CHAPTER 1

# INTRODUCTION

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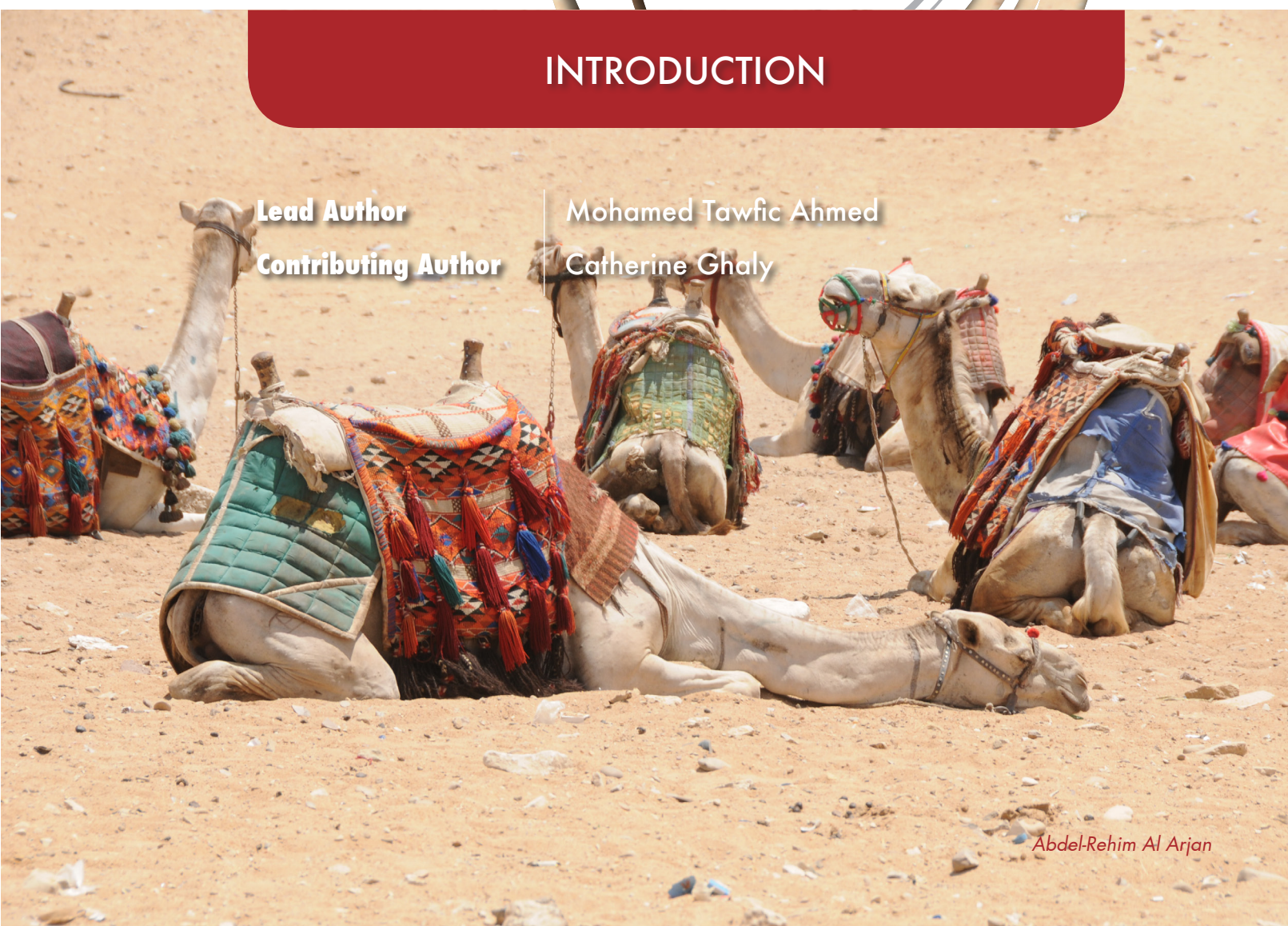

*Abdel-Rehim Al Arjan*

# Main Messages

The Arab region sub-global assessment started in the latter stage of the MA as an associate assessment. Assessments at sub-global scales are essential. Ecosystems are highly differentiated in space and time, thus sound management requires rational local planning and action.

This synthesis report sheds light on the ailing environmental conditions and the root causes of these conditions, as a prelude to prompt corrective plans and actions.

Three sites were selected to be the focal sites for the Arab Millennium Ecosystem Assessment: The Sinai Peninsula, Egypt; Tafilalet Oasis, Morocco; and Asir National Park, Saudi Arabia. The selection of these study areas was based on a number of factors; first and foremost that the areas should embrace a number of unique, biodiversity-rich ecosystems that undergo changes affecting both environmental integrity and the well-being of its inhabitants.

**The report highlights the following key messages:**

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning, regulating, and cultural services which directly affect people, in addition to the supporting services needed to maintain the other services.

Human well-being has multiple dimensions and includes attainment of basic materials for human well-being, good social relations, and freedom of choice, health, and security. Well-being can be perceived differently by different people and cultures, time, situation, and ecological circumstances.

Poor environmental management is related to poverty, environmental degradation, resource scarcity and poor quality of life in the three case study areas.

## 1.1 INTRODUCTION

### Background

Humanity has always relied on the services provided by the biosphere and its ecosystems. Furthermore, the biosphere is itself the product of life on Earth. The composition of the atmosphere and soil, the cycling of elements through air and waterways, and many other ecological assets are all the result of living processes – and all are maintained and replenished by living ecosystems. The human species, while buffered against environmental immediacies by culture and technology, is ultimately fully dependent on the flow of ecosystem services.

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning, regulating, and cultural services which directly affect people, in addition to the supporting services needed to maintain the other services. Changes in these services affect human well-being through impacts on

