El Maghara Scenario A Search for Sustainability and Equity: An Egyptian Case Study

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Abstract

The Millennium Ecosystem Assessment (MA) is an international initiative that means to advise decision makers on the impact of development on environmental setting and human well being. The MA is a multi-scale assessment consisting of interlinked assessments undertaken at local, national, regional and global scales. The sub-global assessments will directly meet the needs of decision-makers at the scale at which they are undertaken, strengthen the global finding on the reality ground and reinforce the local findings with global perspectives, data and models. In Egypt, an MA local community Subglobal assessment was conducted in El Maghara , North Sinai, one of the poorest, most arid, and most marginalized parts of Egypt. El Maghara is exclusively inhabited by Bedouin, characterized by a special lifestyle, predominantly governed by local knowledge. The El Maghara assessment followed the conceptual framework of MA in which ecosystem services were identified, trends and conditions were monitored. The conceptual framework also included scenario building to provide an insight to the plausible future of the assessment and to the uncertainties that may surge up, affecting people and their environment. The paper is organized as follows. In section 1, we introduce the problem, and the objectives of the study. In section 2, we outline the scenario process framework. In section 3, we identify the key drivers via the MIC-MAC method. In section 4, we analyze the objectives and positions of the key stakeholders via the Mactor method. In section 5, we utilize both quantitative and qualitative approaches – that build on the results of the MIC-MAC and Mactor methods – to portray how storyline scenarios may unfold. Finally we conclude in section 6.

Keywords: Millennium ecosystem assessment, subglobal, poverty, sustainability, governance, water scarcity, scenarios, storylines

Introduction

The Millennium Ecosystem Assessment is an international initiative launched in 2002 as a response to the ailing environmental conditions of the globe (MA, 2003). It is designed to meet the needs of decision-makers and the public for scientific information concerning the consequences of changes on human well-being and options for responding to those changes. It is the main objective of MA to bring the findings of science to bear on the needs of decision-makers.

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 on the one hand and because sound management requires careful local planning and action on the other hand.

Egypt's sub-global assessment is conducted at El-Maghara area, North Sinai. El-Maghara is considered as one of the most important floral centers of medicinal plants in the Middle East. Sixty one percent of its flora is considered as medicinal (Abd El-Wahab, Zaghloul, & Moustafa, 2004; Farnsworth, & Soejarto, 1991) It also represents an important area anthropologically due to the presence of different Bedouin tribes with a very unique traditional knowledge that tend to influence various walks of life.

The inhabitants of El-Maghara area are among the poorest in Sinai and probably the whole country. The hardship has limited any migration of non-Bedouin to the area and has also limited the sweeping urbanization that starts sprawling over many parts of Sinai. El- Maghara remains one of the most untouched Bedouin societies in the whole Sinai where pristine Bedouin culture and practices prevail (Dames & Moore, 1985).

Large-scale scenarios tend to depict longer time spans than small-scale scenarios, since changes affecting large areas take much longer than those influencing local or small areas. Scenarios that interlink the interaction between socioeconomic and biophysical systems are used to translate qualitative scenario storylines into quantitative illustrations of changes in ecosystem services. The MA scenarios also reflect uncertainties of long-range outcomes and quantification of key variables linked to ecosystem conditions.

The rest of this paper is organized as follows. In section 2, we outline the scenario process framework. In section 3, we identify the key drivers via the MIC-MAC method. In section 4, we analyze the objectives and positions of the key stakeholders via the Mactor method. Section 5 is titled the "Storyline Scenarios". Finally we conclude in section 6.

The El Maghara Scenario Process Framework

The El Maghara scenarios are an integral component of the El Maghara assessment. The scenario process provides insight into the uncertainties that may surge up, affecting the environmental setting and human well-being. It is also a viable tool that decision-makers can use to set strategies and measures and look for opportunities (Inayatullah, 2009; Saliba, 2009). The scenario process also allowed Bedouin to express their views, hopes, and misgivings.

The timeframe for the scenarios is 20 years. The method employed to develop them was a hybrid method that integrated the Futures Groups Scenario method (Glenn & Gordon, 2003) and the prospective approach (Godet 1994), mainly the MIC-MAC and the Mactor methods. This hybrid approach combined quantitative and qualitative aspects and comprised the following steps (Figure 1).

1) *Identification and Ranking of Drivers.* The driving forces in the study area were identified based on meetings and interviews with local people, and also based on the observations and records made by the assessment team. The drivers were then ranked according to their influence, independence, interrelationship, and a subset of key drivers was selected. Much of the drivers-ranking process was based on Bedouin views and experience. On the other hand, relationships between driving forces were ascertained by using MIC-MAC methodology, based on and using Bedouin intuition, and study team experience.
2) *Identification of Stakeholder Interest, Objectives, and Influence.* Ascertaining the goals and objectives that would meet people needs and aspiration is an important part of the scenario process. A basic step in this respect is to identify the main actors, influential groups in the study area, their stands on these objectives, along with their influence and support. Once the various stakeholders and their concerns were identified, they were clustered into groups according to their interest and support of the objectives and goals set for the study area.
3) *Scenario Matrix Construction and Development.* Using the MIC-MAC method, a matrix, based on the two most important drivers was built to produce four quadrates, each of which characterized one of four scenarios for El Maghara. Based on the four quadrants of the two-dimensional matrix, the four storyline scenarios were created describing the system along key dimensions (ecosystem services, land degradation, etc.)
4) *Quantitative Analysis.* Using the Futures Group scenario method, a quantitative study was undertaken to determine how some of the most important parameters would unfold under various scenarios. These quantitative scenarios were used to help build the storyline scenarios. They were also used to portray a quantitative image of how storyline scenarios may unfold.

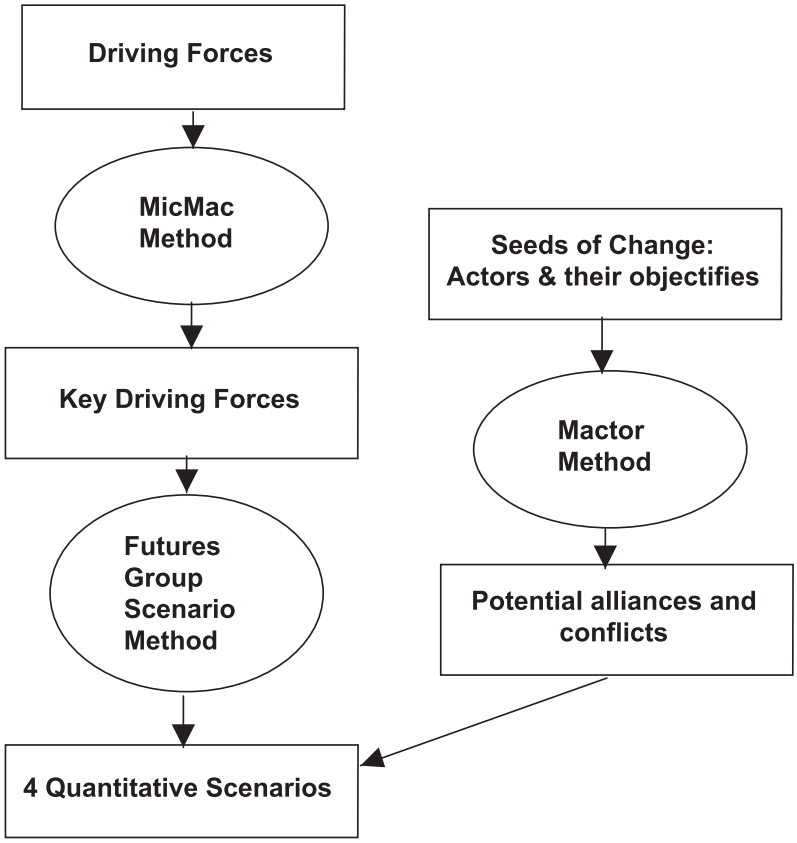

Figure 1. The hybrid scenario process used in the El Maghara assessment

Identification of Key Drivers: The MIC-MAC Method

The MIC-MAC (Cross-Impact Matrix – Multiplication Applied to Classification) method was created by Michel Godet (1994). The method is a way to perform structural analysis of a complex system; i.e., to represent the complex system as comprehensively as possible and then to reduce its complexity to its key driving forces.

The MIC-MAC method has three phases: a) listing all driving forces, b) describing the relationship among them, and c) identifying the key driving forces.

In phase 1, all driving forces characterizing El Maghara area were identified. Several meetings were held with various stakeholders, including Bedouin, research workers at the nearby research institute, mine workers, local government officials, and others. Questionnaires were also used to collect pertinent information.

Phase 2 focused on describing the relationship among the drivers. Drivers have a number of relationships with each others, and very often these relationships determine the ultimate impact of a given driver. Structural analysis connected the driving forces in a two-entry table (direct relations). This entry of the matrix is generally qualitative, with 0 value if there is no relation between driving forces i and j, and 1 value if there

is a relationship. It is however possible to adjust the intensities of the relations (0 = null, 1 = weak, 2 = average, 3 = strong).

Phase 3 involves using the information to determine the key drivers. Interpretation that solely relies on a direct classification of relationships between forces is not accurate because it does not take account of inherent feedback paths in the system. Many forces are indirectly related via other intermediate variables (forces). For example, illiteracy influences unemployment, which in turn influences poverty. Thus one can conclude that illiteracy indirectly influences poverty. The MIC-MAC method automatically computes these measures. For more information, the reader may refer to Godet (1994). Using the MIC-MAC algorithm, driving forces were sorted out by order of influence, and by order of dependence. This obviously gives the possibility to confirm the importance of certain forces, but also to reveal certain forces which, because of their indirect actions, play a dominating role (and which the direct classification did not allow to reveal).

Key driving forces

The process identified thirteen key driving forces.

