shown by the sometimes incautious handling of environmental problems. Environmental awareness campaigns are conducted mainly on a small scale and only a few campaigns reach the broader public.

Mainstreaming the Environment. The environment as a cross-cutting issue has to be tackled by many sectors and sub-sectors. The overall environmental authority in Syria is the *Council for Environmental Protection and Sustainable Development*, which comprises representatives of all ministries and other relevant stakeholder groups to ensure that environmental issues are integrated into their work. In addition to that, most ministries have environmental directorates, which are interlinked with the *Ministry of Local Administration and Environment* through a number of committees and working groups. *Strategic Environmental Assessments*, a system of incorporating environmental considerations into policies, plans and programmes, are in Syria in the state of early discussion. Being not legally enforced is a clear deficit in mainstreaming the environment in national planning.

Recommendations

Syria is a modestly industrialised country which is classified as *Lower Middle Income Country*. It is not only a lack of financial means that sometimes hampers the implementation of environmental protection, but rather a lack of knowledge, institutional and personal capacities and awareness for environmental concerns. To allow Syrian institutions to become more efficient and self-sufficient, donor-funded operations should combine the provision of financial means with Technical Assistance (TA).

Priority should therefore be given to projects and operations which are innovative for Syria and include aspects such as technology transfer and application of approaches which are otherwise not available or not widely applied in Syria; at the same time, projects should include capacity building for strengthening environmental institutions, and should build on the reform agenda of the Government of Syria as laid down in the 10th Five-Year Plan, covering aspects such as decentralization, strengthening the civil society, etc. Projects should also adhere to the polluter-pays principle and strengthen the responsibility of the private sector and state-owned companies. Especially in the fields of solid waste management, sewage treatment and water supply (drinking water and irrigation), investments should go hand in hand with efforts to overcome the presently poor cost-recovery of investment and operational costs, in order to increase sustainability. Priority should be given to projects which produce significant global environmental benefits, in addition to local and national benefits, and which expressly contribute to achieving the *Millennium Development Goals* (MDGs), in particular to poverty alleviation. Financial instruments which leverage additional

national funds for the environment (such as subsidies for environmental loans) should be regarded as an important asset.

This CEP study has shown that consideration should be given to the following environmental issues. It reflects the fact that the water sector ranks high among the environmental problems, and also takes Syria's obligations under the international environmental conventions (e.g. climate change, biodiversity, combating desertification) into account. With reference to the current situation and tendencies of environment in Syria, as well as the political, legislative and institutional framework with regard to environment management, the following recommendations can be made:

- Mitigation of climate change through promotion of energy efficiency and renewable energy building on initial experiences made by Syrian institutions through implementing pilot measures;
- Adaptation to climate change combined with combating desertification in areas of high urgency such as the semi-desertic *badia* region of central and eastern Syria;
- Development and introduction of decentralized sewage treatment systems, possibly combined with biodiversity conservation to create a model for integrated natural resource management in rural areas and smaller municipalities, where 45 percent of the Syrian population lives;
- Support to the establishment of municipal and industrial sewage treatment facilities in pollution hot spot areas identified in the 10th Five-Year Plan and the Horizon 2020 initiative;
- Integrated watershed management for preserving the groundwater resources, and for conserving biodiversity at the same time. The water sector is regarded as the national top priority by the 10th Five-Year Plan and other strategies and policies;
- Municipal pollution control e.g. in the fields of sanitary landfill sites, air pollution control, and waste water treatment as priority identified by the 10th Five-Year Plan, the Horizon 2020 initiative and other strategies and policies;
- Air pollution control and management programmes in air pollution hot spot areas including those identified by the Horizon 2020 initiative.

We recommend that the European Community strengthens its interventions in these domains, thus building on existing Syrian national plans, policies and efforts.

1 Introduction

Syria is located in south-western Asia, at the eastern end of the Mediterranean Sea, with Turkey to the north, Iraq to the east, Jordan to the south, and Israel and Lebanon to the west. It covers a total land area of approximately 185,000 square kilometres, including 1,295 square kilometres of Israeli-occupied territory. Syria also has a short Mediterranean coastline of some 183 km between Lebanon and Turkey. Only one third of the country is fertile land, some 55 percent (10.2 million hectares) are natural pastures, steppe, desert and mountainous area, and only 3.2 percent are forests. Most of the steppes (about 87 percent) are located in the so-called *badia* region.

The population of Syria is estimated at 20.1 million (July 2006)[1], with 37 percent of 14 years old or younger. The annual population growth is 2.19 percent (2008 estimate). Syria hosts a significant population of refugees especially from Iraq and numbering, according to the *World Refugee Survey 2008,* 1,852,000. Currently, approximately 33 percent of the Syrian population lives in rural areas.

Syria is classified by DAC as *Lower Middle Income Country* with a per capita income of US$1,570, which is low by regional standards. Syria's economy faces serious challenges and impediments to growth, including a large and poorly performing public sector, declining rates of oil production, widening non-oil deficit, weak financial and capital markets, and high rates of unemployment tied to the high population growth rate. The Syrian economy grew by an estimated 3.3% in real terms in 2007 led by the petroleum and agricultural sectors, which together account for about one-half of GDP. The government has implemented modest economic reforms in the past few years, including cutting lending interest rates, opening private banks, consolidating the multiple exchange rates, raising prices on some subsidized items, most notably gasoline and cement, and establishing the Damascus Stock Exchange[2].

The political development of Syria since the 1960s has strongly favoured centralised planning and administration. Recently, some Syrian leaders have re-considered centralized planning approaches, and the 10th Five-Year Plan for the period 2006-2010 supports decentralization in decision-making and community development[3]. However, this still has to be translated into concrete policies. The government institutional structure depends on a central government managing and supervising the work of local governments, but remains largely dependent on the leadership and management of a small group of political decision-makers on central level.[4] Although formal local government administration does exist at the provincial and municipal level, these agencies tend to be extensions of central ministries and the national political apparatus (UNDP Local Government Country Profile).

Syria is in a phase of transition, which involves major economic activities and change. At the same time, the environmental resources in Syria are being continuously degraded. The fact that environmental issues ranked low in state planning for a long time is a major reason for the relatively weak performance of Syria in terms of environmental management. Syria is now in the phase to catch up with regional and international standards. The situation is further aggravated by the rapid population growth. Achievements in the environmental sector are sometimes overrun by the rapid population increase.

[1] 19.4 million on 1.1.2008 according to the Central Bureau of Statistics. Differences between different sources can be explained e.g. by the high number of refugees, who are not consistently included.

[2] The Damascus Stock Exchange is scheduled to be officially inaugurated on the 9th of March 2009.

[3] see chapter 25 of the 10th FYP.

[4] UNDP Local Government Country Profile.

There has no system of continuous environmental reporting been established in Syria on a national scale. Annual environmental reporting on a country-wide and/or on governorate level is unknown, and aggregated data are available for only a few environmental parameters. Some information also takes considerable time before it becomes publicly available. Environmental information often has to be collected from many different individual sources and has to be analysed and evaluated before it can be used in a wider context. The overall picture therefore sometimes remains somewhat incomplete.

2 State of the Environment, Trends and Pressures

2.1 Physical Environment

2.1.1 Air and Climate

Syria's climate varies from the Mediterranean type in the west to extremely arid desert conditions in the east. The coastal regions have hot summers and mild winters; in the mountains, summer heat is moderated according to elevation and the winters are much more severe. The steppe and desert areas have extremely hot, arid summers and greatly varying winter temperatures ranging from 21°C to below freezing. Rainfall averages about 750 mm on the coast, around 1250 mm in some mountain areas, and less than 250 mm in the eastern three-fifths of the country. In dry years, rainfall may be reduced by half. When there is sufficient rainfall, the Syrian semi-desert turns into green pasture suitable for grazing, but also droughts occur regularly. Under global climate change, the natural conditions of Syria are expected to change considerably. Key concerns for Syria are rising temperatures, increasing extreme events, changing rain patterns, including an increase in the frequency of droughts in the country, and rising sea-level. Further information on these effects, its reasons and possible implications on national scale are given in chapter 5.

Over the past two decades, air pollution problems in highly populated and industrialised areas in Syria have become increasingly apparent, raising concerns about the effects of air pollution on human health and the environment.

Vehicular traffic emission is a major contributor to air pollution in major Syrian cities like Damascus and Aleppo. The number of vehicles in Syria has increased from 550,000 to 1.5 million since 2001, leading to further air pollution.[5] The Syrian government has undertaken considerable efforts to renew the fleet, but there is still a significant percentage of old cars dating back to 1980s and 1970s models, which significantly contribute to air pollution. Other factors which further contribute to the aggravation of air pollution problem in major conurbations include bad fuel quality (i.e., sulphur content reaching 0.15% in gasoline, 0.7% in diesel and 3.5% in fuel oil), the lack of proper vehicle maintenance and emission testing system, congested roads and poor traffic management system, and poor combustion efficiency of domestic heaters during cold periods.

Emissions from industrial sources are also a significant contributor to air pollution in certain areas like Homs, Tartous, Aleppo, and Banyas. Major sources of industrial air pollution in Syria include emissions from cement plants, crude oil extraction and petroleum refining, electric power plants, a fertilizer complex and few other chemical & mechanical industries. Many of these industries are old, and were established before environmental

[5] 959,431 to 1,213,034 vehicles during the period 2002 – 2006 (Source National Beraue of Statistics).

law and standards came into force. The energy sector has partially converted power generation processes from fuel oil to gas, but the efficiency remains to be improved.

There is no continuous national ambient air monitoring system in Syria running, yet. Nevertheless, major cities like Damascus, Aleppo, Homs and Latakia have recently started establishing ambient air quality monitoring stations. Short-term ambient air quality measurement campaigns had been conducted on intermittent basis by national scientific institutions (Higher Institute of Applied Sciences & Technology, Environmental Studies Centre, Syrian Atomic Energy Commission) which provided limited monitoring data from both industrial and urban areas indicating that the concentration of major air pollutants (i.e., SO_2, NO_x, CO, O_3, TSP, and PM_{10}) significantly exceed national and international standards, e.g. guideline values set by the *World Health Organization* (WHO). Limited monitoring data collected in large cities indicate that air quality is poor. For example daily concentrations of suspended particulate matter (SPM) in most Syrian cities varied between 115 and 600 $\mu g/m^3$ and thus exceed the allowable daily standard of 120 $\mu g/m^3$ set by the Syrian national authorities and WHO guidelines.

Due to the limited capabilities and resources in air pollution monitoring, the longest ambient air quality measurement campaign in Syria was conducted in Central Damascus during 2000-2001. The campaign covered one year measurements of primary air pollutants such as sulphur dioxide (SO_2), oxides of nitrogen (NO_x), carbon monoxide (CO), ground-level ozone (O_3), particulate matter (PM), and particle-associated lead (Pb). Results of this measurement campaign revealed that for example the daily concentrations of sulphur dioxide exceeded 85 times the national and WHO daily standard of 0.047 ppm. It also by far exceeds the allowable number of 24 times per year set by WHO and *National Ambient Air Quality Standard*. The average yearly concentration of nitrogen oxides (NO_x) reached 0.166 ppm which exceeds by ten folds the allowable limit of 0.016 ppm. A more recent measurement campaign conducted in 2004/2005 showed similar high levels trends of SO_2, NO_x, and CO in Damascus. Similarly, high levels were measured in Aleppo.

The concentrations of lead in airborne particles collected from Damascus and Aleppo have shown to decline significantly from 2-4 $\mu g/m^3$ to less than 0.5 $\mu g/m^3$, which is the recommended value by WHO and national standards. Measurements conducted in other Syrian cities like Homs, Latakia, Tartous and Sweida have shown that atmospheric lead levels were within the acceptable limit. This huge reduction was due to the phasing out of lead in gasoline which was introduced in Damascus in 1998 and followed later by other Syrian cities. Nevertheless, lead emissions from industrial sources such as the recycling of used car batteries in lead smelters located in the outskirt of Aleppo and Damascus is still high. Field measurements in the vicinity of secondary lead smelters in Aleppo indicated very high lead concentrations reaching as high as 16-39 $\mu g/m^3$ in airborne particles (recommended value 0.5 $\mu g/m^3$), 166-1344 mg/kg in soil (recommended value 100 mg/kg) and 10-37 mg/kg in plants (recommended value 1-3 mg/kg).

A large number of health complains raised in the Old City of Damascus and Banyas were traced to air pollution – mainly heart and respiratory diseases such as bronchitis and allergies. It is estimated that around 4,000 people die prematurely every year due to air pollution.

Some executive regulations for the control of air pollution are pending. National standards for air pollution have been adopted and a National Action Plan has been prepared, but implementation is slow.

2.1.2 Land-based Resources

Syria is severely affected by land degradation and desertification: it was estimated that approximately 10.9 million hectares equivalent to 59 percent of the country area is affected in one way or the other by desertification and land degradation, and approximately 3.16 million hectares of land or about 18 percent have seriously suffered from degradation. According to the *Ministry of Agriculture and Agrarian Reform,* 50 percent of the soils are exposed to wind erosion and 6 percent of the lands to water erosion.[6] The eastern region of the country, one of the poorest parts of Syria, is among those areas heaviest affected by land degradation.

Some 55 percent or 10.2 million hectares of Syria are covered by natural pastures steppe, desert and mountainous area. Only one third of the country is fertile land. One of the outstanding landscapes is the so-called *badia*, which is the vast semi-desert region in the central-eastern part of the country between the Anti-Lebanon Mountains to the west and the border with Iraq to the east and is only interrupted by the fertile Euphrates valley on the east side. The *badia* is characterised by its dry climate and was originally completely covered by steppes and semi-deserts. Chronic water deficit and low soil fertility limit forage production and livestock production activities. The *badia* is inhabited by Bedouins who live on the steppe, mainly on livestock husbandry. Their subsistence is under serious threat because of recurrent droughts and degradation of grazing resources for their animals. The *badia* is normally considered unsuitable for dryland farming. Wildlife used to be abundant, but overgrazing and uncontrolled hunting has exterminated many species.

Another main landscape unit is the Euphrates River Basin. The Euphrates River is the biggest source of surface water in Syria, and the fertile river valley is the largest irrigated area in Syria. Some of the earliest human agricultural activities were started in this valley. The Euphrates River's main left-bank tributaries, the Balikh and the Khabur, are both major rivers and also rise in Turkey. The right-bank tributaries of the Euphrates, however, are only small seasonal streams. Today, intensive agriculture is practiced in all river basins, with large-scale irrigation systems. The Khabur basin is also called the breadbasket of Syria.

The Syrian coastal region has 183 km of coastline, covers 2 percent of the national territory, but accounts for 11 percent of the population. The coastal plain is abundant with water and fertile soil; the hilly zone has limited water resources and lower quality of agricultural land; the mountains provide relatively poor living conditions. The area accounts for 35 percent of the national energy production, 38 percent of the cement production, 50 percent of petroleum refining, and most exports are made through Latakia harbour. A rapid urban and industrial development resulted in uncontrolled land use in the coastal belt, sprawl of low-density housing, high pollution of the coastal and marine environment, pollution of freshwater resources arising from uncontrolled release of municipal and industrial sewage, destruction of wetlands, sand dunes and other natural habitats for biodiversity.

Desertification and land degradation is thus a major environmental problem for Syria and includes the following forms:

Soil erosion, caused by a high density of livestock and its inappropriate seasonal and spatial distribution (concentration around human settlements caused by sedentarisation of Bedouins, creation of new land use patterns by the use of vehicles), cultivation of marginal land that is not suitable for farming, damage of the upper soil layer by vehicles, col-

[6] National Action Plan to Combat Desertification In The Syrian Arab Republic (2002).

lection of wooden steppe plants as firewood, etc. Soil erosion is a serious problem in particular in the *badia* with its large herds of livestock and is accelerated by climate change.

Decrease of soil productivity (overuse use of water for irrigation, inadequate irrigation systems, and improper use of agrochemicals). The gradual decrease of soil productivity is observed in all agricultural land, in particular in irrigated lands along the main rivers (Euphrates, Balikh, Khabur and Orontes river basins as well as their tributaries) and in the coastal lowlands.

Soil salinisation processes started in the river basins as early as the late 1940s when large scale irrigated agriculture became possible by using diesel irrigation pumps. The process has remarkably accelerated in the 1950s when cotton was introduced into the area as a summer cash crop. Misuse of irrigation water accompanied by the absence of drainage systems and improper management lead to an uprise of the ground water level and consequently salt accumulation within the upper soil layers. Many agricultural fields are today no longer cultivated because of high salinisation. Reports from 1995 indicate that the total area taken out from cultivation in the Euphrates Basin for salinity reasons may be as high as 125,000 hectares or 17.6 percent of the total area[7]. A country-wide assessment came to the conclusion that 3000-5000 ha of formerly irrigated land[8] have to be taken out of agricultural use every year due to extreme salinisation.

2.1.3 Water Resources

Syria is sub-divided into seven main watersheds (i.e. water basins). The Euphrates is the biggest river flowing through Syria. According to the protocol signed in 1987 between Turkey and Syria the minimum share of Syria reaches about 6.627 billion m³/year at a flow rate of more than 500 m³/s. In 1989 Syria and Iraq signed an agreement in which Syria receives about 42 percent and the remaining 58 percent flows to Iraq. A final agreement regarding the Syrian water extraction rights from the Euphrates River is still pending. The average flow of the Orontes River is equal to 13 m³/s (403 million m³/a), whereas the surface water flow of the Kabir River in the Coastal Basin reaches about 8 m³/s (250 million m³/a) in average. The water resources of the Yarmouk Basin total to some 447 million m³/a (14 m³/s).

The main groundwater aquifers are those of Anti-Lebanon and the Syrian Coastal Mountains Series. There are a number of springs discharging from this aquifer system, such as the Ari-Eyh, Barada, Anjar-Chamsine and Ras El-Ain. Recharge to the system occurs from intense precipitation in the mountainous regions which infiltrates through the fractures and fissures of the karstified surface layer. Another significant aquifer system is the Damascus plain aquifers extending from the Anti-Lebanon Mountains in the west to the volcanic formations in the south and east of the country.

The renewable water resources of Syria are estimated at 10-18 billion m³/year (depending on the kind of assessment), with about 33 percent stemming from groundwater, 24 percent from surface water resources, 36 percent from the Euphrates and about 7 percent from Tigris River. These resources are now nearly fully exploited. If demand will further increase, as forecasted, deficits will occur over large areas of the country. Estimates of future demand suggest annual demand growth of around 2 percent over the next 20 years. Water demand is not homogeneous in the country, reflecting the unequal distribution of

[7] National Action Plan to Combat Desertification In The Syrian Arab Republic (2002).

[8] Figure based on "Integrated Sustainable Land Management in the Eastern Region", a GEF Proposal. Other sources give a total area of about 90,000 ha.

the population. The potential for water transfers from the basins in surplus to the areas in deficit is limited, being prohibitively expensive. Nevertheless, water pipes leading water from the Euphrates to urban and industrial centres in the north and west do exist, and two preliminary studies were conducted to investigate the possibility of transferring the Euphrates water to Palmyra and Rural Damascus and to study the possibility of transferring surplus water from Tartous to Damascus.

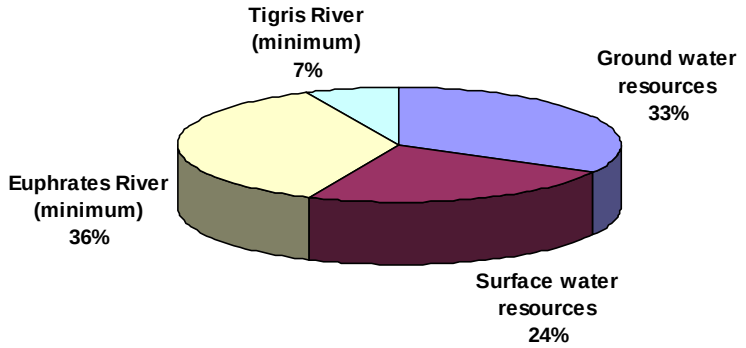


Figure 1. Total renewable water resources quantity (million m³) and its percentage distribution in Syria. The figures are based on the maximum level which may reach as high as 18,209 million m3/year.

Some effects of the shortage have already been seen, including declining aquifer water levels and the associated increasing salinity of groundwater. In addition, some regions, notably Barada valley near Damascus and Yarmouk basin at the border with Jordan, experience acute seasonal shortage of drinking water and there is an increasing probability of drought affecting major population centres in the near future.

Syria has a 500,000 ha large irrigation network and irrigated agriculture accounts for 89 percent of the water use. Only 7 percent is used for domestic purposes and 4 percent for industrial, commercial and tourist purposes. Drinking water consumption per capita ranges between 82 litres/day in rural areas and 176 litres/day[9] in urban areas.[10]

Falling groundwater levels in various regions are evidence of groundwater depletion (Homs: 12-35 m/year; Aleppo sub-basin: 2–5 m/year, Damascus Rif: more than 6 m/year). The main reason is the extraction of groundwater for irrigation. In the season 2001-2002, for example, groundwater use in agriculture exceeded 150 percent of renewable resources. Pressure on water resources is expected to increase further due to the high population growth, the political and economic importance of agriculture and climate change.

Water shortage is exacerbated by poor water quality, particularly in the areas with high economic activities. Surface and groundwater pollution by pathogens, nitrate, ammonia or heavy metals is evident in some of the water basins due to the lack of appropriate waste water collection and treatment as well as the wide and often uncontrolled application of agricultural chemicals. This pollution hampers safe drinking water supply in both urban and rural areas. In some parts of Damascus Ghouta region for example, the population receives water that is unsuitable for drinking purposes. Furthermore, contaminated river

[9] Strategy Paper for the Priority Area "Water" for the Syrian-German Development Cooperation. Figures based on *SPC & MOHC, 2005 "Current drinking water and wastewater sectors analysis", Damascus.*

[10] The urban consumption rate is thus roughly in line with European averages: European household consumption is about 150-200 litres/day (see EU Water Initiative 2007).

water is heavily used for irrigation purposes, which poses a major health hazard to consumers of irrigated vegetables.

Sewage treatment is very limited. At present, only some urban areas are connected to sewage treatment. Countrywide, there are about 20 treatment plants in operation, but the treatment processes do not always meet international standards, and many waste water pipes are leaking, so contributing to environmental pollution. There is no sewage treatment at all in rural areas. Practically all treated waste water is reused in agriculture. For further information, see the chapter on waste water.

The Syrian water sector is presently fragmented and different institutions have overlapping functions and responsibilities. The *Ministry of Housing and Construction* through its 14 water and sanitation directorates is in charge of determining water policies and strategies. It is responsible for proposing, planning and executing the government's programme in the field of water supply and waste water in Syria. The *Ministry of Irrigation* is responsible for the water resources management and for the provision of all irrigation water in the country, including sewage effluent. It is also in charge of controlling and monitoring water quality through the *Water Safety Committee*. The *Ministry of Local Administration and Environment* has the overall responsibility for environmental issues in the country. In the water supply sector, the *Ministry of Housing and Construction* and its establishments are solely responsible for the water supply networks. However, in the sector of sanitary sewerage network, the *Ministry of Local Administration and Environment* and its municipalities are responsible for sewage collection within the cities, whereas the *Ministry of Housing and Construction* takes the responsibility outside the municipalities, including in human settlements with a population of more than 50,000. The *General Commission for Water Resources* has the responsibility to manage, develop and protect the water resources in seven watersheds and to coordinate the work of the *Ministry for Irrigation* and the *Ministry for Housing and Construction* regarding drinking water resources and the reuse of water. Water User Associations (Water Establishments) established on governorate level are responsible for providing water for drinking and irrigation, and for waste water treatment.

A national water master plan defining a long-term framework for sustainable water sector development does not exist. The Syrian water sector is one of the priority sectors that require fundamental reform at the national level. Effort to reshape and improve water policy context and orientation culminated in the preparation process of the 10th Five-Year Plan. Serious steps have been undertaken such as endorsement of the water and environmental laws, introducing management boards with membership from key stakeholders and legalising the establishment of water users associations. Furthermore the *Ministry of Irrigation* has established a specialised training centre for *Integrated Water Resource Management*. The stimulation of private sector involvement as well as effective participation of water users will however be necessary to improve services at all levels.

2.1.4 Mineral Resources and Industry

Syria has rich mineral resources including petroleum, phosphates, chrome and manganese ores, asphalt, iron ore, rock salt, marble, and gypsum. Their exploitation and processing is often linked to serious challenges to the environment.

Important industries include the chemical and engineering industries, the food industry, and oil refining. The largest component of the General Establishment of Chemical Industries (GECI) is the cement industry, which is considered a strategic and is wholly state-

owned. The *General Organization for Cement and Building Materials* consists of six state-owned but independently operated cement companies. In addition, there are another six cement plants planned to be build by the private sector in Aleppo, Homs, Hama and rural Damascus. The *General Fertilizer Company* (GFC), a subsidiary of GECI, has two nitrogenous fertilizer plants and one phosphate-based unit, all located at Homs. In addition, there is a new triple-super-phosphate plant near Palmyra and a nitrogenous complex is planned near Hasakeh to use natural gas from the Omar field in north-eastern Syria. Syria's fertilizer industry rests on its ample deposits of natural gas and phosphates, and produces ammonia, urea and nitrogenous fertilizers. Syria also has an iron-rolling mill at Homs and factories producing furniture, refrigerators, paper, glass and plastic products, and television sets. Syria has two refineries, at Banyas and at Homs, and a new one is planned to be build by China in Deir ez-Zor.

Most light industry is concentrated around Damascus and Aleppo, whilst the heavier industry is around the cities of Homs and Hama in central Syria and Tartous and Banyas on the Syrian coast. Oil and gas meanwhile are produced in the east of the country near Deir ez-Zor.

The cement industry in Syria has long been associated with the emission of high dust concentrations to air depositing on plants, agricultural soils and water courses as well as affecting human health in nearby residential areas. For example, concentrations of suspended particulate matters in towns surrounding Tartous Cement Factory reached as high as 1844 $\mu g/m^3$ and dust deposition rate reached over 518 $tons/km^2/month$. A study conducted in 2005 by the *Ministry of Health* linked the high dust concentrations with the higher respiratory illness and bronchitis encountered in towns and villages surrounding Tartous Cement Factory in comparison with other clean areas.

Dust emission measurements from stack of cement factories and asphalt mixing facilities showed very high concentrations ranging between 600 and 23,000 mg/m^3, whereas the allowable national maximum emission limit is set at 200 mg/m^3.

Significant efforts has been exerted by the Syrian government to reduce air emissions associated with the cement industry such as the installation of new electrostatic precipitators and baghouse filters at Adra and Tartous cement plants which is expected to significantly reduce dust emission. Moreover, most electric power plants in Syria have been converted to operate on natural gas which is expected to reduce the emission of SO_2, CO, soot and Polycyclic Aromatic Hydrocarbons (PAHs). However, the limited availability of natural gas had limited the positive impacts of this procedure.

Although a serious industrial pollution of air, water and land resources around the industries is evident, there is sometimes only limited information available on the level of pollution and the kind of pollutants.

2.1.5 Energy

Syria produces oil and gas, but oil output and production have been declining steadily since 1996, due to a depletion of reserves and an outdated infrastructure. Production has decreased by 30 percent between 1996 and 2005. While domestic consumption rises, it is expected that Syria becomes a net oil importer within the next 5-15 years. The government attempts to further develop the gas e.g. by substituting natural gas for oil in power generation to free up oil for exports. Natural gas still has considerable potential for production and exports; gas production may more than double between 2005 and 2010. Domestic gas demand is growing rapidly at around 6 percent per year, fuelled last not least

by investments in gas-fired electricity generation. Syria is also an important energy transit country for natural gas. Syria is a member of the regional consortium that is developing the so-called 'Arab gas line', an onshore pipeline network that already delivers Egyptian gas to Jordan and will later carry it to Lebanon and Syria. Syria also takes part in the so-called *Euro-Arab Mashreq Gas Market Project* that integrates gas markets and facilitates links to the EU gas market. Syria is further going to become a transit country for natural gas originating from Iraq.