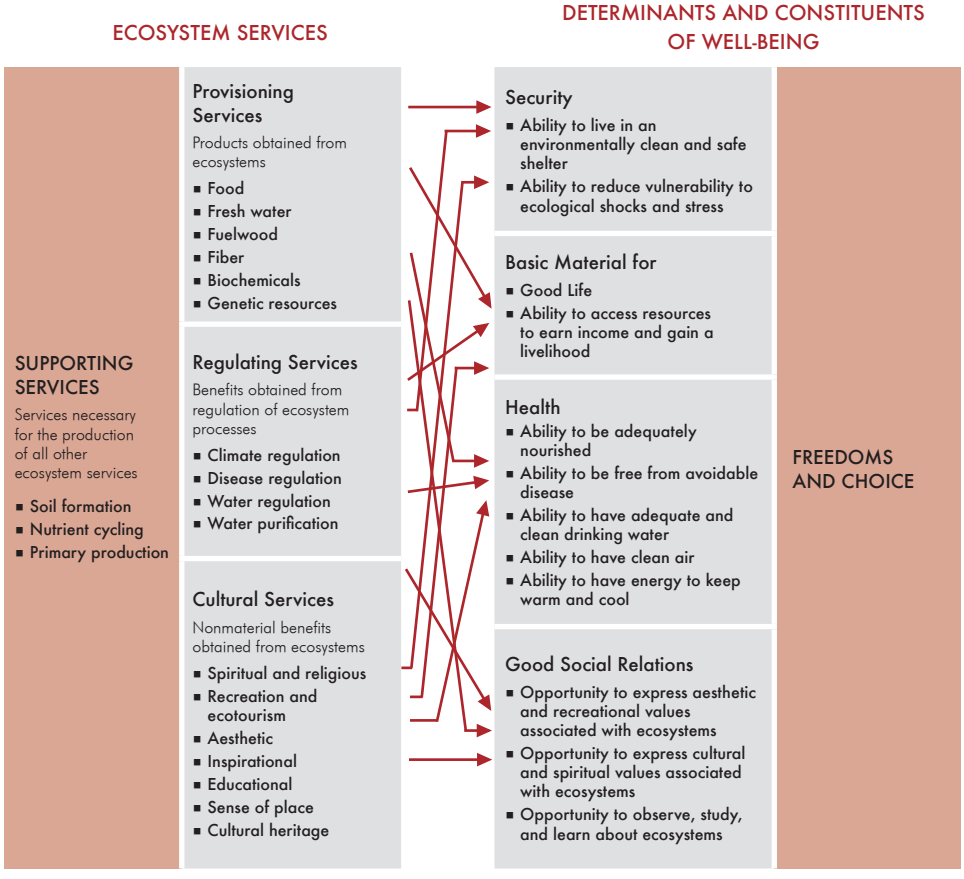


**Figure 1.1 Ecosystem Services, Relationship with Human Well-being**

*Source: UNEP, 2003*

security, the basic material for a good life, health, and social and cultural relations. These constituents of well-being are, in turn, influenced by and have an influence on the freedoms and choices available to people (UNEP 2005).

There are economic social and environmental drivers that hinders the sustainability of communities and ecosystems. The demands for ecosystem services are now so great that trade-offs among services have become the rule. There are many indications that human demands on ecosystems will grow still greater in coming decades. Current estimates of 3 billion more people and a quadrupling of the world economy by 2050 imply a formidable increase in demand for and consumption of biological and physical resources, as well as escalating impacts on ecosystems and the services they provide.

This combination of ever-growing demands being placed on increasingly degraded ecosystems seriously diminishes the prospects for sustainable development. Human well-being is affected not just by gaps between ecosystem service supply and demand but also by the increased vulnerability of individuals, communities, and nations. Productive ecosystems, with their array of services, provide people and communities with resources and options they can use as insurance in the face of natural catastrophes or social upheaval. While well-managed ecosystems reduce risks and vulnerability, poorly managed systems can exacerbate them by increasing risks of flood, drought, crop failure, or disease. With the growth of human population, the demand for ecosystem services is continuously increasing and some of the services are traded-off for others. For example, forest gives way to agriculture while agricultural areas are developed into settlements and other built-up areas. In this process, the capacity of the ecosystem to perform other services such as regulatory and supporting, and even cultural, is significantly reduced. Continued deforestation clearly diminishes the ability of forest ecosystems to store carbon or regulate climate and to an extent, regulate floods.

Human well-being has multiple dimensions and includes attainment of basic materials for good life (although this is subjective), good social relations, freedom of choice, health, and security. Well-being can be perceived differently by different people and cultures, time, situation, and ecological circumstances (UNEP 2003).

## 1.2 MILLENNIUM ECOSYSTEM ASSESSMENT (MA)

The Millennium Ecosystem Assessment is an international initiative launched in 2002 as a response to ailing global environmental conditions. It is designed to meet the needs of decision-makers and the public for scientific information concerning the consequences of ecosystem changes on human well-being or concerning the consequences of changes in ecosystem services on human well-being. It is the main objective of the MA to bring the findings of science to bear on the needs of decision-makers. Leading scientists from over 100 nations have been involved in

the assessment, with oversight by a board comprised of representatives from four international conventions, five United Nations agencies, international scientific organizations, and leaders from the private sector, NGOs, and indigenous groups. The MA is designed to meet some of the needs of the Convention on Biological Diversity, (CBD) Convention to Combat Desertification, (UNCCD) and Wetland Convention (RAMSAR), as well as the needs of other users in the private sector and civil society. It is anticipated that the MA will be repeated every 5-10 years. The MA focuses on ecosystem services and the consequences of changes in the ecosystem on human well-being, as well as on other life on Earth (see Figure 1.2).

The scope of the assessment of changes in ecosystems has been further focused through consultation with MA users. The international conventions have requested specific information, such as an assessment of the impacts of climate change on biodiversity (Convention on Biodiversity). One of the central issues of the MA is human well-being and the interrelationship with the environment, represented by its goods and services and quality of human life.

### Definition of Ecosystem Assessment

An assessment is a critical evaluation of information and knowledge that guides decisions on a complex, public issue. It should also refer to a situation at a specific time in a particular geographical and societal domain. Stakeholders, including decision-makers, play a major role in development of an assessment module, orientation, and outcome.

An ecosystem assessment is usually conducted by a large group of people with different backgrounds and interests. It aims to address a vast portion of the population, with special

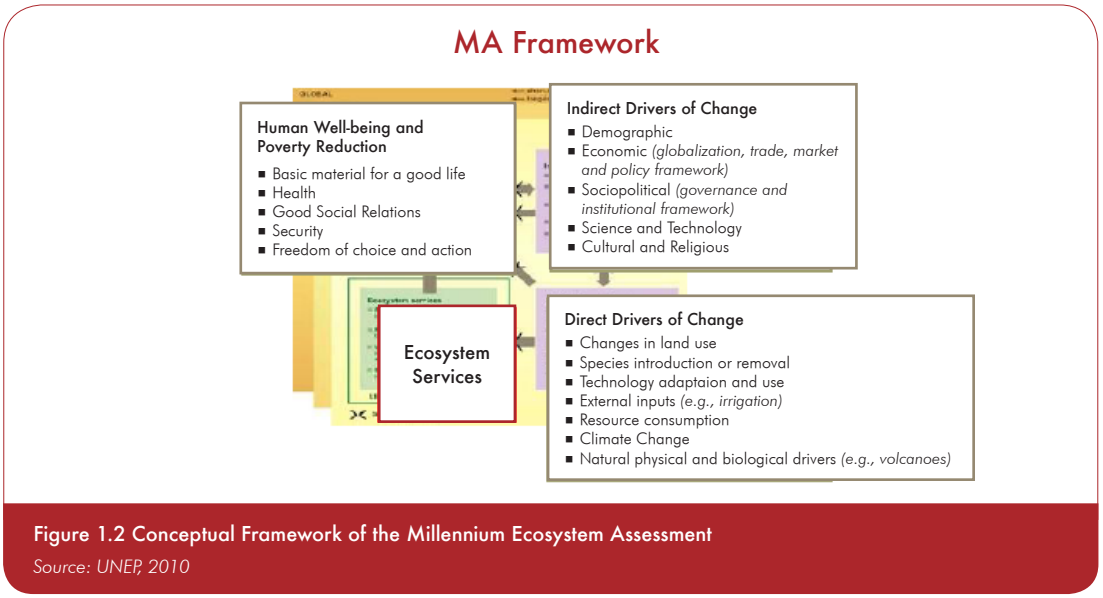


**Figure 1.2 Conceptual Framework of the Millennium Ecosystem Assessment**
*Source: UNEP, 2010*

reference to decision-makers and the like. It should also present scientific endeavours in an explicit manner. Another definition considers assessment as "a social process that uses published peer-reviewed material, and other forms of knowledge/publications to bring the findings of science to bear on the needs of decision-makers" (UNEP and IISD1999).