Water Shortage

Water shortage is the main cause of the inferior quality of life in the area. Water shortage has a profound effect on poverty, health, unemployment, and migration. The area has witnessed a significant drop in rainfall for the last ten years. Climate change is expected to affect precipitation even further within the next years, giving rise to a more complicated situation.

Governance

Weak governance is a strong determinant factor that shapes the overall social and economic landscape of the area. Bedouin accuse government of being weak against quarries and mining contractors operating in the area illegally and inflicting considerable damage on their environment. The massive land use change and landscape fragmentation caused by these activities hinder Bedouin from exploiting flashfloods, with some serious effects on the amount of water available for them.

Employment

The remoteness of El Maghara area and the very poor infrastructure have impeded efforts to promote economic development in the assessment area. Employment opportunities are hence very limited. Agriculture, the main activity of most Bedouin, is drastically hit by the significant drop in rainfall, making a large number of the Bedouin redundant. The high rate of unemployment recorded in the assessment area is a key factor that influences a number of attributes such as poverty, migration, education, and others.

Remoteness

The assessment area is located in an isolated area in Sinai. Transportation services are limited, irregular, and unreliable, with no telecommunication service available.

Sandstorms often cover the roads leading to the assessment area with sands, making travel between El Maghara and other parts risky and almost impossible. The area could be entirely cut off for days with no cars able to move until sand is removed and roads cleared.

Illiteracy

The area has a high rate of illiteracy compared to other parts of Egypt and Sinai. Some primary schools are available; however, no preparatory schools are available in the vicinity and pupils have to walk a long way to reach the schools. Girls are allowed to attend schools only for parts of the primary education, if any, after which societal norms require them to stay home. Poverty and remoteness also play some key role in the high rate of illiteracy recorded in the area.

Mining and Quarrying Activities

The assessment area has a special richness of minerals and some extractive materials, including gravel, marble, and others. The area has the main coal mine in Egypt, where coal was extracted for exportation for years. Stone and marble quarries operating in the area have inflicted considerable damage on ecosystem integrity and the environmental setting. Massive changes took place in landscape and land topography as a result of the quarrying activities, with irreversible impacts on flashfloods quantity and quality.

Services

The area is deprived of most of the essential services such as electricity, water supply, telephone, and others. The health service unit is very poorly equipped, and does not provide adequate service. The poor service in the assessment area is a determining factor shaping many of the assessment findings.

Environmental Degradation

Environmental degradation is highly apparent in the El Maghara and includes a variety of dimensions. Soil degradation, land use change, water pollution, loss of biodiversity, and landscape fragmentation are some of the manifestations of the degraded environmental setting of the study area. Environmental degradation has strong bearing on the quality of life of Bedouin and contributes significantly to poverty, poor health, and pollution problems.

Health

Medical check ups conducted during the assessment work revealed the ailing health conditions of the population, with some common diseases. Contaminated water is a potential cause of many health problems recorded in the area. The remoteness of the area from any health care facilities is an elemental factor contributing to the poor health services. The disappearance of many medicinal plants and other plants that Bedouin use to supplement their food has some negative impacts on their health conditions. Dietary habits could also be another cause for some of the illness recorded.

Migration

Prevailing hardship, unemployment, lack of proper services, and isolation have persuaded many Bedouin families to migrate out of the area to other places either in Sinai or outside, looking for a better quality of life. Most of the migrants are young Bedouin, while elderly Bedouin remain behind. Many families have migrated to Sharkya Governorate in the Nile Delta, where water supply and employment opportunities are better.

Poverty

Poverty is a key factor related to much of suffering in the community. Monthly family income in the area is probably one of the lowest in the country. Environmental degradation has a potential impact on many of the natural resources that Bedouin use to support their living, hence poverty in the assessment area is partially caused by environmental degradation. On the other hand, poverty has numerous effects on the environmental setting and some ecosystem services, causing some severe damage and resource depletion.

Land Use Change

There is no obvious land use pattern in Egypt in general and Sinai is no exception. However, the impact of the land use loose policy to land use is strongly felt in the assessment area. The growing demand for building materials such as gravel, stones, and marble has turned the area into an open field for quarries and mining. With such massive extraction of building materials, the landscape has been fragmented and dissected, with serious effects on biodiversity and other environmental richness.

Pollution

Soil pollution was recorded in the study area. Water samples collected from wells in the area showed high levels of microbial and heavy metal pollution. The coal mine is the main source of soil pollution. Residues of hydrocarbons resulting from coal flushing are the main contaminants of soil in the study area. Heavy metals contamination of groundwater is also caused by the industrial activities in the area. Pollution of both water and soil is one of the reasons for many of the health problems recorded in the area.

Matrix of direct influences (MDI)

The Matrix of Direct Influences (MDI) describes the direct influences among the identified driving forces (see Table 1). An analytical profile that depicts the influence and proximity that each driving force has to other driving forces was developed.

Table 1
Matrix of direct influences (Drivers)
Influences range from 0 to 3, with 0 = no influence; 1 = weak influence; 2 = moderate influence; and 3 = strong influence.

	1 : Employment	2 : Remoteness	3 : Illiteracy	4 : Mining	5 : Service	6 : Env.	7 : Health	8 : Migration	9 : Poverty	10 : Gov.	11 : Water	12 : Land Use	13 : Pollution
1 : Employment	0	1	2	1	1	2	2	3	3	1	1	1	0
2 : Remoteness	2	0	2	2	3	2	2	2	2	2	2	2	1
3 : Illiteracy	2	0	0	1	1	2	2	0	2	1	0	1	0
4 : Mining	2	1	0	0	2	3	2	1	2	2	2	2	2
5 : Service	2	2	2	2	0	2	2	2	2	1	2	2	2
6 : Env.	1	1	0	1	1	0	2	1	2	1	2	2	3
7 : Health	1	0	1	0	0	0	0	0	2	1	0	0	0
8 : Migration	1	0	1	0	0	0	0	0	2	0	1	0	0
9 : Poverty	2	2	2	1	2	2	3	3	0	1	2	1	1
10 : Gov.	2	2	2	3	3	3	3	1	3	0	2	2	2
11 : Water	3	0	2	0	3	3	3	3	3	2	0	3	3
12 : Land Use	1	1	0	2	2	2	2	1	2	2	2	0	2
13 : Pollution	0	0	0	0	2	2	3	0	2	1	2	0	0

The above table shows both the proximity and influence each driving force has to the others, at a scale rating between 0 and 3, where 0 represents no influence and 3 represent the highest scale of influence. Examples of a highly influential relationship is that between migration and unemployment, pollution and the state of health, poverty and unemployment, and environmental sustainability and gravel extraction and mining activities. On the other hand, some of the relationships shown in the matrix represent a state of no influence. The influence of pollution on illiteracy, migration on environmental sustainability, and the influence of health on water scarcity are examples of such non-existing influence. Other relationships may have some degree of influence somewhere between 0 and 3. Examples of these varied degrees of influence are the influence of environmental sustainability on services, illiteracy on governance, and the pollution on services, with all of them having a degree of influence of 2. Meanwhile, at a lower degree of the scale, the influence of land use change on unemployment, the influence of migration on governance, and the influence of migration on illiteracy are all scaled at 1.

Indirect influences and dependence among drivers

The indirect influence / dependence map (Figure 2) shows both the relative dependence and influence of drivers. The x-axis is the "dependence" measure. The *x* value of a certain force gives an indication of how that force is dependent on the other forces in the system. The higher the *x* value, the more the dependence. The y-axis is

the "influence" measure. The *y* value of a certain force gives an indication of how that force is influencing the other forces in the system. The higher the *y* value, the more the influence.

The map shows that the six most dependent drivers are: health, poverty, environment sustainability, services, unemployment, and migration, with health and poverty the most dependent. The most influential drivers – that is, those causing the most potential damage to the ecosystem – are governance, water shortage, remoteness, mining and quarry works, and land use change.

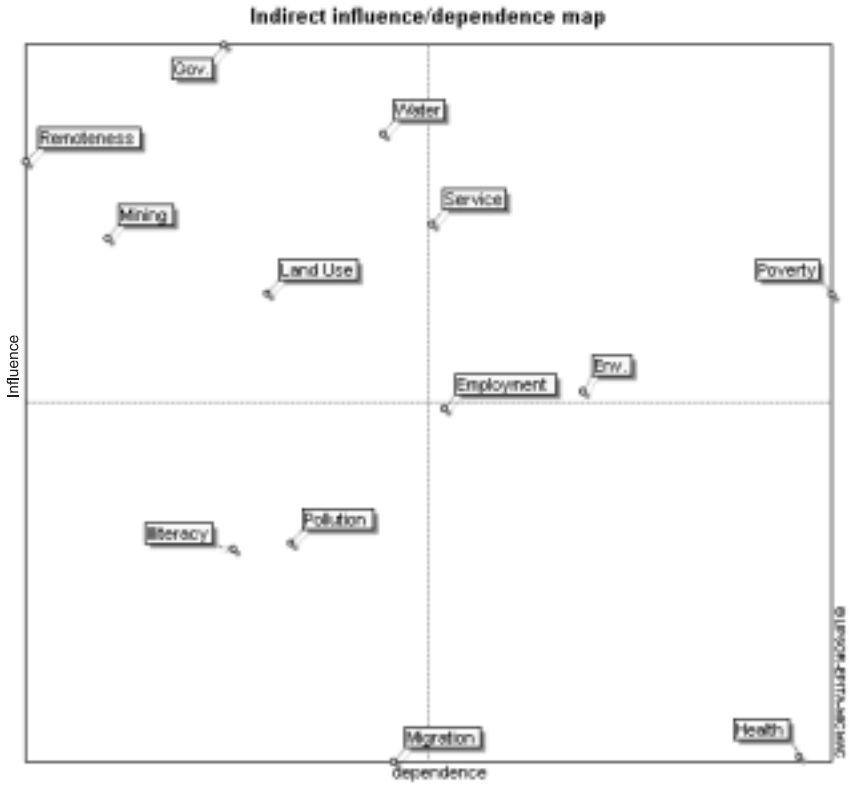

Figure 2. Indirect influence / dependence map

The above figure depicts the degree of influence between the drivers. It is evident that governance, poor service and water shortage have a very strong influence on poverty, health, environmental sustainability, and services. Considering the role of governance in providing health care facilities and other service, such relationship is easily understandable. Poverty, one of the profoundly manifested features in the assessment area, is the product of different factors that mostly rest on governance structure and governance performance in the community. The influence of governance on sustainability is based on the weak control it has over contractors of gravel and stones operating in the area. The assessment team found in its frequent visits to the area that most of the contractors working in the gravel and sand extraction do not con-

fine their activities to the areas allocated for them. Instead, they tend to expand to other unauthorized areas, regardless of the impact this may cause to the environment and land use pattern. Local authorities often turn a blind eye to such violations, despite repeated complaints from local people. Meanwhile, water scarcity has had its heavy burden on Bedouin well-being and on environment integrity. Many Bedouin are no longer able to grow crops that they feed on and also sell. Grazing has also been highly affected, with the vegetation cover withering with the prevailing scarcity of rain, creating serious difficulty for the grazing industry, one of the main venues for Bedouin trade.