Based on population growth rates and increasing per capita consumption of energy sources, the average energy demand is expected to continue to increase at a rate of not less than 4 percent per year. By 2020, this increased demand will create a deficit of approximately 12 million Tonnes of Oil Equivalent (TOE) annually. Meeting this increased demand for energy poses a major economic and financial challenge to Syria. In addition to declining oil export revenue, the country will be compelled to import oil to meet domestic needs. In the light of these facts, energy policy will need to place greater emphasis on improving energy efficiency and on developing and applying renewable sources from the country's natural resources. Promising renewable sources include wind, sun and biomass as well as oil shale and tar sand.

Approximately one third of the Syrian population lives in rural areas and many still rely on animal and agricultural waste as a source of energy. Rural development has been hampered by the lack of available energy for income-generating activities. In contrast to urban areas, commercial energy is often not available. The traditional energy sources have serious environmental impact and high social costs. Women bear the bulk of the burden for collecting fuel wood and suffer the health consequences of smoke hazards from cooking. There is an urgent need for providing energy services to rural communities.

Syria has a considerable potential for the use of renewable energy sources – wind and solar – as well as for improved energy efficiency and energy savings. Already in the 1990s, Syria began to promote renewable energy. Photovoltaic systems with a total capacity of 80 kWp were installed in rural areas (most of this financed through bi-lateral and multi-lateral aid programmes), and 15-20,000 solar heaters were installed throughout the country, including the hospital of Homs, which obtains its hot water from there. Also some small wind mills were established, altogether approximately 20. Two small wind parks with a capacity of 6 MW and 12.5 MW and to be operated by the *National Energy Research Centre* (NERC) are under construction and are expected to become operational in 2009. The announcement of a 100 MW wind park is foreseen for 2009.

The Government of Syria makes preparation for a project on "Promoting Energy Efficiency in Buildings" and applied for an approximately US$3.5 million grant through UNDP to the Global Environment Facility (GEF).

Several barriers exist currently to the path of renewable energy developments in Syria: subsidies to the conventional energy sector, dominance of the public sector, limited awareness of the benefits, lack of favourable policies, tariffs and incentives, underdeveloped human resources, inadequate official assistance and limited interface among the RD&D institutions. An important step towards overcoming organisational bottlenecks was made in 2003 with the establishment of the *National Energy Research Centre* (NERC) under the *Ministry of Electricity* to act as a driving force for the promotion of renewable energies. The strategic role of the centre includes renewable energy, energy efficiency and integrated resource planning programmes.

The *Ministry of Electricity* under the guidance of the *United Nations Department of Economic and Social Affairs* (UNDESA) and with local coordination undertaken by UNDP in

Damascus has prepared a "Renewable Energy Master Plan" (REMP), which was launched in 2002.[11] The master plan delineates sub-plans to be carried out for giving a major thrust to renewable energy development in Syria. Recommended programme initiatives are outlined including specific plans to be taken up for mainstreaming renewable energy in the national energy balance. It includes the identification of pilot projects for technology demonstration as well as investment-worthy projects covering different forms of renewable energy on the basis of existing data. In 2008, with support by GTZ, NERC started to prepare an energy master plan to identify and implement strategies for sustainable energy use.

A law on criteria of energy efficiency for home applications was adopted by the Syrian government (Law No. 18). It is mainly dedicated to reduce the consumption of electricity and will enter into force in October 2009. An *Energy Conservation Law* is expected to be issued in spring 2009 and will make solar heaters and thermal insulation mandatory for public buildings and will also introduce obligatory energy auditing for public buildings. A draft law on the promotion of solar heaters was prepared in 2007. It foresees subsidizing solar heaters with 50% and would require a government budget of US$500,000 over 10 years. The law has not yet been adopted.

2.2 Biological Environment

2.2.1 Biodiversity

The different topographical, climatic and soil conditions are responsible that Syria is home to a large number of species of flora and fauna. Over 3150 species of flowering plants have been recorded of which 22 are Ptyeridophytes, 10 are Gymnosperms and the remaining are Angiosperms. Over 2,500 species of animals have been identified in Syria, of which 62 percent are insects, 15 percent birds, 6 percent reptiles and amphibians, 5 percent mammals. Our knowledge on the fauna and flora is far from being complete and particularly invertebrates are still poorly known.

The bird fauna comprises 394 species, of which 184 have been proven to breed (including 13 species highly endangered or now probably extinct to Syria).[12] These include 27 "Red Data Book" species: species considered at risk of global extinction by the *International Union for the Conservation of Nature* (IUCN). One of these species is the Northern bald ibis, which was once widespread in the interior of the country, but believed to be extinct by the middle of the 20th century. A relict colony was found near Palmyra in 2002. Syria is also an important flyway and resting place of the Eastern Palaearctic for bird species migrating to Africa in autumn and back in spring. This is in particular important for white storks and birds of prey. An inventory of "Important Bird Areas" compiled by *BirdLife International* comprises in Syria 22 sites, with a combined area of 6,300 km² or about 3.5 percent of the country's area. The inventory covers, to a more or less comprehensive degree, all the major habitats of importance for birds.

[11] Renewable Energy Master Plan (REMP): Ministry of Electricity with United Nations Department of Economic and Social Affairs (UNDESA). Prepared with local coordination by UNDP.

[12] Baumgart, W., M. Kasparek, B. Stephan (1995): Die Vögel Syriens. and "Birds in Syria Field Guide" issued by Syrian Society for Conservation of Wildlife (SSCW), 2008.

Table 1. Important Bird Areas (IBAs) in Syria, identified by BirdLife International. Criteria: A: Important Bird Areas - Global importance: A1. Species of global conservation concern; A2. Restricted-range species; A3. Biome-restricted species; A4. Congregations. – B: Important Bird Areas - Middle Eastern importance: B1: Regionally important congregations; B2: Species with an unfavourable conservation status in the Middle East; B3: Species with a favourable conservation status but concentrated in the Middle East. Source: www.birdlife.org/datazone/sites.

IBA Code	International name	Country/Territory	Area	Criteria
SY019	Abu Zad	Damascus Rif	10,000 ha	A1, A2, B2, B3
SY008	Baath Lake	Raqqa	100 ha	A4i, A4iii
SY017	Bahrat Homs	Homs	5300 ha	A1, A4i, A4iii, B1i, B2
SY007	Buhayrat al-Assad	Aleppo, Raqqa	70,000 ha	A1, A4i, A4iii, B1i, B2, B3
SY005	Buhayrat al-Khatuniyah	Hasakeh	80,000 ha	B2
SY016	Buhayrat al-Laha	Tartous	50 ha	B1i
SY010	Euphrates valley	Aleppo, Raqqah, Deir ez-Zor	n/a	A1, B2, B3
SY024	Golan Heights	Quneitra	60,000 ha	A1, A4i, A4iv
SY025	Ibis Protected Area	Homs	23,000 ha	A1, A4i
SY004	Jabal Abdul Aziz	Hasakeh	45,000 ha	B2
SY015	Jabal al-Bilas	Homs	40,000 ha	B2, B3
SY014	Jabal al-Bishri	Raqqah, Deir ez-Zor, Homs	20,000 ha	B2, B3
SY013	Jabal al-Shuah	Latakia	20,000 ha	A3
SY021	Jabal Sis	Damascus Rif	40,000 ha	B1i, B2, B3
SY011	Jabal Slenfeh	Latakia	4,000 ha	A3, B1iv, B2
SY023	Mount Hermon	Quneitra	10,400 ha	A1, A2, A3, B2, B3
SY001	Ras al-Ayn	Hasakeh	100,000 ha	A1, B2, B3
SY006	Sabkhat al-Jabboul	Aleppo	15,000 ha	A4i, A4iii, B1i, B2, B3
SY018	Tadmur & Sabkhat Muh	Homs	45,000 ha	A1, B2, B3
SY003	Tual al-'Abba	Raqqah	30,000 ha	A1, B1i, B2
SY009	Umm al-Tuyyur	Latakia	12,000 ha	A3, B2
SY012	Wadi al-Azib	Hama	24,200 ha	B2, B3
SY020	Wadi al-Qarn - Burqush	Damascus Rif	4,500 ha	A1, A2, A3, B2, B3
SY002	Wadi al-Radd	Hasakeh	48,000 ha	B1i
SY022	Yarmuk valley	Dar'a	20,000 ha	B2, B3

There are 71 mammal species in Syria, of which one is critically endangered, three are endangered, 6 vulnerable, and three near-threatened. One of the species listed for Syria can no longer be found in the wild. The large mammals of Syria suffered more than any other group of animals through loss of habitat, competition from grazing sheep and goats, and uncontrolled hunting. Syrian brown bear, Arabian leopard, lion, cheetah, Mediterranean monk seal, Syrian onager, mountain gazelle, goitered gazelle (reem), and wild goat have disappeared from Syria during the last 150 years. There are efforts to re-introduce oryx gazelles and goitered gazelles into the Syrian semi-desert and the Syrian government has established a few breeding stations toward this end, using animals imported e.g. from

Jordan, Saudia Arabia, Turkey, and the United Arab Emirates. The recent discovery of a small population of mountain gazelles on the Turkish side of the Turkish-Syrian border area gives some hope that the species could survive in the country.

Only recently, in 2004, a regionally important green turtle nesting population was discovered. An estimated 31-35 individual female turtles nest at sandy beaches south of Latakia. This site is likely the ninth largest nesting aggregation of this threatened species in the Mediterranean. There are a few recent records of the freshwater Nile soft-shelled turtle in the area around Latakia and it is likely that a small population could survive in the lower course of one of the rivers.

The fish fauna, which comprises many endemic species, suffers badly from the over-use and pollution of water. Many water bodies virtually disappear during the summer months or even throughout the year, as too much water is extracted mainly for irrigation purposes. This includes many smaller springs where endemic species occur and which have gone extinct now. Many of the remaining water bodies are so heavily polluted that hardly any fish and other wildlife can survive there. The impact on the fish fauna and other aquatic animals seems to be dramatic, but has not been studied extensively.

Syria belongs to the "Fertile Crescent", which holds great diversity in genetic resources (wild relatives) of important food crops and pasture species, and is a major centre of plant diversity and endemism in the world. As an example, a rich diversity of *Triticum* and *Aegilops* species, the parents of wheat, and of *Hordeum* species, the parents of barley, are found in Syria. They are highly important genetic resources. The Fertile Crescent is also the centre of first domestication of small ruminants (goats and sheep) as early as 10,000 years ago. These species have always been an important component of the production systems in the non-tropical dry areas. Over time a rich diversity of breeds has evolved. Shami cattle, Shami goat and Awasi sheep are typical endemic breeds and good examples of Syria's rich agrobiodiversity, which deserves conservation and protection from genetic pollution.

The system of protected areas in Syria is complex and reflects the responsibilities shared by the *Ministry of Agriculture and Agrarian Reform* (MAAR) and the *Ministry of Local Administration and Environment* (MoLAE). It is distinguished between Nature Protected Area, Protected State Forests, Hunting Reserves, Game Management Areas and other protected areas. In most cases, it is not clear whether the protection status is in line with international criteria as set up by IUCN. Lajat in the Sweida Governorate of southern Syria has recently been recognised as Biosphere Reserve under the UNESCO Man and Biosphere Programme (MAB).[13] There are no national parks in place in Syria..

There are 26 protected areas, including five wetlands, one wildlife, a special Bald Ibis protected area, three coastal and marine protected areas and sixteen forest areas. In addition to these there are over 60 rangeland protected areas. The national biodiversity strategy (NBSAP) recommends the establishment of a network of national protected areas covering all ecosystems in the country. In addition to the declared protected areas there does a list comprise some 32 areas proposed for protection but still awaiting adoption. Many of the protected areas are not fully implemented. Their legislation and administration are still at early stages and would need further development. Most protected areas do not have local staff and thus exist only on the paper.

[13] UNESCO: Man and the Biosphere (MAB) Programme. Meeting of the Bureau of the International Co-ordinating Council, Paris, 12-13 February 2009. SC-09/CONF.206/10 Rev.

Syria only recently began to integrate the local communities in conservation efforts. A UNDP-GEF project to strengthen the protected area system is under implementation and aims at building the capacity of the government for a modern biodiversity management.

Hunting is a major threat to many species, in particular large mammals and some resident and migratory birds. The number of hunters in Syria is estimated to be 500,000 where 300,000 of them are registered hunters.[14] There are also a high number of gun owners, not considered as hunters such as the peasant hunters. The number of hunters is supplemented by hunters coming for hunting from Lebanon and the Gulf States. These include some falconers, who come to Syria to hunt with their falcons. Officially, hunting has been banned until 2010. However, implementation of this ban is weak.

Syria is party to the Cartagena Protocol on Biosafety of the Convention on Biological Diversity. The *Ministry of Local Administration and Environment* together with UNDP is preparing a GEF project on the implementation of biosafety regulations and standards in Syria.

Table 2. List of Protected Areas in Syria. Year = Year of establishment; Area in ha.

No.	Name	Governorate	Area	Year	Main Habitats
1	Damnet Al-Souida	Al-Souida	653	2001	Degraded *Quercus* Forest
2	Jubbat Al-khashab	Al-Qunaitera	133	2005	Forest
3	Dair Mar Mousa	Rural Damascus		2004	Heritage site
4	Allazab	Homs-Damascus	19,000	2006	Degraded *Pistacia* Forest
5	Dair Atiya	Rural Damascus		2005	Degraded land
6	Abu Kobeis	Hama	11,000	1999	Evergreen Forest
7	Al Sha'ara-East	Tartous	1,000	1998	Evergreen Forest
8	Cedar – Fir	Latakia	1,350	1996	*Cedar-Abies* Forest
9	Ra'as Ibn Han	Latakia	1,000	2000	Marine Ecosystem
10	Um Al-Toyour	Latakia	1,000	1999	Pine Forest & Marine Environment
11	Ras Al-Bassit	Latakia	3,000	1999	Brutia Pine Forest
12	Ferunluk	Latakia	1,500	2000	Oak-Pine Forest
13	Al-Bassel Forest	Idleb	2,000	2005	Forest
14	Sabkhat Al-Jabboul	Aleppo	10,000	1972	Wetland
15	Al-Thawra Island	Raqqa	590	1994	Wetland
16	Jabal Abdul Aziz	Deir ez-Zor	49,000	2002	Degraded *Pistacia atlantica* Forest
17	Huwaijet Ayaash	Deir ez-Zor		2005	Forest and wetlands
18	Huwaijet Abu Hardoub	Deir ez-Zor	450	2005	Forest and wetlands
19	Jabal Al-Bala'as	Hama	34,365	2008	Degraded *Pistacia atlantica* Forest
20	Jabal Abou Rojmen	Homs	60,000	2002	Pistacia/Mountain
21	Bald Ibis Special Protected Area	Homs	1,000	2003	Reproduction habitat of Bald Ibis
22	Talila	Homs	22,000	1991	Desert habitat
23	Al-Mouh Lake	Homs		2006	Wetland
24	Allajat	Al-Sweida	2,000	2008	Degraded land
25	Kherbt Solas	Latakia	7,760	2009	Forest
26	Alokaiba	Aleppo	500	2009	Plants Garden

[14] Attar, W. (2005): National Report on Hunting.

2.2.2 Forest Resources

Studies indicate that forests covered at the beginning of the last century about one third of Syria's surface area. Today, they comprise only 3.2 percent of the country's surface area. Examples for areas with decreasing forest include are Abdul Aziz, Abo Rajmein, and Balaas Mountains, and the famous orchards of Damascus, which have shrunken from over 3,000 ha. to a few hundred only.

Due to the increased demand for wood, the government has developed afforestation projects to obtain these products, to prevent the soil erosion and to protect the infrastructure from winds and erosion. Afforestation activities in Syria started already in 1953. In 1970, the total plantation area comprised 2,800 ha. Until 1984, seedling production and planted area were doubled to 24,000 ha and 30 million seedlings annually. By 1998, the total planted area reached 222,291 ha distributed as follows: Damascus 1,342 ha, Rural Damascus 23,507 ha, Daraa 7,948 ha, Al-Sweida 8,070 ha, Al-Qunaitra, 2,024 ha, Homs 26,215 ha, Hama 19,044 ha, Al-Ghab 5,138 ha, Aleppo 30,954 ha, Idleb 36,685 ha, Latakia 7,794 ha, Tartous 13,633 ha, Al-Raqqa 12,036 ha, Deir ez-Zor 4,429 ha and Al-Hasakeh 23,972 ha.[15] The main species used in afforestation programs are *Pinus brutia*, *P. pinea*, *P. halepensis*, *Cupressus* spp., *Eucalyptus camaldulensis*, *E. meliodora* and *E. gomphocephala*, *Pistacia* spp. and *Pyrus syriaca*. Most of the planted areas are located in the inland regions of the country. Accordingly, the survival rate of the planted seedlings is affected by the adverse environmental conditions and seedlings need irrigation during the first years after being planted.

The enlargement of human settlements, including the construction of summer houses and infrastructure, is still a major threat to the forest ecosystems in the coastal region. Forest fires constitute a permanent threat to forest resources. For example, 2,000 ha of forests were destroyed by fire near the border with Turkey in 2004 (IFFN 2004). As much as 8,000 ha of forests were converted to other land uses by burning between 1985 and 1993, and an additional 2,440 ha of forests were converted to farmland during the same period. According to the World Bank and UNDP, more than 20,000 ha of coastal forests have burnt in north-western Syria since the 1970s, resulting in an annual soil erosion of up to 20 tonnes/ha on steep slopes[16].

2.2.3 Agricultural Land

Until the mid-1970s, agriculture had been Syria's primary economic activity. Beginning in the mid-1970s, the relative contribution of the agricultural sector to the national economy decreased as other sectors grew more rapidly. Still today, agriculture generates around 20 percent of the country's Gross Domestic Product (GDP) and 10 percent of total exports. More significant is the fact that a third to half of the Syrian population still lives in rural areas, giving the agricultural sector a dimension that goes beyond strict economic factors. Agriculture still suffers from major under-investment. Loans extended to the sector stood at only 13 percent of total outstanding loans by the banking sector in 2007, well below the contribution of agriculture to GDP.

Syria has a 500,000 ha large irrigation network and irrigated agriculture accounts for more than 90 percent of the water use. The fees collected from farmers for irrigation water do not provide any incentive for water conservation. The water charges are fixed per

[15] FAO (2004).
[16] UNEP (2009).

unit area irrelevant to the consumption level and there is a lack of proper monitoring of water use. The structure of the water tariff collected from farmers covers only a part of the cost for the irrigation water distribution network plus the costs of network operation and maintenance. The tariff is fixed at around $US70/ha irrespective the type of crops, or the amount of exploited water. It would be essential to shift to a volume-based tariff for irrigation, in spite that till now there is no strong policy to set prices for irrigation water, and no legal regulation for invoicing the price of irrigation with volume-related pricing system (Aquastat 2008). A solution can be the pricing policy reforms that link the water charges to level of consumption and seasonal availability. These policy changes could enhance water productivity especially in cotton-irrigated fields by accelerating shifts in technology (e.g. drip irrigation systems) which are capital-intensive as well as water management measures which are labour-intensive. The introduction of drip, sprinkler, and subsurface irrigation methods is handicapped because of the limited amount of funds available to the common farmer. In regions where private wells are dominant, the main issues are uncontrolled water pumping and illegal well digging.

The *Ministry of Irrigation* (MoI) and with considerably national funds, started in 2001 an ambitious plan on the rehabilitation and modernization of old irrigation projects to improve conveyance efficiency and minimize distribution losses through converting open irrigation canal systems to pressurized pipe systems and rehabilitate the canal systems. However, the level of adoption of these techniques is still low, last not least because of the lack of confidence amongst farmers in the expected financial return.

Large areas of irrigated land became degraded by salinisation and water logging, particularly in the lower parts of the Euphrates valley, because of poor drainage systems. As a result, more recent work has focused on installing better drainage and restoring existing areas, rather than expanding into new ones.

Agrochemicals are used abundantly in Syria. During the period 1990-1994, close to 800 tonnes of insecticides, rodenticides, herbicides, fungicides and other pesticides were used. About 2,355 tonnes were used in 2001 and the number almost doubled to 5,303 tonnes in 2007.[17] A project funded by UNDP with technical assistance from FAO was implemented in 2002-2003 by the *Ministry of Agriculture and Agrarian Reform* and the *Ministry of Local Administration and Environment* for the repacking and proper storage of about 600 tons of obsolete pesticides including 217 tons of chlorinated pesticide (Lindane). Recently, Swiss Development Cooperation (SDC) and GEF have agreed to fund a new project for the safe transfer of these obsolete pesticides for treatment outside Syria.

2.2.4 Rangeland

A large proportion of Syria's land surface consists of steppes and semi-deserts, called the *badia* (Al-Badiah); it is characterised by dry climate with an average annual precipitation less than 150 mm, but there is high precipitation and temperature variation; the evaporation rates are high due to hot summers and strong winds. Cold winters allow a short growing season. Soils are generally calcareous and gypsiferous, shallow, rocky and extremely poor in organic matter. Chronic water deficit and low soil fertility limit forage production and livestock production activities. The *badia* is inhabited by Bedouins who live on the steppe, mainly on livestock husbandry. Their subsistence is under serious threat because of recurrent droughts and degradation of grazing resources for their animals. The *badia* is

[17] Source: National Chemical Safety Profile.

normally considered unsuitable for dryland farming. Wildlife used to be abundant, but uncontrolled hunting has exterminated many species.

The importance of the *badia* to the livestock sector in Syria is illustrated by the following figures:

- The badia produces 3.2 million tons of dry forage each year of average precipitation;
- The badia once provided the major feed requirements for 5 million sheep, and now it only provides 20-25% of their feed;
- The badia produces two thirds of all red meat production in Syria,
- The badia produces one third of all milk production in Syria.

However, despite the efforts and programmes of the Ministry of Agriculture and Agrarian Reform – such as forage stores, distribution facilities, surface dams, plus planting shrubs over millions of hectares – the plant cover of the badia continues to deteriorate.

Sheep are the most important livestock resource, being found across most regions of the country. The fat-tailed *Awassi* is the only sheep breed in Syria adapted to the harsh environmental conditions and is the main breed. It is famous for its meat and milk products and is known for it ability to tolerate heat, drought, cold and cold treks. There are about 11.5 million heads of *Awassi*, contributing 78 percent, 30 percent and 100 percent of the country's total red meat, milk and wool production, respectively.

The number of livestock in the Syrian *badia* has constantly increased over the last decades, and the present level clearly exceeds the carrying capacity of this fragile ecosystem. The phenomenon of overgrazing is observed throughout the *badia*, and is partly due to the availability of subsidized animal feeds. An increasing sedentarisation of the Bedouin population has lead to a certain concentration of livestock around the settlements, with serious consequences for land degradation there. The cultivation of the *badia* with field crops such as barley has exacerbated the situation. Barley is used both as cash crop which brings additional income to the Bedouins, and as fodder plant (grazing of herds in the reaped fields). Ploughing of *badia* soils make them highly vulnerable to wind erosion. The grazing areas are today recorded as state land to which pastoralists have customary access rights. However, there is no ownership by the Bedouins which would create incentives not to overuse it. Climate change with more frequent periods of drought constitutes an additional threat to this fragile ecosystem. Droughts in 2007 and 2008 have been linked to climate change and had serious socio-economic effects on the *badia* population.

Political, social and economic changes that have occurred over the last few decades, including the proclamation of the Badia as state land, resulted in increased competition for shrinking resources and a growing disregard for environmental deterioration. The results have been a profound qualitative and quantitative decrease of native forage output, plus a strong dependency on barley, which have contributed to further rangeland degradation and marginalization. Transhumant production and the classical Bedouin way of life faces extinction. It will take an enormous effort to stabilize livestock populations at a sustainable level and to restore degraded rangelands. This will be costly, but failing to halt the desertification of rangelands will be even costlier as flocks and herds eventually shrink and as the resulting poverty forces large-scale migration from the affected areas.

2.2.5 Marine Resources

Albeit short, the Syrian coast and marine environment provides some contributions to the economy. Fishing is quite limited, with a few small and medium-sized boats fishing off the Mediterranean coast. The annual catch of marine fish has been increased since the mid-1980s and reached 2,581 metric tons in 2000.

The marine fish fauna of Syria comprises 224 species belonging to 155 genera pertaining to 75 families, dominated by the families of Sparidae, Blennidae, Carangidae and Gobiidae. The fish fauna includes 37 migrant species from the Red Sea (Lessepsian migrants) and 14 species originating from the western Mediterranean and the Atlantic Ocean.

The beaches near Latakia are an important nesting area for two species of marine turtles, the green turtle and the loggerhead turtle. Both species are threatened and are in urgent need of protection measures. The main site for the nesting of the marine turtles is proposed to be declared as a nature protected area. The highly threatened Mediterranean monk seal was occurring along the Syrian coast, but has disappeared apparently because of persecution and disturbance by fishermen. The last report on a sighting stems from 2002.

Pollution of the sea water is a major issue along the Syrian coast. There are four major population centres, Latakia, Tartous, Jableh and Banyas, which discharge untreated sewage into the sea, plus a number of smaller municipalities as well as non-coastal towns whose sewage reaches the sea through rivers ending in the sea. The severity of the municipal sewage problem is manifested by the drifting of raw sewage along the shoreline, and the eutrophication and bacteriological contamination of the coastal seawater at the points of discharge of raw untreated sewage water. The problem becomes particularly acute during summer seasons.

Industrial pollution along the coast is caused by the following industries:

Banyas Oil Refinery: It is one of the major polluters in the coastal region. It discharges its industrial liquid effluents through a joint pipeline with the Banyas Oil Terminal directly into the sea. Effluents originate from the industrial processes, segregation of water from petroleum crude in the storage tanks, and surface water run-off contaminated with spills that typically overflows the retention basins during heavy rainfall periods.

Oil terminals of Banyas and Tartous: Aqueous effluents consist of hydrocarbon contaminated surface water run-off that originates from segregated water from the petroleum products in the storage tanks, and from oil spills around the petroleum tanks. No waste water treatment is undertaken for the effluent at the Banyas oil terminal, whereas partial treatment is performed for the effluents to the Hussein River at the Tartous oil terminal that ultimately ends to the Mediterranean Sea.

Banyas Thermal Power Station: Waste water originates from four sources: regeneration water of the softeners, industrial process water, boilers' blow down, and hydrocarbon-contaminated surface water runoff from spills around the fuel tanks. Waste water is treated in two new units, but little treatment is carried out in the older units. Under normal operating conditions, combined domestic and industrial waste water effluents estimated to be 50 m^3/hour are discharged; the majority of which are domestic in nature.

Tartous Cement Factory: Cement dust in the form of suspended particulates is emitted from the manufacturing process. Electrostatic precipitators have been installed to retain particulates prior to discharge to the atmosphere. However, these units continue to face numerous problems resulting in reduced efficiency. According to the *National Environ-*

mental Action Plan (NEAP 2003), average concentrations of total suspended particulates in the proximity of the Tartous Cement Factory vary from 115 to 486 μg/m^3 that exceeds WHO allowable limits of 150 μg/m^3. New baghous filters have been installed and fugitive dust emission control system are in operation now, which is expected to significantly reduce dust emissions from Tartous Cement Factory.

Tartous Phosphate Loading Dock: This is an important source of suspended particulates. Emissions result from the processes of phosphate mineral handling, storage, and loading onto ships. Concentrations of particulates exceed allowable WHO limits.

In the frame of UNEP-MAP, a CAMP (Coastal Area Management Plan) project on Syrian coastal areas was implemented between 1989 and 1992 to promote local sustainable development. Within the frame of the Life Project „Improving Coastal Land Degradation Monitoring in Lebanon and Syria" funded by the EC, a "Erosion Mapping and Management Programme" was supported, with two pilot areas in the Latakia and Tartous areas, respectively. Also the GTZ has supported land use planning in the coastal region of Syria.

2.2.6 Rivers and Wetlands

Syria possesses rather few major natural wetlands other than the Euphrates River. Furthermore, most of those wetlands which did exist have been degraded or destroyed by drainage for agriculture and diversion of water supplies for irrigation purposes. The Mediterranean coast is mostly rocky with narrow sand beaches and does not harbour major wetlands. There are no river deltas or estuaries. Numerous permanent streams and rivers flow down from the coastal ranges onto the narrow coastal plain, but virtually all of the former wetlands in this area have been drained for agriculture and other purposes.