### 1.2.1 Global and Sub-global Assessments

An ecosystem assessment should relate to a situation at a specific time in a particular geographical and societal domain. Stakeholders play a major role in the development of an assessment module, orientation and outcome. Decision-makers are key stakeholders of any assessment.

Unlike a scientific review, an assessment is policy relevant, usually conducted by a large group of people with different backgrounds and interests. Assessments should be far from complex and able to address people of different cultural and scientific background. The MA is a multi-scale assessment, consisting of interlinked assessments undertaken at local, national, regional and global scales.

Assessments at sub-global scales are needed because ecosystems are highly differentiated in space and time, and because sound management requires careful local planning and action.

Local assessments alone are insufficient, however, because some processes are global and because local goods, services, matter, and energy are often transferred across regions. Sub-global assessments (see Figure 1.3), will directly meet the needs of decision-makers at the scale at which they are undertaken, strengthen the global finding with on-the-ground reality, and strengthen the local findings with global perspectives, data and models.

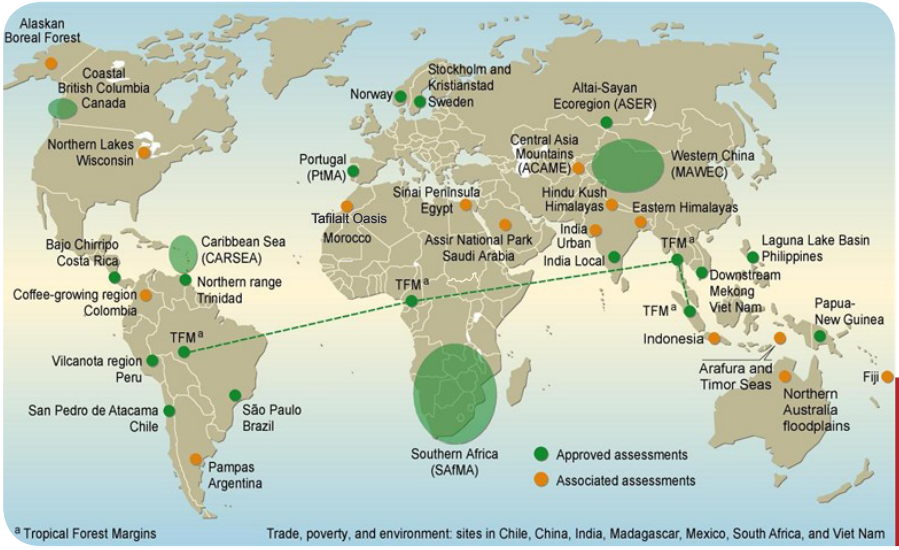


**Figure 1.3 Map of Sub-global Assessments**
*Source: Updated from UNEP, 2005*

### 1.2.2 Arab Millennium Ecosystem Assessment

The Arab region sub-global assessment started in the latter stage of the MA as an associate assessment; as such, it was intended to go beyond the global MA. Three sites were selected to be the focal sites for the Arab Millennium Ecosystem Assessment-Sinai Peninsula in Egypt; Tafilalet oasis in Morocco; and Asir National Park in Saudi Arabia. (Figure 1.4)

The objective of the Arab MA aims to:

- Meet the needs of and communicate the assessment information to decision-makers concerned with the pilot sites at national and local levels, and integrate the findings into regional and global perspectives;
- Build capacity to undertake integrated assessments of ecosystems of key partners;
- Help develop and test methodologies for integrated multi-scale ecosystem assessments and methodologies for integrating local and "scientific" knowledge;
- Promote widespread adoption of integrated assessment approaches in the region;
- Build a framework for the collection, analysis, and synthesis of ecosystem-wide data for decision making at multi-level, including the local community;
- Link and incorporate the outcomes into global assessments;
- Identify networks of actors and organizations playing critical roles in the sustainable management of ecosystems of those sites and to bridge gaps between science, technology, and sustainable development and define the existing resource base devoted to bridging these gaps.

The Arab MA also intended to generate problem-solving knowledge that facilitates action on critical issues of sustainable development and protection of the environment through the design of institutional arrangements that foster the generation, collection, analysis, diffusion, and use of scientific knowledge for the sustainable use of ecosystems.


**Figure 1.4 Locations of Arab MA**
*Source: Adapted from UNEP, 2010*

## Egypt Sub-global Assessment at Sinai Peninsula, El Maghara

Egypt's sub-global assessment is a community-based assessment, conducted in the El Maghara area, North Sinai Peninsula (Figure 1.5). Community-based assessments are necessary components of multi-scale assessments such as the MA. They capture real life experience of changes in ecosystems and human well-being.

Sinai, located between the Nile Valley in Africa and West Asia, is an important heritage site embracing a unique collection of sacred shrines and ecologically valued landmarks, including a number of rare animal and plant species. St. Catherine's monastery, located in Southern Sinai, is one of the oldest Christian establishments. The original chapel is believed to have been established in 330 AD at the place of the Biblical Burning Bush. Other sacred sites include Gebel Mousa (Mount Sinai), where it is believed Moses received the Ten Commandments. Because the Sinai is a land bridge between Asia and Africa, it combines a distinguished faunal and floral wealth. The Sinai has a diverse landscape encompassing wetlands, desert terrain, sand dunes, and mountainous highlands. The unique culture and traditions of the Bedouin, the main inhabitants of the Sinai, are other salient factors in the mosaic diversity of Sinai. Their local knowledge, wisdom, and experience are important historical features of the Sinai that have allowed them to survive the harsh spells Sinai has frequently faced.