Key Stakeholders: The Mactor Method

The Mactor method (Godet, 1994) looks at each stakeholder's preference and degree of support for identified objectives. It also defines the degree of support each stakeholder potentially has for each objective and clusters groups of stakeholders according to their stand towards various objectives. The method is based on inter-stakeholders influence.

The assessment identified the main stakeholders (key actors) as the well as the community's main goals and objectives.

The Stakeholders and the Objectives

The key groups of actors in the El Maghara area are a) Governance (those responsible for the area's governance); b) Investors (defined to also include gravel and marble extraction contractors); c) Bedouin; and d) Environmentalists (Naturalists).

An objective is an issue whose outcome may affect the future evolution of the system under study, especially those upon which actors having sensible diverging positions and means to influence their outcomes. In the El Maghara assessment, the most important objectives identified were:

- governance and services improvement,
- sustainable development promotion,
- poverty alleviation,
- employment,
- return on investment,
- water availability, and
- land use pattern control.

Matrix of Direct Influences

The table below shows the influence the key stakeholder groups have on one another, with the actor listed on the left being the one to influence the actor listed across the top. The numerical number signifies the degree of influence. Thus, for example, Governance government has a strong influence on the Bedouin and a moderate influence on Investors.

Table 2.
Matrix of direct influences (Actors)
Influences range from 0 to 3, with 0 = no influence; 1 = weak influence; 2 = moderate influence; and 3 = strong influence.

MDI	Gov.	Investor	Bedouin	Naturalist
Gov.	0	2	3	1
Investor	2	0	1	0
Bedouin	1	0	0	1
Naturalist	1	0	1	0

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The matrix in the table below shows the key actors' stances on various objectives (whether as a group they are pro, against, neutral, or indifferent). The position of an actor over an issue represents the actor's preferred outcome of the issue, i.e. the outcome which, if realized, would best suit their objectives. The position indicates the direction towards which an actor is willing to exert influence over an issue.

Table 3.
Valued position matrix

2MAO	Services	Sus. Dev.	Poverty	Employment	ROI	Water	Land Use
Gov.	2	1	1	1	0	1	0
Investor	1	-1	0	0	3	1	-2
Bedouin	3	2	3	3	0	3	2
Naturalist	2	3	2	2	0	3	3

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Influences and Dependence among Actors

Using the Mactor software, the assessment mapped the actors' positions with respect to influences and dependence in relation to one another. The positions are calculated automatically by the software. Figure 3 shows that Investors (including gravel and marble extraction contractors) and Governance are the most influential actors in El Maghara, while Environmentalists and Bedouin are the least. It also shows that Bedouin are the most dependent and least influential actors. Environmentalists are also among the least influential actors but with a high degree of independence.

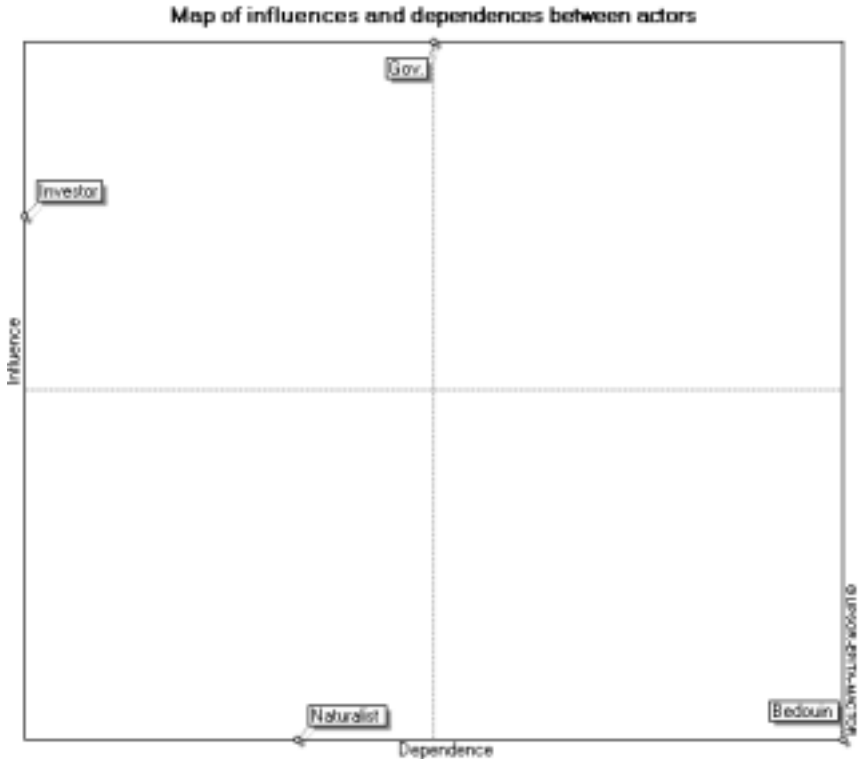

Figure 3. Map of influence and dependence between actors

Investors are well situated in the social hierarchy. With their financial resources, and good connections with influential circles that extend from the local governance to upper tier of governance, they are well vested to lobby for their demands and interest. Investors strive to ensure a good return for their investment in the shortest possible time, without regard for the ethics of sustainability or environmental codes.

Local governance has the greatest influence as well as the upper hand in running, supervising, and managing administrative issues in the assessment area. Their mandate includes legislative issues such as authorizing and supervising gravel and stone extraction activities, the distribution of water tanks, maintaining land use patterns, among many others. The isolation and remoteness of El Maghara, coupled with Bedouin lack of awareness, the attitude and efficiency of local officials in El Maghara is hardly monitored or audited by higher governance circles, hence allowing local officials an authoritarian and independent role.

Relatively few in number, environmentalists are always outsiders who come and go just for short spells of time with no strong or permanent presence in the area. Their ideas and thoughts may only be expressed in research papers and technical articles that are not widely read and have a very limited impact.

Bedouin are the most vulnerable and weak actor in El Maghara. Their social fabric that keeps them living in small cut-off communities, in addition to their nomadic

tendency, have their weakened their sense of togetherness and their rights to demand. On the other hand, poverty, high rates of illiteracy, and lack of public awareness and public participation have stifled Bedouins' initiatives for independence and ability to communicate with Governance representatives on an equal footing.

This situation is well presented in the next figure, the Sustainable Development Scale. In this scale, the Mactor method would weigh the interest of each and every stakeholder in promoting sustainable development in El Maghara. The relevant position of each stakeholder, multiplied by the stakeholder's influence, would decide its given weight in a hypothetical balance shape, indicating whether this group of stakeholders supports sustainability or is against it. Mactor analysis of sustainable development competitiveness (see Figure 4) has clearly indicated that, with the exception of Investors, all stakeholders, including Bedouin, Governance, and Environmentalists, are inclined to support sustainable trends to prevail in the area.

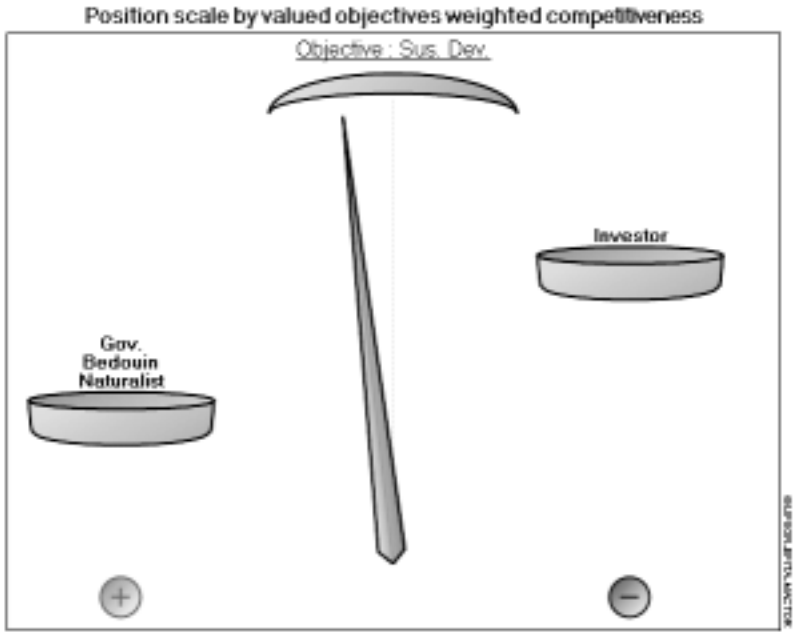

Figure 4. Sustainable development competitive scale

Storyline Scenarios

Scenarios are either quantitative or qualitative. Qualitative scenarios are made of storylines, a narrative description of each scenario that highlights how the future may unfold and the role of various driving forces. Storylines impart people's wishes, hopes, and ideas and merge them into a holistic pattern that reflects how people feel about their future, possible uncertainties and surprises, and any other factors that are likely to shape future trends. Storylines are a core constituent of a scenario and much of the quality of a scenario rests on the authenticity and transparency of its storyline compo-

nent. Driving forces that influence and cause changes, along with the flickering uncertainties that people feel, are the backbone of good storylines. In the El Maghara assessment, synthesizing storylines was an integral part of creating the El Maghara scenarios.