Until the late 1960s, there was a large area of small lakes and permanent marshes along the meandering course of the Orontes River in the Al-Ghab depression. Nowadays, the river is heavily utilised for irrigation purposes, and virtually dry in summer. Some winter flooding may still occur in places. When there is some water in the river bed in winter, it is heavily polluted from industrial and agricultural sources.

Syria's largest wetland is Sabkhat al Jabboul, a large shallow salt lake near Aleppo, renowned for its greater flamingos and other water birds. Recent changes in hydrology have resulted in a lowering of the salinity and colonisation by aquatic vegetation. 10,000 ha of the Jabboul Lake were designated as *Wetland of International Importance* under the Ramsar Convention in 1998. Wetlands included in this list acquire a new status at the national level and are recognised by the international community as being of significant value not only for the country, or the countries, in which they are located, but for humanity as a whole.

Other notable salt lakes include Sabkhat Muh near Tadmur (Palmyra), and a group of small lakes in the Jabal Sis area in the south. Lake Qattine, also known as Bahrat Homs, is a semi-artificial eutrophic reservoir near Homs, created by a barrage on the Orontes (Asi) River dating from Roman times. The lake is heavily polluted with phosphate and urea from the nearby Fertilizer Complex, and has lost its ecological importance completely.

The River Euphrates flows for some 420 km through Syrian territory and is joined by two important tributaries, the Balikh and Khabur rivers. Although large areas of former floodplain wetland have been converted to agricultural land, islands in the river continue to support remnants of the native riverine woodland, while oxbow lakes, quiet backwaters and riverine marshes remain important for migratory waterfowl. In the extreme north-east

of the country, a series of large springs formerly supplied water to a number of small lakes and marshes which eventually drained into the Khabur, Balikh and Jaghjagha rivers. Most of these wetlands have been drained for agriculture or had their water supplies taken for irrigation.

The loss of natural wetlands in Syria has to some extent been compensated for by the creation of a number of large water storage reservoirs, some of which have become important for migratory waterfowl. A large section of the Euphrates Valley was dammed and flooded in the 1970s, creating Lake Asad. This huge reservoir, covering over 63,000 ha and much the largest water body in the country, now supports very large numbers of waterfowl in winter. Other important man-made lakes include Baath Lake, behind a dam on the Euphrates River downstream from Lake Asad.

2.3 Human Environment (Urban-industrial Environment)

2.3.1 Waste Water

Sewage treatment is very limited in Syria. In 2002, the total waste water produced throughout the country was estimated 1,364 million m³. At present, only some urban areas (approx. 20 percent of the population) are connected to sewage treatment. There are about 20 treatment plants in operation, including four main plants in Damascus, Aleppo, Homs, Hama, and Salamieh. The treatment processes, however, do not always meet international standards. Also many waste water pipes are leaking, so contributing to environmental pollution and threatening drinking water resources (high nitrate concentrations were found e.g. in the groundwater of Damascus Rif). There is no treatment of discharged waste water in rural areas. All treated waste water is reused in agriculture. The amount of reused treated waste water was approximately 500 million m³ in the early 2000s. There are cases of agricultural usage of untreated waste water or insufficiently treated waste water, causing a health risk.

The 10th Five-Year Plan foresees the establishment of 200 treatment plants, so that 50 percent of the population will be covered. According to the *Ministry of Housing and Construction*, in addition to the 20 operational treatment plants, 22 treatment plants are currently under construction, and further 95 are in some state of planning. The construction of treatment plants is often supported by international financial institutions and implemented by international firms. These include rural Aleppo (EIB), Damascus Rif (Malaysian bank), Idleb (Arabian bank), Tartous (negotiations with Chinese company), Banyas (negotiations on a soft loan from EIB and the EC), Hasakeh (negotiations on soft loan with Iran), Latakia (Iranian company), Yarmouk (feasibility study, KfW).

There is an ongoing project on the rehabilitation and upgrading of the industrial waste water treatment plant in Banyas Refinery, including chemical and biological treatment. There were two recent announcements on the establishment of waste water treatment facilities for the yeast and sugar industries. Otherwise there is little information available on industrial waste water treatment.

2.3.2 Solid Waste

Garbage collection is done in all Syrian towns. It is mainly carried out by municipalities, except in few towns where collection is shared by private companies and the municipality. Most of towns have so called “Cleanliness Departments”, with an engineer at the

head. The overwhelming majority of collected waste is disposed at open dumpsite located in the outskirts of towns. Open burning is quite common in Syria hence adding dioxin and other gases to the air pollution already caused by uncovered waste. In most cases, medical and other hazardous industrial waste is mixed together with domestic waste prior to disposal (see below).

The practice of sanitary landfilling is still in its infancy in Syria. The majority of waste does not have any adapted treatment. The most engineered landfill is found in Homs with a clay layer of low permeability. It is fenced from almost all sides, has controlled access, and biogas is collected. Damascus and Hama have semi-controlled landfills with controlled access, regular levelling, compaction and soil covering of waste. The landfill site at Deir ez-Zor is equipped with a bituminous geomembrane, but it will not ensure a complete water-tightness because of the nature of the material and its insufficient dimensions. Projects for sanitary landfill sites in Latakia and Tartous, to be funded from national sources, are in an already advanced state, but implementation is likely to start not before 2010.

There are only two composting plants in operation in Syria: One is located at Damascus, which is an exemplary plant with a capacity of 500 tons per day, the other in Latakia, which has a daily capacity of 137 tons, but is old and suffers from bad maintenance. A pilot plant for composting and mecano-biological treatment before landfilling has also been established at Salamieh municipality near Hama with support by GTZ, and another composting project is planned for Al Qusair municipality, based on the Salamieh experiences.

Otherwise, there is no official recycling system in Syria. However, an informal private sector participates through scavenging recyclable materials. Data is not available, but the activity is common across the country. Scavengers make a living from sorting and selling plastic, metals, glass, etc. Organic waste is collected to feed the animals. Scavengers are not allowed to work at the dump, but do so anyway and the cities benefits from their work: they reduce the amount of waste and recyclable materials are used optimally.

Currently there are no landfill regulations on standards that provide a basis for monitoring but national guidelines for these standards are being prepared. Practically none of the dumpsites is engineered to appropriate standards and none of them was engineered to take care specifically about bulky and inert waste. Dumpsites in Syria are rough, all really simple, badly operated because of lack of material, knowledge and financial means.

One of the bottlenecks for establishing proper solid waste management systems in Syria is insufficient cost recovery. At present, the cost recovery is mostly below 10 percent (see table) and thus economically not viable. The cost recovery seems to be high only in Homs, but they have accounted an international grant as cost recovery (which should not be accounted in such a way). It should furthermore be considered that the municipal tax collection rate is low, below 50 percent. So any efforts for achieving better cost recovery must go hand-in-hand with efforts to improve the tax collection system.

The *Ministry of Local Administration and Environment* (MoLAE) has commissioned the French firm TRIVALOR to prepare a master plan for municipal waste management in Syria. The report was completed in 2004.[18] It makes detailed recommendations for the improvement of collection (containers, vehicles, workers and engineers, drop-off centres), transportation (transfer station network), treatment (composting/sorting plants), and disposal (sanitary landfills). The plan also gives detailed suggestions for the establishment of

[18] Master Plan of Solid Waste Management in Syria. – Ministry of Local Administration and Environment and TRIVALOR. 2004.

40 sanitary landfill sites, 38 sorting plants, 22 composting plants, and 110 transfer stations. The total investment costs are estimated 1.7 billion SYP (approx. €28m), the operation costs 280 million SYP. Preparations are made to introduce garbage incineration as an element of integrated waste management and energy production.

Table 3 Current cost recovery for municipal solid waste in the governorates of Syria. Source: *Ministry of Local Administration and Environment*.

	Costs	Revenues	Cost recovery rate (%)
Damascus	685,000	67,888	9.9
Aleppo	385,115	43,792	11.4
Homs	111,428	64,500	57.9
Hama	88,112	4,950	5.6
Latakia	119.900	3,400	2.8
Tartous	73,068	4,029	5.5
Daraa	18,041	72	0.4
Hasakeh	34,900	2,630	7.5
Raqqa	32,400	3,000	9.3
Idleb	23,007	1,987	8.6
Deir ez-Zor	35,200	1,370	3.9
Sweida	19.417	603	3.1
Jaramana	15,164	322	2.1

2.3.3 Chemical Substances and Hazardous Waste

Hazardous waste is a major problem in solid waste treatment, because a small quantity of waste is responsible of high pollution. Hazardous waste from household is estimated at 0.9 kg per inhabitant and per year, that is approximately 16,000 t/year. This ratio is half of European generation of hazardous waste from households.

Hazardous waste coming from households is included in domestic waste (e.g. batteries with high mercury and Ni-Cd content). It is not collected separately, except of medical waste in Damascus. The *Cleanliness Directorate* of Damascus enforce hospitals to sort their waste and to put their medical waste in special containers, where this kind of waste is collected separately by a special compactor, and then transferred to specific incinerators where it is burned. In 2002, the *Cleanliness Directorate* collected in Damascus 711 tons of medical waste (2.3 t/day). Overall medical waste amounted 3,000 tons in 2002, and is estimated to increase by 4,500 tons by 2010.

Table 4. Amount of hazardous waste in Syria.

Source	Tons of hazardous waste per year
Automobile	10,000
Building	6,400
Handicraft and trade	5,000
Health care	4,600
Total	***26,000***

Source: TRIVALOR, Master plan for solid waste. 2004.

For medical waste the master plan recommends to establish one treatment centre for each governorate, using autoclaving (steam sterilisation) or chemical sterilisation technologies.

Incineration is not recommended because of cost and potential environmental impacts (atmospheric emissions and toxic ash). Other hazardous waste such as batteries, solvents, oils, pesticides and paints should be identified, separately collected, securely stored in lockable containers and treated in special centres or landfills. One central site for physical and chemical treatment and incineration is proposed. Failing this, hazardous wastes would need to be exported for treatment and disposal.

The Government of Syria is aware of the new European Community Regulation on chemicals and their safe use (EC 1907/2006). The REACH regulation, which deals with the **R**egistration, **E**valuation, **A**uthorisation and Restriction of **Ch**emical substances, entered into force in 2007. The aim of REACH is to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. Representatives from the *Ministry of Industry* took part in training on REACH and its implications for Syrian export into the EU.

There is a proposal to establish a Clean Production Centre with the assistance of UNIDO. No decision has been taken yet.

2.3.4 Noise

In recent years, noise pollution has become a serious problem in most urban areas and especially in urban centres like Damascus and Aleppo. Noise levels in residential and commercial parts of Damascus ranged between 70 and 79 dB, and between 74 and 94 dB in nearby industrial areas and workshops. Similar levels were also recorded for Aleppo. High noise levels (60-67 dB) were recorded within hospital premises in Damascus. The problem is aggravated by the rapidly increasing car fleet and congested traffics in Damascus and Aleppo. National allowable maximum limits for noise where adopted by the *Council for Environmental Protection and Sustainable Development*, however, enforcement and control is still poor.

2.3.5 Urbanisation

Syria has experienced a process of rapid urban development since the 1980s, when the annual population growth rates were as high as five percent; the current rate is lower, but still considerably high according to world standards. About 55 percent of the total population lives in urban areas. Some 45 percent of the total population is concentrated in and around Damascus and Aleppo. The urban population is expected to increase from 9.6 (2005) to 18.3 million people (2030), with then more than half of them living in Damascus and Aleppo.

There are some important demographic factors underlying this process of rapid urban development, which deserve special mention:[19]

- population growth: the current population is approximately 20.1 million, growing at an annual rate of over 2.3 percent;
- rural-to-urban migration within the borders of the provinces and increasingly towards Damascus, Aleppo, Homs and other main cities;
- internal population displacement resulting from the Israeli occupation of Syrian lands;

[19] According to Fernandes (2008).

- international migration and influx of refugees, mostly Palestinian, Lebanese and Iraqi; Syria has reportedly received between 1.5 and 2 million Iraqi refugees in recent years, being one of the countries that received the most refugees in 2007.

The environmental impacts resulting from rapid urban development are escalating: air pollution, water contamination, energy shortage, etc. Also land issues including urban sprawl constitute a major environmental problem: the rapid growth of cities implicate serious land and housing supply problems, and urban sprawl. The lack of suitable and sufficient urban planning mechanisms including the release of both public and private land for urban development has led to a considerable bottleneck in the land and housing market and constitutes a major problem for land use planning. The ongoing processes of urban sprawl are a direct reflection of the country's current land and housing crisis: urban development has increasingly been taking place informally.

Indeed, informal land development has been happening since the 1960s, but it certainly is escalating: informality accounts for 50 percent of urban growth in the outskirts of conurbations and houses 40 percent of the population.[20] The rate of informal development has been estimated as between 40 and 50 percent in Damascus. More than ever, informal access to urban land and housing is no longer the exception, but it has become the rule.

[20] according to Fernandes (2008).

3 Environmental Policy, Legislative and Institutional Framework

3.1 Institutional Set-up

The *Council for Environmental Protection and Sustainable Development*[21] is the supreme environmental authority in Syria and has the responsibility of setting national policy and coordinating environmental activities. It has been established in the frame of Law No. 50 in 2002 and replaced the *Higher Council for Environment Safety* stipulated in legislative decree No.11 for 1991. The *Council for Environmental Protection and Sustainable Development* is composed of representatives from all sectoral ministries as well as representatives from important stakeholders such as the Women General Union, Craftsmen Union, President of the Chamber of Industry, etc.

The *Ministry of State for Environmental Affairs* was established in 1991 with a mandate to protect the whole environment. It was the first independent environmental ministry in the Arab states. It was later been merged with the *Ministry of Local Administration* and has since become the *Ministry of Local Administration and Environment* (MoLAE). A number of technical consultative and secondary committees assist the MoLAE, which operates through two executive agencies:

- The *General Commission for Environmental Affairs* (GCEA), which is the technical arm of the ministry and advises the ministry on policy and technical issues at both the central and local levels. GCEA works through several central directorates, including those on biodiversity, water safety, land safety, climate change, atmospheric safety, chemical safety, Environmental Impact Assessment (EIA), public awareness, etc.
- The *Environmental Studies Centre* (ESC),[22] which is the scientific arm of the ministry and has the authority to conduct pollution monitoring, control and research, and to coordinate with international research organisations. Following its creation in 1995 with the aim of enhancing its role as the national centre for conducting environmental research and studies which would assist the Syrian government and decision makers in tackling environmental issues in Syria and in setting up suitable action plans and pollution prevention approaches. However, this role had never been achieved due to the lack of necessary equipment, technical staff, qualified experts and researchers at ESC. Moreover, for over a decade the centre was mainly involved in scattered pollution monitoring campaigns and in conducting some environmental studies related to GHG emissions, solid wastes, air and water pollution. Nowadays, the centre has received considerable attention, support and funding from the government where it has its new building with modern laboratories for conducting pollution monitoring and researches. Nevertheless, ESC still lack qualified environmental researchers and is still relying on conducting environmental studies and research in collaboration with researchers from national universities.

Based on a ministerial decision, the MoLAE started in 2004 to establish environmental directorates in the governorates. Today, environmental directorates are available in all 14 governorates as part of the local administration. These directorates have subordination to the governorate secretariat as well as to the General Commission for Environmental Affairs. These offices are presently being equipped with stationary and mobile laboratories as well as specialised equipment, aimed to implement the environmental policies and monitor compliance with related commitments at the local level. However, it was noted

[21] Formerly called the "Supreme Council for Environmental Protection".
[22] Formerly called the "Environmental & Scientific Environmental Research Centre" (SERC).

that there is in general a shortage in human and material resources and more time is needed to develop these directorates to fully functional working units.[23]

Many environmental issues fall under the responsibility of the *Ministry of Agriculture and Agrarian Reform* (MAAR). The institutional structure of MAAR includes agriculture directorates in all governorates and a few central administrations, including the natural resources administration. The management of protected areas and biodiversity, forest production and protection, etc. falls under the responsibility of the Forestry Directorate, which consists of five sectors and comprises a staff of more than 50.

The *General Commission for Scientific Agricultural Research* (GCSAR) is an umbrella organisation including all institutions working in agricultural research at the *Ministry of Agriculture and Agrarian Reform* (MAAR). GCSAR comprises a well-distributed network of 19 research centres, 50 research stations, and 70 specialized laboratories to cover all agro-ecological zones of the country. GCSAR staff includes 180 PhD's and MSc's, and about 1000 agronomists. It has an annual budget of about US$20 million.

The *Ministry of Irrigation* plays an essential role in water resources protection, the development of water policies, combating water pollution, etc. through the *General Commission for Water Resources*.

The various sectoral ministries have established environmental directorates, which are interlinked with MoLAE through a number of committees, working groups, etc.

Research on environmental subjects is carried out by universities and specialised research and study centres belonging to the *Ministry of Higher Education*. These include two specialised institutes belonging to Teshreen University in Latakia: the *High Institute for Ecological Research*, founded in 2001, which consists of three major departments: ecosystem engineering, ecochemistry, and ecoprotection. Its main concern is water and waste management issues, and the *High Institute for Marine Researches*.

In addition to national institutions, two international research institutions are based in Syria: The *International Centre for Agricultural Research in the Dry Areas* (ICARDA) is one of the 15 centres supported by the *Consultative Group on International Agricultural Research* (CGIAR). With its main research station and offices based in Aleppo, ICARDA works through a network of partnerships with national, regional and international institutions, universities, non-governmental organisations and ministries in the developing world; and with advanced research institutes in industrialised countries. The *Arab Center for the Studies of Arid Zones and Dry Lands* (ACSAD) is located at Damascus. It is a specialised Arab organisation working within the framework of the *League of Arab States* to develop the scientific agricultural research in the arid and semi-arid areas, help in the exchange of information and experiences and make use of the scientific progress and the modern agricultural techniques in order to increase the agricultural production.

Syria's environmental civil society is relatively weak according to regional standards. There are about 40 registered environmental NGOs in Syria, but most of them have only a small membership and do not have the capacity to implement larger projects and campaigns. Syrian environmental NGOs include the *Syrian Environment Association* (SEA), the *Syrian Environment Protection Society* (SEPS), the *Fund for Integrated Rural Development of Syria* (FIRDOS), the *Syrian Coast Society for Environmental Protection*, the *Environment Protection and Development Organisation*, the *Syrian Society for the Conservation of Wildlife (SSCW)*, the *Palmyra Society for the Protection of Environment and*

[23] Institutional and Human Resources Assessment. Biodiversity Conservation and Protected Areas Management Project. UNDP-GEF (2008).

Wildlife, and others. The 10th FYP recognises that the environment for non-governmental organisations (NGOs) has not been suitable in Syria in the past, and aims at establishing the civil society as a third power to be added to the government and private sector (chapter 6-4).

3.2 Legal Framework

The *Environmental Protection Law*, which was adopted as Law No. 50 for the year 2002, is the central legal tool for safeguarding the environment. It specifies the responsibilities and authorities of the *Ministry of Local Administration and Environment*. Law No. 50 also makes provision for the establishment of an "Environment Protection & Support Fund" to support the ministry's tasks.

Old legislation subsists on air quality, water quality and other issues. The government plans to adopt new laws in these areas. The legislation for forestry, agriculture, fisheries, industry, water utilisation, transport etc. all includes even very strict regulations to safeguard the environment. The picture is slightly different concerning the adoption of the same attitude in the private sector. Implementation is generally speaking weak.

There is currently no specific legislation for *Integrated Pollution Prevention and Control* (IPPC) although there are a number of executive legislations and standards that set maximum allowable limits on the discharge of factories to air, water courses and public sewage network. However, these regulations are not effectively enforced. Within the industrial sector this problem is linked to inherent structural and institutional weaknesses that result in encouraging operators to discharge up to the maximum emission limits allowed. As such, there are no financial incentives for companies to reduce emission limits beyond those stated, nor to continually improve environmental performance.

There is specific IPPC legislation in Syria. UNEP-MAP and MoLAE has started within the framework of the MEDPOL Programme a pilot project to establish a National Pollutants Release and Transfer Register (PRTR) for twelve major industries. A number of companies have implemented ISO 14001 and management tools such as waste minimisation and energy management programmes, good housekeeping practices, impact assessments and environmental auditing have been incorporated into their Environmental Management Systems.

Despite the fact that a good number of sectoral laws, decrees and standards have been issued (see table), the secondary legislation (executive legislation) to implement Law No. 50 is still far from being complete. For example, the prosecution of violations of the law is often impossible, as secondary legislation including a penal system (fines) is absent or insufficient.

3.2 Multilateral Environmental Agreements

The Syria is party to several multilateral environmental conventions including:

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. The Basel Convention is the most comprehensive global environmental agreement on hazardous and other wastes and aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. Syria signed the Convention and it went into force in 1992.

Table 5. Selection of laws and decrees related to the environment.

Law / Secondary Law	reference
Environmental Law	Law No. 50 (2002)
Implementing Regulation of Law No. 50 of 2002 on Environmental Protection (executive act)	No. 478/S/B/GH/J of 2004 (Official Gazette No. 10, 9.3.2005)
Cleanliness Law	Law No. 49 (2004)
Executive Rules for Law no. 49 on Cleanliness	2008
Executive Procedures for Environmental Impact Assessment	MoLAE, Ministerial Order No. 225, 29.1.2008
Forest Law	No. 41 (2007)
Forest Protection Law	No. 25 (2007)
Protected Areas Conditions	Adopted by the Supreme Council for Environmental Protection (2003)
Protection of Animal Wealth	No. 29 (2008)
Badia Area as a Part of Government Ownership (Badia Protection Law)	No. 62 (2006)
Licensing System for Ozone Depleting Substance	2006
Establishing Water Resource Departments in all Provinces of Syria	Resolution No. 1647 of 16.10.2005 (Official Gazette No. 46, 16.11.2005)
Resolution on Game Hunting	Resolution No. 210/T of 23.9.2007 (Official Gazette No. 45, 31.10.2007)
Resolution Establishing the Solid Waste Management Department at the Ministry of Local Administration and Environment	Resolution No. 147/Q of 27.9.2005 Official Gazette No. 46 (16.11.2005)
Resolution Classifying the Course of Al-Asi (Orontes) River as a Natural Site Subject to the Protection of the Ministry of Environment	Resolution No. 189/1 of 1998 Official Gazette No. 55 (10.12.1998)
Resolution Issuing the Implementing Regulation of the General Authority for Water Resources established by the Legislative Decree No. 90 of 2005	Resolution No. 1916 of 27.11.2005 (Official Gazette No. 52, 28.12.2005)
Water Regulation	Legislation No 31 of 2005
Resolution Establishing Fund for the Conversion to Modern Irrigation Methods	Legislative Decree No. 91 of 2005
National Legislations for the Protection of the Marine Environment from Pollution.	Legislative Decree No. 9 of 2006
Law on Regional Planning	Draft adopted by the Council of Ministers; expected to be issued in the near future.
Criteria for Energy Efficiency for Home Applications	Law No. 18 (2008)
Energy Conservation Law	To be issued February 2009
Decree for the Establishment of Industrial Zones	
Decree for the Classification of Industries	Decree No. 2680
Ambient Air Quality Standard	SNS No. 2338/2004
Drinking Water Quality Standard	No. 46/1996
Reclamation of treated municipal waste water for irrigation purposes	SNS No. 2752/2003
Maximum Discharge Limits of Pollutants to the Water Environment	Adopted by the Supreme Council for Environmental Protection (2003)
Maximum allowable limits for the discharge of pollutants from economic activities to the national sewer network	SNS No. 2580/2002
Maximum Discharge Limits of Air Pollutants at Source	Adopted by the Supreme Council for Environmental Protection (2003)
Classification of industrial solid wastes according to their content of hazardous materials	Adopted by the Supreme Council for Environmental Protection (2003)
Maximum Noise Thresholds	Adopted by the Supreme Council for Environmental Protection (2003)

Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention). The Barcelona Convention aims to achieve international cooperation for a co-ordinated and comprehensive approach to the protection and enhancement of the marine environment in the Mediterranean area. Protocols for the Prevention of Pollution by Dumping from Ships and Aircraft, and for Cooperation in Dealing with Pollution Emergencies have been adopted. Syria is contracting party to this Convention and has, for example, prepared within the frame of this convention a "National Action Plan for Protection of the Mediterranean Marine Environment from Land-Based Activities" (Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources, LBS Protocol) (adopted in 2005).

Convention on Biological Diversity (Biodiversity Convention, CBD). The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from commercial and other utilisation of genetic resources. The agreement covers all ecosystems, species, and genetic resources. Syria is member to the CBD since 1996 and has also signed the *Cartagena Protocol on Biosafety* in 2003. Syria has prepared in the framework of CBD a *National Biodiversity Strategy and Action Plan* (NBSAP).

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species. Syria is member to CITES since 2003.

Convention on the Conservation of Migratory Species of Wild Animals (CMS) (Bonn Convention) (1983). The Bonn Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. Parties to the CMS work together to conserve migratory species and their habitats by providing strict protection for the most endangered migratory species. Syria ratified the Convention in 2003 and its also party to the related AEWA and ACCOBAMS agreements.

Convention to Combat Desertification (UNCCD). The objective of the UNCCD is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approaches. Syria signed the agreement in 1994 and it went into force in 1997. The government fulfilled its reporting obligations and provided so far three status reports plus a *National Action Plan to Combat Desertification* (NAP).

International Convention for the Prevention of Pollution from Ships. The MARPOL Convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 respectively and updated by amendments through the years. Syria is party to the Convention and to almost all related Protocols and Amendments.

International Treaty on Plant Genetic Resources for Food and Agriculture (2004). The objectives of the treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use for sustainable agriculture and food security. Syria ratified the Treaty in 2003, but still waits approval.

Ramsar Convention on Wetlands. The Ramsar Convention provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention covers all aspects of wetland conservation and use, recognising wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. Syria ratified the Convention and it went into force in 1998. Syria has designated one Ramsar site, which is Jabboul Salt Lake near Aleppo, and which covers 10,000 ha.

Rotterdam Convention. The objectives of this Convention are to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to the environmentally sound use of those hazardous chemicals. Syria has accessed the Convention and it went into force in 2003.

Stockholm Convention on Persistent Organic Pollutants (POPs Convention). A global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife. In went into force in Syria in 2003.

United Nations Framework Convention on Climate Change. The UNFCCC provides the basis for global action to protect the climate system for present and future generations. Syria joined the convention in 1996 and signed the related Kyoto Protocol, which then went into force in 2006. Syria is currently preparing with assistance by the *Global Environment Facility* (GEF) and UNDP its initial national communication.

World Heritage Convention (WHC) (1972). The primary mission of the WHC is to identify and conserve the world's cultural and natural heritage, by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection. Syria adhered to the Convention in 1975. The *World Heritage List* includes five cultural sites in Syria (Ancient City of Damascus 1979, Ancient City of Bosra 1980, Palmyra 1980, Ancient City of Aleppo 1986, Crac des Chevaliers and Qal'at Salah El-Din 2006), but so far no natural site.

3.3 Environmental Policy

3.2.1 Overall Environmental Policies

The formulation of Syria's national Agenda 21, known as *National Environmental Strategy and Action Plan* (NEAP), brought together representatives of various ministries, universities, and civil society organisations, thus reflecting a multi-sectoral and participatory approach to sustainable development. The preparation of the NEAP was lead by the *Ministry of Environment* (which later became the *Ministry of Local Administration and Environment*) and was supported by UNDP and the World Bank. The strategy describes the state of the environment on a national scale, identifies environment priorities for the country and sets up a general framework for environmental planning until 2010. It is a commitment towards Agenda 21 and sustainable development. Launched in 2003, it identifies water issues and land degradation as the most critical environmental problems in Syria. It builds on the "National Environmental Action Plan", which was published in 2001. The NEAP was endorsed by the *Higher Council for Environmental Safety* (which later became the *Council for Environmental Protection and Sustainable Development*). The Environmental Law (Law No. 50) is one of the outputs of this process. Also the "Syrian National Strategy Report for Sustainable Development" prepared for the World Sum-

mit on Sustainable Development, which took place in Johannesburg 2002, is based on the NEAP process.