The selection of El Maghara as the assessment site was based on a number of factors. The area embraces a number of biodiversity-rich and special ecosystems that undergo changes and transitions that

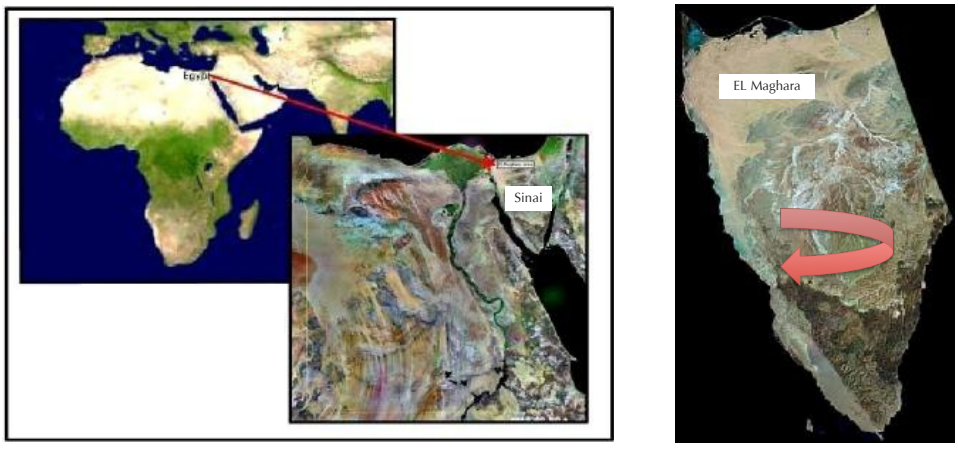


**Figure 1.5 Location Map of El Maghara Area with Reference to the Middle East Region**
*Source: UNEP , 2010*

affect the environmental integrity and the well-being of the inhabitants. El Maghara is considered one of the most important floral centres for medicinal plants in the Middle East. Sixty-one per cent of its flora is considered medicinal (Abd El-Wahab and others 2004, Farnsworth and Soejarto 1991).

In addition, it represents an important area of anthropological value due to the presence of a number of Bedouin tribes that each has unique traditional knowledge. An appreciation of biodiversity and the importance of each and every living organism are deeply rooted in Bedouin culture.

The inhabitants of El Maghara area are among the poorest in Sinai. This hardship has limited the migration of non-Bedouin to the area and has also limited the sweeping urbanization that has sprawled over other parts of Sinai. El Maghara remains as the one area in the whole of Sinai where pristine Bedouin culture and practices prevail.

The remoteness and isolation of the area have also made it very difficult for key decision- makers to understand the magnitude of damage in the area. It also makes it even harder for the people of El Maghara to convey their message to decision-makers. One of the main objectives of the El Maghara assessment was to draw decision-makers' attention to the magnitude of damage in the area, and to provide them with some new leads for better, more rational management of the area's natural stocks.

### Saudi Arabia Sub-global Assessment at Asir National Park

The Kingdom of Saudi Arabia covers an area of more than two million square kilometres. It is located approximately between latitudes 18° and 19° N and longitudes 41° and 42° E, and is characterized by dry, harsh climatic conditions and limited natural resources of water, soil and vegetation.


Asir National Park, Saudi Arabia

The sub-global assessment in Saudi Arabia was conducted at Asir National Park (ANP), located in the Asir Mountains which contain one of the most important ecological hotspots in the Arab region.

ANP is a vast area spread over 45 000 hectares. ANP includes a combination of four ecosystems, namely, mountain ecosystem with juniper forest, terrace agriculture, grazing land, and coastal and marine ecosystems. The Asir mountain area (Figure 1.6), occupies the south part of Sarawat Mountains, which are particularly important for agricultural production in the country.


**Figure 1.6 Map of Saudi Arabia, Showing the Location of Asir Province**

*Source: UNEP, 2010*

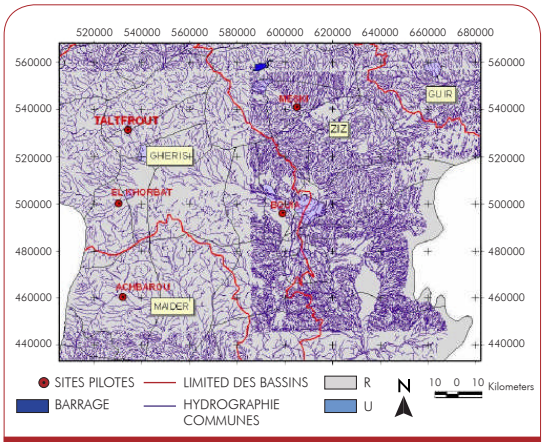


**Figure 1.7 Watersheds of Tafilalet and Hydrographic Network**

*Source: UNEP, 2009*

Most of the forest area covers the Sarawat Mountains, which represent about 1.2 per cent of the area of Saudi Arabia. The complex landscape of the mountainous areas consists of steep slopes, terraced croplands, sloping rangelands, and scattered patches of shrubs and trees.

### Morocco, Sub-global Assessment at Tafilalet Oasis

Tafilalet is part of Errachidia province, located within the region of Meknès-Tafilalet that covers an area of 77 250 km$^2$, roughly 20 per cent of total Moroccan oasis zones. Tafilalet lies in the structural area of the Anti-Atlas and the southern part of the Oriental High Atlas. Its northern part dates back to the Jurassic age, the middle part to the Cretaceous period and its southern part to the Paleozoic and Precambrian ages. Tafilalet covers, among other parts, four watersheds that are, from west to east, Ghéris, Ziz, Guir and Maeder in the south (Figure 1.7). These four watersheds cover a total area of 60 000 sq. km, or 9 per cent of the national territory, accommodating a population of approximately 0.81 million inhabitants, or 2.7 per cent of the national population of Morocco. These four watersheds cover three economic regions (Bouanane-Bouarafa, Sous Massa-Draa and Meknes Tafilalet) and four provinces (Errachidia, Zagora, Ouarzazate and Figuig).

## 1.2.3 Arab Ecosystem Assessments

### Types of Ecosystems

An ecosystem is a dynamic complex of plant, animal and micro-organism communities

and their non-living environment interacting as a functional unit. Humans are an integral part of ecosystems. Ecosystems and their biomes are the products of a huge array of interacting factors, both biotic and abiotic. Ecosystems may also interfere with each other. The three assessments represent different types of ecosystems. While Asir includes a diverse combination of four ecosystems, namely, mountain ecosystem with forest and terrace agriculture, agricultural and grazing land, and coastal and marine ecosystems, El Maghara is a desert hyper-arid ecosystem, while Tafilalet is an oasis, with a predominant cultivated ecosystem.

### Common Features of Ecosystems, Arab Ecosystem Assessments

Despite the spatial differences between the three assessment areas, and the various dominant traits of each, they bear some significant commonalities in a number of issues.

Hot, dry and continental patterns of climate prevail in the three sites, with temperatures soaring up to 40°C in summer. In Asir, the average rainfall ranges from 305 mm/year in Tagir, to 535 mm/year, in Tamnia. El Maghara stands as the driest assessment area with an average rainfall of about 100 mm/year. In Tafilalet, the average annual rainfall is about 250 mm in the North and less than 60 mm in the South.