Stakeholders at all levels provide the fabric of a scenario and their participation is an elemental component in the construction of a viable scenario. In building the El Maghara scenarios, several meetings and interviews of individuals and groups were held in and outside the assessment site, seeking information and exploring uncertainties.

Bedouin, mine workers, civil servants, gravel contractors, truck and taxi drivers, children and others, were all part of the scenario construction process. Parts of the several questionnaires and the medical surveys were designed to collect baseline information for the scenario-building processes. On the other hand, the assessment team, being closely involved with the Bedouin for years, also contributed in the building process as each team member was asked to delineate on some of the critical issues that touches upon the future of the area and how it may unfold.

The El Maghara scenarios were constructed using a blend of two factors – the highest ranking drivers and ongoing meetings with the local population. The drivers that ranked as the most influential driving forces in El Maghara (as shown in Figure 2) – inefficient governance and water scarcity – were used to build two axes for draft scenarios (Figure 5). The vertical axis shows good local governance at the top; this includes a commitment to the environment and community, the provision of good services, and enlightened governance with a prime concern for enforcing laws and sustainable conduct as well as for keeping Bedouin interests as its prime responsibility and objective. At the bottom of the axis is inefficient local governance that provides inferior services and turns a blind eye to environmental perturbation committed by industries and gravel contractors (as El Maghara currently does). The horizontal axis shows the spectrum from water scarcity to water availability. Under good water availability, water would be made available through a branch of El Salam Canal, passing Nile freshwater to Sinai, making a regular supply of irrigation water available to Bedouin for the first time ever. On the other extreme, a branch of El Salam Canal to cover the area would not be approved and the area would have continued water scarcity.

Frequent meetings and interviews with stakeholders streamlined into a dialogue-like conversation that centered on a number of questions and answers between the assessment team and Bedouin. Questions posed in the dialogue were to disclose issues still not expressed explicitly before, with emphasis on:

- What are the major threats to the area that may affect you?
- How could the problems of the area be alleviated and the quality of life improved?
- What is the governance mechanism needed to bridge the growing gap that alienates them?

The questions were formulated and put forward to help Bedouin express their worries, and spell out their current and future concern, including fears, threats, and even misgivings. The dialogue also explored uncertainties looming in Bedouins' mind.

The issues addressed related to changes needed and changes expected (and possibilities of each) and whether environmental degradation and its impact on people would continue even further and how conditions could be improved.

The scenario building process took place in stages, continually review the emerging scenarios, refining them, and incorporating any emerging new themes. In this process, efforts were made to highlight contrasts among the scenarios while eliminating duplicative themes. In the final stage, a decision was made for four scenarios, as determined by the four quadrants of the axis made earlier. The decision was made after the assessment team, and Bedouin determined that focal questions and concerns fit equally well into the four possible scenarios portrayed by the quadrant.

The four scenarios are shown in Figure 5 as S1 (also called the Gazelleg Scenario), S2 (the Butterfly Scenario), S3 (the Tortoise Scenario), and S4 (the Dead Horse Scenario).

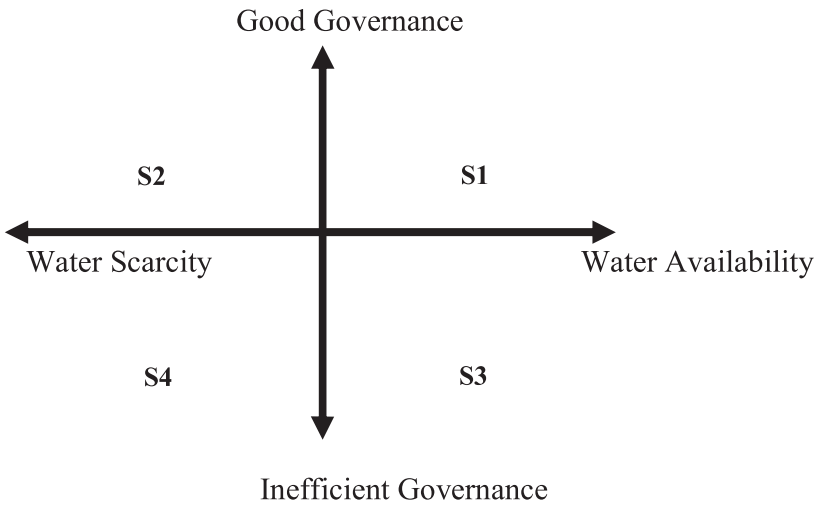

Figure 5. Quadrate of key drivers shaping the scenarios

S1: THE GAZELLEG SCENARIO: Good Governance and Water Availability – Also the Best Case Scenario

Scenario background

The Gazelleg scenario is an illustration of how big hopes may come true in El Maghara. In this scenario, efficient governance, good services, and water availability combine to strike an ideal synergy, stimulating economic growth while maintaining environmental sustainability. The central theme of this synergy is to have all stakeholders of El Maghara striving to de-couple economic growth from environmental degradation with a focus on environmental integrity. In this scenario, Bedouin, governance, environmentalists, and industry all have the same influence on such critical issues as land use pattern, water, poverty alleviation, good services, and others.

The Gazelleg Scenario is the product of long battling of Bedouin's representatives in the parliament, coinciding with a newly formed government that puts special emphasis on marginalized communities of Egypt and how to improve their quality of life. The cabinet has included a state minister for marginalized communities and poverty alleviation for the first time in Egypt's history. One essential drive of the newly introduced ministry is to learn and study success stories of other countries in order to avoid pitfalls and "leapfrog" toward achieving sustainability and prosperity.

El Salam canal branch to central Sinai: An old dream comes true

The provision of freshwater to Sinai through El Salam canal was one of the main accomplishments of Egypt's vision for Sinai development. The canal provides Nile water for the first time into Sinai. In its first stages, the canal covered areas in North Sinai, but not Middle North Sinai where El Maghara area is located. Bedouin of Central Sinai felt deeply left out, but never lost hope of having a tributary forking out of the main canal to their area. The repeated demands and strong pleas Bedouin representatives put forward to the government finally yielded a positive response and a decision was taken to extend a small branch of the canal to the area. The provision of water was a momentous and credible addition to El Maghara that changed many of the Bedouins' deeply rooted norms and life practices, and laid down a robust foundation for a settled rural society.

Business-oriented community

The provision of water for agriculture offered an excellent platform for a number of initiatives in various domains with agriculture and tourism industries as the propeller for a better economy. An action plan, based on a package of economic reform measures, is developed to revitalize El Maghara area. The ten-year economic reform plan has the ultimate objective of doubling per capita income, creating employment opportunities, and adopting sound mechanisms to market the environmental services and assets of El Maghara. A basic tier in the program is to allow banks to operate in the area with new credit schemes that would encourage Bedouin to establish their own business. In parallel, a national campaign is made to market the area to national and international tourist organizations and environmentalist associations.

The action plan has a number of cornerstones that include:

- Banks and financial institutions are allowed to have outlets in the area, promoting small businesses and allowing Bedouin to use loans to establish private business in the area.
- New projects of diversified nature are established in the area, including ecotourism projects, medicinal plants processing, olive oil industries, and others. Industries based on gravel and sand extraction that have sound environmental practices are allowed to operate. Governance encourages companies to adopt sound environmental practices and to use cleaner production technologies. Companies with an ISO certificate are given special incentives and business priorities, while companies failing to implement a sound environmental management system have their operation license suspended.

- Governance helps to provide newly established companies with a package of logistical advantages such as a grace period for taxation and others. In return, these companies are asked to employ local people and train them. With the support of good governance, industries contribute in providing infrastructure and other services in the area and help build schools, roads, and hospitals.

The ten-year action plan is made of well-defined stages, each with specified time limit.

- In the first stage, consisting of five years, the concepts of good agricultural practices and entrepreneurship are introduced to Bedouin.
- The second stage is planned for three years, during which the El Maghara coal mine operational under new set of rules and business conditions.
- The third and most important stage is to alleviate poverty in El Maghara by the end of the action plan, i.e., in ten years time.

Environmental sustainability

An emphasis on environmental sustainability is a key component of the Gazelleg scenario.

Good agriculture practices

With an active role played by the extension unit of the Department of Agriculture, a rigorous integrated pest control program is enforced to minimize risks of environmental impacts on people and environment. Officials launch a well-planned program to address risks related to agriculture expanding activities and to waterborne contaminants and their impacts on humans and the environment. The concepts of good agriculture practices were introduced to Bedouin, including the rational use of pesticides and fertilizers. The extension service has established a extension fields for a number of medicinal crops that Bedouin can learn from.

Protected areas and buffer zones

A sound program for sustainable development and an action plan are implemented to restore the floral and faunal diversity of the area. The program would also aims to enhance the productivity of El Maghara ecosystems and to improve the social and economic welfare of the Bedouin. International environment bodies, including the World Wild Fund (WWF), United Nations Environment Programme (UNEP), and others, along with international donors, are invited to participate in the regional program to salvage the El Maghara environment. A training program, consultation, and expert views are provided on aspects of environmental damage and the restoration processes.