Syria adopted its reform agenda, the 10th Five-Year Plan (FYP) for 2006-2010, by Law No. 25 on 8 May 2006. Approval followed a wide consultation process involving government institutions, the Baath Party, non-state actors such as the Chamber of Commerce and Industry, and the People's Assembly (Parliament). The government also discussed the draft with donors. The 10th FYP focuses on economic and social reform and includes decentralisation of decision-making. NGOs and the civil society get an important role to play in the further development of the Syrian society. In general, the 10th FYP stresses the importance of achieving sustainable use of the resources and promotes the use of clean and renewable energies. It summarises problems and challenges faced by the environment as follows:

- Poor sector coordination, and failure to consider the environment an essential approach for formulating the development plans;
- Poor public awareness as regards the environment, and absence of deterrent controls for environment protection;
- Lack of comprehensive environment surveys and lack of data bases;
- Lack of clear-cut sectoral policies aimed to reduce the environmental impact of past planning practices, which led to evident environmental damages.

Recently, the Syrian Government has prepared a "State of the Environment" Report. At the time of the preparation of the CEP Syria, this report has not been adopted by the *Council for Environmental Protection and Sustainable Development* and only a draft version in the Arabic language is available. The study covers all aspects of the Syrian environment including description of economic and social development, situation of environmental media, crosscutting environmental issues, environmental strategies and management, future environmental expectations and recommendations and priorities of action plans.

The *Poverty Reduction Strategy*, which covers the period 1996 to 2004 and was published in 2005 by UNDP, seeks to guide and coordinate the various poverty-related initiatives across the various sectors.[24] It recognises that environmental conditions such as the scarcity of water in Syria, and their degradation contribute to poverty.

3.2.2 Sectoral Plans and Policies

The *National Environmental Strategy and Action Plan* (NEAP) is supported by a number of sectoral strategies, master plans, and action programmes.

As member of the *Convention on Biological Diversity*, the Syrian government has prepared a *National Biodiversity Strategy and Action Plan* (NBSAP), which covers environmental considerations to decrease all environmental threats in development projects for the conservation and sustainable use of biological resources. One of the important objectives is the protection of all natural sites in particular forests and other natural ecosystems. The main indicator used to monitor progress is total protected land, and the objective is to increase the percentage of protected areas from the 1.28 percent in 2002 to 10 percent of the total land area. The Syrian government puts efforts into the enlargement of the protected area system and has designated a number of new protected areas in recent years.

[24] Poverty in Syria 1996-2004: Diagnosis and Pro-Poor Policy Considerations. – UNDP Damascus. 2005.

The *Global Environment Facility* (UNDP-GEF) supports MoLAE to build capacities for a modern protected areas management.

The *National Action Programme to Combat Desertification* (NAP) is the key instrument in the implementation of the *UN Convention to Combat Desertification* (UNCCD). The NAP describes the state of the land resources and identifies measures necessary to reverse the trend of land degradation. It was adopted by the Syrian government in 2002 and awaits implementation.

With the assistance of UNDP-GEF, the MoLAE is currently preparing its initial communication to the *UN Framework Convention on Climate Change* (UNFCCC). The communication, which is a standard procedure and obligation to all parties to the convention, will describe the possible impact of climate change on Syria, and will identify possible interventions in the field of mitigating climate change and adapting to climate change.

Syria established a "National Master Plan of Solid Waste Management", for which a French company was assigned. Syria is facing today the need for a modernization of the management of municipal waste generated in the country. This is due to the increase of the waste production as well as their higher impact on health and environment. The master plan was adopted in 2004.

The MoLAE has prepared a "National Action Plan for Protection of the Mediterranean Marine Environment from Land-Based Activities", in the frame of the *Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources* (LBS Protocol) of the *Barcelona Convention* (Convention for the Protection of the Mediterranean Sea against Pollution). This Strategic Action Programme (SAP) was adopted in 2005.

In the field of Oil Spill Response Arrangements, the Syrian Government prepared a national contingency plan for oil and other hazardous substances under a project financed by the *European Commission* and managed by the *Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea* (REMPEC). The plan was prepared with the cooperation and assistance of the competent Syrian authorities and was completed in 2000, but has not yet been formally adopted.

In the field of energy, the MoLAE's *Environmental Studies Centre* (ESC) with the support by GTZ prepared a country study on Green House Gases (GHG) Emissions. It includes an inventory of sources and sinks of GHG, an assessment of the future development of GHG, and an elaboration of technical and non-technical options to reduce GHG. The assessment was completed in 2000. Based on this experience the *Ministry of Electricity* under the guidance of the *United Nations Department of Economic and Social Affairs* (UNDESA) and with local coordination undertaken by the UNDP in Damascus, prepared a "Renewable Energy Master Plan", which was completed in 2003. In 2008, again with support by GTZ, NERC started to prepare an energy master plan to identify and implement strategies for sustainable energy use.

Within the framework of Integrated Coastal Zone Management (ICZM) and the MED-POL Programme, some local sectoral plans for the costal region were prepared in 2005 by the MoLAE, including municipal waste water, municipal solid waste, liquid and solid industrial and agrarian wastes, air emissions and for pollutants of special concerns. These sectoral plans where adopted in 2008 by the *Council for Environmental Protection and Sustainable Development.*

With the assistance by GTZ, MoLAE recently developed "National Guidelines and Regulations for Environmental Impact Assessment" which aim at providing standards for EIA

and guiding the development and implementation of capacity-building programmes. As a result, the "Executive Procedures for Environmental Impact Assessment" was finally approved and adopted by the MoLAE.

The quality and the level of detail vary greatly among all these strategies, master plans and action programmes. Due to the fact that most of them were prepared a couple of years ago, they often do not reflect the current situation. No sectoral strategies are available for some sectors, subsectors or subjects such as the water sector (waste water treatment and water supply), pollution control (air pollution, industrial pollution), transport, land use planning (urban sprawl), and others.

3.4 Integration of Environmental Concerns into the Main Policies and Sectors

Environmental issues are integrated into the main sectors through the 10th Five-Year Plan, cross-cutting policies, strategies and plans, the environmental assessment process as well as through the education system.

The integration of environmental issues into government policies, strategies, action plans, investment programmes, etc. takes place at several levels:

- Pursuant to the requirements of the Environmental Law (Law No. 50), an inter-ministerial body, the *Council for Environmental Protection and Sustainable Development* has been established with the responsibility of setting national policy and coordinating environmental activities. The State Planning Commission, all ministers and selected representatives from the private sector are members to the council. It is the highest body related to the environment and convenes at least all two months.
- The *Ministry of Local Administration and Environment* has the responsibility of coordinating environmental issues, taking into account the cross-cutting nature of environment. The ministry has established *Environmental Directorates* within all 14 governorates, to integrate environmental issues on governorate and municipal level.
- Most of the line ministries have employed either officers dedicated solely to environmental issues or officers who work on environment as part of an overall job description. The extent of liaison and coordination between the sectoral ministries and the MoLAE varies widely and is often related to whether the individual in the line ministry has had sufficient environmental training and secondly whether they are encouraged and facilitated within their particular ministry to execute the necessary activities. The link between the sectoral ministries and the MoEAL is also facilitated through a number of thematic committees and working groups.

Environmental issues are also integrated into development projects through *Environmental Impact Assessment* (EIA), for which provision was made in the Environmental Law No. 50. Since 2006, GTZ has been helping the *General Commission for Environmental Affairs* (GCEA) and the *Syrian Engineering Syndicate* in capacity-building and in developing a systematic procedure for the establishment of EIA system in Syria. As a result, the "Executive Procedures for Environmental Impact Assessment" was finally approved and adopted by the *Ministry of Local Administration and Environment*. The EIA Executive Procedures are now enforced and all new development projects must submit an EIA study to GCEA and its Environmental Directorates. During the past year, several major development projects have submitted full EIA studies to GCEA (for example ce-

ment factories and wastewater treatment plants). Moreover, tens of EIA studies for small & medium-sized projects have been submitted to the environmental directorates in the 14 governorates. The EIA Executive Procedures lists and categories all projects and activities which require or exempted of submitting EIA. Nevertheless, there are currently few environmental consulting firms in Syria who are capable of conducting full EIAs according to national and international standards. Efforts are undertaken to build the capacity of state organisations and the private sector to conduct and evaluate EIAs. Four national training courses have been conducted between 2007 and 2009 at GCEA and the *Syrian Engineering Syndicate*, with technical and financial assistance from GTZ, to qualify national EIA experts. Altogether, about 120 EIA experts were qualified and given a certificate of EIA National Expert which allows them to conduct EIA studies. Moreover, training courses were conducted in all 14 governorates to build the capacities of responsible officers and staff in the field of EIA and reviewing EIA studies.

Strategic Environmental Assessments (SEA) are still not foreseen by the Syrian law. However, preparation is underway to include SEA in the national legislations.

4 Climate Change Implications

Under global climate change, the natural conditions of Syria are expected to change considerably. Key concerns for Syria are:

- Rising temperatures,
- Increasing extreme events, and
- Changing precipitation patterns, including an increase of droughts in the country.

Rising concentrations of greenhouse gases alone could cause warming over the Mediterranean region similar in magnitude to the global increase. The results show that temperatures across the region could rise between 0.7 and 1.6°C for every degree rise in global mean temperature. Clearly, there remains considerable uncertainty over how precipitation will change over the Mediterranean region in response to the changing composition of the atmosphere. However, the balance of evidence seems to suggest reductions in precipitation over much of the region, with a possible transitional period for some areas due to aerosol effects. In terms of the ecological and social impacts of climate change, changes in moisture availability are more important than changes in precipitation or temperature alone. Low levels of moisture availability are associated with droughts. There is evidence of reductions in water availability over much of the Mediterranean region during both winter and summer. The effects of increased concentrations of greenhouse gases may be mitigated in some areas by the effects of aerosols. Despite these uncertainties over exactly how climate variability and extremes will change in the eastern Mediterranean and Syria in particular, the overall picture does suggest an increase in the frequency of extreme events and, in particular, of droughts. The effect of rising sea-level is expected to be modest in Syria, as there are no large river deltas and other lowlands found as in neighbouring states such as Egypt, Greece or Turkey.

Syria is highly vulnerable to climate change, as it is a water-scarce region and greatly dependent on climate-sensitive agriculture. It thus needs to implement adaptation measures more than many other countries. Projections indicate that per capita renewable water resources in the Arab region will drop by half, reaching 550 m^3 per person per year in

2050.[25] Climate-induced resource scarcity could further tensions in the region's conflict-ridden areas, potentially escalating violence and political turmoil. This is supported by the fact that 80 percent of surface water resources and 66 percent of total water resources in the Arab region is a shared water resource. Syria shares some of its most important water resources with neighbouring countries. Climate change is putting additional stress on the region's marginal environment. For much of the Arab region, the climate is predicted to become even hotter and drier, according to the recent (2007) scientific assessments by the International Panel on Climate Change (IPCC). Higher temperatures and reduced precipitation will increase the occurrence of droughts, an effect that is already materializing in Syria. Climate change will also require a more severe adjustment in the management of the region's water resources than any other region, since most of water resources are already being exploited for human uses. How drastic the effects of climate change may become is shown in a study conducted by Yale University: it was shown that an increase in average temperature by 5°C will result in reduction of Euphrates discharge by 40 percent.[26]

Adaptation to climate change thus becomes a significant challenge for many sectors, with the water sector and agriculture being of top priority. The development of a multi-sectoral adaptation strategy to protect water resources and to meet the various other challenges imposed by climate change is required if national socio-economic goals are to be attained. The Syrian government is in an early stage to discuss and integrate issues of climate change into national policies and strategies, and to plan pilot measures for identifying and testing ways to adapt to a changing climate.

The most severe effects of climate change in Syria are expected for the *badia* region, as it is highly vulnerable marginal land: this region consists of semi-deserts and even slight changes of climate may have a strong impact on agricultural activity and livestock management. The region already saw severe droughts in recent years (2007, 2008), which are apparently linked to climate change, and the situation in 2009 is likely to become even worse. The *badia* region is therefore regarded as a priority for adaptation measures.

The Syrian CO_2 emissions in terms of GDP and energy consumption (per TOE) are higher than the global, continental and middle-eastern levels, and are closely related to the relatively high level of industrial development, while most industries operate with environmental standards not reflecting the technical state of the art. These emissions are also expected to increase considerably if the current energy mix remains predominantly fossil fuel-based.

A first country study on Green House Gases (GHG) Emissions was prepared by the *Environmental Studies Centre* (ESC) with the support by GTZ and completed in 2000. It includes an inventory of sources and sinks of GHG, an assessment of the future development of GHG, and an elaboration of technical and non-technical options to reduce GHG. Based on this experience the *Ministry of Electricity* under the guidance of the *United Nations Department of Economic and Social Affairs* (UNDESA) and with local coordination undertaken by the UNDP in Damascus, prepared a "Renewable Energy Master Plan" (REMP), which was completed in 2004. Successively, by mid-June 2003, and in order to implement this master plan, the Syrian Government has enacted legislation that established the *National Energy Research Centre* (NERC). The strategic role of the centre should involve renewable energy, energy efficiency and integrated resource planning pro-

[25] See report by ACSAD presented at the World Water Forum http://portal.worldwaterforum5.org/wwf5/en-us/worldregions.

[26] R. B. Smith et al.: Hydrologic Trends in the Middle East: Modeling and Remote Sensing. www.yale.edu/ceo/Projects/swap/pubs.

grammes. In 2008, again with support by GTZ, NERC started to prepare an energy master plan to identify and implement strategies for sustainable energy use.

The Syrian cement industry is a major source of CO_2 emission, due to the heavy fuel oil consumption in this industry and the technological processes. The quantities of CO_2 gas emissions differ according to the production method. The annual emissions from this industry are estimated to be around two million tons. This quantity exceeds the CO_2 emissions from all other industries, such as glass, lime stone and brick industries, etc.

The fertilizer industry is one of the other main industries in Syria. It is based in Homs and includes the production of nitrogen fertilizers, superphosphate fertilizers and ammonia-urea. In 1996, 184,000 tons of fertilizers were produced, with each ton being combined with the emission of 3.8 tons of CO_2, thus resulting in an overall emission of 691,000 tons CO_2. This figure is 40 percent higher than what is produced when modern production technology is used.

There are a large number of other chemical factories of small and medium size, including paper and paints industries. For example, 28,000 tons of paints were produced in 1996, being equivalent of 534 tons of CO_2 emissions.

According to the *Blue Plan* ("Plan Bleu") (2008) Syria was late to engage in Rational Energy Use (REU) and Renewable Energy (RE), but plans to take significant measures.[27] A first national framework for energy efficiency, the *Energy Conservation Law* (ECL), comprising the establishment of a REU and RE dedicated legislative framework, incentive measures and an action plan, is under development. The *National Energy Research Centre* (NERC) in 2003, this agency has not yet been provided with significant means of action. However, this situation should change, as the NERC was entrusted with implementing the REU and RE measures envisioned under the *Energy Conservation Law* (ECL) 2006-2010.

In terms of REU promotion, three new laws should be promulgated, as well as a thermal regulation for buildings and standards related to electric appliances. REU actions concerning energy production (electricity) will also be implemented in order to enhance the reliability of the whole production – transmission - distribution chain. As for REU, even though such actions have been undertaken since 1998 by various government agencies, the absence of coordination and of a comprehensive policy did not allow a real development of these sectors.

Solar thermal potential is significant: individual solar water heaters are relatively widespread and the *Energy Conservation Law* envisions to fully developing this market, in view of its positive impact, not only in terms of energy, but also of job creation. The photovoltaic is also present in the national strategy, even though it relates mainly to rural decentralized electrification and pumping in isolated zones. Syria has a considerable potential for the usage of wind energy. The capacity of the country was estimated as 140 MW. Two small wind parks with a capacity of 6 MW and 12.5 MW are under construction and are expected to become operational in 2009.

[27] Plan Bleu (2008): Climate Change and Energy in the Mediterranean. – Regional Activity Center with EIB and Euromed.

Table 6. Carbon Dioxide (CO_2) Emissions in Syria. Source: EarthTrend, the Environment Information Portal. http://earthtrends.wri.org/text/climate-atmosphere/country-profile-175.html.

Carbon Dioxide (CO_2) Emissions (in thousand metric tons)	**Syria**	**Middle East & N Africa**	**World**
Total Emissions (1998)	50,636	1,546,030	24,215,376
Percent change since 1990	+41 %	+46 %	+8 %
Emissions as a percent of global CO_2 production	0.2 %	6.4 %	
Emissions in 1998 from:			
▪ solid fuels	0	130,585	8,654,368
▪ liquid fuels	35,105	833,523	10,160,272
▪ gaseous fuels	9,838	461,305	4,470,080
▪ gas flaring	3,451	50,244	172,208
▪ cement manufacturing	2,242	70,373	758,448
Per capita CO_2 emissions, 1998 (1000 metric tons of CO_2)	3	4	4
Percent change since 1990	+14 %	+18 %	-2 %
CO_2 Emissions by sector, 1999 (in million metric tons of CO_2)			
▪ Public electricity, heat production, and auto producers	12	417	8,693
▪ Other Energy Industries	2	150	1,205
▪ Manufacturing Industries and Construction	10	300	4,337
▪ Transportation	4	242	5,505
▪ Residential	2	118	1,802
▪ Other Sectors	X	196	5,640
Total Emissions All Sectors:	X	1,423	27,180

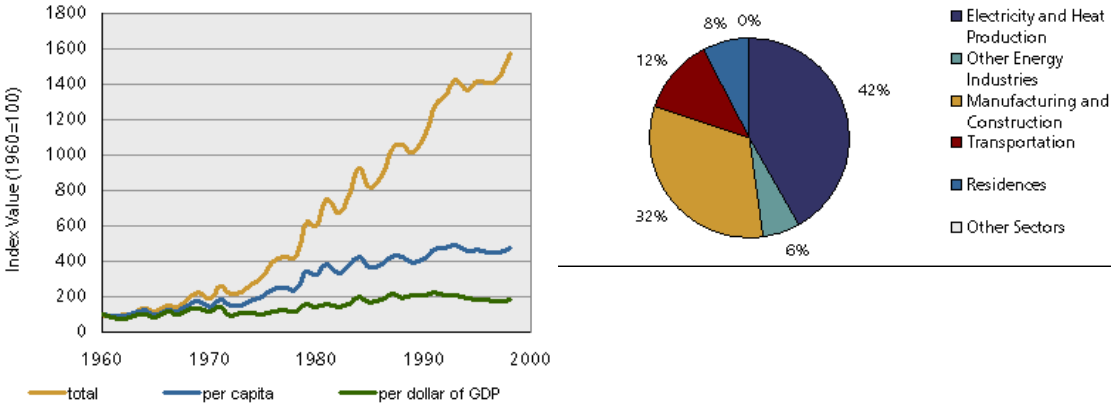


Figure 2. CO_2 emissions: relative trends in Syria 1960-1998 (left graph) and emissions by sector in 1999 (right graph). Source: http://earthtrends.wri.org/text/climate-atmosphere/country-profile-175.html.

Since the beginning of 2008, the Syrian government has granted licences to five alternative energy plants, all of which are due to start operations by the end of 2009. This includes a solar power plant, a US$75 million investment, which is being built by a Kuwaiti real estate company, and is scheduled for completion by the end of 2009. A further two large-scale solar power projects for generating electricity are also expected to be launched in cooperation with German and French companies in the near future.

Syria acceded to the Vienna Convention for the Protection of the Ozone Layer and its *Montreal Protocol* in 1989. In 1993, Syria prepared its country programme for phasing out the ozone depleting substances. This programme compiled an inventory list of imported ozone-depleting substances, and their industrial applications. Furthermore, a strategy and national action plan for the gradual substitution of these substances was prepared. Syria does not produce any controlled substances under the Montreal Protocol. A number of projects were implemented to replace old process technologies utilizing ozone-depleting substances by clean technologies using non-ozone-depleting substances. Industrial sectors included in this programme consist of manufacturers of refrigerators, foam, and aerosols. Ozone-depleting substances such as methyl bromide in use for grains sterilization were also substituted.

5 EU and Other Donor Co-operation from an Environmental Perspective

5.1 European Commission

5.1.1 Country approach

The EU is the main donor in Syria. Environment was not a priority of MEDA I (1995-1999) and MEDA II (2000-2006). While the *Country Strategy Paper* (CSP) for the Syrian Arab Republic 2002-2006 covers five priority areas that do not explicitly target the environment, the subsequent CSP 2007-2013 opens a window for interventions in the field of environment: The Strategic Objective "Support to political and administrative reform" explicitly mentions the environment. Decentralised environmental management, establishment of environmental strategies and leverage of investments in the field of environment such as water management, waste management and industrial pollution are given as examples for fields of possible assistance.

The CSP 2007-2013 mentions that interest-rate subsidies are foreseen to leverage EIB investments in the field of water and waste water, and that FEMIP (Facility for Euro-Mediterranean Investment and Partnership) TA operations could be implemented in the water sector under the 2007-2010 programme. Interest-rate subsidies could target investments in Rural Damascus (Damascus Rif), so as to accompany the decentralisation process.

Based on the CSP, the *National Indicative Programme* (NIP) 2007-2010 foresaw €10 million for support for investment projects (including interest-rate subsidies) in the field of environment. After completion of the 10th FYP and consultations held between the EC and the Syrian Government, it was agreed that the NIP should be fully adapted to the needs and priorities as identified in the 10th FYP. The resulting revised NIP 2008-2010 confirms the budget allocation of €10 million to support and accompany environmental loan operations promoted by financing institutions in accordance with the priorities of the Syrian government.

EIB has recently conducted a study to identify priority investments in the Mediterranean region, called "Horizon 2020 – Elaboration of a Mediterranean Hot Spot Investment Programme (MeHSIP)". The overall objective of the MeHSIP is to support the countries participating in the European Neighbourhood Policy in the implementation of priority pollution reduction investment projects. The MeHSIP aims to accelerate the rate of preparation of loan commitments by the EIB and other International Financing Institutions. Invest-

ment financing requirements in Syria have been identified for the municipal waste, the urban waste water and the industrial emissions sectors as well as in other sub-sectors. Funding has so far not yet been secured for any of these projects.

Table 7. Projects identified by the Horizon 2020 Initiative as priorities for Syria.

No.	Project Name	Sector
1	Construction of a central sanitary landfill for Latakia Governorate including 13 transfer stations, vehicles and sorting & composting	Domestic Solid Waste
2	Construction of a central sanitary landfill for Tartous Governorate including nine transfer stations, vehicles and sorting & composting	Domestic Solid Waste
3	Construction of a Waste Water Treatment Plant and main collectors for Banyas city	Domestic Wastewater
4	Construction of a Waste Water Treatment Plant north of Tartous City, two pumping stations and 18 km main collectors	Domestic Wastewater
5	Construction of a Waste Water Treatment Plant south of Tartous City, one pumping station and 22 km main collectors	Domestic Wastewater
6	Conversion of units 3 & 4 of Banyas Thermal Power Plant (TPP) from fuel oil to gas	Industrial Air Pollution
7	Rehabilitation and upgrade of Banyas refinery Waste Water Treatment Plant, chemical & biological treatment	Industrial Effluents
8	Facilities for recycling and treatment of fuel oil sludge from Banyas and Homs refineries	Hazardous Solid Waste

5.1.2 EC-supported Projects

The EU promotes the "Municipal Administration Modernisation" (MAM) Project, which supports the devolution process and capacity-building in the *Ministry of Local Administration and Environment* and the municipalities. Through the support of and capacity-building for regional planning, the project is closely related to the environment. The project end was extended for a year and the project is now going to be completed at the end of 2009.

The EU furthermore supports the "Water Supply and Sanitation in Palestinian Refugee Camps" Project, which promotes healthy living conditions in two Palestinian refugee camps in the wider surroundings of Damascus, by integrating them into the regional water supply and treatment system. Towards this end, the EC has made available an interest-rate subsidy for an EIB loan to build water supply installations and waste water treatment plants. Implementation has not yet started.

In 2006, an EIB loan over €45 million was subsidized by the EC with a grant of €5 million, to construct two sewage treatment plants in the southern part of Damascus Rif. This grant is closely related to the support for two Palestinian refugee camps in the same area, and the entire investment totals some €93 million, including €45 million EIB loan, €35 million contribution from the government, and €13 million (€5 + €8 million) from the EC.

A €5 million interest-rate subsidy was also foreseen for a water supply project in Aleppo, co-funded by EIB and KfW. This loan operation should complement capacity-building activities to improve urban management carried out under the *Municipal Administration*

Modernisation (MAM) programme. However, this project was cancelled by the *Ministry of Housing and Construction* on short notice.

Some limited assistance to Syria is also provided under the *Life-Third Countries* programme – which assists with the development of environmental policies and action programmes in countries bordering the Mediterranean and Baltic Seas. So far, the following small-scale projects have been supported: "Building sustainable municipal waste management in Syria" (2006), "Integrated medical waste management plan in Syria" (1997), "Promotion of concerted sustainable local development planning in Syria" (2004), "Environmental audit and pollution prevention and control of the Syrian textile industry" (1996), and "Environmental management systems in the Syrian enterprises" (2000). Syria also takes part in some regional projects and initiatives funded by the EC, for example the "Integrated Waste Management for Olive Pressing Industries in Lebanon, Syria and Jordan", which was completed recently (2009).

5.2 Non-EU Donor Assistance

According to regional standards, Syria obtains in the field of environment only relatively little donor support. The main donors in the field of environment are the European Union, followed by Germany and Japan as bilateral donors and UNDP-GEF, IFAD and FAO as multilateral donors.[28] Although donors cover a wide range of activities, most interventions are focused in the water sector (water supply, waste water treatment). Nevertheless, the financial volume of the donors' contributions is small compared to the investments of the Syrian government in the water sector. The planned investments for the entire Syrian water sector amount to 2,796 million € for the period of the 10th Five-Year Plan. Approximately 50 percent of this budget shall be spent in the irrigation sector where the other 50 percent shall be spent for drinking water and sewage projects.

Other major fields of donor support are solid waste (JICA and GTZ), rangeland management (IFAD), forestry (FAO), biodiversity and protected area management (UNDP-GEF), etc.

Asian Development Bank (ADB): Syria is not member to ADB.

Aga Khan Development Network (AKDN). The focus of projects funded by the *Aga Khan Development Network* in Syria is on economic, cultural and social development. The portfolio so far does not include environmental projects.

Arab Fund for Economic and Social Development (AFESD): The Kuwait-based *Arab Fund for Economic and Social Development* (AFESD) provided a loan of approximately €53 million toward the "Badia Integrated Development Project" implemented by the *Ministry of Agriculture and Agrarian Reform*. The project has close links to desertification control and supports the preparedness of Bedouin people to climate change.

United Nations Food and Agriculture Organisation (FAO): FAO has long-established relationships with Syria and promotes several projects in the field of environment and food safety. It supports the government in developing agricultural policies, organic farming, integrated pest management and methods for water harvesting. FAO further supports the forestry sector through policy development and fire management, the fisheries sector, and also helps the Syrian government to manage obsolete pesticides and Persistent Organic Pollutants (POPs).

[28] In overall development aid, Germany was in the period 2006-2007 the biggest donor, followed by the EC, UNRWA, the Arab countries, France and Japan (OECD-DAC statistics).

France: AFD (Agence Française de Développement) was only recently authorized to operate in Syria. There are no ongoing environmental projects. However, AFD and SPC have recently signed a memorandum of understanding (3.9.2008) for initiating projects for different sectors including some which may have environmental benefits such as waste water treatment, solid wastes, renewable energies, transport sector, and production sector with emphasis on environmental aspects.