Water scarcity is a major common feature and a serious concern at the three sites alike, with a wide range of impacts manifested in both economic and social spheres. Groundwater is the basic source of drinking water for the inhabitants. Flash floods are the main resource of water stocks at the three sites, with a number of dams established to store water and to protect surrounding areas from flood hazards. Inhabitants attach great importance on flash floods to irrigate their crops since it requires no investment or special facilities, such as pumping.

Fluctuating rainfall has marked the last few years in the three assessment sites, with prolonged spells of drought, especially in Sinai and Tafilalet, leading to a number of environmental and economic repercussions. Tafilalet has had prolonged drought spells during the last century and the beginning of this century: 1913-1918, 1927-1931, 1933-1939, 1945-1947, 1955-1957, 1973-1976, 1979-1984, 1987-1988, 1993-1995, 1997 (Benmohammadi and others 2000, Kabiri and others 2003). Similarly, El Maghara has had a long spell of drought extending through the last 10 years (UNEP 2010).

Lack of clean water causes a number of diseases that affect the community at all stages of life. Water shortage is one of the main reasons, along with unemployment, for the migration of many young men and families seeking a better income and quality of life in other parts of the country. Hence, water shortage has affected the age structure of the people, leading to a high ratio of elderly Bedouin, in comparison to other ages. Water shortage has also had economic repercussions. Cash flow is very

limited, as grazing and agriculture, the most important activities in the area, have been badly hit by long-lasting droughts.

Resource depletion, ecosystem and vegetative cover degradation are evident in the three assessments. In Asir, the natural vegetal cover is currently at risk in some parts due to the adverse climatic factors and anthropogenic misuse. This risk is posed by unplanned tree removal, intensive unbalanced pasturing, fires, diseases, tree senescence and weak natural regeneration. This, in turn leads to the continuation of deterioration of natural resources such as forest trees soil, water and wildlife unless appropriate actions are taken at various levels.


Drought in Tafilalet, Morocco

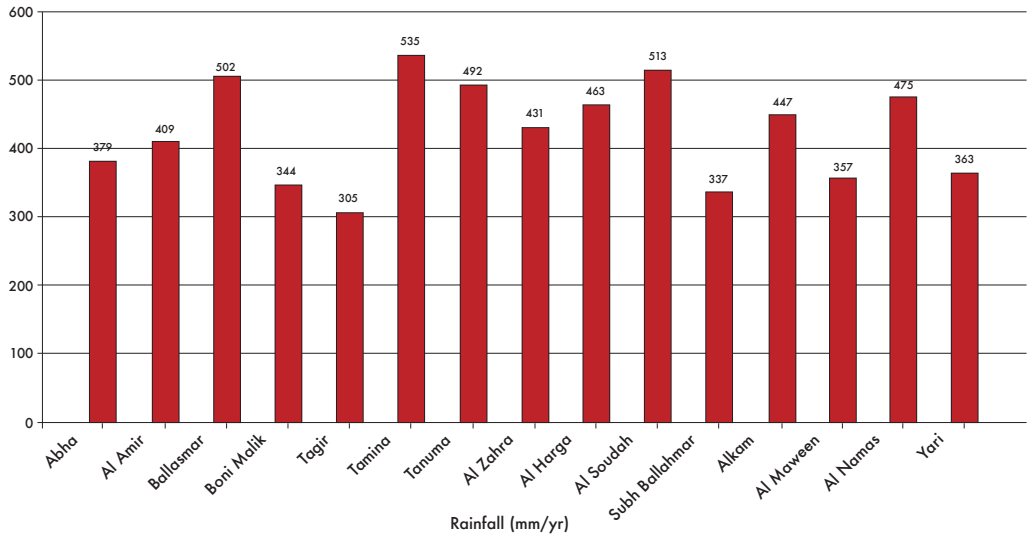


Figure 1.8 Average Rainfall in Various Parts of Saudi Arabia

*Source: UNEP, 2010*

Changes in land-use pattern, unauthorized mining of stones, marble and sand in El Maghara are among the major causes of the degraded environmental condition. A major manifestation is landscape fragmentation, and genetic discontinuity. The destruction of Sheikh Hemid wood, one of the vibrant characteristics of Sinai is a sad example of uncontrolled land-use norms and practices. Similar cases of gross violations of land-use pattern, with subsequent manifestations on environmental assets were also reported in the Asir and Tafilalet assessments.


Impact of Mining on Acacia Trees, El Maghara, Sinai

Desertification, soil erosion, sand encroachment, and other features of ecosystem degradation were reported in the three sites alike. Man-made causes are the main drivers for this degradation. However, natural causes, represented by wind and water erosion and sand encroachment are central factors for the desertification currently witnessed in the three assessment sites.

Overpopulation and urbanization are key factors in the environmental degradation reported in both the Asir and Tafilalet assessments. In Tafilalet, inhabitants tend to abandon Ksours, the old traditional houses for new modern houses inconsistent with the natural surrounding landscape. Traditional construction style, well-known in the oases for ages, is currently threatened as it is being replaced with multi-storied concrete constructions, built to accommodate large numbers of families, rather than only one family as Ksours tend to accommodate.

A change in lifestyle is an emerging social trait in all three assessments with some apparent repercussions. Changing patterns of consumption and production, heavy demand on natural resources, and decline of local knowledge and traditional practices are some of the common manifestations of changes in lifestyle.

Poverty and unemployment are common factors in both Tafilalet and El Maghara, and are considered behind much of the degradation inflicted on the environment. The relationship between poverty and the environment, and between poor people and natural resources, is complex and has been the subject of extensive debate.

Poor people are often impoverished by an austere resource base, and thus forced by their circumstances to degrade the environment even

further (World Commission on Environment and Development 1987, Durning 1989, Cleaver and Schreiber 1994, Ekbom and Bojo 1999). Poverty reduction is becoming a global issue. Generally, demand on natural resources exceeds its biocapacity in some parts of the Region increasing its ecological deficit (see chapter 4). The Millennium Development Goal (MDG) objective of halving the number of poor people by 2015 is one of the major driving forces in this field.

In Tafilalet, the unemployment rate is quite significant and women are the most vulnerable and disadvantaged. Lack of income for these populations is one of the main causes of damages affecting the environment, particularly the overuse of agricultural lands.