Bedouin, who use the surrounding environment as a potential source for services, are likely to develop a hostile attitude to these protected areas. Experience has shown that buffer zones are a conciliatory approach to overcoming such hostility. The International Union of the Conservation of Nature (IUCN) defines buffer zones as areas adjacent to protected areas, adding to their protection and providing valued benefits to the neighboring local communities. Buffer zones address two principal issues:

- They provide extend the habitats contained in the PAs for the core species.
- They also act as a socioeconomic buffer by absorbing resources pressures on the socioeconomic needs of surrounding Bedouin communities.

In the Gazelleg scenario, buffer zones respond to the strong calls for conservation and maintaining environmental integrity while also accommodating Bedouin needs for utilizing the environmental assets necessary for their livelihood.

Protection of rare and endangered species

The environmental harassment encountered in El Maghara area has rendered a number of species as rare and endangered. A valued approach to species protection is protecting them in their natural habitats. Medicinal plants are a major asset for the economy of the Bedouin of El Maghara and for Egypt at large. The Gazelleg scenario includes the propagation and domestication of these plants so that in due course they can be properly conserved, under sound scientific conditions. Cultivation of these plants would meet the growing market demand at comparatively lower prices while meanwhile easing the pressure on natural population in the wild.

El Maghara coal mine

The coal mine is one of the pressing factors affecting the environment of El Maghara, with direct responsibility for soil degradation, water contamination, and loss of biodiversity. In this scenario, efforts are made to ensure restoration of the mine's production, while observing a sound program to maintain environmental quality and integrity, with a factual and active representation of the local Bedouin on the mine board. Bedouin members of the board also have the chance to express the community's views in relevant issues.

A three-year plan to restore the sustainable operation of El Maghara Coal Mine offers a number of possibilities based on economic viability and ecological measures, with emphasis on how to maximize Bedouin benefits and share of responsibilities. Under the plan, part of the mine's production is used to fuel a power plant to supply the area with electricity and other sources of energy. Moreover, part of the mine's revenues are dedicated to the development of the area, funding some community services projects such as schools and hospitals. Bedouin should have a priority to join the mine for jobs, and they should be also treated equally with others coming from outside El Maghara area regarding health care and social welfare.

Under the new management of El Maghara coal mine, a top agenda issue is how to restore the ecosystem viability and remediate the massive environmental damage caused by the mine. A group of national experts considers various approaches to deal with land degradation, water pollution, biodiversity losses, along with other symptoms. The eco-restoration process entails good funds, expertise, and time. The mine owners, along with other national and international donors, provides necessary funds, and the panel of experts provides an action plan with different remediation strategies. An ongoing monitoring scheme to gauge water, soil, and biodiversity quality is enforced and run side- by-side with the mine operation.

Socioeconomic issues

Agriculture expansion would have a strong impact on economic performance and help elevate family income to a significant extent. It would also provide a good source of nutrition to Bedouin, with direct bearing on their health and well-being. The grazing industry would develop, making use of the good extension program of the department of agriculture and the good quality sheep they brought to Bedouin. Export of sheep to national and international markets would ensure an additional flow of cash to Bedouin and would contribute heavily to family income in addition to creating jobs for young Bedouin. Improving the economic conditions of Bedouin would increase their demand for meat and milk. This in turn would, encourage Bedouin to invest in grazing.

Industrial development and societal impacts

The economic growth brought about by good governance and adequate services under the Gazelleg scenario allows many non-Bedouin to come and settle in the area. Newcomers bring much of their traditions and pattern of life to the area, and tend to live in separate quarters. One of the main objectives of the city council is to make sure that local knowledge and social structure of the local Bedouin are not affected by newcomers and the new practices they bring about. A center for the conservation of traditional knowledge and practices is established with the help of industries acting in the area and the supervision of relevant governmental bodies.

Services

Good services are the backbone for any progress that a community can reach. In the Gazelleg scenario, the introduction of irrigation water and the substantial shift the community is making toward a new sustainable and prosperous future have also ushered in a new efficient service system. The local council was reformulated, with new members representing all stakeholders. The council has adopted policies and strategies meant to improve the infrastructure and to secure the needs for newly emerging companies and activities. Industry representatives have donated seed money to start the service upgrading scheme. Improvement of services includes the provision of clean water, electricity, schools, and communications facilities such as telephones. Houses have access to clean tap water for the first time. Meanwhile, sewage water is collected and treated through a biological system, and wastewater may be re-used.

The impact of utility service improvement on health and welfare is significant, and easily reflected in the decreasing number of child death, good control over the spread of communicable diseases, awareness raising, illiteracy eradication, and many other factors. A big virtue of the provision of good services is ridding the area of the problems caused by isolation and remoteness. The provision of telecommunication facilities and of an efficient network of bus services connecting El Maghara with other parts of Egypt benefits almost all social, economic, and civic activities.

Good bureaucracy is a fundamental requisite for people's welfare, and is strongly felt in a number of spheres such as good teaching, a sound extension services, health and vaccination programs, and many others. Follow-up programs and regular visits of

key officials to the area ensure an adequate bureaucratic performance of civil servants and governmental employees, with reasonable efficiency and proficiency.

El Salam canal water and Bedouin health

A large proportion of the water provided by the new canal is wastewater that contains some biological and chemical waste. Stringent efforts were made by officials to forestall any impacts of wastewater on Bedouin health. An awareness campaign, orchestrated by specialists, held numerous meetings to explain how to use the water without being exposed to the high risks of contracting waterborne diseases. Bedouin women were briefed on best practices to protect their children from any risks. Series of vaccinations were administered freely to almost all the population of the area, with close follow up. In some cases, canal water was treated through some filtering systems that officials recommended for the removal of many of the waterborne pollutants. With the help of academicians, simple and cost-effective treatment facilities were devised and approved. Bedouin are encouraged to establish their own water treatment facilities, with officials providing logistic and technical support.

S2: THE BUTTERFLY SCENARIO: Good Governance and Water Scarcity

Scenario background

In this scenario, efforts to have a branch of El Salam canal serve the El Maghara area were not successful. People's request for a small extension canal was turned down on economic grounds. The decision not to support an extension of the canal was conveyed to senior officials of the district's city council, who in turn conferred with representatives of the local council, to explain the reasons that led to turning down their request. Both officials and Bedouin were utterly disappointed. However, a strong zealous spirit of determination was sparked to turn the disappointment into a big challenge.

The governing body gave an outstanding example of how to go forward, ridding El Maghara from the precarious conditions it went through, with sincere efforts to help Bedouin attain a reasonable standard of living, while strengthening environmental sustainability ethics and practices. By mobilizing available natural and human resources, the community was able to navigate out of the existing impasse. A key factor in this process was ensuring the participation of all sectors of the community based on equity and sharing responsibilities. One of the biggest challenges faced by the city council was to encourage Bedouin to play their participatory role at area level. Several meetings were held with Bedouin chiefs, senior sheikhs, and others to persuade them to pledge the needed support for the city council through participation and communication. Bedouin members of the council took advantage of any celebration such as weddings, Molid, such as Sheikh Hemid Molid to talk to Bedouin, urging them to speak up about their views and participate in city council meetings meeting.

An action plan to promote sustainability and prosperity

The city council drafted a package of measures to restore the environmental setting of the area. A central focus of the plan is to capitalize on the area's highly valued environmental assets as a basic precursor for a sound economy, business activities, and prosperity. A ten-year rehabilitation plan is designed to accomplish this target.

Poverty alleviation and bank of the poor

In El Maghara, poverty is a natural product of ailing economic conditions, scarce employment opportunities, and the unsustainable exploitation of natural stocks and environmental assets. A prime concern of the city council is to halve poverty in El Maghara by 2017. An initiative in that direction is the creation of a new banking system through the Bank of Poor, which provides long-term loans and loans that charge almost no interest and have long grace periods to poor Bedouin willing to start some small business, once they prove their ability and capabilities to establish and run a profitable and environmentally friendly business.

Social fund agreement, social and economic improvement

The city council has entered into an agreement with the Social Fund of Egypt to provide some loans to young Bedouin willing to establish some small business in the area of medicinal plants and olive oil production. The city council, in turn, has forged a number of contracts with big supermarkets in Cairo and main cities to supply them with quality, organic olive oil and medicinal plants produced at these units. Part of the fund is dedicated to supplying Bedouin with small trucks to transport their products to the several marketing venues in Cairo and other cities.

The new economic reforms introduced to El Maghara have an impact on poverty alleviation and economic improvement in the area, as evidenced by changes in population density and changes in population dynamics trends. Migration of local Bedouin to other parts of Sinai and Egypt stopped as a result of the societal and economic improvement, and others, including both Bedouin and non-Bedouin, are moving to El Maghara, attracted by the industrial rejuvenation of El Maghara.

El Maghara rehabilitation initiative

The continuous efforts of the city council to draw public attention to the deteriorated conditions of El Maghara environment has captured the interest of one of the most influential nongovernmental organization in Egypt, which has launched a strong appeal to save and restore the environment of El Maghara. The goal of the El Maghara Rehabilitation Initiative is to reconcile economic development with environmental sustainability for the benefit of the people and the environment. Basic elements of the initiative include: conservation of medicinal plants, restoration of degraded woods, establishment of protected areas, enforcement of the polluter pays principle, and other relevant codes.

The Initiative has made a big change in industries' attitude toward the environment, and has helped them adopt sustainable production programs. Extractive industries are limited to the licensed area with no violation of land use pattern. Observing

sustainable land use patterns brings several advantages to the local Bedouin, including:

- good harvesting of flashfloods and the elimination of pollution sources that used to affect the quality of flashfloods water, such as heaps of coal in the pathway of flashfloods;
- the ability to provide sound ecosystem services as a result of the decline in landscape fragmentation;
- possible restoration of damaged ecological landmarks in the El Maghara area such as Sheikh Hemid acacia wood; and
- use of minerals and other extractive materials as long as extraction is performed under strict control in especially designated sites. Such sustainable exploitation is bound to maximize the area's reserve, adding more potential and longer exploitation.