Germany. Germany supports a comprehensive programme in the water sector, implemented by the German implementing agencies BGR, DED, InWEnt, GTZ, and KfW. Development Cooperation in the water sector focuses on helping modernize the institutions and the general set-up in the sector. The ***Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)***, strengthens the *Ministry of Irrigation* (MoI) and its subordinate authorities in core tasks of water resources management, especially in groundwater monitoring and water budgeting and planning. The ***German Development Service (DED)*** supports the decentralization of administrative structures in the water sector, the introduction of a performance-based fee system and the establishment of autonomous regional water supply enterprises. Special emphasis is given to strengthen the *Order of Syrian Engineers and Architects* (OSEA) and their capacities for education and training, and to provide Technical Assistance to the *General Establishment for Drinking Water and Sewerage Damascus Rif* (GEDWS). Training in the water sector is also provided by ***InWEnt, Capacity Building International***, in the frame of the regional capacity building programme. ***German Technical Cooperation (GTZ)*** supports the reform of the water tariff system to increase cost-recovery, decentralisation and re-organisation of water institutions and capacity-building. GTZ's work is focused on Damascus Rif and Aleppo. In addition to the water sector, GTZ establishes together with NERC, the *National Energy Research Centre*, a master plan for renewable energy and energy efficiency. The ***Kreditanstalt für Wiederaufbau (KfW)*** supports the water sector (water supply and sanitation) in Damascus Rif (including the Palestinian Refugee Camp of Al-Saida Zeynab) in close cooperation with the EC and EIB. A soft loan over approximately €50 million for the construction of sewage treatment plant is waiting final approval. Also the agreement on an Investment Fund for the purchase of equipment for the water sector in Aleppo and Damascus Rif, which KfW is going to support with a loan subsidy, is still not ratified. A project on "Water Loss Reduction" in Aleppo (2009-2016) is being supported through a soft loan and a grant for TA (accompanying measure). Additionally, the KfW is in discussion with the Syrian government about financing the establishment of a *Higher Institute for Water Management* in Homs.

IFAD (International Fund for Agricultural Development): IFAD gave a loan to the Government of Syria in order to implement the "Badia Rangelands Development Project", which has links to desertification and indirectly strengthens the capacities of Bedouins for preparedness to climate change. The project is blended with a soft-loan from AFESD. IFAD supports two more projects in the field of agriculture, which are, however, linked to a lesser degree to the environment.

Islamic Development Bank: Syria has a small share of the Islamic Development Bank. No projects have been funded in Syria so far.

Italy: The Italian government supported between 1994 and 2004 the project "Range-land Rehabilitation and Establishment of a Wildlife Reserve in the Syrian Steppe". It was funded by the Italian Cooperation (approx. US$5.1m) and implemented by FAO and is an important example for biodiversity conservation and badia rehabilitation. Some aspects of this project are currently followed-up in cooperation with IUCN-The World Conservation

Union. The Italian government also supported measures for the rationalisation of the use of water resources in the region of Ras al-'Ain. Additionally, several projects funded by the Italian government have been implemented by FAO.

Japan. Environmental Protection and Management is one of JICA's (Japan International Cooperation Agency) main targets in Syria. JICA works mainly in the fields of solid waste management and sewage treatment. Japanese aid grant contributed to rehabilitate garbage collection vehicles of Damascus in 1996 and Aleppo in 1998. JICA conducted development studies in Homs and Latakia in 2000-2002, which resulted in a master plan on solid waste management in both cities. Collection vehicles were granted to both cities in 2007, and the total number of vehicles granted has reached over 200. In respect to sewage treatment, JICA is going to support the preparation of a master plan for seven governorates, to improve maintenance of the sewerage network and the operation of existing facilities.

In the water sector, JICA is supporting the Syrian government to develop efficient irrigation techniques (improvement of water use efficiency, reduction of water losses) in three governorates (Damascus Rif, Daraa, Hama), has placed an international water policy adviser with the *General Commission for Water Resources*, and recently completed a project working with the *Ministry for Irrigation* on the establishment of a *Water Resources Information Centre* (WRIC).

JICA plans to provide three mobile stations for air pollution monitoring, and also supports capacity-building for environmental monitoring in all 14 governorates of Syria. A second phase of this project has started in 2009. Through dispatching volunteers, Japan also promotes environmental education. The provision of street lighting on the Damascus – Daraa highway based on a photovoltaic system is in the planning stage.

Netherlands: The Dutch-Syrian water cooperation included four projects during the period 2001-2007 in the areas of waste water reuse, coastal water resources management, groundwater model development and water resources management awareness. These projects have been completed meanwhile.

Sweden: Sweden made contributions towards the regional initiative for obsolete pesticide management, implemented by FAO. Within its "Regional Programme for the Middle East and North Africa", SIDA promotes the sustainable use of water resources, focusing in particular on regional and transboundary water issues, from both a poverty reduction and conflict prevention viewpoint. Discussions have taken place with the *Ministry of Local Administration and Environment* on possible new projects in the water sector.

Spain: The Government of Spain is going to support a project on SME Development. It comprises a €5 million loan and a €3 million grant for the construction of a modern lead smelter in Aleppo for lead recovery from used car batteries. Cooperation is foreseen to this end with the *Ministry of Industry*. The project has been approved and awaits signature.

Switzerland: Swiss Development Cooperation (SDC) has made financial and technical contributions toward the establishment of a national system for the management of hazardous substances. The Syrian Hazardous Information Management System (Sy-HSIMS) is now in its second phase of implementation. In a regional effort, Switzerland supports the establishment of ecotourism at Jabboul salt lake near Aleppo, working through NGOs.

United Kingdom: Syria is not among those countries which receive funding from the Department of International Development (DFID).

United Nations Development Programme (UNDP): UNDP as one of the Implementing Agencies of the *Global Environment Facility* (GEF) is one of the biggest donors in the area of environment. There are ongoing operations in the field of biodiversity and protected area management (US$3.4m) and a *National Capacity Self-Assessment* (NCSA) for Global Environment Management, which targets all three environmental Rio conventions (biodiversity, climate change, desertification). Recently completed project include the establishment of a national biodiversity strategy, a needs assessment for capacity building in the field of biodiversity management, and a project on energy conservation planning. A comprehensive project on energy efficiency in buildings and another on biosafety are in preparation.

United Nations Environment Programme (UNEP): UNEP assisted the Syrian government to prepare a national implementation plan for the Stockholm Convention on Persistent Organic Pollutants (POPs), which was completed in 2005. Syria took furthermore part in several regional initiatives lead by UNEP.

United States of America (USAID, U.S. Agency for International Development): There are no ongoing projects in Syria supported by USAID.

World Bank: There are no active projects in Syria supported by the World Bank.

5.3 Donor Coordination

There is no formal donor coordination in Syria. The *State Planning Commission* (SPC) officially assumes the role of coordinating donor activities. Apart from a donor conference organised by the SPC a few years ago, there are no regular meetings of the donor community. On the other hand, the donor community is relatively small, so that the various organisations have often meetings on an *ad hoc* basis. Nevertheless, practically all donors wished to have a more formal forum for exchanging information.

The *Paris Declaration on Aid Effectiveness* (2005) calls upon harmonization of development aid and for greater aid effectiveness and promotes joint funding. Both the EC and the Government of Syria adhere to the Paris Declaration. Although there are no joint programmes in the sense of the Paris Declaration (e.g. basket funding), the water programme to be implemented in Damascus Rif jointly by the EC/EIB, KfW, UNRWA, GAPR (General Authority for Palestine Arab Refugees) and Syrian Authorities (e.g. State Planning Commission, Ministry of Housing and Construction, Damascus Rif Establishment) can be regarded as a harmonized joint effort.

6 Conclusions and Recommendations

Syria faces serious natural and man-made environmental problems that need to be urgently addressed. Syria was relatively late in engaging in the environment. Despite some early efforts, Syria only recently began to build up the full range of capacities for environmental management, which will still take considerable time to become fully effective. As Syria only relatively recently started to give higher priority to environmental issues, great efforts are necessary to catch up with current regional and international standards. There are, for example, many old industries which have been established before environmental standards existed, and which today constitute major polluters and need considerable efforts and funds to convert them into clean production techniques.

Major drivers for environmental degradation (air, water, land, waste, noise) include a rapid urbanisation. Syria has a rapidly growing population and nowadays some 55 percent of its population lives in an urban environment. The high rate of population growth puts high pressure onto the environment and makes achievements regarding environmental protection hardly visible. Population development sometimes overruns achievements in the environmental sector.

Environmental degradation is today affecting the health of the population and economic productivity of the country. The costs of environmental degradation are estimated by the World Bank at 2.3 percent of GDP.[29] Environmental protection is therefore essential for the country's economic development.

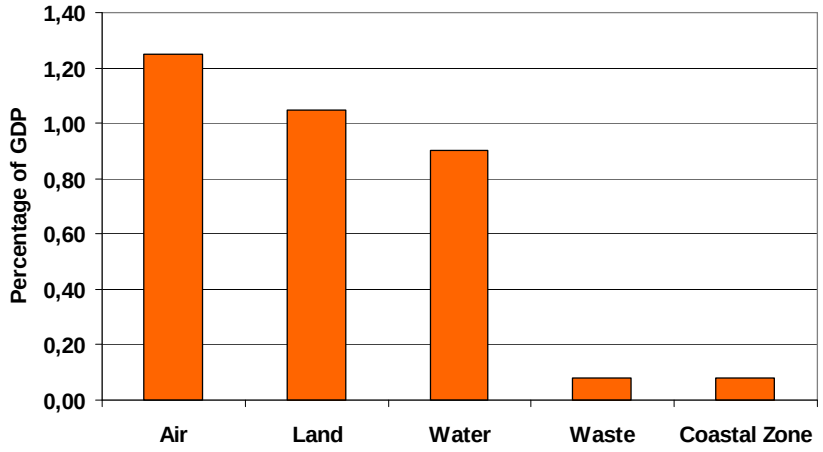


Figure 3. Annual costs of environmental degradation by environmental category (mean estimate as percentage of GDP). Source: World Bank/METAP 2004.

According to the *National Environmental Action Plan* (NEAP) that was issued in 2003, major environmental challenges in Syria include among others (listed together with indicators):

Depletion and contamination of water resources

- Poor treatment of polluted drinking water and lack of drinking water and sewerage networks in some rural areas,

[29] The costs of environmental degradation have been assessed at 3.3 percent GDP by World Bank/METAP in 2004 (Cost Assessment of Environmental Degradation. Final Report 2004). However, a recent update based on refined assessment revealed a value of 2.3 percent (SPC, pers. comm.)

- Loss of recreational areas due to the pollution of rivers, lakes and coastlines,
- High costs associated with the provision of alternative water resources as a result of the depletion of surface and groundwater resources.

Soil degradation and land contamination

- Decrease in the agricultural land areas due to salinisation, water and wind erosion,
- Inappropriate land use and desertification.

Air pollution

- Increase in patients' numbers and costs associated with the treatment of air-born diseases resulting from the impact of air pollutants on human health

Degradation of the urban areas

- Contamination of water with leachate generated from landfills,
- Illegal housing,
- Costs associated with the illegitimate supplies of water and electricity.

Loss of natural resources and biodiversity

- Deterioration in flora and fauna, including land and aquatic (freshwater and marine) biodiversity,
- Establishment and rehabilitation of protected areas.

Loss of cultural heritage

- The need for restoration of archaeological sites.

Enabling Environment

There are several challenges in the enabling environment that impede a fully effective and efficient environmental management in Syria.

Institutional Capacities. Syria was the first country in the Arab region to establish an environmental ministry, which since then has gradually expanded its capacities. The creation of several thematic directorates of the *General Commission for Environmental Affairs* (GCEA), including those on biodiversity, land degradation, climate change, chemical safety, Environmental Impact Assessment (EIA), public awareness, etc., as well as the creation of environmental directorates in all 14 governorate administrations are regarded as major steps for the environment to become an integral part of government policy.

It appears difficult for the Syrian government to attract highly qualified expertise under the conditions of the current civil service system. The work conditions with relatively modest salaries are often not attractive enough to work for the government and many experts look for better-paid jobs in the private sector. The situation is different for donor-funded projects, where staff can directly be hired by the project and remuneration does not have to follow government rules. The performance of donor-funded projects thus clearly distinguishes from regular government work.

The relatively low performance of government work constitutes a major threat to the sustainability of projects. Once the external support ends and the tasks are assumed by the government, the continuation is often hampered by insufficient personal capacities.

Whereas the institutional setup for the environment with a well-established environmental ministry, provincial environmental directorates as part of local administration, an *Environmental Studies Centre* as the scientific arm of the environmental ministry, and environmental directorates in almost all sectoral ministries is highly satisfying, the personal capacities clearly need to be further developed to meet the challenging demands and international standards.

Public Participation. Environmental protection is still largely understood as a pure government task, not as a task of the entire society. The civil society plays a relatively small role in environmental protection. Participation of various stakeholder groups in environmental decision-making is in Syria at the very beginning. Only the 10th Five-Year Plan covering the period 2006-2010 opened the door for strengthening the civil society, and aiming at establishing the civil society as a third power to be added to the government and private sector. The number of environmental NGOs is relatively small, and they have very limited capacities to play an active role in environmental decision-making on the one side and to implement environmental projects with significant impact on the other side.

Public participation is also still weak in decision-making on investment projects. Although EIA procedures foresee the active involvement of the public, these procedures still need to be further developed and settled in Syria.

Legislative Framework. With the Environmental Law (Law No. 50) issued in 2002, the Syrian government laid the foundation for a comprehensive regulatory framework necessary to improve the environmental situation in the country. A number of executive orders, decrees, regulations, environmental standards, by-laws, etc. have been put into place since then, but the process is still far from being complete. The Environmental Law should be regarded as framework law, for which the secondary legislation still has to be created. For example, violations of the law can hardly be fined, as the fines and the criteria for fining are still absent. Needless to say that there is still a long way until the Environmental Law will lead to a significant reduction in environmental degradation.

Environmental Monitoring and Knowledge Management. The *Environmental Studies Centre* (ESC), which is part of the *Ministry of Local Administration and Environment*, is the central institution to collect and evaluate environmental information and to translate it into concrete policies. Other institutions include the *National Energy Research Centre* (NERC), the *General Commission for Scientific Agricultural Research* (GCSAR), the *General Organisation of Remote Sensing* (GORS), university institutes, and others. Despite all these efforts, it is often difficult to obtain updated information on the national environmental situation. The personal and institutional capacities to share available information for overall assessments needs to be further developed.

The culture of information-sharing is little developed in Syria's environmental institutions. Environmental information and knowledge are often still regarded as power and as the government's domain, with environmental information not being disclosed to the public. Although the situation has changed considerably in recent years, shortages in information-sharing still hamper an effective environmental management.

There is no overall environmental reporting in Syria. Annual environmental reports on the state of the environment are neither available on a national, nor on governorate levels. There is a general lack of aggregated environmental data which would show general trends, including achievements for improving the environmental situation. Air pollution monitoring stations, for example, were recently installed in major cities, but the measurements are mostly not continuous and the results from all stations are not combined for the sake of an overall assessment.

Awareness for Environmental Issues. The awareness for the environment has increased a lot in recent years, both among decision-makers and in the broader public. Environmental concerns are now taken into consideration in many decisions, and the 10th Five-Year Plan or the introduction of EIAs are good examples for the enhanced role that the environment plays in Syrian development now.

However, environmental awareness is still in its infancy in Syria, as can be shown by the sometimes incautious handling of environmental problems. When air or water pollution, for example, exceeds the maximum limits as set e.g. by the *World Health Organisation* (WHO), the sources of pollution are normally not closed down immediately. Especially the population living in pollution hot spot areas with high industrial aggregations suffer a lot from the insufficient handling of pollution control.

Environmental awareness campaigns are conducted mainly on a small scale and only a few campaigns reach the broad public. Environmental NGOs in Syria do not have the capacities to play a key role in awareness-building and to conduct major campaigns.

Mainstreaming the Environment. The environment as a cross-cutting issue has to be tackled by many sectors and sub-sectors. The supreme environmental authority in Syria is the *Council for Environmental Protection and Sustainable Development*, which has the responsibility of setting national policy and coordinating environmental activities, and in which representatives from the *State Planning Commission*, all line ministries and other relevant stakeholder groups are found, to ensure that environmental issues are integrated into their work. In addition to that, most ministries have environmental directorates, which are interlinked with the *Ministry of Local Administration and Environment* through a number of committees and working groups. *Strategic Environmental Assessments*, a system of incorporating environmental considerations into policies, plans and programmes, is in Syria not a legally enforced assessment procedure and a clear deficit in mainstreaming the environment in national planning.

Recommendations

Syria is a modestly industrialised country which is classified as *Lower Middle Income Country*. It is not only a lack of financial means that sometimes hampers the implementation of environmental protection, but it is likewise a lack of knowledge, institutional and personal capacities and awareness for environmental concerns. Donor-funded operations should therefore combine the provision of financial means with Technical Assistance that allows Syrian institutions to become more efficient and self-sufficient.

The current EC policy is promoting a shift away from the traditional project approach towards sectoral support (SWAP, Sector Wide Approaches) and General Budget Support (GBS). The nature of the environment as a cross-cutting theme does not favour SWAPs for environmental issues in general, and the conditions of SWAP core elements in Syria such as a clear-cut overall environmental policy/strategy, the environmental budget and its medium term perspective, and the environmental coordination framework[30] favour at present traditional project approaches. Nevertheless, SWAPs may be considered as a medium- or long-term option for the more focused water sector.

Among the many project ideas and concepts, those projects should be given higher priority, which …

- are innovative for Syria and include aspects such as technology transfer and application of approaches which are otherwise not available in Syria (*innovation*);

[30] EuropeAid (2007): Support to Sector Programmes. Covering the three financing modalities: Sector Budget Support, Pool Funding and EC project procedures. – Guidelines No. 2.

- support the reform agenda of the Government of Syria as laid down in the 10th five-year-plan, covering aspects such as decentralization, strengthening the civil society, etc. (*change management*);
- adhere to the polluter-pays principle; the government should not assume the responsibility for environmental pollution caused by the private sector nor by state-owned companies (*adherence to the polluter-pays principle*);
- have a good sustainability prognosis through a full cost-recovery at least of the operational costs (water supply systems for drinking water and irrigation, sewage treatment and solid waste management are often highly subsidized) (*sustainability through cost-recovery*);
- produce global environmental benefits, in addition to local and national benefits; international environmental convention may be taken as guidance for global environmental benefits (*global environmental benefits*);
- build on already existing national, regional or international initiatives to tackle environmental problems, including the Horizon 2020 initiative by the Euro-Mediterranean governments to tackle the top sources of Mediterranean pollution *(build of existing initiatives/Horizon 2020)*;
- contribute to the achievements of the *Millennium Development Goals* (MDGs), in particular to poverty alleviation (*MDGs/poverty alleviation*);
- contribute to strengthening the institutional and personal capacities of national and local institutions including governmental institutions (*capacity building*);
- leverage funds for the environment, for example through the preparation of large-scale investments or through loan subsidies (*leverage of funds*);
- have relatively short preparation times; already available project concepts are regarded as advantage (*short preparation times*).

This CEP study has shown that, in the Syrian instance, consideration should be given to the following environmental or environment-related issues. It reflects the fact that the water sector ranks high on the government's agenda, and also takes Syria's obligations under the international environmental conventions (e.g. climate change, biodiversity, combating desertification) into account. With reference to the current situation and tendencies of environment in Syria, as well as the political, legislative and institutional framework with regard to environment management, the following recommendations can be made:

- Mitigation of climate change: Promoting the energy efficiency of buildings and renewable energy through private sector strengthening and other measures, building on experiences already gained on pilot scale; combination of TA with investments.
- Adaptation to climate change and combating desertification: rangeland management and measures against drought in particular in highly vulnerable areas such as the semi-desertic *badia*; TA and investments in infrastructure.
- Introduction of decentralized sewage treatment: preservation of groundwater and surface water resources (e.g. Jabboul salt lake, which is a Ramsar site), establishment of waste water treatment facilities; impact on biodiversity conservation and adaptation to climate change; investments and TA.

- Municipal and industrial waste water treatment facilities in pollution hot spot areas identified e.g. by the Horizon 2020 initiative: establishment of treatment plants; investments.
- Watershed management: river basin management for preserving groundwater resources and protecting them from pollution; anticipated side effects are adaptation to climate change and conservation of biodiversity; TA and investments.
- Municipal pollution control: leverage of funds for municipal pollution control e.g. in the fields of sanitary landfill sites, air pollution control, and waste water treatment; investments and TA.
- Air pollution control & management: implementation of management tools and technical applications to prevent urban and industrial air pollution in hot spot areas including those identified by the Horizon 2020 Initiative; TA and investment support.

We recommend that the European Community strengthens its interventions in these domains, thus building on existing Syrian national plans, policies and efforts.

There are already successful joint approaches towards funding environmental projects in the water sector between EC-EIB and KfW (Germany). Opportunities for co-ordinating with other donors, seeking to achieve complementarities and synergies in order to more effectively deliver development objectives should be expanded. In particular the water sector (sewage network, sewage treatment, water supply) and air pollution control requires large-scale investments and offers many opportunities for approaches coordinated within the donors community.

7 Country Strategy Paper Environmental Annex Summary

Syria faces serious natural and man-made environmental problems that need to be urgently addressed. The most pressing ones are related to water scarcity and contamination, soil degradation, air pollution, inappropriate solid waste treatment and disposal, biodiversity loss and coastal and maritime pollution. Environmental degradation is now affecting the health and economic productivity of the population. The incidence of environment-related disease is high and a recent World Bank study came to the conclusion that the annual costs of environmental degradation are at 2.3 percent of GDP. Undesirable environmental changes are driven by many factors including economic growth, population growth, urbanisation, intensification of agriculture, rising energy use and transportation, but importantly with a better understanding and management there is scope to improve the current situation. Poverty still remains a problem at the root of several environmental problems. The fact that environmental issues ranked low in state planning over a long period is a major reason for today's relatively weak performance of Syria in terms of environmental issues. Syria is now in the phase of catching up with regional and international environmental standards.

State of the Environment

Air: Syria faces serious air pollution problems, mainly in industrial areas in the coastal zone (Tartous, Banyas, Latakia), the midlands (Hama, Homs) as well as in big cities like Aleppo and Damascus. Main sources of air pollution include significant industrial emissions from the Fertilizer Complex, cement plants, power stations and refineries, low efficiency of domestic heaters, a relatively old transportation fleet (despite considerable efforts in recent years to renew the fleet), and fuel quality. Syrian crude oil contains high concentrations of sulphur and a large number of vehicles operate on diesel. The total number of vehicles has increased from 960,000 to 1.2 million in the period 2002-2006, leading to further pollution. The lack of enforced emissions standards compounds the problem. Air quality monitoring stations have been established recently in some major cities, but the system is still at an early stage and the results have not yet been translated into action.

Land resources: Syria is severely affected by land degradation and desertification: it was estimated that approximately 10.9 million hectares equivalent to 59 percent of the country area is affected in one way or the other by desertification, and approximately 3.16 million hectares of land or about 18 percent have seriously suffered from degradation.

A decrease of soil productivity is observed in particular in irrigated land through the overuse of water for irrigation, inadequate irrigation systems, and improper use of agrochemicals. This happens mainly along the large rivers and in the coastal lowlands. Many agricultural fields are today no longer cultivated because of high salinisation. A country-wide assessment came to the conclusion that 3000-5000 ha of formerly irrigated land have to be taken out of agricultural use every year due to extreme salinisation. As a result, more recent work has focused on installing better drainage and restoring existing areas, rather than expanding into new ones. The government of Syria through the *Ministry of Irrigation* (MoI) and with considerable national funds started in 2001 an ambitious plan on the rehabilitation and modernisation of old irrigation projects to improve conveyance efficiency and minimise distribution losses. However, the level of adoption of these techniques is still low, not least because of a lack of confidence amongst farmers of the expected financial return. Agrochemicals are widely applied in Syria, with frequent inappropriate applications.

Soil erosion is severe in particular in the *badia* drylands, which is the vast semi-desert region in the central-eastern part of the country with its large herds of livestock, caused by inappropriate seasonal and spatial use, cultivation of marginal land, damage of the upper soil layer by vehicles, and further accelerated by climate change. The number of livestock in the Syrian *badia* has constantly increased over recent decades, and the present level clearly exceeds the carrying capacity of this fragile ecosystem. The phenomenon of overgrazing is observed throughout the *badia*, and is partly due to the availability of subsidised animal feed, supporting high levels of livestock. An increasing sedentarisation of the Bedouin population has lead to certain concentrations of live-

stock around settlements, with serious consequences for land degradation there. The cultivation of the *badia* with field crops such as barley has exacerbated the situation, as ploughing makes the soils highly vulnerable to wind erosion. There is no land ownership among the Bedouin which would create incentives not to overuse the land. Climate change with more frequent periods of drought constitutes an additional threat to the *badia* land.

Water resources: The renewable water resources of Syria are estimated at 10-18 billion m³/year (depending on the kind of assessment), with about 33 percent stemming from groundwater, 24 percent from surface water resources, 36 percent from the Euphrates and about 7 percent from Tigris River. These resources are now nearly fully exploited. Estimates suggest annual growth in demand of around 2 percent over the next 20 years, which will result in deficits over large areas of the country. Syria's 500,000 ha large irrigation network accounts for 89 percent of the water use. Only 7 percent is used for domestic purposes and 4 percent for industrial, commercial and tourist purposes. Potable water consumption per capita ranges between 82 litres/day in rural areas and 176 litres/day in urban areas. Falling groundwater levels in various regions are evidence of groundwater depletion (Homs: 12-35 m/year; Aleppo sub-basin: 2-5 m/year, Damascus Rif: more than 6 m/year). The main reason is the excessive extraction of groundwater for irrigation. In the season 2001-2002, for example, groundwater use in agriculture exceeded 150 percent renewable resources. Water shortage is exacerbated by poor water quality, particularly in areas with high economic activities. Surface and groundwater pollution by pathogens, nitrate, ammonia or heavy metals is evident in some of the water basins due to inappropriate waste water collection and treatment as well as the wide and often uncontrolled application of agricultural chemicals. Serious steps have been undertaken such as endorsement of water and environmental laws, introducing management boards and legalising the establishment of water users associations. A national water master plan defining a long-term framework for sustainable water sector development is needed but currently does not exist. The Syrian water sector is one of the priority sectors that require fundamental reform at the national level.

Rivers and wetlands: Many wetlands have been degraded or even destroyed by drainage for agriculture and diversion of water supplies for irrigation purposes, and by heavy pollution. Until the late 1960s, there was for example a large area of small lakes and permanent marshes along the meandering course of the Orontes River in the Al-Ghab depression. Nowadays, the river is heavily utilised for irrigation purposes, and virtually dry and non-existent in summer. When there is some water in the river bed in winter, it is heavily polluted from industrial and agricultural sources. Syria's largest wetland is Sabkhat al Jabboul, a shallow salt lake near Aleppo, renowned for its greater flamingos and other biodiversity. Recent changes in the hydrology of the lake have resulted in ecological changes. 10,000 ha of the lake were designated as *Wetland of International Importance* under the Ramsar Convention in 1998.

Marine Resources: The marine environment along the Mediterranean coastline is home to natural habitats and several threatened species of animals and plants. The beaches near Latakia, for example, are important nesting areas for two species of threatened marine turtles, green turtles and loggerhead turtles. The government has established a few protected areas to conserve the natural features of the Mediterranean coast. With an annual catch of marine fish of 2,581 metric tons (based on figures from the year 2000), the marine fishery is quite limited. Although the coastal area covers only two percent of the national territory, it accounts for 11 percent of the population and is an area with intensive economic activities. Four major population centres, Latakia, Tartous, Jableh, and Banyas discharge untreated domestic and industrial sewage into the sea, causing serious pollution. The severity of the municipal sewage problem is manifested by the drifting of raw sewage along the shoreline, and the eutrophication and bacteriological contamination of the coastal seawater at the points of discharge sites. The problem becomes particularly acute during summer months.

