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Regional Office for the Near East (RNE)
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Country Study on Status of Land Tenure, Planning and Management in Oriental Near East Countries

CASE OF EGYPT

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Foreword

Land tenure, planning and management gain increasing importance in view of accumulating problems related to natural resources degradation notably for the Oriental Near East Countries (namely the Arab Republic of Egypt, Lebanon, the Syrian Arab Republic, Jordan, Iraq and the Islamic Republic of Iran).

Natural resources degradation constitutes an important threat for the human society especially in the Near East region. Land and water degradation is affecting and will affect agriculture and all dimensions of food security, such as food availability, food accessibility, food utilization and food systems stability. Scarcity and degradation of land and water have and will have an impact on human health, livelihood assets and food production as well as growing threat to food security.

The State of the World's Land and Water Resources for Food and Agriculture (SOLAW), recently published, notes that food production has been associated with inappropriate management practices that have degraded the land and water systems.

The global assessment of the state of the planet's land resources is showing that one quarter are highly degraded. Another 8 % are moderately degraded, 36 % are stable or slightly degraded and 10 % are ranked as "improving." The remaining shares of the earth's land surface are either bare (around 18 %) or covered by inland water bodies (around 2%). Some 40 % of the world's degraded lands are located in areas with high poverty rates. Around 30 % are in areas with moderate levels of poverty while 20 % are in areas with low poverty rates.

The Oriental Near East Sub-region (SNO) is one of the most affected regions by direct and indirect causes of land degradation that is remaining one of the main challenges of the twenty-first century. The threats are still present throughout all member countries and will likely worsen with important impacts on sustainable agriculture in general and food security in particular.

Over the last few years, FAO has: i) dedicated considerable attention to land issues and taken a wide range of initiatives and activities, particularly in the Near East Region; ii) promoted sustainable land management constitutes one of the main priorities in the agenda of FAO Regional Office for the Near East; iii) reinforced capacity in land management and tenure for sustainable agriculture in the Sub-region; and iv) helped in the identification of appropriate actions and developing capacities in land tenure, planning and management.

In response to requests from its Member Countries, FAO has also dedicated considerable attention to improve agricultural productivity and food security with special consideration to sustainable land management and natural resources conservation. FAO approaches land management by developing land degradation assessment methods and sustainable land management and decision support tools for national and local levels.

Presently, FAO is more focusing on:

- Land tenure and implications of climate change scenarios;
- Land tenure and implications of policy options in relation to the rapid growth of land use for bio-energy production;
- Land tenure in emergency and post-emergency work;
- Compulsory purchase of land and compensation;
- State land management;
- Low-cost land tenure security;
- Good governance in land administration; and
- Making land information accessible for the poor..

FAO/SNO produced this country study on the "Status of Land tenure, Land Management and Land use planning in SNO Countries" – Case of Egypt to update information and data, and subsequently,

identify issues and priorities for technical and policy support, both with a sub-regional dimension and needed recommendations. It aims at providing a highlight of the current situation regarding land tenure, planning and management and making and adopting potential recommendations on what needs to change at policy and institutional and ground levels to promote interdisciplinary and inter-ministerial/institutional processes.

FAO and its partners, in collaboration with member countries, will continue to cooperate and provide technical assistance with practical and feasible recommendations for promoting sustainable land management and on what needs to change at policy and institutional and ground levels to promote interdisciplinary and inter-institutional processes on planning, tenure and management in the sub-region.

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I have to acknowledge that mentioning a commercial company or product in this publication does not imply the endorsement of the FAO or cooperating agencies. Trademark names and symbols are used in an editorial fashion with no intention of infringement on trademark or copyright laws.

The contents and views expressed in this publication do not necessarily reflect the views or policies of FAO and the agencies cooperating in this study. I regret any errors or omissions that may have been unwittingly made.

Ahmed O. El-Kholei

Cairo, October 2011

Executive Summary (Part I)

The share of agriculture in the GDP declined from 16 percent in the 1990s to almost 14 percent in 2010. Meanwhile, those employed in agriculture as a percent of total labor force is declining since 1960 to 2006. Despite losing labor and share of the GDP, agriculture is, and will continue to be, among the major economic activities in Egypt, and a generator for economic growth. The balance between agriculture and other productive sectors of the economy require proper spatial and land use planning. Land tenure is central to this planning exercise.

Land property right is the result of common factors, such as occupation and religion i.e. Islam, and agro-climatic conditions. Land property rights are multiple and complex. They are inherited from pre-Islamic rules (*Orf*), Islamic (*Sharia*) and colonial as well as post-colonial legislation. All these rules are co-existed. There are number of land status (regimes) such as private ownership (*melk*), collective land (*waqf*). Also there is a dichotomy (rural-urban).