Monitoring sustainability

New departments have been established to monitor environmental conditions in the area. Newly appointed rangers and inspectors were trained for conservation and monitoring. Patrol groups cover the area on a regular basis to make sure that industrial activities are running with no violation of environmental codes.

Sheikh Hemid wood conservatory

Because of the importance of the floral diversity of the El Maghara area, and Egypt at large, a United Nations sponsored project was launched for the conservation of these plants. Special importance was given to Sheikh Hemid Wood, a unique icon that combines unique biological biodiversity, local knowledge, and anecdotal history. One of the main recommendations of the project was to turn the wood into a national heritage conservatory. The city council swiftly picked up the recommendation, and turned it to an international plea to secure needed funds. The fundraising campaign, orchestrated by the ministries of environment and tourism and the governorate of North Sinai, proved very successful. Donations, coming from local and international bodies, have enabled the establishment of Sheikh Hemid Conservatory, which was inaugurated in a public ceremony attended by a number of ministers and some foreign ambassadors.

Sheikh Hemid Conservatory was a turning point in El Maghara's history, ushering a new era of improved services, good roads, and more business opportunities, taking advantage of the increasing numbers of visitors and holiday makers. National and international touring groups come regularly to visit the conservatory, whose sound and light show attracts a great number of visitors enjoying the narrative part of the show amid the desert sceneries and special sound effects. With the help of a renowned land development firm, the city council has announced a national tender for the exploitation contracts for areas around the Conservatory to be used as shops, motels, safari excursions, and other similar activities.

Services

Restriction on land use enforced by city council was an elemental factor that maintained land topography, helping Bedouin collecting flashfloods and make good use of them for agriculture and domestic use. In addition, water storage facilities, were further improved and supervised by medical staff to ensure a reasonable quality of drinking water. The city council, through his good office has convinced some of the major gravel extraction companies working in the area to sponsor the installation of some water desalination units attached to some of the major wells of the area. Desalinated water was distributed equally to Bedouin in the vicinity. However, with the growing population of El Maghara, and almost no migration outside the area water was always a critical issue, with some occasional shortage spills.

Intellectual capital, sustainable development and poverty alleviation

For the sustainable development concept to gain momentum people have to understand it intellectually as well as have a sense of awareness, intimacy, and appreciation of their surroundings. This state of mind is often referred to as *the intellectual capital*. Factors promoting intellectual capital are numerous and include education, good health, and an influx of people and ideas carried by new investors and newcomers and enlightened media. The new paradigm created by the synergy between good dedicated governance and the candid interest to salvage El Maghara is necessary to expose El Maghara to many of the these factors. The essence of intellectual capital is reflected in various sectors, creating new impetus and providing sound sustainable practices and trends, with the ultimate goal of reducing poverty and improving the quality of life.

S3: THE TORTOISE SCENARIO: Inefficient Governance and Water Availability

Scenario background

In any community, governance occurs at multiple tiers, each with its own duties and responsibilities. At higher tiers, governance focuses on deciding centrally controlled issues such as budget allocations and national utility planning, such as electricity and water supply, medical insurance, pension, education, and others. At lower levels, governance is entrusted to supervise and observe the implementation of policies and strategies created by higher tiers, while providing logistic support. In addition, local governance is responsible for managing issues of local nature, such as issuing licenses and applying the law for those who violate codes and laws established at central level. Lower governance tiers are also responsible for suggesting action plans and budget requirements, as well as for reporting the state and conditions of their localities to allow a regular bottom-up feedback influx between local community and central governance level. With inefficient governance, uncertainties and unaccounted risks tend to pose potential threats to people, their properties, and their environment despite the major changes the provision of water would create. Weak governance also gives

rise to strong feeling of alienation, discontent, and a sour feeling of injustice and inequality.

An eminent factor in such a paradigm is the level of influence that localities and their stakeholders can line up to pressure governance and push for their needs and aspirations. Parliamentarians, celebrities, as well as local people are the driving force that can always generate the support needed to call attention to their people's needs. The role of this driving force is crucial, and communities that lack that leverage may not be able to go very far with their demands and needs.

In Egypt, weak governance is a product of some well-defined features, such as inequity, illiteracy, feelings of alienation, lack of democracy, corruption, and poverty, especially in marginalized communities where these features are strongly felt. Good governance can only thrive in communities where all people are aware of their rights, duties and enjoy considerable degree of freedom to express their views, which is not the case at El Maghara.

El Maghara city council has several members whose main objective is to follow up on governance performance and convey people's wishes and views to administrative officers. Ideally, the council is selected from citizens with recognized experience in public work and community services. But in the Tortoise scenario, members of the council are mostly gravel and stone extraction contractors. During the selection campaign, contractors pressed very hard, offering presents and using unlawful means to support those loyal to them. With its members so industry oriented, the council is not always effective in its role of controlling and maintaining environmental sustainability, a situation aggravated by the community's passive participation and inferior representation.

El Salam canal branch

A decision has been taken to extend a branch of El Salam Canal to Middle Sinai, including El Maghara area. The decision was made on strategic grounds with the ultimate goal of attracting people from the old land in the Delta and Nile valley to come and settle in Sinai, particularly young people and fresh graduates. The decision is part of Egypt's strategy to reduce the vulnerability of Sinai demonstrated in previous conflicts with Israel.

When the new branch of the canal was extended, the local council and local government employees were supposed to provide the necessary logistic and administrative support necessary by upgrading and improving the technical and administrative skills of key officials. Unfortunately, the El Maghara governing body failed to accommodate the necessary changes and failed to live up to the expectations that both Bedouin and higher-level senior officials had.

Land acquisition problems

Lack of transparency and definitive and fair governing policies applied to land acquisition has trickled down in a series of potential problems, involving Bedouin families, tribes, and also newly established companies. On several occasions, regulatory bodies have given a blind eye to some unlawful acquisition of land, practiced either by families, tribes, or companies. This, in turn, has created friction between some tribe

of the area and the newly founded enterprises on sovereignty and rights over land. Land ownership was subject to tribal and local Orfi laws (customary laws) approval, with little interference from the government except on security-related issues. The growing demand for land after the provision of water and the several requests from companies to establish some new large farms in the area has created a new tense atmosphere over land rights. Serious repercussions dominate the area, including spells of violence.

Economy and services

The construction of the canal provided excellent opportunities to many Bedouin throughout the different stages of the canal. In the construction stages, many Bedouin started small businesses to provide construction workers with food and beverage were established and flourished around the construction sites. With the completion of the canal and provision of water, expansion in agriculture and related activities began. Each Bedouin family was granted a fixed land allotment in the vicinity of each village. Occasional squabbles erupted between Bedouin families and/or tribes over land rights. Nevertheless, Bedouin were offered a good package of advantages to help them start new business, especially in the field of medicinal plantation, with loans for purchasing seeds and fertilizers. The growing agricultural activities and crop production have ensured unprecedented income levels for Bedouin families, with direct bearing on their well-being and quality of life.

In the Tortoise scenario, the provision of water and the subsequent improvement of business opportunities were not paralleled by a sound economic package of logistic and other support measures. The local council is not able to decide about many of the economic issues because of limited experience and the tendency to not include members from outside the community. Economic planning and implementation strategies are short-sighted and mostly based on individual visions, with no thorough studies or consultations. However, a number of banks have been established in the area, along with some other financial organizations that hope to foster good business. In particular, companies want to develop the area as an ecotourism magnet, investing heavily in the region.

It was not too long before organizations and investors new to the region recognized that the gross lack of service facilities and basic infrastructure, especially telecommunications, hospitals, and sanitation, is a major barrier for cost-effective operation of these companies; some have even tried to have their own utility facilities, such as power generating units and private clinics. Massive deterioration of environmental assets, caused by gravel and stone contractors, is also hindering plans to promote an ecological tourism industry.

Transportation between El Maghara and other parts of Sinai and Egypt has improved to some extent but not enough to meet the growing demands and needs. More buses are used as demand grows, but their quality is not adequate. A number of private companies have been formed, taking advantage of the growing demand and lack of good public service. Private companies provide much better service and have a good share of the market, but in view of the weak governance, most of the companies do not abide by official tariffs put by the city council.

Environment and sustainability

Unsustainable agriculture and business opportunities

A major opportunity to boost the economic vitality of the area and to improve the quality of people's lives is through promoting exports of medicinal and aromatic plants. Growing demand for medicinal plants, coupled with the long experience of Bedouin and the suitability of environmental conditions have favored business opportunities in this field. With the help of some NGOs and some businesses, a number of cooperatives have been established to produce medicinal and aromatic plants for export. With the irrational use of pesticides, and the high residue levels of heavy metals and other pollutants in the irrigation water, however, many products are not suitable for international markets. On several occasions, exports have been turned down and sent back because of high residue levels of pesticides and other pollutants. The refusal of several shipments of medicinal plants has caused some considerable loss; some cooperative have gone bankrupt and a large number of the workers have been laid off.

The irrational use of pesticides has caused some serious impact on wild life in the area. Large numbers of local fauna have been reported dead, presumably after being exposed to highly toxic unregistered pesticides or to their residues in their prey or food. With wastewater as one main component of the canal water, growers regularly encounter problems that the inefficient governance and lack of extension service failed to meet. Flood irrigation is the most applied irrigation system in the El Maghara area, allowing leaching of heavy metals and other pollutants to concentrate in soil and to penetrate down to groundwater level. Problems of soil contamination are apparent in some of the crops produced in the area that failed to meet health regulations.

Gravel industry and canal water

The presence of the canal water was unlawfully exploited by a number of the gravel companies operating in the area in some of the industrial process, cooling and washing of hardware. A number of cases have been reported of gravel companies dumping solid waste generated from the gravel industry in the canal. The excessive use of canal water by the gravel industry, especially in summer, has led to some conflicts between gravel contractors and agriculture companies that have suffered serious losses as a result of water shortage.