Mineral resources and industry. Syria has rich mineral resources including petroleum, phosphates, chrome and manganese ores, asphalt, iron ore, rock salt, marble, and gypsum. Their exploitation and processing is often linked with serious environmental problems such as land degradation and pollution. Most light industry is concentrated around Damascus and Aleppo, whilst the

heavier industry is around the cities of Homs and Hama in central Syria and Tartous and Banyas at the Syrian coast. Oil and gas meanwhile are produced in the east of the country near Deir ez-Zor.

Energy. Syria produces oil and gas, but oil output and production has decreased by 30 percent between 1996 and 2005, due to a depletion of reserves and an outdated infrastructure. It is expected that Syria will become a net oil importer within the next 5-15 years. The government is attempting to further develop the gas sector e.g. by substituting natural gas for oil in power generation to free up oil for exports. Syria has a considerable potential for the use of renewable energy sources – wind and solar – as well as for improved energy efficiency and energy savings. Syria began to promote renewable energy already in the 1990s. Today, photovoltaic systems with a total capacity of 80,000 V are installed in rural areas, and 15-20,000 solar heaters are available throughout the country. Two small wind parks with a capacity of altogether 18.5 MW are expected to become operational in 2009 (the overall current installed capacity in Syria is about 7019 MW). Several barriers exist currently to the path of renewable energy developments in Syria: subsidies to the conventional energy sector, dominance of the public sector, limited awareness of the benefits, lack of favourable policies, tariffs and incentives, underdeveloped human resources, inadequate governmental assistance and limited interface between the RD&D institutions. The implementation of the "Renewable Energy Master Plan" (REMP), launched by the Syrian government in 2002, is therefore slow.

Biodiversity: Syria is rich in biodiversity, although several animal and plant species have become extinct in the last decades due to over-use. These include in particular large mammals (mountain gazelle, goitered gazelle, wild goat, Syrian brown bear, Syrian onager, etc.) which suffer a lot from hunting pressure in addition to habitat loss. There are 26 protected areas, including five wetlands, one wildlife reserve, a special Bald Ibis protected area, three coastal and marine protected areas and sixteen forest areas. In addition to these, there are over 60 rangeland protected areas. There are no national parks or biosphere reserves in Syria, and most protected areas are not fully in line with international standards and criteria. The *National Biodiversity Strategy and Action Plan* (NBSAP) recommends the establishment of a network of national protected areas covering all ecosystems in the country. Integrating local communities into the efforts for establishing and maintaining protected areas have only recently started to become government policy.

Forest resources: Today, forests make up only 3.2 percent of the country's surface area. The enlargement of human settlements, including land clearings for the construction of summer houses and infrastructure, is still a major threat to the forest areas in the coastal region. Forest fires impose further threat to this ecosystem. According to the World Bank and UNDP, more than 20,000 ha of coastal forests have burnt in north-western Syria since the 1970s. Reforestation programmes began in the early 1950s and show considerable achievements. The FAO supports the Syrian government in forest fire management and in developing a coherent forestry policy.

Waste water: In 2002, the total waste water produced throughout the country was estimated 1.4 billion m³. Most Syrian towns and cities have sufficient sewage collecting networks, but only some of them are connected to sewage treatment plants. There are about 20 treatment facilities in operation, including four main plants in Damascus, Aleppo, Homs, Hama and Salamieh. The treatment processes, however, do not always meet international standards. Also many waste water pipes are leaking, so contributing to environmental pollution and threatening drinking water resources. There is no treatment at all of discharged waste water in rural areas. All treated waste water is reused in agriculture and the amount of reused waste water was approximately 500 million m³ in the early 2000s. The 10th five-year-plan foresees the establishment of 200 new treatment plants, so that 50 percent of the population will be covered. 22 treatment plants are currently under construction, 30 plants are being contracted, 24 plants are in the biding process and 41 plants are under study. The rest is in the planning phase.

Solid waste: Refuse collection is done in all Syrian towns, normally organised by the municipal "Cleanliness Departments". The majority of waste, however, does not have any particular treatment and the practice of sanitary landfilling is still in its infancy in Syria. There are only three

composting plants in operation in Syria: in Damascus, Latakia, and Salamieh. An official recycling system does not exist, but an informal private sector participates through scavenging recyclable materials. Practically none of the dumping sites is engineered to appropriate standards and none of them was engineered to specifically manage bulky and inert waste. Dumping sites in Syria are rough, simple and badly operated because of lack of material, knowledge and financial means. One of the bottlenecks for establishing proper solid waste management systems in Syria is insufficient cost recovery, which is mostly below 10 percent and thus not economically viable. A master plan for municipal waste management was completed in 2004 and makes detailed recommendation for the improvement of collection, transportation, treatment, and disposal. The necessary total costs for the initial investments (without operation) are estimated at 1.7 billion SYP (approximately €28m). Preparations are made to introduce garbage incineration as an element of integrated waste management and energy production.

Chemical substances and hazardous waste: Hazardous household waste is estimated at 0.9 kg per inhabitant per year, that is, approximately 16,000 tonnes/year. This ratio is half the European generation of hazardous household waste. It is not collected and treated separately. FAO financed and provided technical support for a project in Syria to complete a national inventory and safeguard all obsolete pesticides. In 2004/2005 a total of 600 tonnes of obsolete pesticides from over 100 locations were logged, repackaged in compliance with international regulations and transported to two secure depots. Medical waste is collected separately and treated only in Damascus. There is only little information available on the amounts of industrial hazardous waste and the treatment processes. Moreover, there are no designated landfill sites for receiving hazardous wastes.

Urbanisation: Syria has experienced a process of rapid urban development since the 1980s, when the annual growth rates were as high as five percent; the current rate of two to three percent is lower, but still considerably high according to world standards. About 55 percent of the total population lives in urban areas. The urban population is expected to increase from 9.6 (2005) to 18.3 million people (2030). The environmental impacts resulting from rapid urban development are escalating: air pollution, water contamination, energy shortage, etc. Other land issues as urban sprawl also constitute a major environmental problem.

Environmental Policy, Legislative and Institutional Framework

The *Council for Environmental Protection and Sustainable Development* is the overall environmental authority in Syria and has the responsibility of setting national policy and coordinating environmental activities and the adoption of environmental legislation, regulations and action plans. It is composed of representatives from all sectoral ministries as well as representatives from important non-governmental stakeholders. The *Ministry of Local Administration and Environment* (MoLAE) is assisted by a number of technical consultative and secondary committees, and operates through two executive agencies:

- The *General Commission for Environmental Affairs* (GCEA), which is the technical arm of the ministry and advises the ministry on policy and technical issues at both the central and local levels. GCEA works through several central directorates, including those on biodiversity, water safety, land safety, climate change, atmospheric safety, chemical safety, Environmental Impact Assessment (EIA), public awareness, etc.
- The *Environmental Studies Centre* (ESC), which is the scientific arm of the ministry and has the authority to conduct pollution control, monitoring and research and to coordinate with national and international research organisations.

The MoLAE has established environmental directorates in all 14 governorates, as part of the local administration. They are presently being equipped with stationary and mobile laboratories as well as specialised equipment, aimed to implement the environmental policies. Furthermore, the various sectoral ministries have established environmental directorates, which are interlinked with MoLAE through a number of committees, working groups, etc. Environmental civil society is relatively weak according to regional standards. There are about 40 registered environmental

NGOs in Syria, but most of them have only a small membership and do not have the capacity to implement larger projects and campaigns.

The *Environmental Protection Law*, which was adopted as Law No. 50 for the year 2002, is the central legal instrument for safeguarding the environment. It specifies the responsibilities and authorities of the *Ministry of Local Administration and Environment* and the *General Commission for Environmental Affairs* and makes provision for the establishment of an "Environment Protection & Support Fund" to support the ministry's tasks. The *Environmental Protection Law* also makes provisions for establishing *Environmental Impact Assessment* (EIA) as a standard procedure for investment projects. Despite the fact that a good number of sectoral laws, decrees and standards have been issued, the secondary legislation (executive legislation) to implement Law No. 50 is still far from being complete. For example, the prosecution of violations of the law is often impossible, as secondary legislation including a penal system (fines) is absent or insufficient.

Syria is party to most multilateral environmental agreements. It plays a positive and proactive role in several international forums. Syria has prepared most of the strategies and action plans, as well as national reports related to these conventions. Syria still needs to design and adopt executive regulations to meet its international obligations and to accelerate implementation on national level.

The formulation of Syria's *National Environmental Strategy and Action Plan* (NEAP) reflects a multi-sectoral and participatory approach to sustainable development. The strategy describes the state of the environment on a national scale, identifies environment priorities for the country and sets up a general framework for environmental planning until 2010. Launched in 2003, it identifies water issues and land degradation as the most critical environmental problems in Syria.

Syria has adopted a reform agenda, the 10th Five-Year Plan (FYP) for 2006-2010, which stresses the importance of achieving sustainable use of the resources and promotes the use of clean and renewable energies. It summarises problems and challenges faced by the environment as follows:

- Poor sector coordination, and failure to consider the environment an essential approach for formulating the development plans;
- Poor public awareness as regards the environment, and absence of deterrent controls for environment protection;
- Lack of comprehensive environment surveys and lack of data bases;
- Lack of clear-cut sectoral policies aimed to reduce the environmental impact of past planning practices, which led to evident environmental damages.

These observations are fully in line with the results of the analysis made in the course of the CEP preparation.

Climate change implications

Despite uncertainties over exactly how climate variability and extremes will change in the eastern Mediterranean and Syria in particular, the overall picture does suggest an increase in the frequency of extreme weather events and, in particular, of droughts. The most severe effects of climate change in Syria are therefore expected on water availability in general and for the *badia* region in particular. This region consists of semi-deserts and even slight changes of climate may have a strong impact on agricultural activity and livestock husbandry. The region already saw severe droughts in recent years, which are apparently linked to climate change, and the situation in 2009 is likely to become even worse. Interventions by the Syrian authorities and donors are so far focused on disaster management, rather than tackling the long-term consequences of climate change.

Syrian CO_2 emissions relative to GDP and energy consumption are higher than global and middle-eastern levels, and are closely related to the relatively high level of industrial development, in combination with most industries not operating with environmental standards reflecting technical state of the art. These emissions are also expected to increase considerably if the current energy

mix remains predominantly fossil fuel-based. The Syrian cement industry is a major source of CO_2 emission, due to the heavy fuel oil consumption in this industry and the technological processes. The annual emissions from this industry are estimated to be around two million tons. This quantity exceeds the CO_2 emissions from all other industries, such as glass, lime stone and brick industries, etc.

According to the *Blue Plan* (2008) Syria was late to engage in Rational Energy Use (REU) and Renewable Energy (RE), but plans to take significant measures. A first national strategy for REU und EE, a "Renewable Energy Master Plan" was completed in 2004, and an *Energy Conservation Law* (ECL), comprising the establishment of a REU and RE dedicated legislative framework, incentive measures and an action plan, is under development. A *National Energy Research Centre* (NERC) was established in 2003 and an "Energy Master Plan" to identify and implement strategies for sustainable energy use is now being prepared. Syria relatively recently started to deal with climate change issues, and is currently preparing its initial national communication for UNFCCC. It is expected that this process will lead to building and strengthening national capacities and will trigger further actions.

EU and other donor co-operation in the field of environment

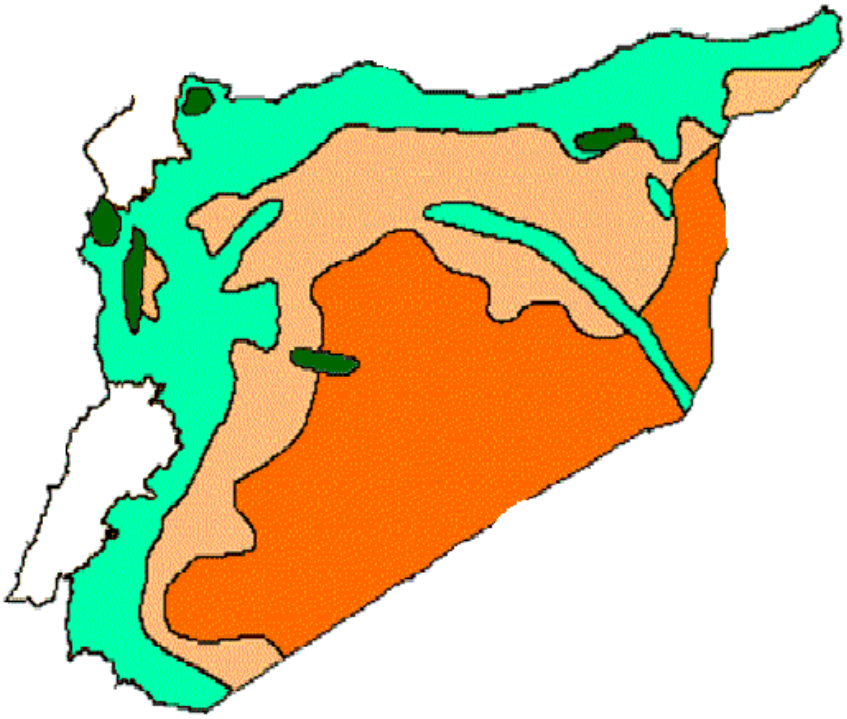
Compared to regional standards, Syria receives only relatively little donor support in the field of environment. The main donors are the European Union, followed by Germany and Japan as bilateral donors, and UNDP-GEF, IFAD, AFESD, and FAO as multilateral donors. Although donors cover a wide range of activities, most interventions are focused on the water sector (water supply, waste water treatment). Nevertheless, the financial volume of donors contributions is small compared to the investments of the Syrian government in the water sector. The planned investments for the entire Syrian water sector amount to €2.8 billion for the period of the 10th Five-Year Plan. Approximately 50 percent of this budget will be spent on the irrigation sector while the other 50 percent will be spent on drinking water and sewage projects. Other major fields of donor support are solid waste (JICA, GTZ), rangeland management (IFAD), forestry (FAO), biodiversity and protected area management (UNDP-GEF), etc. The State Planning Organisation is planning to strengthen donor coordination.

Annex

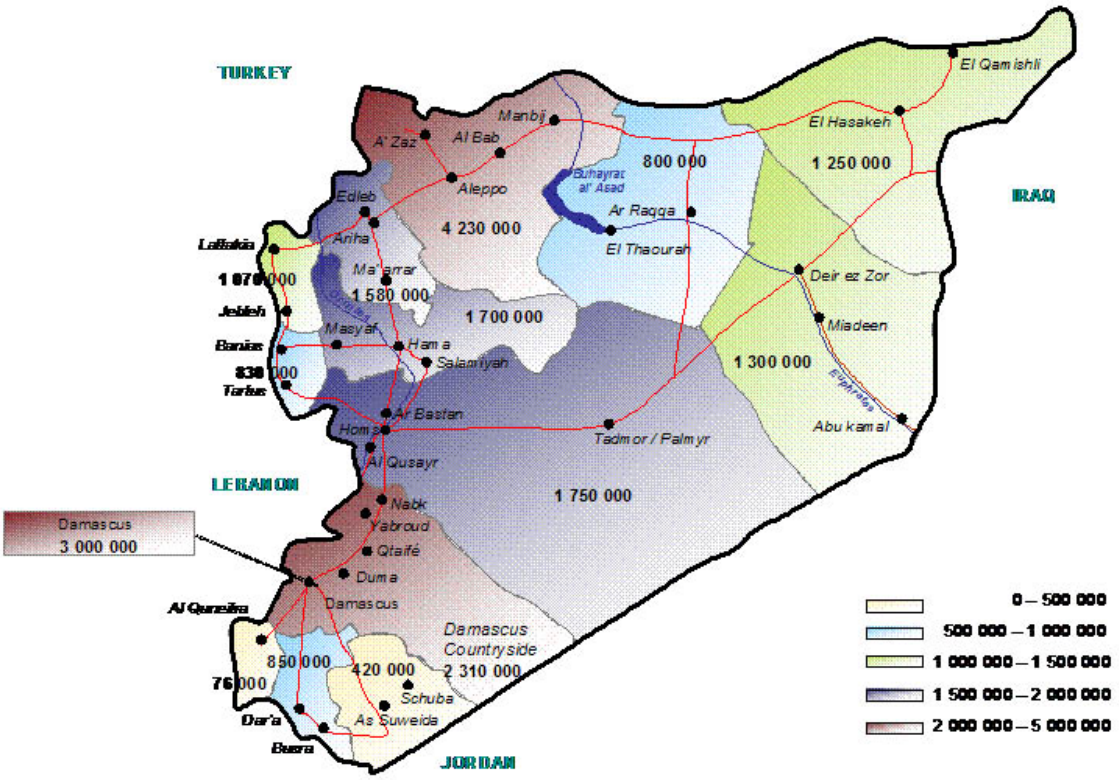
A: Technical appendices

1. Environmental maps of the country

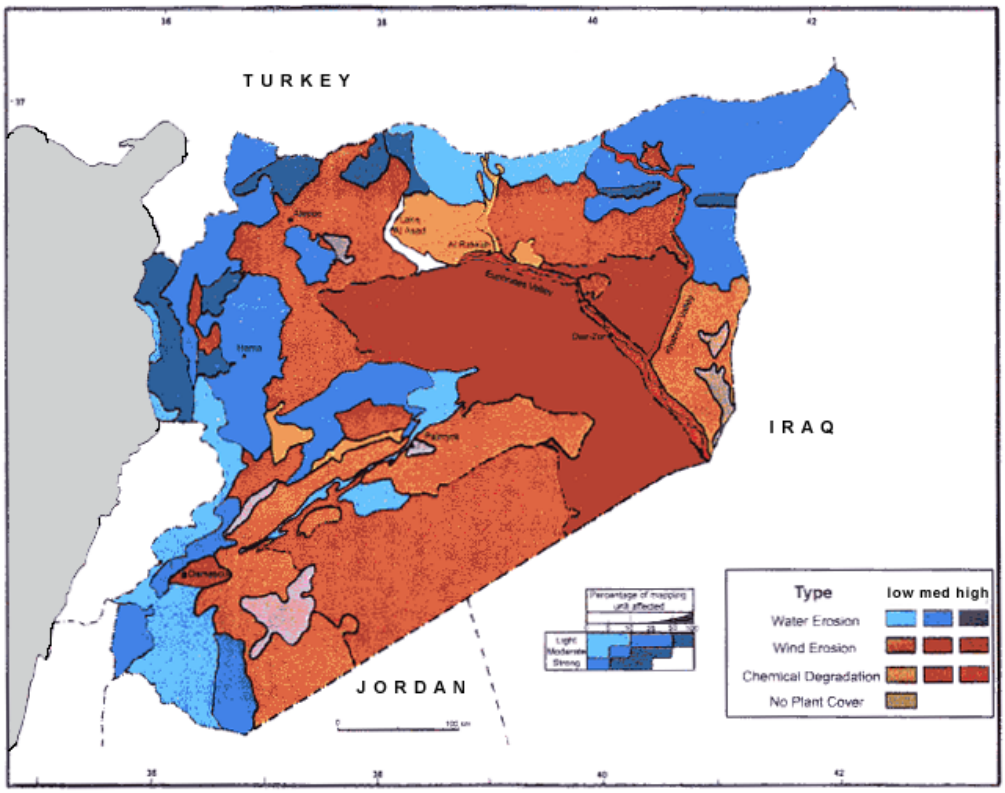
Syria: overview of the landscape. Source: Google Earth [downloaded 27.1.2009].



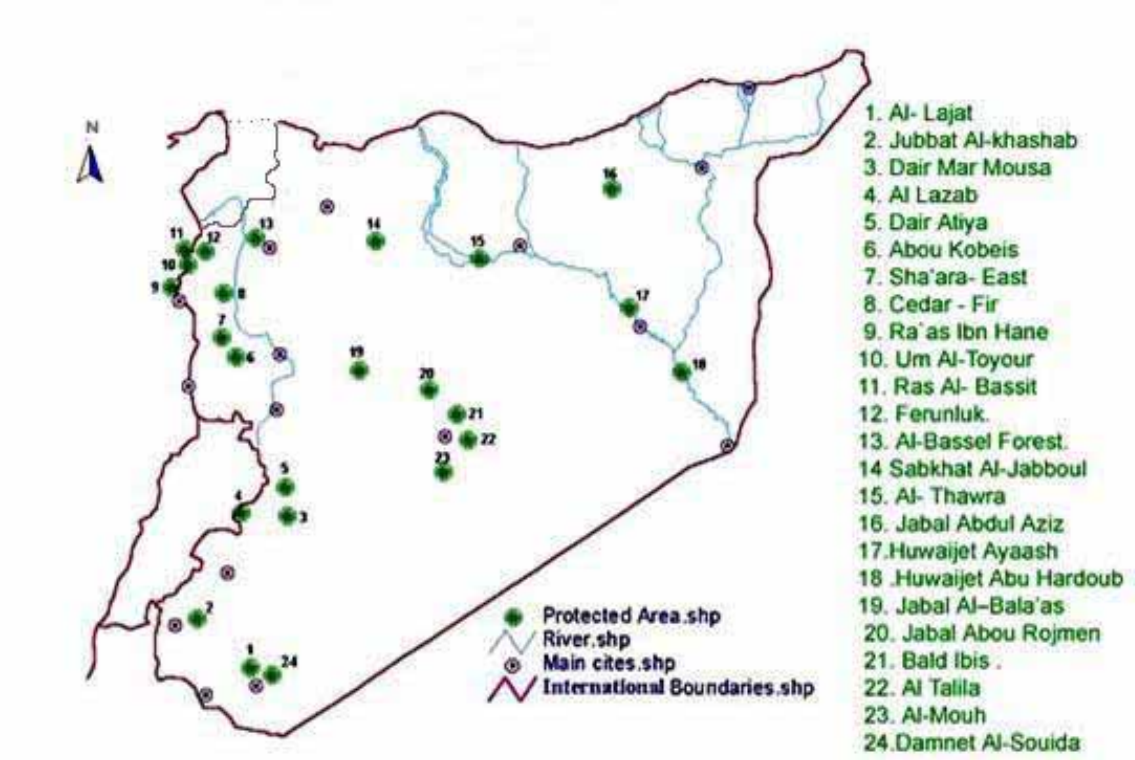
The natural regions of Syria.
Light green: agricultural land; dark green: forests; orange: badia (semi-desert).



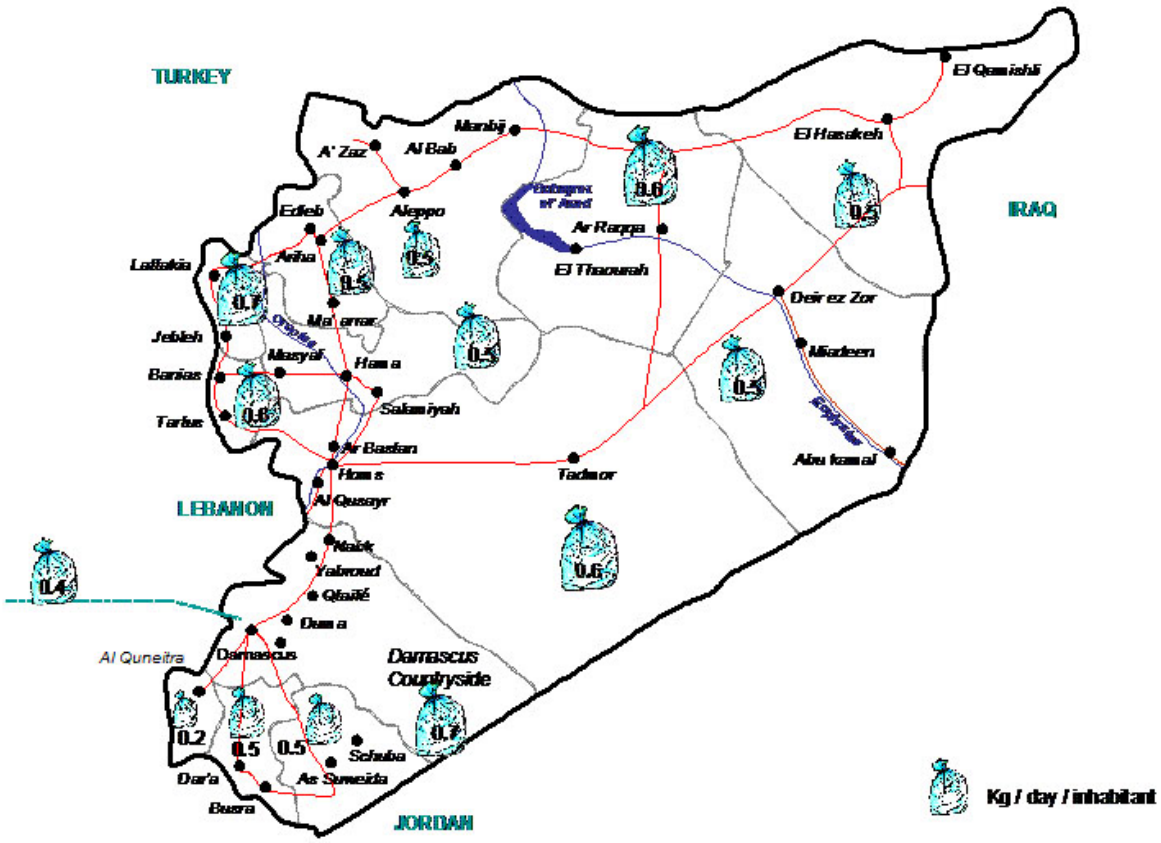
Distribution of the population of Syria (according to 2002 figures).



Human-induced Soil Degradation in Syria (from: UNCCD-NAP 2002)



The distribution of Nature Protected Areas in Syria.



Distribution of municipal waste over the governorates of Syria (average in kg per inhabitant per day, without demolition waste). Source: TRIVALOR Master Plan 2004).

Location of the main industries in Syria.

2. Reference list of environmental policy documents and action plans

Central Bureau of Statistics. Prime Minister Office. 2007 (English + Arabic versions on CD).

10th Five-Year Plan of the Syrian Arab Republic 2006-2010 [English translation available].

Executive Procedures for Environmental Impact Assessment. Ministry of Local Administration and Environment (Ministerial Order No 225 dated 29/1/2008).

Identification of National Energy Policies and Energy Access in Syria. Ministry of Electricity. 2005.

Master Plan of Solid Waste Management in Syria. – Ministry of Local Administration and Environment and TRIVALOR. 2004.

National Action Plan to Combat Desertification in the Syrian Arab Republic. – Ministry of State for Environmental Affairs, Land Directorate, in cooperation with UNDP. 2002.

National Guidelines and Regulations for Environmental Impact Assessment (GTZ and Ministry of Local Administration & Environment, 2008).

National Millennium Development Goals of the Syrian Arab Republic. – State Planning Commission and UNDP. 2003.

Overview of the current situation of MSWM [Municipal Solid Waste Management] in Syria and the National MSWM Master Plan. – Presentation document. Ministry of Local Administration and Environment. 2006.

Poverty in Syria 1996-2004: Diagnosis and Pro-Poor Policy Considerations. – UNDP Damascus. 2005.

Renewable Energy Master Plan (REMP): Ministry of Electricity with United Nations Department of Economic and Social Affairs (UNDESA). Prepared with local coordination by UNDP.

Self Assessment of National Capacity Building Needs in Syria to Manage Global Environmental Issues. The NCSA Strategy and Action Plan to Implement the UN Environmental Conventions in Syria. (NCSA/SYR/05/012) (Ministry of Local Administration & Environment with GEF and UNDP). 2007.

State of the Environment in Syria. Draft Report. – Ministry of Local Administration & Environment/General Commission for Environmental Affairs, 2005-2006 [available in Arabic]. 2008.

Strategy and National Environmental Action Plan for the Syrian Arab Republic. – The Ministry of State for Environmental Affairs in coordination with The World Bank and financed by The United Nations Development Programme (UNDP). 2003.

The Syrian National Strategy Report for Sustainable Development. For the 2002 World Summit on Sustainable Development Johannesburg, South Africa. – Ministry of State for Environmental Affairs. 2002.