Land policy formulation and management in Egypt have been transforming in close association with institutional transformations. Since the Ottomans, to Mohamed Ali, to the Nasser's regime, and ending by the Mubarak administration, each period of time had its dogma and accordingly its land tenure systems. Today, Egypt has investment opportunities map till 2017 that defines land uses for the overall development. Today there are number of institutions responsible for planning the uses of this land and the mechanism to transfer the ownership of this land.

The land question can be framed in the current status of dwarf and fragmented holdings. This is the result of complicated procedures to secure property right, inheritance, and increased prices and/or rents per unit of land used for agricultural or non-agricultural uses. Consequences include persisted rural poverty, violent disputes as a result of increased population densities and informality. The impacts are a multitude of economic inefficiency and idle land markets.

Laws and regulations that govern land markets come in ten sets of groups. Islamic, customary and civic laws co-exist next to each other. The institutional framework that governs land markets need serious transformations including, but not limited to, redefining the mission and mandate of public bodies responsible for land distribution and sectoral development, and adopting principles of good governance.

For perfectly competitive land markets, there is a need for updated cadastral and registry of land by which each parcel of land has a national identification number. The registry has to include specification of each parcel, information concerning the owner(s), sub-divisions, etc.

Aside of these corrective and preventive measures, there is a need for a wide range of supportive measures. Educating and enlightening the public with their rights and means to access land is essential for perfectly competitive markets. Applying taxes on wind-fall gains is another measure to control freezing savings and money in the form of land and vacant dwellings. Also levying an annual tax on unused land and closed dwellings is prone to divert money needed for investment away and curb the tendency to speculative practices. This recommendation is in line with Islamic *Shariya* where the owners of utilized assets, in the form of land, gold, real estate, etc. have to pay 2.5 percent of its assessed value in the form of *zakat*. This recommendation will free frozen assets, and will avail money for investment that can generate employment opportunities.

Executive Summary (Part II)

Part II is a report on land management in Egypt. It includes an inventory of land resources and ecosystems in Egypt. It also presents Egypt's agricultural zones, land uses and desertification; and then challenges and State plans. The report addresses the main reasons for land degradation, and types of land degradation. Recommendations conclude the report.

The Egyptian terrain consists of a vast desert plateau interrupted by the Nile Valley and Delta which occupy about four percent of the total country area. Most of the remaining land is desert. The land surface rises on both sides of the valley reaching about one thousand meters above sea level in the east and about 800 m above sea level in the west. The highest point of the country, at Mount Catherine in Sinai, is 2,629 m above sea level and the lowest point, at the Qattara Depression in the northwest, is 133 m below mean sea level. The protectorates (29 locations) constitute about 19 percent of the gross area. Coastal zones and marine environment are included in the total area; about 53 percent of Egyptians live within 00 km away from the coast line.

According to SOTER program and the soil map of Egypt, the soils can be classified into eight SOTER units. As a result of homogeneity in landform each unit contains only one terrain component and one soil component except SOTER unit No.1, which contains three soil components. Also every terrain component contains only one soil component. The sand dunes in the north of the Delta (SOTER unit 2) do not contain a soil component because there is no soil in these active dunes.

The agricultural land base consists of old land in the Nile Valley and Delta; rain fed areas; several oases; and reclaimed land from the desert since 1952. Due, in part, to good climatic conditions (maximum sunlight, mild winters) and reasonable quality of land and water resources, Egypt is ideally suited to cultivate a wide variety of crops. The most notable fact is cultivating two water-demanding crops during the summer, namely, rice and sugarcane. This poses pressure on the limited amount of water available for irrigation. Egypt is blessed with a number of mineral resources, such as petroleum. However, land mines and Explosive Remnants of War (ERW) is common hurdle that faces land development.

Egypt can be divided into four agro-ecological zones: North Coastal Belts; the Nile Valley and Delta, the Oases and Southern Remote Desert Areas, and Desert Inland (Sinai and Eastern Desert). The strategies for agricultural development aim to increase cultivated land and crop production by three to four percent annually. Cultivated and cropped areas increased in the past few years. With population growth around two percent per annum associating with a decline in fertility of land and shrinking agricultural land, the resultant is food insecurity.