Poor governance and industries

The presence of water has brought about ideal opportunities to change industrial development emphases in El Maghara area and to limit the growing trends of unsustainable activities such as mining and gravel and marble extraction. However, in this scenario, with the weak governance, mining barons have continued exerting their pressure and have a strong hold on the area. Extensive gravel, sand, and stone extraction continue to cover new areas, including areas of ecological significance, with massive impacts on environment setting.

With lax governance, highly polluting industries that cannot be accepted in other parts of Egypt, such as chemical, cement, and other similar industries, are easily estab-

lished, taking advantage of the loose environmental codes of the area. The establishment of such industries is further deteriorating the environmental setting and massively depleting the already exhausted natural recourses. Housing facilities for the employees on new industries are being built with no consideration of land use pattern and environmental setting. Municipal problems such as solid waste and sewage are surfacing, causing many environmental impacts.

The irrational increase in quarries and mining activities is exacting its toll, resulting in:

- landscape fragmentation, with losses of habitats, floral and faunal biodiversity;
- soil compaction as a result of heavy trucks moving and transporting stones and sand;
- air pollution from dust and other particulate matter provoked by gravel extraction and deposited on plants, and intoxicating all other sorts of life;
- contamination of groundwater with leachates of piled heaps of stones, coal, and other extracted materials; and
- losses of flashfloods, with bad consequences for agriculture and other rangelands.

People's health and welfare

People's health and welfare are basic obligations that governance should strive to achieve through the provision of adequate facilities and services. Having lived in Sinai, outside Egypt's mainland, Bedouin have always been immune from some waterborne diseases, particularly schistosomiasis, transmitted through canals and drains. The regular exposure of Bedouin to the wide variety of waterborne pathogens during irrigation is now causing a high incidence of these diseases. Bedouin children are even more vulnerable as a result of bathing in the canal. On the other hand, many of the children bathing in the canal drowned, especially in the early days of the canal.

Much of the blame for the deteriorating health conditions in the Tortoise scenario is directed to the governing body. The provision of water through the canal should have been preceded by a stringent campaign to raise Bedouin awareness about the drawbacks of using wastewater and expected risks. On the other hand, the inferior services at local hospitals, and the chronic shortage of staff, have aggravated health problems. The events that evolved in the area are the ultimate result of inferior governance and services.

S4: THE DEAD HORSE SCENARIO: Inefficient Governance and Water Scarcity – Business as Usual

Scenario background

Inefficient governance at local level, with almost no public participation to support community demands, has failed to prepare a good and convincing case for a canal branch, and their demand was turned down. The refusal to support the canal branch has brought about a deep sense of dismay and disappointment that drove the area even further in an endless vicious circle of despair and isolation, with the gap among various stakeholders growing.

In the El Maghara area, most key officials are not local Bedouin but come from far away places, mostly outside Sinai. The rugged quality of life in the area has not encouraged them to settle in the area and to bring their families. Instead, their presence is considered temporary until they are moved out again to some other place or to the place they came from originally. Thus most officials do not develop a sense of belonging to the area. The different culture and traditions prevailing in El Maghara and Sinai in comparison to those in all other parts of Egypt has even deepened the feeling of alienation and allowed a barrier between these officials and the local Bedouin. A key factor in the relationship between Bedouin and their governance is built around this gap, making communication difficult.

Environmental setting

Efficient governance and good public participation are essential edge for a community to have good prospects. Flaws in either of these result in a community's inability to meet emerging challenges and or to control conduct. In the Dead Horse scenario, inefficient governance and regulatory bodies' lack of follow up and control have allowed gravel and sand contractors to expand their activities even in the most ecologically sensitive areas.

More works were established, without respect to land use patterns. The environmental setting is deeply affected, with a number of alarming manifestations such as:

landscape fragmentation and loss of biodiversity;

- land degradation;
- species disappearance, with some becoming enlisted as threatened or extinct; and
- loss of plant land cover.

Deterioration of environmental stocks has many impacts, particularly economic and welfare. Problems such as loss of flashfloods, loss of plant cover, abandoned agriculture, and others constitute daunting challenge to Bedouin, with direct bearing on their economy and subsistence.

One of the main environmental attractions of the area, the acacia wood located at Sheikh Hemid, has been badly affected, with many trees uprooted and used for fuel. Overharvesting of groundwater is turning the groundwater saline, and is increasing seawater intrusion, causing soil degradation and introduction of some invasive species that flourish on saline groundwater. In addition, some rare medicinal plants species may disappear as a result of the severe drought and overcollection. Loss of plant cover will inflict major losses on grazing activities and the grazing products that nourish Bedouin and help improving their economic conditions.

Inferior services

Under the Dead Horse scenario, services in El Maghara are profoundly affected by the gross negligence brought about by inefficient governance and inferior public participation. With no plans for maintenance and follow up, remaining schools and hospitals are failing to address the increasing demand for health care and education.

Health, a central issue of Bedouin quality of life, is badly affected. Water pollution caused by unhealthy storage facilities is a detrimental factor in people's health and

well-being. The incidence of communicable diseases is increasing, especially in summer. Child mortality figures are increasing as well. Considering the inadequate hospital facilities and the lack of preparedness to meet such emergencies, a high possibility of communicable diseases outbreak seems possible. Meanwhile, air pollution caused by the massive cutting and polishing of stones in the area, is resulting in widespread pulmonary diseases among the local people.

The deterioration of services is having strong repercussions on social, culture, security, and especially gender issues. Women have the heavy burden of managing the family's affairs under such hardships. Fetching water, plants for food, and fuel, and managing grazing activities, are all harder under the circumstances.

Social impact and the eruption of violence

Lack of basic services, in addition to inefficient governance, has contributed much to breaking societal harmony and communications at tribal level. It also has influenced relationships among tribes and between the whole tribal community and local authorities. The relationship among individuals in each tribe is strained because of the dominant hardship and the harsh competition for food, water, and other resources. A tense atmosphere is growing among tribes over the right of grazing, vegetation, and water, instigated by resources scarcity, inferior services, lack of governance supervision and control. Unrest between tribes may develop to a pan- community unrest in which tribes confront governance represented by police. A long episode of sectarian and communal unrest can drag the area to bleak uncertainty, with possible catastrophic violent consequences.

Growing feelings of hardship and discontent among Bedouin causes some of them to get involved in growing and trafficking narcotic plants. Regular raids by police forces are made, and several arrests add a new dimension of confrontations with the local people. Growing and trafficking drug plants brings some extra money to the area, much of which is used to buy arms for use against police forces, pushing the area to the verge of open conflict. The spread of illegal activities on the part of some allows the influx of drug dealers from other parts of the country, hence adding more uncertainty and challenge to the future of the area. The area turns into an enclave in which strict police patrols and security forces are heavily involved.

Poverty and its effects

As in the other scenarios, poverty is not only about low income but goes far beyond that to include lack of clean water, clean air, safe shelter, and above all freedom of choice.

Environmental damage and resources depletion have denied Bedouin getting their supplementary needs from their surrounding environment. The inferior quality and quantity of water and the vast area of land turning infertile are additional causes of poverty, let alone inaccessibility to quality education, the spread of diseases, and the high rate of child mortality. Inferior services and inferior infrastructure, including transportation and telecommunication facilities, have made little room for any economic development in the area, and average income is only about 350 LE per family per month.

The repercussions of poverty in all its dimensions are significant. While a majority of Bedouin have succumbed to their destined fate, with their grudges and pain growing one day after the other, a minority group of young Bedouin have developed a religion-based cult that allows the use of violence to address the poverty and injustice they feel.

The incidence of violent eruptions in which extremist Bedouin are showing a hostile attitude to government forces stationed in the area is becoming more frequent. As a result, government is increasing the number of anti-terrorist groups in the area, with the imposition of new regulations on people's movements in the area. The emergence of young fundamentalists is a turning point in El Maghara's history. Having been known for being tolerant and peaceful, some Bedouin are now adopting a revolutionary attitude that fragments the community, and a number of young Bedouin are involved in attempted terrorist attacks and political unrest. Growing fanaticism in El Maghara is driven by poverty and fed on negligence, corruption, ignorance, some of the consequences of inefficient and uncommitted governance.

Comparative analysis of the four scenarios

Using the Futures Group scenario method, a quantitative study was undertaken to determine how some of the most important variables would unfold under various scenarios. These quantitative scenarios have provided valuable benchmarks that contributed signifincatlly in building the storyline scenarios. They also show the time path of the most important indicators in each of the four built scenarios.

The Futures Group scenario method is a scenario construction method developed by the Futures Group International. In a nutshell, the main steps are as follows: First define the axes of the scenario space, where each axis will be associated with a key driving force. The usual practice is to define two axes, in order to construct a two-dimensional scenario space that is divided into four alternative worlds. Then project the key variables in each alternative world (scenario). In this study, we utilized the Enhanced Trend Impact Analysis method to make such projections (Agami, Omran, Saleh, & El-Shishiny, 2008; Agami, Atiya, Saleh, & El-Shishiny, 2009)

The Enhanced Trend Impact Analysis method is generally used to estimate the possible impacts of probable occurrences of some events – with different severity degrees – on the future values of the variables under study. This method takes as inputs the probabilities and impacts of events and the historical data for each variable. In our study, the probabilities of events differ in each alternative world, and this is the reason that we get different projections for the same variables in the various worlds.