3. Ongoing and recently completed donor-funded projects in the field of environment.

The table includes some pipeline projects (projects in preparation)

Project Title	Programme / Type of Intervention	Period	Status	Funding	Beneficiary
AFESD (Arab Fund for Economic and Social Development)					
▪ Badia Integrated Development Project	Soft Loan	1998-2004	Ongoing	c. €53,000,000	Ministry of Agriculture and Agrarian Reform
European Commission (EC)					
▪ Municipal Administration Modernisation (MAM)	MEDA II / Technical Assistance	2004-2009	Ongoing	c. €18,000,000	Ministry of Local Administration and Environment
▪ EIB Water Sector Interest Rate Subsidy (two sewage treatment plants in southern Damascus Rif; subsidy on a €45 million EIB loan)	MEDA II / Investment Support (interest rate subsidy)	2006	In preparation	€5,000,000	
▪ Water Supply and Sanitation in two Palestinian Refugee Camps (WSSPRC)	MEDA II / Investment Support	2002-2009	In preparation	€8,000,000	General Authority for Palestine Arab Refugees (GAPAR) and Ministry of Housing and Construction
▪ MED-ENEC Energy Efficiency in the Construction Sector	MEDA / Technical Assistance	n/a	n/a	€4,000,000	10 countries in the MEDA region
▪ Building sustainable municipal waste management in Syria	Life Third Countries / grant	2006	Completed	€246,000	Syrian Environment Protection Society (SEPS)
▪ Integrated medical waste management plan in Syria	Life Third Countries / grant	1997-1999	Completed	€392,000	Syrian environmental technologies
▪ Promotion of concerted sustainable local development planning in Syria	Life Third Countries / grant	2004	Completed	€358,000	Fund for integrated rural development of Syria
▪ Environmental audit and pollution prevention and control of the Syrian textile industry	Life Third Countries / grant	1996	Completed	€245,000	Syrian environmental technologies
▪ Environmental Management Systems in the Syrian Enterprises	Life Third Countries / grant	2000	Completed	€205,000	Ministry of Local Administration and Environment
▪ Integrated Waste Management for Olive Pressing Industries in Lebanon, Syria and Jordan	SMAP II (regional programme)	2005-2008	Completed	€1,700,000 (3 countries)	Ministries of Local Administration and Environment (Syria component)
FAO (UN Food and Agriculture Organisation)					
▪ Water Harvesting in the Southern Region of Syria	Technical Assistance	2007-2009	Ongoing	US$298,000	Ministry of Agriculture and Agrarian Reform,
▪ Forest sector policy and institutional development	Technical Assistance	2007-2009	Ongoing	US$310,000	Ministry of Agriculture and Agrarian Reform
▪ Emergency assistance to destitute farmers affected by the severe drought of 2007/2008 in the north-eastern regions [3 different projects]	Emergency Response Operations and Post-crisis Management	2008-2009	Ongoing	c. US$1,800,000	
▪ Sustainable Fisheries Policies and Strategies in	Trust Fund (FAO-Government Coop-	2005-2008	Ongoing	US$381,000	

the Eastern Mediterranean - EastMed Project Formulation and Preparatory Phase	erative Programme)				
▪ Regional Initiative for Obsolete Pesticide Management - Syria, Jordan and Lebanon	Trust Fund (FAO-Government Cooperative Programme)	2007-2011	Ongoing	US$60,000	
▪ Prevention and Disposal of POPs and Obsolete Pesticides in Syria	GEF: Persistent Organic Pollutants (POPs) (medium-sized project)		In preparation	US$975,000	
▪ Assistance in Institutional Strengthening and Agricultural Policy - Phase II	Trust Fund (FAO-Government Cooperative Programme)	1997-2008	Ongoing	US$9,080,000	
▪ Institutional Development of Organic Agriculture in Syria	FAO – Italian Government Programme	2005-2009	Ongoing	US$999,000	Ministry of Agriculture and Agrarian Reform
▪ Integrated and community based fire management (follow-up phase)	FAO – Italian Government Programme	2008-2011	Ongoing	US$900,000	Ministry of Agriculture and Agrarian Reform
▪ Regional Integrated Pest Management (IPM) Programme in the Middle Eastern Countries (TF Component: Food Security)	FAO – Italian Government Programme	2004-2009	Ongoing	US$5,082,000	Ministry of Agriculture and Agrarian Reform
Germany Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)					
▪ Advisory Services to the Ministry of Irrigation in the Geo-Environmental Sector	Technical Assistance	2006-2009	Ongoing	n/a	Ministry of Irrigation (MoI)
▪ Management, Protection and Sustainable Use of Groundwater and Soil Resources	Regional Project / Technical Assistance	2008-2011 (current phase)	Ongoing	n/a	Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)
Germany: German Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit GTZ GmbH)					
▪ Modernisation Programme for the Syrian Water Sector	Technical Assistance	2006-2008	Ongoing (second phase in prep.)	€5,600,000	Ministry of Housing and Construction and other partners
▪ Advisory Services on Water Management for ESCWA and ESCWA Member Countries	Technical Assistance, regional project	2005-2008 (1st phase)	Ongoing	€1,500,000	United Nations Economic and Social Commission for West Asia (UN ESCWA)
▪ Support for Arab Centre for Studies of Arid Zones and Dry Lands (ACSAD) in Implementing the Convention to Combat Desertification	Technical Assistance, regional project	2005-2008	Ongoing	€1,500,000	Arab Centre for Studies of Arid Zones and Dry Lands (ACSAD), Syrian Ministry of Agriculture and Agrarian Reform and other partners
▪ Master plan for Renewable Energy and Energy Efficiency	Technical Assistance; Study and Expert Fund	2008-2009	Ongoing	c. €300,000	National Energy Research Centre (NERC)
Germany: German Development Service (Deutscher Entwicklungsdienst) (DED)					
▪ Capacity Building in the Water Sector	Technical Assistance (dispatching of experts)	2008-2018	Ongoing	n/a	Order of Syrian Engineers and Architects (OSEA), General Establishment for Drinking Water and Sewerage Damascus Rif (GEDWS) and others
Germany: German Development Bank (Kreditanstalt für Wiederaufbau) (KfW)					
▪ Waste water treatment in Damascus Rif includ-	Soft Loan	2009–	Not yet ap-	c. €50,000,000	State Planning Commission with Ministry of

ing the Palestinian Refugee Camp Al-Saida Zeynab			praised		Housing and Construction; Executing agency: Damascus Rif Establishment
▪ Investment Fund for Water Management (Aleppo, Damascus Rif)	Soft Loan		Agreement not yet ratified	€8,000,000 (soft loan)	State Planning Commission with Ministry of Housing and Construction; Executing agency: Damascus Rif and Aleppo Establishments
▪ Establishment of a Higher Institute for Water Management in Homs	Soft Loan		Under preparation	c. €9,100,000	State Planning Commission with Ministry of Higher Education
▪ Water Loss Reduction Aleppo	Soft loan + grant	2009-2016	Ongoing	€47,800,000 (soft loan) €5,000,000 (grant for TA)	State Planning Commission with Ministry of Housing and Construction; Executing agency: Aleppo Establishment
International Fund for Agricultural Development (IFAD)					
▪ Badia Rangelands Development Project	Loan	1998-2010	Ongoing	US$20,200,000	
Italy: Italian Cooperation (DGCS)					
▪ Rangeland Rehabilitation and Establishment of a Wildlife Reserve in the Syrian Steppe (with FAO)	Grant	1996-2004	Completed	US$6,000,000	Ministry of Agriculture and Agrarian Reform (MAAR); Implemented in cooperation with FAO
▪ Water irrigation rationalization project in Ras Al Ain	Technical Assistance (implemented by IAM Bari)	2004-2008	Completed	€ 3,040,000	Ministry of Irrigation
▪ Integrated and sustainable resources management in the Lattakia Governorate	Technical Assistance		Pipeline	€ 2,500,000	Ministry of Agriculture and Agrarian Reform
▪ Modernization and Upgrading Plan of Tishreen gas power station (units one and two)	Technical Assistance	2009-2010	In preparation	€ 7,973,030 (Soft Loan + Grant)	Ministry of Industry
▪ Forest fire early alert control system	Technical Assistance		Pipeline	€ 1,500,000	
▪ Rationalization of the use of Natural Resources for the improvement of the agriculture production	Technical Assistance (implemented by IAM Bari)	2009-2011	In preparation	€ 12,600,000 (3,300,00 Grant 9,300,000 Soft Loan)	Ministry of Agriculture
▪ Protected Area Management in Syria (Collaborative management of natural resources and biodiversity in the Palmyra desert and in the Ethiopian highlands)	Technical Assistance (implemented by IUCN)	2007-2009	Ongoing	€ 160,000	Ministry of Environment, Ministry of Agriculture and Agrarian Reform, IUCN West Asia and Middle East
Japan: Japan International Cooperation Agency (JICA)					
▪ Water Policy Adviser	Technical Assistance (Personal Cooperation)	2007-2009	Ongoing	€340,000	Ministry of Irrigation
▪ Development of Efficient Irrigation Techniques and Extension (DEITEX), Phase II	Technical Cooperation	2008-2012	Agreement signed	€3,226,000	Ministry of Agriculture and Agrarian Reform
▪ Human Resources Development Project in	Technical Cooperation	2009-2011	Agreement	€2,113,000	Ministry of Housing and Construction, Da-

Sewerage Sector			signed		mascus Sanitary Drainage Company
▪ Water Resources Information Centre (WRIC)	Technical Cooperation	2009-2011	Under discussion	n/a	Ministry of Irrigation
▪ Establishment of an Observation Station (provision of equipment for Badie Basin)	Grant	2010-2011	Under discussion	n/a	Ministry of Irrigation
▪ Operation and Maintenance Techniques of Leakage Detection	Technical Cooperation	2010-2012	Planning stage	n/a	Ministry of Housing and Construction
▪ Improving Solid Waste Treatment in Local Cities (three projects for Damascus, Aleppo and Homs & Latakia)	Grants	1995-2006	Ongoing, new phases in prep.	€15,163,000	Ministry of Local Administration and Environment, Damascus, Aleppo, Homs and Latakia governorates
▪ Capacity Development for Solid Waste Management	Technical Cooperation (training and dispatching senior volunteer)	2008-2010	Ongoing	n/a	Ministry of Local Administration and Environment, local governorates
▪ Capacity Development for Environmental Monitoring at Directorates for Environmental Affairs in Governorates (Phase I + II)	Technical Cooperation	2005-2012	Ongoing	€7,492,000	Ministry of Local Administration and Environment
▪ Human Resources Development Project in Sewerage Sector	Technical Cooperation & Grant	2009-2011	Ongoing	c. €2,112,000	Damascus Sanitary Drainage Company, Ministry of Housing and Construction
▪ Study on Sewerage System Development in Syria	Master Plan	2005-2007	Completed	€2,293,000	Ministry of Housing and Construction
▪ Capacity Development in Environmental Education	Technical Cooperation (dispatching volunteers)	2005-2012	Ongoing	n/a	Directorate for Environmental Affairs Damascus, Ministry of Local Administration and Environment
▪ Improving Environmental Monitoring at Directorates for Environmental Affairs	Cool Earth Partnership / Grant	Planning stage	Planning stage	Not yet fixed	Ministry of Housing and Construction and others
▪ Solar Street Lighting Project (Damascus – Daraa Highway)	Cool Earth Partnership / Grant	Planning stage	Planning stage	Not yet fixed	National Energy Research Centre (NERC), Ministry of Electricity
Switzerland (DEZA - Direktion für Entwicklung und Zusammenarbeit): Swiss Development Cooperation (SDC)					
▪ Regional Programme for Biodiversity Conservation through Ecotourism / Aleppo pilot site	Technical Cooperation (together with Jordan and Lebanon)	n/a	Ongoing	n/a	Syrian Society for the Conservation of Wildlife together with Royal Society for the Protection of Nature
▪ Syrian Hazardous Information Management System (Sy-HSIMS)	Technical Cooperation	n/a	2nd phase (ongoing)	US$500,000	General Commission for Environmental Affairs (Ministry of Local Administration and Environment)
United Nations Development Programme (UNDP): Global Environment Facility (GEF)					
▪ Biodiversity Strategy and Action Plan and Report to the CBD	GEF: Biodiversity (Enabling activity)	1997-1999	Completed	US$190,000	Ministry of Local Administration and Environment
▪ Assessment of Capacity-building Needs and Country-specific Priorities in Biodiversity	GEF: Biodiversity (Enabling activity)	2001-2003	Completed	US$120,000	Ministry of Local Administration and Environment
▪ Biodiversity Conservation and Protected Area Management	GEF: Biodiversity (Full size project)	Start: 2004	Ongoing	US$3,486,000	Ministry of Local Administration and Environment
▪ Supply-Side Efficiency and Energy Conserva-	GEF: Climate Change	1998-2006	Completed	US$4,610,000	Ministry of Planning

tion and Planning					
▪ National Capacity Self-Assessment (NCSA) for Global Environment Management	GEF: Multi-focal area	Start: 2004	Ongoing	US$200,000	Ministry of Local Administration and Environment
▪ Conservation and Sustainable Use of Dryland Agro-Biodiversity of the Fertile Crescent	GEF: Biodiversity (regional project together with Jordan and Lebanon)		Completed	US$8,232,000	Scientific Agricultural Research Directorate
▪ Small Grants Programme (27 grants so far)	GEF		Ongoing	Individual grants up to US$50,000	Various executing organisations (NGOs, scientific institutions, etc.)
▪ Promoting Energy Efficiency in Buildings	GEF	Anticipated start 2010	In preparation	US$3,460,000 GEF grant, planned co-funding US$11.5m	Not yet fixed
▪ Capacity building for the Implementation of the National Biosafety Framework of Syria	GEF	2009-2013	In preparation	US$925,000	Ministry of Local Administration and Environment / General Commission for Environmental Affairs.(MoLAE-GCEA)
United Nations Environment Programme (UNEP): Global Environment Facility (GEF)					
▪ Enabling activities for the Stockholm Convention on Persistent Organic Pollutants (POPs): National Implementation Plan for Syria	GEF: Persistent Organic Pollutants (POPs)	2002-2005	completed	US$469,000	Ministry of Local Administration and Environment

B. Other appendices

1. Study methodology/work plan

The study was to assess the state of the environment (current status, pressures, trends) and Syria's environmental performance in meeting objectives in the physical environment; biological conditions, biodiversity, ecology and nature conservation; and socio-economic conditions, socio-cultural conditions and human health. The analysis included assessments of key environmental issues and trends, environmental policy and legislation, institutional structure and capacity, integration of environmental concerns into the main economic sectors, involvement of civil society, EC co-operation and international development assistance, and recommendations and priorities.

The Consultant fielded a team of two consultants; Dr Max Kasparek and Dr Marwan Dimashki. Both consultants have complementary core competencies with Dr Kasparek's key expertise being focused on natural resources management, and Dr Dimashki's core competency being in the field of industrial and urban pollution control. These consultants worked as a unit supporting each other. The team the team portrayed itself as a unit and conducted meetings and interviews as a team whenever possible.

At the beginning of the assignment, the consultants prepared a work plan, which was submitted to task manager of the EC Delegation in Damascus. In an initial briefing with the EC Delegation in Damascus the mission sought to obtain the Delegation's views on environmental issues in Syria and the future role of environmental issues in EC–Syrian cooperation. Advice was taken in setting up of appointments with relevant government institutions, projects, other donors, etc.

The mission was conducted in two blocs: during the first part, all major meetings were held, while a stakeholder workshop was organised in the second part to present and consolidate the results. The period inbetween these two blocs was used for evaluating the interviews, collecting more information through correspondence and an intensive internet search, and for report preparation. The national consultant could in this period follow-up the meetings of the first bloc, and could in particular collect specific documents and data which were not readily available during the meetings. The international consultant could have in this period meetings with the country managers of German implementing agencies.

In order to research the Country Environmental Profile the team met with over 50 individuals from key government departments, NGO's, funding organisations and the private sector. Appendices 2 and 3 give the meeting schedule and list the individuals and organisations met.

In assessing the state of the environment, due attention was given to the urban, industrial and the rural environments both terrestrial and aquatic and the interaction between these environments and the human environment. As part of the study recent, current and planned international co-operation projects or strategies in Syria were reviewed.

A national half-day workshop was held to present the results of the mission and to give the team a rapid initial feed-back on its findings, assistance to prioritising environmental issues within Syria. The workshop was attended by altogether 42 representatives of several ministries, state agencies, non-governmental organisations as well as representatives of the major donors in Syria. These were in principal those individuals who had been interviewed before.

Following the feedback session, the final draft report was compiled and submitted to the EC for comments and discussions. These comments were incorporated in the final report submitted to the EC. During the entire study, the team briefed and maintained close contact with the EC officer in charge.

2. Consultants' Itinerary

(M.K.: Max Kasparek; M.D.: Marwan Dimashki)

	Date		Consultant		Activity
			MK	MD	
Week 1	05-Jan	Mo	x	x	Preparation of Work Plan, collection of documents
	06-Jan	Tu	x	x	Preparation of Work Plan, collection of documents
	07-Jan	We	x	x	Submission of Work Plan, collection of documents
	08-Jan	Th	x	x	Collection of documents, arrangements of meetings
	09-Jan	Fr	x	x	Collection of documents, arrangements of meetings
	10-Jan	Sa			–
	11-Jan	Su			Collection of documents, arrangements of meetings
Week 2	12-Jan	Mo	x	x	Collection of documents, arrangements of meetings
	13-Jan	Tu	x x	x	▪ Preparation of field mission ▪ Meeting with Martina Craemer, GTZ Syria Desk Officer, at GTZ headquarters Eschborn
	14-Jan	We	x	x	Collection of documents, arrangements of meetings
	15-Jan	Th	x	x	Collection of documents, arrangements of meetings
	16-Jan	Fr			–
	17-Jan	Sa	x		Travel M.K. to Syria
	18-Jan	Su	x	x	▪ Briefing meeting at EC (Economic Cooperation Section) ▪ General Director of the General Commission for Environmental Affairs ▪ General Director of the Environmental Studies Center
Week 3	19-Jan	Mo	x	x	▪ Ministry of Housing and Construction: Deputy Minister ▪ Ministry of Industry: Directorate of Environment ▪ National Centre for Energy Research (NCER), General Director ▪ Ministry of Local Administration and Environment, Deputy Minister
	20-Jan	Tu	x	x	▪ State Planning Commission, Director of Environment ▪ State Planning Commission, Director of Cooperation with Europe ▪ Ministry of Local Administration and Environment, Deputy Minister (Eng. M. Sadek Abowatfa) ▪ Ministry of Local Administration and Environment, Head of Solid Waste Department ▪ Ministry of Local Administration and Environment, Directorate of Chemical Safety
	21-Jan	We	x	x	▪ Ministry of Local Administration and Environment, Land Directorate (Director) ▪ Ministry of Irrigation, General Commission for Water Resources (General Director) ▪ UNDP, Energy and Environment Programme ▪ Ministry of Local Administration and Environment, UNFCCC Project ▪ GTZ, Water Sector (Programme Manager) ▪ JICA, Assistant Resident Representative ▪ MAM Project
	22-Jan	Th	x	x	▪ FAO, Representative and Assistant to the Representative ▪ KfW: Director Damascus Office ▪ Ministry of Petroleum and Mineral Resources, Chairman of Homs Refinery Board and Technical Consultant to the Minister Ministry of Local Administration and Environment: Deputy Minister

					▪ Ministry of Local Administration and Environment: Head of Biodiversity Directorate ▪ Ministry of Local Administration and Environment: GEF Biodiversity Project ▪ EC Delegation Damascus
	23-Jan	Fr	x		Return flight to Germany
	24-Jan	Sa			
	25-Jan	Su		x	Ministry of Agriculture, International Cooperation Department
Week 4	26-Jan	Mo	x		Report preparation
	27-Jan	Tu	x		Report preparation
	28-Jan	We	x		KfW, Frankfurt, Desk Officer Syria; report preparation
	29-Jan	Th	x		Report preparation
				x	Director of the Water Safety Directorate
	30-Jan	Fr	x		Report preparation
	31-Jan	Sa			
Week 5	01-Febr	Su		x	Ministry of Agriculture, General Commission for Scientific Agricultural Research
	02-Febr	Mo	x	x	Report preparation
	03-Febr	Tu	x	x	Report preparation
	04-Febr	We	x	x	Report preparation
	05-Febr	Th	x	x	Report preparation
	06-Febr	Fr	x		Travel to Syria
	07-Febr	Sa	x		DED: Coordinator for the Water Sector
	08-Febr	Su	x	x	▪ EC Delegation ▪ Ministry of Transport ▪ Syrian Environment Association
Week 6	09-Febr	Mo	x	x	▪ GORS (General Organisation of Remote Sensing) ▪ Field mission to Homs (freshwater ecosystem, fertilizer complex, refinery)
	10-Febr	Tu	x	x	Report preparation, workshop preparations
	11-Febr	We	x	x	Report preparation, workshop preparations
	12-Febr	Th	x	x	Report preparation, workshop preparations
	13-Febr	Fr	x	x	Report preparation, workshop preparations
	14-Febr	Sa	x	x	Workshop preparation
			x		DED
	15-Febr	Su	x	x	Workshop: presentation and validation of the findings of the mission (42 participants)
			x	x	Debriefing meeting with the EC Delegation
Week 6	16-Feb	Mo	x		Return flight to Germany
	17-Feb	Tu	x	x	Report preparation
	18-Feb	We	x	x	Report preparation
	19-Feb	Th	x	X	Report preparation
	20-Feb	Fr	x	x	Report preparation
	21-Feb	Sa			
	22-Feb	Su			
	27-Feb	Fri	x	x	Report submission

3. List of Persons/Organisations Consulted

Persons who were consulted by email/teleconference, but not personally met, are indicated by an asterisk (*).

Organisation	Designation	Name
1. Ministries and other Government Organisations		
State Planning Commission	Director of Cooperation with Europe	Bassam Al-Attar
	Director of Environment	Mohamad Alloush
Ministry of Local Administration and Environment	Deputy Minister	▪ Eng. Imad Hasoun ▪ Eng. M. Sadek Abowatfa
▪ General Commission for Environmental Affairs	General Director	Dr Akram S. Al-Khouri
▪ Environmental Studies Center	General Director	Eng. Suleman Khaled Kalou
▪ Solid Waste Department	Head of Department	Eng. Roula Abazeed
▪ Directorate of Chemical Safety	Head of Directorate	Eng. Fouad El-Ok
▪ Directorate of Land Degradation	Director	Eng. Khaled Al-Sharaa
▪ Water Safety Directorate	Director	Eng. Reem Abd-Rabou
▪ Directorate for Biodiversity	Director	Akram Eissa Darwich
▪ MAM Project	Programme Director	Eng. Arfan Ali
▪ Biodiversity Project	National Project Director	Eng. Adnan Saad
▪ Climate Change Project	National Project Director	Dr. Yousef Meslmani
▪ National Focal Point for UNFCCC	Environmental Specialist	Eng. Haitham Nashawati
Ministry of Agriculture and Agrarian Reform	Director of International Cooperation	Mrs. Diram Hakki
▪ General Commission for Scientific Agricultural Research	General Director	Dr. Waleed Al-Taweel
	Programmes Director	Dr. Faten Hamed
Ministry of Electricity		
▪ National Centre for Energy Research (NCER)	Acting General Director	Eng. Mouhamad Khalil Cheiki
Ministry of Housing and Construction	Deputy Minister	Dr. Kamal l Sheikha
	Director of Planning and Statistics	Eng. Mazen Lahaam
Ministry of Industry	Directorate of Environment, Director	Mrs. Amal Hassan
Ministry of Irrigation	General Director	Eng. Hussein Makhlouf
▪ General Commission for Water Resources	Consultant	Eng. Ghassan Rostom
Ministry of Petroleum and Mineral Resources	Chairman of Homs Refinery and Technical Consultant to the Minister	Dr. Eng. M. Riad Zarka
Ministry of Transport	Director of Studies, Research and Environmental Affairs	Dr. Mahmoud Al-Haffar
General Organisation for Remote Sensing (GORS)	Director General	Dr. Osama Ammar
2. EC Delegation Damascus		
Economic Cooperation Section	Head Programme Officer	Angel Gutierrez Hidalgo Jean-Marie Frentz
3. Donor Community		
DED (German Development Service)	Coordinator for the Water Sector	Peer Gatter

FAO (UN Food and Agriculture Organisation)	Representative Damascus	Abdulla Tahir Bin Yehia
	Assistant Representative	Dr. Salim Zahoueh
GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH	Desk Officer Syria	Martina Craemer
	Country Director Syria & Lebanon	Dr Magdy Menshawy
	Programme Manager Water Sector	Jochen Rudolph
	Ass. Project Manager Project Manager	Bashar Shakra Ahmad Alkasir
Italian Cooperation	Cooperation Office, Italian Embassay Damascus	Paul Gasparini
JICA (Japan International Cooperation Agency	Assistant Resident Representative	Hibino Takashi Mrs. Murakami Mayumi Itagaki Masaki
KfW (Kreditanstalt für Wiederaufbau)	Director Damascus Office	Ulrike Lassmann
	Middle East Department	Sebastian Jacobi
	Water Sector Policy Division (Division Chief)	Dr. Jürgen Welschof
	Water and Sanitation Division (Senior Technical Adviser)	Alexander Grieb
UNDP (United Nations Development Programme)	Environment and Energy Programme, Programme Manager	Mrs Abeer Zeno
	UNFCCC Project (National Project Director)	Dr Yousef Meslmani
	Small Grants Programme, National Programme Coordinator	Firas Shuman

4. Non-governmental Organisation

Ornithological Society of the Middle East (OSME)	Experts for Syria	David Murdoch*
		Gianlucca Serra*
Syrian Environmental Association	Chairman of the Board	Eng. Samir Safadi
	Vice President	Dr. Bassima Mdoar
Coordination Committee of Volunteer Organizations (COSV)	Project Coordinator	Frederico de Nardo
Syrian Coast Society for Environmental Protection	President	Dr. Souhair Al-Rayes

4. List of documentation consulted

See also Annex A.2 for a list of government documents (policy documents, action plans, etc.) use for the preparation of the CEP.

Attar, W. (2005): National Report on Hunting. Country: Syrian Arab Republic. Report of a project funded by the European Union (Project Ref: LIFE 04 TCY/INT/000054). – BirdLife, AAO, SPNL.

AQUASTAT (2008): FAO's Information System on Water and Agriculture. Syrian Arab Republic. www.fao.org/nr/water/aquastat/countries/syria/index.stm [downloaded 29 January, 2009]

Baumgart, W., M. Kasparek, B. Stephan (1995): Die Vögel Syriens. Eine Übersicht. – Heidelberg, 124 pp.

Biological Diversity: National Report. Biodiversity Strategy and Action Plan and Report to the Conference of the Parties (NBSAP). 1999.

BMZ (2008): Grundlagen, Schwerpunkte und Perspektiven der deutschen Entwicklungspolitik mit der Region Nahost / Nordafrika. – BMZ (German Ministry for Economic Cooperation and Development).

Chahoud, J. (2003): Syria's renewable energy master plan: a message from the government. – Proceedings of the International Seminar on Nuclear War and Planetary Emergencies 30th Session (Erice, Italy).

Climate Change and the Mediterranean Region. – http://archive.greenpeace.org/climate/ science/ reports/fulldesert.html.

Earth Trends: Coastal and Marine Ecosystems. Syrian Arab Republic. – http://earthtrends.wri.org/pdf_library/country_profiles/coa_cou_760.pdf.

Environmental and Scientific Research Centre (ESRC) and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH: Country Study on Green House [Gases] Emissions in Syria. – February 2000.

European Neighbourhood and Partnership Instrument (ENPI). Regional Strategy Paper (2007-2013) and Regional Indicative Programme (2007-2010) for the Euro-Mediterranean Partnership. – EUROMED.

European Neighbourhood and Partnership Instrument (ENPI): Syrian Arab Republic Strategy Paper 2007-2013 & National Indicative Programme 2007-2010.

European Neighbourhood and Partnership Instrument (ENPI): Syrian Arab Republic. Revised National Indicative Programme 2008-2010.

European Investment Bank (EIB) (2008): Horizon 2020 - Elaboration of a Mediterranean Hot Spot Investment Programme (MeHSIP). – Final Report for Contract REG/2006/02, FWC Beneficiaries. EuropeAid/119860/C/SV/multi, Lot No 2: Transport and Infrastructures.