The Nile is the main and almost exclusive source of fresh water in Egypt. Groundwater in the deserts and Sinai, rainfall and flash floods, and desalinization of seawater are other complementary sources of fresh water. Non-conventional water resources include renewable groundwater aquifers in the Nile basin and Delta, agricultural drainage water, and treated wastewater. Desalinization of seawater in Egypt as a source of water has received a low priority due, in part, to its high cost that ranges between LE three to $7/m^3$. Nonetheless, sometimes it is feasible to use this method to produce and supply potable water, particularly in remote areas where the cost of constructing pipelines to deliver Nile water is relatively high.

Agriculture uses approximately 85 percent of the fresh water resources. All cultivated land is equipped for irrigation. Most of the cultivated land is watered through surface irrigation, about 83 percent of the cultivated land.

Desertification is a serious issue. Drought, declining per capita share of fresh water, climate change are among the factors complicating the matter. Degraded water quality has its impact on agricultural production and contributes to both economic and social losses.

Today, there are number of challenges that Egypt faces. These challenges include: population growth, decline in per capita share of fresh water, decline in fossil fuels sources of energy, and encroachment on arable land at an unsustainable rate, and the potential threats of climate change.

The Government responded through the Ministry of Agriculture and Land Reclamation (MALR) by elaborating a National Action Plan (NAP) for Combating Desertification, 2004 and Strategy for Sustainable Agricultural Development, 2030 in 2009; and a Strategy for Physical Development, that

the Ministry of Housing, Utilities and Urban Development elaborated this year. Both plans addressed the issue of land from a sectoral viewpoint, and both disregarded environmental issues, such as the need to conserve biodiversity, and to consider risks that associate with climate change, such as inundation of the Nile Delta as a result of Sea Level Rise. Both schemes paid little attention to the backward and forward linkages of agriculture with other sectors, such as manufacturing, and the role of land in strengthening these linkages. Furthermore, both schemes dealt with institutional transformation and developing human resources as supportive measures, while in reality there is need for corrective measures in these spheres. A plan cannot be complete without a component for monitoring and information generation to be sure that triggers are addressed and targets are met.

The NAP described the various land degradation types. Direct reasons for land degradation include improper management of soil, crop and rangeland; overgrazing; over-exploitation of vegetation for domestic use, mixed land uses, such as mining and tourism activities nearby coral reefs; and encroachment of human settlements over valuable agricultural land. Indirect reasons for land degradation include fragmented and dwarf holdings that hinder the likelihood of using economies of scale in land management, and rapid population growth.

GoE applied a number of engineered interventions to protect ecosystems, including protecting coastal zones; introducing water harvesting in the North Coast, and planting timber tree and biofuel trees at the hinterland of human settlements using treated wastewater.

No doubt Egypt needs a scheme for land uses and management. The recommendations include a proposed participatory planning modality to elaborate this scheme. The scheme has to mitigate for land market imperfections; avail public goods; address the issue of negative externalities; assure social justice; and induce institutional transformations for a sustainable land use and management.

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Measurements and Conversion

Distance
1 centimetre (cm) = 0.394 inches
1 meter (m) = 39.370 inches
1 kilometre (km) = 0.620 mile
1 Kilometer = 1000 meters = 0.6214 miles
Area
1 square kilometre (km2) = 0.386 square mile
1 feddan (fed) = 0.420 hectare, 1.037 acre
1 hectare (ha) = 2.470 acre
1 square kilometer = 0.386 square mile
1 hectare = 10,000 square meters
1 feddan = 24 qerat = 4200 square meters
Weights
1 kilogram (kg) = 2.205 pounds
1 metric ton (t) = 2,205 pounds
1 tonne = 1000 kilograms =1.102 tons
Volume
1 cubic meter (m3) = 35.3 10 cubic feet
1 litre = 1.057 quart
1 litre per second = 0.035 cubic feet per second
1 Liter = 0.22 galon
Power
1 kilowatt (kw) = 1.360 horse power
Currency
Exchange Rate Effective October 7th, 2011, Central Bank of Egypt http://www.cbe.org.eg/
Currency Unit = Egyptian pound (EGP)
1 USD = EGP 5.9481 (Buy), 5.9766 (Sell)
Fiscal Year
Fiscal Year. July 1-June 30