In the best case scenario (S1), by year 2025, average income is well above 650 LE per month per family. While in the worst case scenario (S4), by year 2025, average income is around 300 LE per month per family. Thus in the best case, average income is twice as much as the percent increase in the worst case. This is a significant difference. Note also that, with respect to income, S3 is better than S2. (Figure 6)

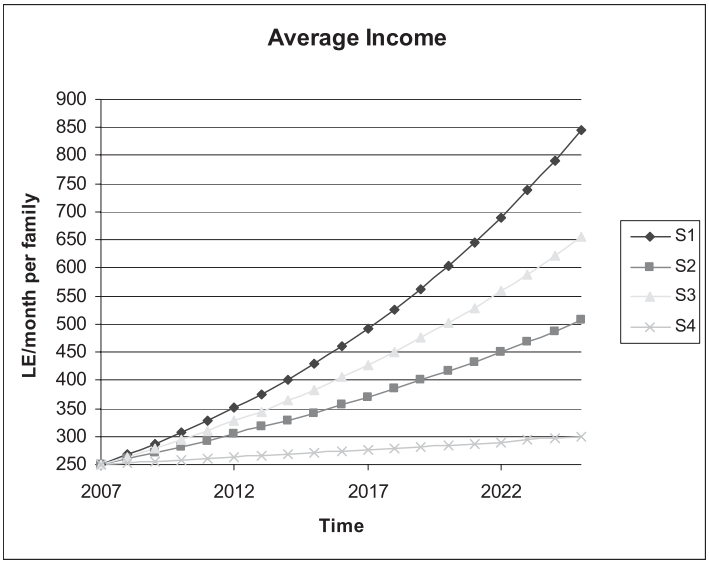

Figure 6. Average monthly family income in each scenario

With respect to literacy, in the best case scenario, by year 2025, the literacy rate is around 60 percent, while in the worst case scenario it is about 35 percent. In the best case, the literacy rate is thus more than a third higher in the best case than the worst. This is a significant difference. Moreover, in this aspect, the second scenario is slightly better than the third one. (Figure 7)

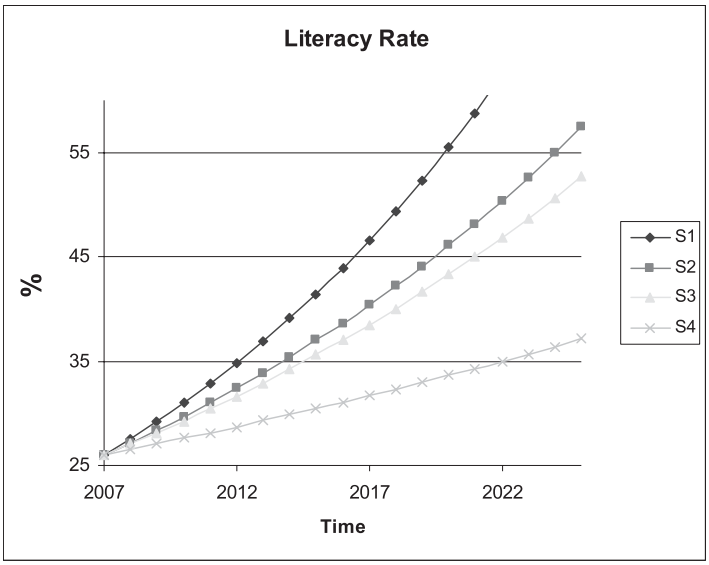

Figure 7. Literacy rate in each scenario

With respect to employment rate by the year 2025, as well, there are significant differences, with the best case scenario showing an employment rate of more than 70 percent, and the worst case scenario showing about just over 35 percent. In the best case, the employment rate is thus 100 percent more than in the worst case. The third scenario is better with respect to employment than the second one. (Figure.8)

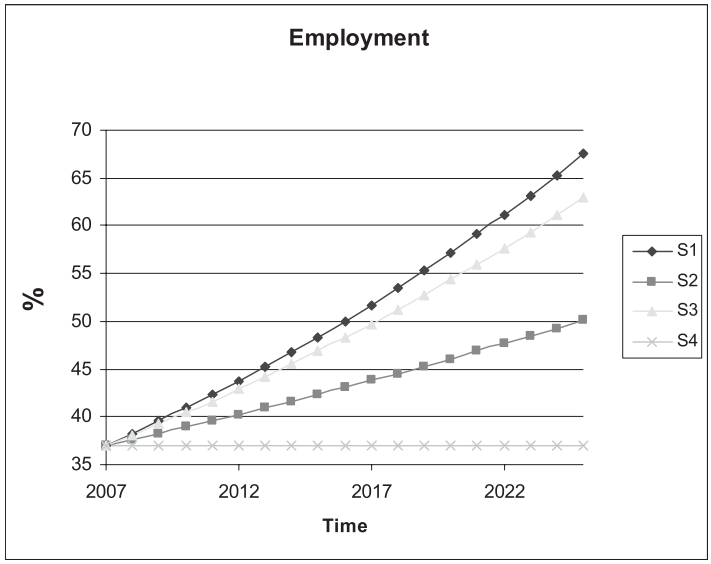

Figure 8. Employment rate in each scenario

In terms of population, there is also some difference among the scenarios. In the best case scenario, population is expected to be around 1,700 persons by year 2025; in the worst case scenario, 1,400 persons. (Figure 9.). Reasons behind this trend is probably the migration of many young Bedouin in the worst case scenario, to other places where employment is available.

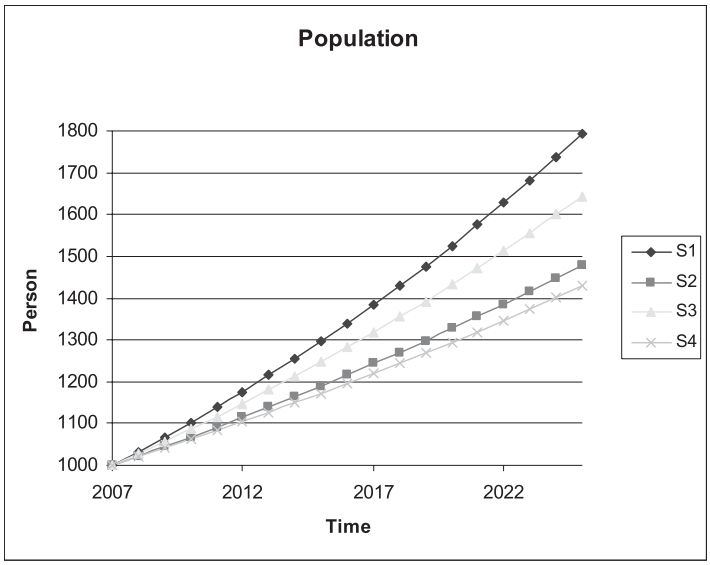

Figure 9. Population levels in each scenario

In the best case scenario, water share per capita is more than 650 liter per person per year by 2025, whereas it is less than 300 liters per person per year in the worst case scenario; i.e., . in the best case, water share per capita is 20 percent more than in the worst case. The scenario is far better than the second scenario, as a result of the canal branch serving the area. (Figure 10.)

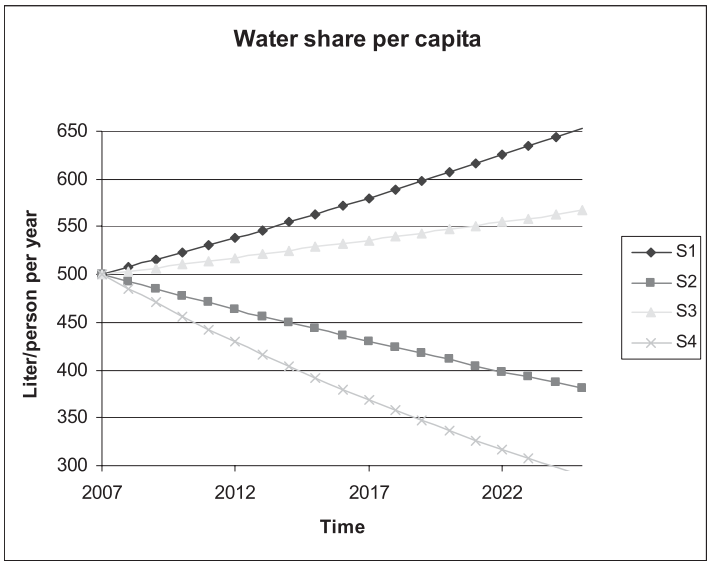

Figure 10. Water Share Per Capita in Each Scenario

Conclusion

In El Maghara assessment, the timeframe for the scenarios is 20 years. The method employed to develop them was a hybrid method that integrated the Futures Groups Scenario method (Glenn & Gordon, 2003) and the prospective approach (Godet, 1994), mainly the MIC-MAC and the Mactor methods. This hybrid approach combined quantitative and qualitative aspects.

Major drivers of ecosystem changes were identified, using the MIC MAC method, while describing the relationship among them, and identifying the key driving forces. Several meetings were held with various stakeholders, including Bedouin, local government officials, and others. Questionnaires were also used to collect pertinent information. Water shortage and poor governance were identified as the most influential drivers. On the other hand, Mactor method was used to look at each stakeholder's preference and degree of support for identified objectives. It also defines the degree of support each stakeholder potentially has for each objective and clusters groups of stakeholders according to their stand towards various objectives. The method is based on inter-stakeholders influence. Using the Mactor software, the assessment mapped the actors' positions with respect to influences and dependence in relation to one another. The positions are calculated automatically.

Storyline scenarios were constructed using a blend of two factors – the highest ranking drivers and ongoing meetings with the local population. The drivers that ranked as the most influential driving forces in El Maghara inefficient governance and water scarcity – were used to build two axes for draft scenarios. The vertical axis shows good local governance at the top. At the bottom of the axis is inefficient local governance. The horizontal axis shows the spectrum from water scarcity to water availability. Four scenarios were accordingly constructed as S1 (also called the Gazelleg Scenario), S2 (the Butterfly Scenario), S3 (the Tortoise Scenario), and S4 (the Dead Horse Scenario).

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