European Water Initiative (2007): Mediterranean Water Scarcity and Drought Report. Technical report on water scarcity and drought management in the Mediterranean and the Water Framework Directive. - Produced by the Mediterranean Water Scarcity & Drought Working Group (MED WS & D WG). www.emwis.net/topics/WaterScarcity

Evans, M. I. (1994): Important Bird Areas in the Middle East. – BirdLife Conservation Series No. 2.– Cambridge.

Fernandes, E. (2008): Informal settlements in Syria: a general framework for understanding and confronting the phenomenon. – www.mam-sy.org/userfiles/file/AP9/Informal%20settlements%20in%20Syria.pdf.

FAO (2004): Forestry country profiles. Syrian Arab Republic. – www.fao.org/forestry/18316/en/syr.

GTZ (2007): Strategie der Abteilung 3130 Mittelmeer und Mittlerer Osten zur Umsetzung der Entwicklungszusammenarbeit im gemeinnützigen Bereich (GnB) 2008 bis 2011. – GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH).

Hamzeh, A. (2004): Overview of the Syrian energy profile. – Beirut Regional Collaboration Workshop on Energy Efficiency and Renewable Energy Technology. Beirut, Lebanon. April 30, 2004.

IUCN (2006): Biodiversity in European Development Cooperation. Supporting the sustainable development of partner countries. – International Union for the Conservation of Nature.

IFAD (2001): Country Programme Evaluation. International Fund for Agricultural Development, Rome.

IFFN (2004): The Forest Fire Emergency in Syria in October 2004. – International Forest Fire News (IFFN) No. 31 (July – December 2004, 19).

Kasparek, M. (1995): Nesting of marine turtles on the coast of Syria. – Zoology in the Middle East 11: 51-62.

Murdoch, D. A. & K. F. Betton (2008): A checklist of the birds of Syria. – Sandgrouse, Supplement 2: 1-48.

Palerm, J., J.-P. Ledant, P. Brinn (2007): Environmental Integration in EC Development Co-operation Programming, Experiences in the Use of Country Environmental Profiles. – Training and manual (methodological support) for environmental integration in development co-operation. European Commission.

Plan Bleu (2008): Climate Change and Energy in the Mediterranean. – Regional Activity Center with EIB and Euromed.

Rees, A.F., M. Jony, D. Margaritoulis, B. J. Godley (2008): Satellite tracking of a Green Turtle, *Chelonia mydas*, from Syria further highlights importance of North Africa for Mediterranean turtles. – Zoology in the Middle East 45: 49-54.

Salman, M. (2004): Institutional reform for irrigation and drainage in Syria: diagnosis of key elements. ftp://ftp.fao.org/agl/iptrid/conf_syria_04.pdf.

Scott, D. A. (1995): A Directory of Middle East Wetlands. – Wetlands International.

Serra, G. (2008): Preliminary Report on Natural Heritage Sites in Western Syria. / Preliminary Report on Natural Heritage Sites in Western Syria. - Municipality Administration Modernization Project MED/2004/6264: EUROPE AID/119822/SV/SY.

Simmons, E. (2005): Municipal Administration Modernisation Project in Syria: Action Plan 14. Solid Waste Management. – Inception Report.

UNDP Local Government Country Profile: www.pogar.org/countries/theme.asp?th=6&cid=19 [downloaded on 24.02.2009].

UNEP (2009): GEO-3: Global Environmental Outlook. – www.unep.org/geo/geo3/english/209.htm.

United Nations (2000): Common Country Assessment. Syrian Arab Republic. – December 2000.

United Nations Development Assistance Framework (UNDAF) 2007-2011. Syrian Arab Republic. – Damascus. http://planipolis.iiep.unesco.org/upload/Syrian%20AR/Syria%20UNDAF.pdf.

World Bank (2005): Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem. A GEF/World Bank/UNEP-led initiative to address transboundary pollution and catalyze investments in the basin.

World Bank/METAP (2004): Syrian Arab Republic. Cost Assessment of Environmental Degradation. – Final Report.

WWF, BirdLife & FERN (2007): Environmental tools in EC development cooperation. Transparency and public availability of documentation. A review. – World Wide Fund for Nature.

5. *Curricula vitae* of the consultants

Name	**Dr Max Kasparek**
Place and Year of Birth	Germany, 1956
Civil Status	Married (2 children)
Present Employer:	Freelance Consultant for Natural Resource Management

Key qualifications

- Development of strategies, programmes and policies in the field of environment;
- Project development, project management, project co-ordination and back-stopping;
- Project screening; monitoring & evaluation, complex portfolio evaluations;
- International environmental Conventions, in particular UNFCCC (Convention on Climate Change), CBD (Biodiversity Convention), UNCCD (Desertification).
- Regional focus on the Middle East (Turkey, Lebanon, Syria, Yemen, etc.) and Central Asia.

Education

1984 - 1986	Darmstadt University, Doctorate in Natural Sciences (Dr. rer. nat.)
1981 - 1982	Middle East Technical University Ankara: Internship & preparation of diploma thesis
1978 - 1984	Heidelberg University: Diploma in Biology ("Dipl.-Biol."/M.Sc. equivalent)

Examples of recent assignments

- Peer review of project proposals submitted to the Global Environment Facility (GEF) in the fields of land degradation and cross-sectoral environmental themes (for UNDP-GEF, since 10/2006).
- Long-term support to the management of the German Biodiversity Programme (for the Biodiversity Programme implemented by GTZ, since 1/1995).
- Turkey: Preparation of a project on sustainable use of biodiversity project in the field of forest management (for UNDP Country Office Turkey, 5-12/2008).
- Development of a Regional Strategy for German Development Aid in Armenia, Azerbaijan and Georgia in the Field of Natural Resource Management (for GTZ with BMZ and KfW, 1-4/2008).
- Syria: Capacity assessment in the field of environment (for UNDP Syria with ELARD, 3/2007-1/21008).
- Outcome Evaluation of UNDP's Energy & Environment Portfolio in Lebanon (for UNDP Lebanon Country Office, 12/2007-1/2008).
- Syria and Lebanon: Case study for the implementation of the Convention to Combat Desertification (UNCCD) and Germany's support to ACSAD (Germany Ministry for Economic Cooperation and Development, 2-6/2007).
- Land Management in Syria: Development of a GEF (Global Environment Facility) proposal in the field of land degradation in eastern Syria (for UNDP & UNOPS, 6-9/2005).
- Portfolio Review of World Bank Operations on Sustainable Land Management (SLM) in Africa (for World Bank, 4/2004-6/2005).
- Environmental Action Plan Lebanon. Preparation of the Chapter on Natural Heritage (for EU through GTZ-IS, 3/2004-12/2005).

Main clients

BMZ (German Ministry for Economic Cooperation and Development), GTZ, GTZ International Services, World Bank, UNDP, UNDP-GEF, EC (DG Ib, DG Environment, Twinning, LIFE), Council of Europe, GEF (for UNDP and World Bank), German Agency for Nature Conservation (Bundesamt für Naturschutz), World Wide Fund for Nature (WWF).

Country work experience (selection)

Europe: Balkan countries, Bulgaria, Turkey. – *Middle East and North Africa:* Lebanon, Syria, Yemen, Egypt, Morocco. – *Central Asia*: Kyrgystan, Kazakhstan. – *Asia*: India. – *Africa*: Eritrea, Ethiopia, Mozambique, Namibia.

Language skills

German: native; English: very good; Turkish: good; Azeri: basic.

Name	**Dr Marwan Dimashki**
Place and Year of Birth	Damascus 08/01/1958
Civil Status	Married (4 children)
Present Employer:	Environmental Consultant Lecturer at the Arab International University and Damascus University

Key qualifications

- Air & water pollution monitoring, control & treatment.
- Management and co-ordination of environmental projects.
- Environmental impact assessment and environmental reviewing processes.
- Environmental education & training.
- International environmental Conventions, in particular UNFCCC (Convention on Climate Change), Stockholm Convention, Basel & Rotterdam Conventions.
- Regional experience (Syria, Lebanon, Kuwait and Jordan).
- Team-leader for the development of the first national study for estimating the "National Emission Inventories of Green House Gases".
- Member of the national team of experts for the preparation of the national report on the State of Environment and Environmental Indicators in Syria.
- Member of the national team of experts for the Establishment of POPs national inventories.
- Member of the scientific committee for the preparation of the National Chemical Safety Profile.
- Member of the national team of experts for the establishment of the Syrian Hazardous Substances Information Management System (Sy-HSIMS).
- Member of the experts working group for the development of the Syrian National Environmental Strategy and the National Environmental Action Plan.
- Member of the experts working group at the Ministry of Environment for the preparation of the "Syrian National Report on Sustainable Development".
- Member of the national panel of experts for investigating the possible environmental effects of the 1991-Kuwait oil wells fires on the Syrian environment.
- Member of the National Experts for the Development of the "National Environmental Impact Assessment Act & Guidelines".
- Member of the national experts for the development of the National Environmental Law (No. 40) and its Executive Orders.

Education

1993-1998	University of Birmingham, School of Chemistry, Birmingham, United Kingdom (Ph.D. in Chemistry -Environmental Health)
1984-1985	Leeds University, Department of Fuel and Energy, Leeds, United Kingdom (MSc. in Environnemental Pollution Control)
1976-1980	Damascus University, Faculty of Science, Chemistry Department, Syria (BSc in Applied Chemistry)

Examples of recent assignments

- National Project Director – 2005-2008 (UNDP-Syria) "*Integrated Management of Olive Oil Production Wastes in Lebanon, Syria, and Jordan*". A regional project implemented by UNDP Offices and the Environment Ministries in Syria, Lebanon, and Jordan.
- National project Director 2008-2009 (UNEP/MAP): Preparation of the Pollutants Release and Transfer Register (PRTR) for Syria.
- Lecturer at the Arab International University (AIU), 2007-2009 Lecturing "Ecology Course".
- Lecturer at Damascus University/Faculty of Science, 2004-2009, Lecturing two modules at the postgraduate MSc Course "Environmental Management and Safety of Industrial Systems".
- Participating in the preparation of "Syrian Arab Republic Cost Assessment of Environmental Degradation" World Bank/METAP, February 9, 2004.

Language skills

Arabic: native; English: very good; French: basic.

6. Terms of Reference for the Country Environmental Profile

1. Background

Syria suffers from a number of environmental problems, aggravated by increased economic production and high rates of rural-urban migration: soil degradation, contamination and over-exploitation of water resources, air, water and soil pollution, inappropriate waste disposal and natural resource depletion are among the main problems. The social cost on the environment, as well as on health and standard of living is substantial.

The Syrian authorities have become increasingly concerned about environmental issues and have signed a number of international agreements, such as those on climate change, conservation of biodiversity and desertification. This has, however, not yet translated into a comprehensive environmental legislation and environmental planning and management institutions and regulations remain inadequate.

On the other side, environmental issues rank high in the framework of co-operation with the EU and support in environmental policy is considered as one of the priorities of support to economic modernisation.

The Country Strategy Paper 2007-2013 for Syria envisages support for investment projects in the field of environment and sustainable energy, through grant contributions aimed at leveraging investments by international financing institutions. A budget of €10 million is earmarked in 2010 to support and accompany loan operations promoted by financing institutions in accordance with the priorities of the Syrian government. In this context, due account will be taken of the list of priority projects identified under the Horizon 2020 initiative as well as work undertaken under the LIFE programme in Syria.

2. Objective

The main objective of the Country Environmental Profile is to identify and assess environmental issues to be considered during the review of the Country Strategy Paper, which will directly or indirectly influence EC co-operation activities. The Country Environmental Profile will provide decision-makers in the partner country and in the European Commission with clear information on the key environmental challenges (including those resulting from climate change), the current policy, legislative and institutional framework and the strategies and programmes (including those of the EC and other donors) designed to address them. This information will ensure that the EC co-operation strategies systematically integrate environmental considerations into the selection of focal sectors and co-operation objectives/strategies, and also establish the necessary environment safeguards for all co-operation activities undertaken in the country. The Profile will describe the key linkages between the environment, climate change and poverty reduction. It will constitute an important source of baseline information and contribute to focusing political dialogue and co-operation with the country on key areas of concern including sustainable development as well as raising awareness among policy-makers.

3. Results

The profile will deliver the following results:

- an assessment of the state of the environment and key environmental factors and trends, including those related to climate change, influencing the country's sustainable development and stability;
- an assessment of the main links between the environment and human development in its multiple dimensions (income, consumption, health, security, vulnerability, …);
- an assessment of national environmental policy and legislation, institutional structures and capacity, and the involvement of civil society in environmental issues;
- an assessment of available analysis on the impact of climate change on different sectors and the strategies and processes in place or under development to respond to them;
- an assessment of the integration of environmental concerns in development policy and sectors with key linkages with environmental issues;

- an overview of past and ongoing international (including EC) co-operation in environment as an area for cooperation and environmental integration;
- recommendations and, as far as possible, guidelines or criteria for mainstreaming environmental concerns including those concerning adaptation to climate change in co-operation areas. These recommendations should support the preparation of the Country Strategy Paper/National Indicative Programme and include guidelines or criteria to be used for environmental mainstreaming in subsequent phases of the cycle of operations.
- A pre-identification study will be carried that will identify the priorities of future EC cooperation in the area of environment and identify possible future projects for which the €10 Million earmarked for 2010 could be used, together with possible partnerships.

4. Issues to be assessed

The following issues should be assessed using existing sources of information and key stakeholder perspectives. It is not expected that the preparation of the profile will involve the collection of original environmental data.

4.1. State of the environment, trends and pressures

This chapter should identify the **state** and **trends** of key environmental resources or components in the country, including (as relevant), but not necessarily limited to:

Themes	Aspects
Land	Soil erosion and degradation
	Desertification
	Land use, arable land, losses due to urbanisation or infrastructure building
Water	Water regime
	Ground water
	Water quality
Air quality	Urban air quality
	Indoor air quality
Forest, vegetation, ecosystems	Forest cover and volume
	Pastureland
	State of particular ecosystems (e.g. savannahs, mangroves, coral reefs)
Biodiversity, wildlife	Local status of globally threatened species/habitats
	Alien invasive species
	Fish stocks
	Species with special value
Mineral resources and geology	Mineral resources
	Geological risks (seismic, volcanic and related risks)
Landscape	Aesthetic and cultural value of landscape
Living conditions in human settlements	Air and water quality
	Sanitation
	Slums
	Health
	Vulnerability to disasters

Pressures on the environment explaining the main negative trends should be identified, as well as pressures contributing to global environmental problems, using the following table as a guiding checklist.

Environmental pressure	Possible aspects to consider
Mining, extraction of hydrocarbons	Extraction, treatment and transport of minerals and hydrocarbons, and the resulting pollution and waste
Water use and management	Water extraction (surface- and ground-water)
	Waste water discharges, water treatment

	Water use
Land use and management	Land use planning including strategic environmental implications
Forest exploitation, hunting, fisheries, biodiversity	Forest extraction
	Forest and fisheries management practices
	Hunting and fishing activities, poaching
	Use of NTFP (non-timber forest products)
	Fires
	Introduction of alien species
Livestock	Overgrazing
	Rangeland management, use of fire, water management
	Livestock waste and pollution management
Agriculture	Extension of agricultural land
	Shifting cultivation
	Intensification
	Irrigation and water use
	Pest control
	Agricultural practices, soil management
	Agricultural waste and pollution management
Energy production and use	Sources of energy
	Extraction- and production-related waste and emissions
	Energy consumption
	Energy efficiency
Urbanisation, infrastructure and industry	Urban growth and sprawl, urban planning
	Dams, roads, major infrastructure, polluting industries, tourism
Transport	Transport of goods
	Transport of people
Waste disposal and management	Waste production
	Waste management
	Public behaviour and practices, existing systems
	Hazardous waste management

As far as possible the **driving forces** influencing these pressures should be identified, such as economic incentives, demographic pressure, access rights to natural resources and land tenure systems.

Environmental trends should be assessed with regard to their social and economic impact, including:

- decline in economic production or productivity (e.g. agriculture, forestry, fisheries);
- threats to human health;
- human exposure to environmental disasters (e.g. floods, drought);
- conflicts and security;
- impact on poverty, differentiated impact on women and men, impact on vulnerable groups (including children and indigenous peoples);
- sustainability of resource use;
- cultural values.

The concluding paragraphs of this section should summarise the main problems identified, described in terms of situations or trends that are undesirable due to their current socioeconomic consequences (e.g. falling productivity, health problems, natural risks, social crises, conflicts), their future consequences (e.g. decline in natural resources, cumulative pollution) or their contribution to global environmental problems. The main links between the environment and human development (in its multiple dimensions: income, consumption, health, security, vulnerability, …) should be highlighted, possibly in the form of a matrix or "problem tree".

As appropriate, the consultant should refer to environmental indicators that could be used for monitoring changes in the studied country. To the extent that data are available, trends in MDG 7[31] indicators should be provided; trends in additional indicators related to country-specific environmental issues can also be provided, as available, to highlight those that are significant.

If appropriate, the information could be organised according to eco-geographical subdivisions with the scale (regional, national, local) of the issues indicated.

4.2. Environmental policy, legislation and institutions

A brief description and review should be provided of the strengths and weaknesses of the following aspects, with their associated evaluation criteria given for guidance:

Aspect	Evaluation criteria
Policies[32]	Existence of national policies, strategies and action plans for the environment, including possible National Strategy for Sustainable Development (NSSD) and National Environmental Action Plans (NEAP). Policy response to global issues, sustainability issues (depletion of natural resources), and specific environmental issues identified above. Consistency between policies. Policies on gender and environment. Important measures taken by the government to solve environmental concerns. Effectiveness in achieving targets.
Regulatory framework, including Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) legislation	Ratification status and implementation of Multilateral Environmental Agreements (MEAs) such as those concerning climate change, biodiversity and desertification (with reference to any official plans, programmes, communications or reports issued in the context of these conventions). Adequacy of (current and in preparation) environmental legislation (including land tenure and land reform, access rights to natural resources, management of natural resources, requirements for environmental assessment such as for EIA and SEA, pollution control, development control). Provision and procedures for public participation in environmental issues. Effectiveness of legislation enforcement. Use of other (non legislative) instruments, e.g. "green budgeting" (or Environmental Fiscal Reform) and market-based mechanisms, voluntary schemes (environmental management systems, environmental labelling, industry-government agreements). Potential impact of non-environmental legislation.
Institutions with environmental responsibilities	Identity, number and quality of institutions (involved in policy making, legislation, planning, environmental protection, monitoring and enforcement). Level of co-ordination and decentralisation. Strength and capacity of individual institutions. Influence on other institutions. Good governance practices. Capabilities, means, functioning of environmental services. Major NGOs, institutes or other organisations involved in environmental management or policy.
Public participation	Transparency and access to environmental information. Role of NGOs and civil society in environmental decision-making. Effective participation. Participation by women and traditionally less represented groups. Access to justice in environmental matters.
Environmental services and infrastructures	Protected areas: number, areas, relevance, and effectiveness. Sanitation and waste treatment infrastructure. Disaster risk reduction systems.

[31] See http://www.undp.org/mdg/

[32] Note that climate change policies and strategies may be described here but are also covered in more detail in section 4.4.

	Emergency response mechanisms.
Environmental monitoring system	Relevance of selected indicators (with reference to MDG7). Measurement of the indicators: periodicity, liability. Integration in the general development indicators.

The analysis should identify both the potential institutional/policy/regulatory causes of environmental pressures and the **response** by the government to solve the environmental problems.

4.3. Integration of environmental concerns into the main policies and sectors

The assessment should examine the integration of environmental concerns in the overall development policy and in sectors/areas that have key linkages with environmental issues and which might be identified for EC support, taking into account the focal areas of the current CSP as well as and any pre-identified options for future cooperation. This section should examine whether there is a Strategic Environmental Assessment (or similar assessment) for the national development strategy or the Poverty Reduction Strategy and for the sectors of interest. If such an SEA exists, it should be briefly described including the main recommendations. The main legislation and institutional arrangements and measures of the sector which address environmental issues, especially those identified in section 4.1, should be examined.

4.4. Implications of climate change

The CEP report should include an overall estimation of both vulnerability and capacity to respond to the consequences of increasing climate variability and change, based on readily available sources of information. The analysis should review existing information on efforts to address climate change issues; these are likely to include Communications under the United Nations Framework Convention on Climate Change (UNFCCC) and for the least developed countries (LDCs) National Adaptation Programmes of Action (NAPAs). Other national or sub-regional studies on the expected effects of climate change should be reviewed including proposed responses. These responses may include technical, policy and institutional components.

In this section of the report, particular emphasis should be placed on assessing the overall implications for focal areas of cooperation; any safeguards or need for additional analyses to ensure that investments are adapted to predicted climate change effects should be identified.

4.5. EC co-operation with the country from an environmental perspective

This section should briefly review the past and current experience with development co-operation interventions related to environmental and natural resource management, as well as the steps taken to integrate the environment into other co-operation areas (e.g. SEA or EIA studies conducted in the context of EC-funded programmes/projects). Where information is available the environmental impacts or potential risks of past or ongoing co-operation should be identified for the benefit of future programmes. The results of existing evaluations/reviews should be summarised.

4.6. Co-operation funded by other donors from an environmental perspective

This section should review the past and current involvement of other donors (in particular EU Member States, but other significant donors should also be included) and their experience in the country, and include a list of recent and planned projects/programmes with an environmental and/or climate change focus or anticipated impact. Co-ordination mechanisms between donors and the EC with respect to the environment should be assessed.

5. Conclusions and recommendations

The key aspects of the state and trends of the environment in the country, including policy, regulatory and institutional constraints and challenges, should be identified as clearly as possible. These may be presented in a matrix, comparing environmental concerns and the main sectors or policies.

Based on a comprehensive assessment of available information and on consultations with stakeholders, conclusions and recommendations should be formulated on how the Commission and the partner government can best address identified environmental challenges (including those related to climate change) in the Country Strategy Paper, taking into account current cooperation and any pre-identified options for future cooperation. Conclusions and recommendations should feed into the country analysis, response strategy and possibly the identification of focal cooperation sectors[33]. They should address (but not necessarily be limited to) the following aspects:

1) Rationale for considering the environment as an area for co-operation, and/or (more frequently) the need to consider safeguards and complementary actions in other areas of cooperation, in order to address environmental constraints and opportunities as appropriate. Safeguards may include, for example, proposals for institutional strengthening and capacity building (including the enhancement of the regulatory framework and enforcement capacities) or recommendations for undertaking Strategic Environmental Assessments, particularly in relation to environmentally sensitive sector programmes and GBS programmes.

2) Recommendations to ensure that environmentally sensitive projects and programmes are adapted to increasing climate variability and predicted climate change effects, and can thus deliver sustained developmental benefits. Information gaps preventing this work from being accomplished should be identified.

3) Opportunities for co-ordination on environmental issues with other donors, seeking to achieve complementarities and synergies in order to more effectively deliver development objectives.

(4) Proposals for environmentally-relevant indicators to be used in the NIP (National Indicative Programme) or to be considered during the formulation of a GBS programme or SPSP (if relevant). The proposed indicators should be chosen taking account of the availability of data and actual capacity to monitor their evolution. The report should mention whether the proposed indicators are included in the performance assessment framework of national (e.g. PRSP) or sectoral strategies/programmes.

Individual recommendations should be clearly articulated and linked to the problems to be solved and grouped according to the sector concerned or institutional stakeholder. The relative priority of the recommendations and an indication of the challenges to their implementation should be given.

Any constraints to preparing the profile resulting from limited information should be described.

6. Work plan

The work plan should include but not necessarily be limited to the following activities:

- Consultations with EC country desk officers and other relevant officials, EC Delegation, the national environmental authority and a selection of national and local authorities, key international donors, plus key national and international civil society actors operating in the environmental field.
- Review of key documents and reports, including the 10th Five-Year Plan and the Strategy and National Environmental Action Plan for Syria (2003); the current EC Country Strategy Papers; evaluation reports, existing SEAs (particularly those concerning potential focal sectors), EIAs of EC-funded projects; environmental literature, environmental policy, environmental legislation and regulations, information on monitoring and environmental performance indicators.
- Field visits to sites of key environmental concern and (if possible) the organisation of a national workshop that national authorities, donors, experts and representatives of civil society should be invited to participate with the aim of clarifying and validating key environmental concerns.

[33] Taking into account that other factors intervene in the choice of cooperation sectors, including past co-operation areas and the "division of labour" between development partners in the context of the Paris Declaration.

- On the basis of the outline work plan and time schedule given in these Terms of Reference, a detailed work plan should be proposed, not later than five working days after the start of the assignment. The tentative starting date of the assignment would be the 4th of January, followed by the field visit which is to start at the latest 10 days after the start of the assignment.

7. Expertise required

The proposed mission shall be conducted by a team of (two) experts who should have the following profile:

- Expert level I with at least 15 years wide experience in environmental issues, including institutional aspects; international environmental policies and management; environmental assessment techniques and experience in rapidly assessing information and developing recommendations. He/she would be the team leader.
- Expert level II with 10 years experience and with an environment background complementary to the team leader.

In addition:

- Previous working experience in Syria and/or the MEDA region is requested.
- Experience in undertaking environmental analyses and preparation of development programmes would be an asset.
- Familiarity with Commission guidance on programming, country strategies, PCM, policy mix and integration of environmental issues into other policy areas is desirable.
- Experience of participatory planning processes and gender issues would be an advantage.

The experts should have excellent skills in English and knowledge of Arabic would be an asset. The final report must be presented both in English and in Arabic. The pre-identification report would only need to be presented in English.

8. Reporting

The results of the study should be presented in the Country Environmental Profile in the format given in Section 10 of these ToR. The draft profile, in 10 hard copies and electronic version (Microsoft Word), should be presented to the EC Delegation by 15 February at the latest (assuming that the assignment will start on 4 January). Within 5 weeks, comments on the draft report will be received from the EC. The consultants will take account of these comments in preparing the final report (maximum 45 pages excluding appendices). The final report in English and Arabic and 50 copies in each language and the electronic version are to be submitted by 19 April 2009, assuming that the assignment will start on 4 January.

A pre-identification report for possible areas of future EC cooperation in the area of environment will be produced according to the same deadlines. This document will only need to be produced in English and 10 hard copies together with the electronic version submitted by 19 April 2008.

9. Time schedule (*example*)

	Expert I	**Expert II**
Desk analysis (work place of consultant)	*5*	*5*
Field phase including travel and workshop, starting with a briefing at the Delegation	*15*	*15*
Report finalisation	*3*	*3*
Debriefing in Damascus-not later than (*5 April*)	*1*	*0*
Final report end (*19 April*)	*1*	*1*
Total days	*26*	*25*

10. Report format for a Country Environmental Profile

Standard report format for a Country Environmental Profile: Maximum length (excluding appendices): 45 pages. The following text appears on the inside front cover of the report:

This report is financed by the European Commission and is presented by (*name of consultant*) for the European Commission. It does not necessarily reflect the opinion of the European Commission.

1. Summary
The summary should succinctly and clearly present the key issues described in the profile following the order of headings 2 to 6 given below. The summary should not exceed 6 pages.

2. State of the environment, trends and pressures

3. Environmental policy, legislative and institutional framework
3.1. Environmental policy
3.2. Environmental legislation and institutional framework

4. Integration of environmental concerns into the main policies and sectors

5. Climate change implications

6. EU and other donor co-operation with the country from an environmental perspective

7. Conclusions and recommendations

8. Country Strategy Paper environmental annex summary
Comprising the main issues presented in sections 2 to 5 above (excluding section 7) in not more than 4 pages.

9. Technical appendices
I. Environmental maps of the country
II. Reference list of environmental policy documents, statements and action plans, and other relevant technical information.

10. Other appendices
I. Study methodology/work plan (1–2 pages)
II. Consultants' itinerary (1–2 pages)
III. List of persons/organisations consulted with their affiliation and contact details (1–2 pages)
IV. List of documentation consulted (1–2 pages)
V. *Curricula vitae* of the consultants (1 page per person)
VI. Terms of Reference for the Country Environmental Profile.