**Sand Encroachment in Tafilalet, Morocco**
*Source: UNEP, 2009*


**Impact of Housing and Road Construction on Terrace Agriculture System, Asir, Saudi Arabia**

### Socio-economic Background

Communities are the vibrant units that make up the mosaic component of societies. Community construct is a composite in which ethnicity, culture, and history along with other attributes mingle together to provide the ultimate texture of the community. A good degree of resemblance seems to shape the community fabric of the three assessments involved in the present study. Being tribal and with some nomadic nature, has had an apparent impact on the socio-economic identity of the communities involved. Local knowledge, a valuable asset in the three assessments, is inherently used in coping with resource depletion, and managing and harnessing environmental externalities, such as water scarcity. Local plants in the vicinity are used to augment food supplies, and compensate for poverty, as is the case in both El Maghara and Tafilalet. The three reports provide abundant examples of how local knowledge has built a valuable body of information that reflects on people welfare and ability to combat prevailing environmental hardship. Water scarcity is a central subject that local knowledge has tackled, especially in El Maghara and Tafilalet.

**Table 1.1 Major Drivers of Ecosystem Change, Tafilalet, Morocco**

| Change Driving Forces | Direct Impact | Indirect Impact |
|---|---|---|
| Inadequate Governance | | x |
| Agricultural Expansion and Intensification | x | |
| Ignorance / Illiteracy | | x |
| Poverty | | x |
| Population Growth | | x |
| Excessive Livestook | x | |
| Market Forces | | x |
| Changes in the Way of Living | | x |
| Exclusion and Marginalization | | x |
| Inadequate Mobilization of Surface Water | | x |
| Isolation | | x |
| Urban Sprawl | | |
| Changes in Land Use | x | |
| Tourism Development | x | |
| Locust Invasion | x | |

*Source: UNEP, 2009*

In Tafilalet, inhabitants have developed an innovative process of mobilizing groundwater and/or surface water, using rudimentary techniques to cope with violent flash floods, high loss through evaporation and sand invasion. Similar trends of using local adaptive capacities in water and drought management have been recorded in Asir and El Maghara. Local knowledge is also considered the main think tank of each of the three assessments, used in managing a number of crucial issues that would include but not restricted to disease management, risk management including droughts and flash floods, sand storms and others.

Customary law, a major tributary of local knowledge, and a major cornerstone of tribal communities is still playing an influential role, particularly in El Maghara, Sinai, though winds of change have affected the status of local knowledge gained through centuries as is the case at Asir where the role of Hemaia seems to be in decline. Change of life style is a potential threat to local knowledge in the three sites.

Poverty and unemployment have had severe tolls, manifested in a number of humanitarian and socio-economic domains in both El Maghara and Tafilalet, with significant drawbacks on people and their environment. Poverty in El Maghara is one of the major drivers that initiated a somber string of events, deeply endowed in people history, reflecting on their conception and sometimes to their tolerance and relationship with officials. Reports of clashes between inhabitants of El Maghara and police forces are considered signs of the strained relationship between Bedouin and governance, mainly stirred up by poverty and massive unemployment.

Inferior services and lack of infrastructure have alienated development and investment potentials in the El Maghara and Tafilalet. Women in the two locations are probably the most vulnerable to poverty as their share of hardship is much higher than that of men. Collection of edible plants, fetching water, and travelling long distances with grazing livestock are extra hardships that women experience and have to endure.

**Box 1.1 Bedouin Protest Against Government, Sinai, Egypt**

Frequent clashes between police forces and some militant Bedouin groups were reported in 2007, and a number of senior police officers, soldiers, and Bedouin were reported killed. Bedouin protested their mistreatment at the hands of the government and their inferior living conditions. They demanded the economic development of the Sinai Peninsula, which they say has been historically neglected by the government, as well as more employment opportunities for the local population. "Central Sinai is among the poorest areas in the world, with rampant unemployment and few basic services available." http://ipsnews.net/news.asp?idnews=38209.

A high rate of illiteracy was recorded in both El Maghara and Tafilalet, with illiteracy being higher in women than in men. With the prevailing poverty, inhabitants tend to involve their children in any type of income earning activities rather than sending them to schools that would require extra expenses that would place extra burdens on the parents. In addition, deficiency of schools in the vicinity discourages parents from sending their children to distant schools, especially in bad weather, a frequent incidence in some assessment areas such as El Maghara. The poor quality of education in the few available schools is also behind the high rate of illiteracy, especially in El Maghara. The situation is much better in Asir, due to generous government spending on education and schools.

Primary School Children, El Maghara, Sinai

In Tafilalet, there are some informal literacy programs and initiatives to raise awareness regarding the protection of the environment. In addition, some occasional

**Table 1.2 Health Conditions, El Maghara, Sinai**

| Age Group | Common Diseases | Causes |
|---|---|---|
| Infants under one year of age | Eye infections<br>Common cold diseases | Bad hygiene and erroneous mother's traditions<br>Lack of medical care<br>Exposure to weather changes<br>Bad housing |
| Children above 2 years of age and up to school age | Amoebiasis and other intestinal parasites which need a stool analysis | Bad hygiene |
| Adult group | Renal colic | Excessive use of fat in cooking<br>Excessive consumption of tea<br>Heavy smoking in case of men<br>Consumption of saline water<br>Hyper acidity |

*Source: UNEP, 2010*


**Awareness Raising and Training Session, Tafilalet, Morocco**
*Source: UNEP, 2009*

and sporadic actions to raise awareness of environmental issues are undertaken by certain voluntary groups. Otherwise, the general trend is mostly dominated by high illiteracy and a significant lack of awareness and mobilization of players for the rational management of natural resources, that creates a sub-optimization of resource allocation.

### 1.2.4 Assessment Needs

The Arab MA aimed, among other things, to reveal the flaws in the environmental setting, and conceptual understanding of environmental integrity in some of the Arab countries.

It also aimed to raise awareness, and promote technical capabilities among a wide sector of researchers in the area of ecosystem assessment. The selection of Egypt, Morocco and Saudi Arabia was based on the diversity embedded in the locations, nature, and the contents of the environmental attributes of the three countries. With Morocco located in the far west of North Africa (El Maghreb) and Saudi Arabia located in the centre spot of West Asia (El Mashriq), Egypt is a link, where Sinai is a physical bridge, ensuring the continuity and connectivity between the two distinct poles of the Arab region, El Mashriq and El Maghreb, Asia and Africa.

The Arab region is endowed with a diverse environmental and ecological setting, with thriving examples of integration of people and their environment. The area has always been a congenial media for a unique richness of local knowledge that bears the blueprints of a well recognized civilization, as

well as a distinguished array of ecosystems that provide a number of special services. The Arab Millennium Assessment portrays the dominant ecosystems in the region, namely drylands, agriculture, marine, oasis, and mountainous ecosystems.

Each of the three assessments studied has a definitive set of objectives. For instance, Asir park assessment is a twofold: (i) to assess the impacts of degradation of Asir park on ecosystems, and (ii) to enhance community livelihood through improving the existing linkages between local authorities in the Asir region, researchers, NGOs and national development organizations.

In general, the present study is warranted by the need for a holistic understanding of the relationship between human beings and the ecosystem, and how to manage this relationship so as to ensure the durability of the benefits and services provided by the ecosystem, as well as to contribute to the evaluation of the ecosystem on a global scale.

The Arab MA also intended to generate problem-solving knowledge that facilitates action on critical issues of sustainable development and protection of environment through the design of institutional arrangements that foster the generation, collection, analysis, diffusion, and use of scientific knowledge for the sustainable use of ecosystems. With such overarching goals in mind, each of the assessments also had other special objectives. For example, in El Maghara, a basic objective of the assessment was to uncover the magnitude of damage


Asir Mountains, Saudi Arabia


**Traditional Agriculture, a Main Activity at Tafilalet, Morocco**
*Source: UNEP, 2009*

inflicted on the environment, and to expose the suffering of the people in the area, with the ultimate hope of alleviating their suffering and improving their conditions. While in Tafilalet, one main objective of the assessment was to seek funding to implement an action plan to improve general conditions of the oasis.

The Arab MA has had an impact on the global and regional level. The Global Millennium Assessment report has used the materials originated from the MA sub-global assessment in a number of cases, with special reference to community assessment, dryland ecosystems and the relationship between local knowledge and human well-being. At the regional level, information and findings of the MA, whether on global or sub-global levels were incorporated in a number of reports, including the *Environmental Outlook of the Arab Region*, (UNEP, CEDARE and LAS 2010) and other national state of the environment reports. The strong plea the El Maghara assessment has sent about the gross mismanagement of Sheikh Hemid wood, one of the major ecological features


**Sheikh Hemid, One of the Main Shrines in Sinai**

of the assessment area, was met with due interest. The plea has already invoked a new diligent attitude from decision-makers, and the possibility of including the wood into a conservatory has gained good momentum and support.

### 1.2.5 Stakeholder Engagement and User Groups

Unlike conventional scientific endeavours, ecosystem assessments are a composite structure made of assorted efforts, in which a wide spectrum of stakeholders, from different backgrounds are involved. Bearing in mind that an ecosystem assessment trajectory is to improve the quality of life, through a better environment, there is a role for each party to play towards that end.

Local inhabitants, decision-makers at various tiers, scientists, NGOs and other pressure groups, and laymen equally have the same footage in an ecosystem assessment. Nevertheless, the role of the local inhabitants is always the most overarching and the most explicit. Local inhabitants are the factual driving force that determines the scenario of events, the goals, and the approach to reach that goal.

The three assessments of the Arab MA have had a strong reliance on local inhabitants who bear the real burdens, and are inextricably linked to the generic conditions of their surrounding environment. Information driven from stakeholders at all levels is the backbone of assessment construct and the nuclei that scientists and others may delineate on. The significant role of local inhabitants is most evident in narrating the scenarios, in each of the three assessments. Stakeholders, with special reference to local inhabitants of the assessment provide the bricks of a scenario, and their participation is a basic foundation in the construction of viable scenarios. Apart from local inhabitants, a diverse group of users is already served by each assessment. Stakeholders are a decisive factor for the success of an ecosystem assessment, and the success of any assessment is intimately related to stakeholders' involvement and active participation.

In the Asir assessment, stakeholder involvement during the study was ensured by: (i) closely coordinating with the office of Abha's Governor (ii) involving all concerned government ministries and agencies such as the Ministries of Agriculture, Water, Presidency of Meteorology and Environment (PME), National Commission for Wildlife Conservation and Development (NCWCD), and Educational Institutions/Universities (iii) contacting members of the farming community and nomads and explaining to them the objectives of the study. The results of the study were discussed in a workshop and conveyed to the decision-makers in a meeting.

The assessment will be of particular interest to the following primary beneficiaries:

- Pastoralists whose animals graze the park area.
- Farmers involved in agriculture in ANP.
- Tourists that visit the Asir National Park.

- Local agencies such as the Asir Governorate.
- Ministry of Agriculture who produced the original report on the Asir National Park.
- Presidency of Meteorology and Environment, the central environmental protection agency and lead agency in this study.
- Municipalities and local communities.
- Universities such as King Saud University and King Abdulaziz University which have conducted agricultural and environmental research in maintaining Bedouin culture and traditional way of life.
- Other government agencies including King Abdulaziz City for Science and Technology (KACST), Ministry of Water and National Commission of Wildlife Conservation and Development (NCWCD).

In Tafilalet, the analysis of the stakeholders was carried out according to the following steps:

- Identification of stakeholder groups: this step allowed the identification of the players who may have direct or indirect relations with the project, and who positively or negatively influence the project.
- Identification of interests of the project: the identification of the role or roles the player may play.
- Evaluation of importance and influence: to determine whether the concerned player is essential or not for the success of the project and whether he/she has an influence on the development of the various phases of the project. The degree of importance and influence was determined by combining a qualitative weight factor.


The City of Abha, in the Vicinity of Asir, Saudi Arabia

Meanwhile, assessment users in Tafilalet would include:

- National institutions, including the Ministry of Energy, Mines, Water & Environment, the Ministry of Agriculture and Fisheries, and others.
- Regional, provincial and local institutions: such as the Regional Agency for Irrigation and Agriculture Development of Tafilalet.
- Institutions specialized in scientific research: including main universities and higher institutes.
- International agencies: UNEP, UNESCO and others.

In El Maghara, Assessment main users were:

### *The Bedouin Community*

Bedouins are the main inhabitants of Sinai and the focal group of the present assessment. The Bedouin need the assessment findings for many reasons, but particularly because of their need for sound ecosystem services to help address their needs for food, water, shelter, and security.

### North Sinai Governorate

The North Sinai governorate is a focal stakeholder, with direct involvement in this assessment. It represents the official and logistic reference to all activities, services, and civic affairs of El Maghara. Enforcement of law and observing sound environmental conduct is embedded in governance dedication and efforts to stop industry violations of sustainability codes, protecting the environment, and providing due care to the Bedouin.


El Maghara Community, Sinai

### Department of Environment and Environmentalists

El Maghara embraces some of the most highly distinguished environmental assets in Sinai and Egypt at large. The significant collection of floral diversity, terrain landscapes, and historical sites are among the most renowned. The Department of Environment, along with environmentalists, are potential stakeholders. Their role in including the El Maghara area in their future conservation and maintenance plans is crucial.

### Department of Agriculture

Agriculture is the main activity of most of the Bedouin in the study area. Thus, the involvement of the Department of Agriculture is important in improving agricultural conditions, such

Information Collection, Sinai Assessment

as promotion of agrodiversity, improvement of medicinal plant production, and the implementation of good water management programmes.

### Department of Water Resources and Irrigation, DWRI

A central mandate of the Department of Water Resources and Irrigation is to supply the area with water for domestic use as well as for agriculture. Most of the deep wells of the area belong to the DWRI, particularly their operation, monitoring, and maintenance.

### Suez Canal University

Suez Canal University is the scientific organization running the Sinai assessment project. Fostering development and prosperity in Sinai is a major objective of Suez Canal University, which is also oriented more than most to community service and environmental studies. The university's facilities in Sinai include: a) an environmental research station in South Sinai (St. Catherine); b) an environmental agriculture faculty in North Sinai (El Arish); and c) a marine science research station at Sharm El Sheikh.

## 1.3 GENERAL APPROACH USED BY THE ASSESSMENTS

The Arab assessments have adopted a multidisciplinary approach that addresses issues from the biophysical, technical, socio-economic, cultural, institutional, and policy perspectives. They have also stimulated interactions among researchers, policy-makers, and community leaders. Such an integrated approach ensures that all resources are studied together within the system and that socio-economic and policy issues are considered throughout. The three assessments have also been implemented in a collaborative and participatory mode involving researchers, policy-makers, and farmers, nomads and other community members. The study was designed to develop close interaction with the beneficiaries to ensure that the assessment and the responses developed were accepted by the target groups.

A number of techniques were used in each of the assessments. Geographic Information System (GIS), and Remote Sensing (RS) were the most commonly spatial analytical tools used in the three assessments. Satellite

images, and change detection were employed to compare changes in landscape and other attributes over time.

Sets of biophysical and socio-economic indicators were also used as tools for assessing the relationship between ecosystems and human well-being. Indicators were used to assess the quality of environmental attributes and services and to gauge the degradation of some of these services. In this respect, levels of heavy metal pollution, and bacterial count in groundwater samples were used to indicate water quality in the El Maghara assessment, while in Tafilalet, concentration of ammonia was monitored to reflect the quality of water and the incidence of wastewater discharge into freshwater canals. In Asir, the distribution of chlorophyll was used to measure vegetation cover.

In addition, models were used with special reference to quantitative scenarios, and to ascertain relationship and influence between driving forces.

The method adopted within the framework of this study is the same described in the conceptual framework of the Millennium Ecosystem Assessment, (MA) Global Environmental Outlook (GEO) and Environmental Outlook of the Arab Region (EAOR).

The methodology used is based on the DPSIR analytical framework (Driving forces of change - Pressures - State - Impact - Responses), developed by the European Agency for the Environment from an initial model of the Organization of Cooperation and Economic Development (PSR model: Pressure - State - Responses). It used to analyse the interactions between society

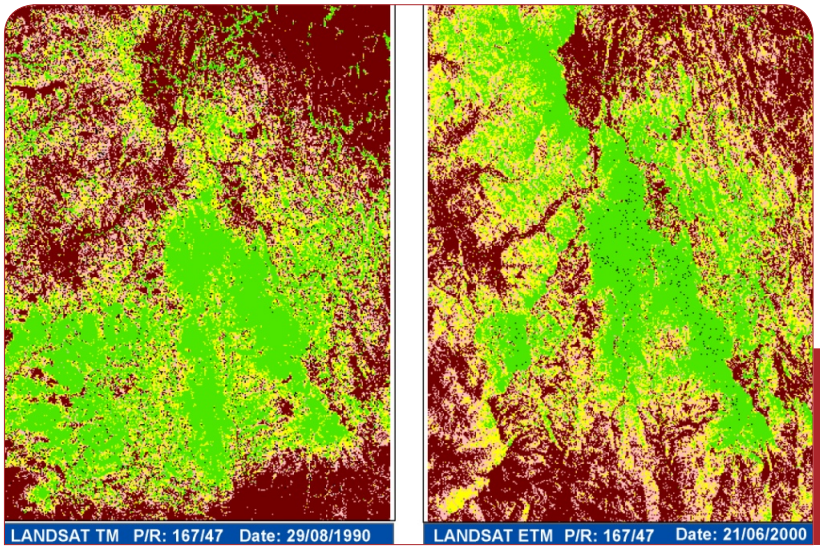


**Figure 1.9 Changes in Vegetation Cover**

*Source: UNEP, 2010*

*Chlorophyll distribution in Asir study area (Chlorophyll was used to reflect vegetation cover) on 29/8/1990 and 21/6/2000*

Table 1.3 Indicators and Tools for Assessing Ecosystem Components

| Ecosystem Component | Indicators | Methodological Tool |
|---|---|---|
| **Mountain:** Forest/Woodland | Forested area by species<br>Change in forested area<br>Condition of forest areas | Historic satellite imagery with GIS and ground level verification |
| **Mountain:** Terrace Agriculture | Terraced area<br>Condition of terraces<br>Crop production | Satellite imagery with ground level verification<br>Local interviews |

*Source: UNEP, 2010*

and the environment through environmental indicators. The framework which is used in the Millennium Ecosystem Assessment allows carrying out of environmental evaluations, providing information about the elements of that are shaping the state of the environment.

### Questionnaires

The conceptual framework for the MA places human well-being as the central focus for assessment. The MA conceptual framework assumes that a dynamic interaction exists between people and other parts of ecosystems.

As humans are an integral part of ecosystems, the MA pays particular attention to the linkages between ecosystem services and human well-being. In this respect, questionnaires have a central role in identifying the human needs, demands and aspirations that the assessment is addressing.

Questionnaires, mostly performed through a personal approach have been instrumental in mapping socio-economic status in the three sites alike. In all three assessments, much of the information obtained was the result of questionnaires that covered a good number of stakeholders.

In Tafilalet, the first survey, called 'Ksar' Survey, was conducted to identify habitat conglomerations, administrative locations, demographic characteristics, and existing basic infrastructure such as electricity, drinking water, sanitation, schools, and roads.The second survey, called household survey, focused on collecting information about different household socio-economic characteristics, such as household structure, production and reproduction, exploitation of natural resources, water management, the risk of sand encroachment, etc.

In Asir, four types of questionnaires, related to: 1) the marine environment; 2) the forest and mountain ecosystem; 3) terraced agricultural areas; and 4) livestock herding areas, were used. The questionnaires were distributed to thirty individuals in different

parts of the park between September and November 2006. Three questionnaires were produced and used throughout the study to map out the socio-economic profile of the population at the assessment site. A group of the assessment team experts with diverse backgrounds in medicine, psychology, sociology, economics, and environmental science were involved in the production and analyses of the questionnaires.

In El Maghara three questionnaires were conducted. The first questionnaire was designed to examine the ability of the Bedouin sample to respond and communicate with the team. It was also meant to pave the way to discuss other issues discussed in subsequent questionnaires. Because the vast majority of the Bedouin were illiterate, the study teams performing the questionnaires had to interview each person individually, explaining the question if necessary before writing down the information.

Female team members were involved in conferring with Bedouin females, who constituted about one-third of the sample. The first questionnaire dealt with basic life activities and generic social issues of the community, as it meant to establish a mutual relationship between the study team and the Bedouin. The other questionnaires that followed were more structured and targeted to ascertain more subtle and indirect information such as the quality of life, environmental awareness, local knowledge, and the role of medicinal plants in Bedouin life. A large part of the interview process was incorporated into a medical examination so that the Bedouin would be encouraged to talk and express their views.

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