List of Abbreviations

ACSAT	Access to sanitation
AGPEST	Pesticide regulation
AGSUB	Agricultural subsidies
AGWAT	Agricultural water intensity
ANC	Authority for New Communities
ARDC	Agricultural Research and Development Council
asl	above sea level
AUC	American University in Cairo
AZE	Critical habitat protection
BCM	Billion Cubic Meters
CAPMAS	Central Agency for Public Mobilization and Statistics
CBD	Central Business District
CBOs	Community-Based Organization
CIDA	Canadian International Development Agency
CO2KWH	CO2 emissions per electricity generation
DALY	Disability-Adjusted Life Year (Environmental Burden of Disease)
DFI	Direct Foreign Investment
DRC	Desert Research Center
EAI	Energy Allied International
ECES	Egyptian Center for Economic Studies
EEAA	Egyptian Environmental Affairs Agency
EEZTD	Trawling and dredging intensity
EGP	Egyptian Pound
EPI	Environmental Performance Index
ERSAP	Economic Reform and Structural Adjustment Program
ERW	Explosive Remnants of War
FAO	Food and Agriculture Organization
FORCOV	Forest cover change
FORGRO	Growing stock change
GARPAD	General Authority for Reclamation Projects and Agricultural Development
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GHGCAP	Greenhouse gas emissions per capita including land use emissions
GHGIND	Industrial greenhouse gas emissions intensity
GIS	Geographic Information System
GoE	Government of Egypt
GOPP	General Organization for Physical Planning
ha	Hectare
HDRs	Human Development Reports
IDA	Industrial Development Authority
IDSC	Information and Decision-Support Center
IEA	International Energy Agency
INDOOR	In-door air pollution
IRWR	Internal renewable water resources
ISAS	Integrated Seawater Agriculture Systems
IUCN	International Union for Conservation of Nature
km^3	cubic kilometers
LCHR	Land Centre for Human Rights
LD	Local Development
LIS	Land Information System
m^3	cubic meter
MALR	Ministry of Agriculture and Land Reclamation
MENA	Middle East and North Africa
MHUUD	Ministry of Housing, Utilities and Urban Development
mm	millimeter
MPAEEZ	Marine protection
MTI	Marine trophic index
MW	megawatt

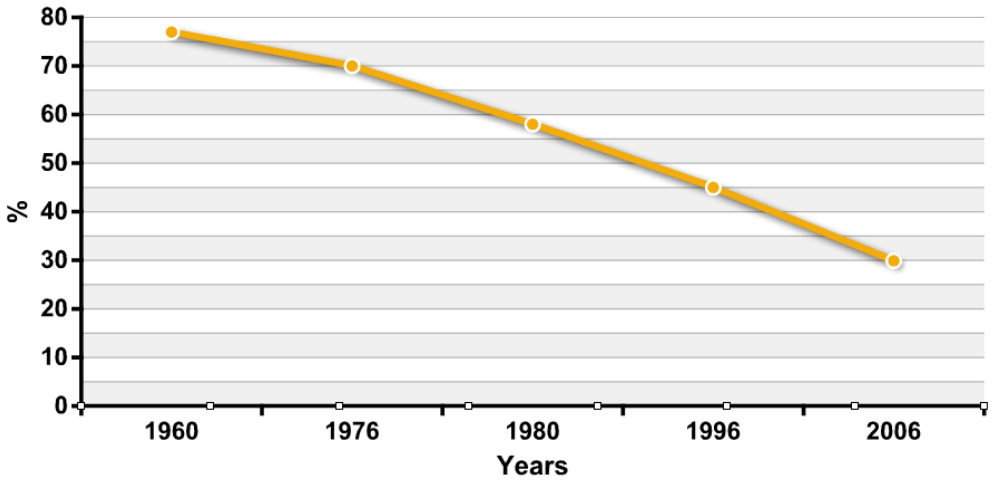
MWRI	Ministry of Water Resources and Irrigation
NAP	National Action Plan
NARSSS	National Authority for Remote Sensing and Space Sciences
NCPSLU	National Centre for Planning State Land Uses
NDP	National Democratic Party
NGOs	Non-Government Organizations
NMVOC	Non-methane volatile organic compound emissions
NOX	Nitrogen oxides emissions
NWC	North Western Coast
Op. cited	in the work cited
OUTDOOR	Out-door air pollution
OZONE	Ecosystem ozone
PACOV	Biome protection
PBDAC	Principal Bank for Development and Agricultural Credit
ppb	part per billion
ppm	part per million
Ramsar	The Ramsar Convention on Wetlands
SADS	Sustainable Agriculture Development Strategy
SCA	Supreme Council for Antiquities
SO2	Sulfur dioxide emissions
SOTER	Soil and Terrain
sq. km	square kilometer
TDA	Tourism development Authority
toe	metric ton of oil equivalent
TPES	Total Primary Energy Supply
TSF	The Seawater Foundation
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UN-HABITAT	United Nations Human Settlements Programme
US$	United States dollar
USAID	United States Agency for International Development
WATSTR	Water stress index
WATSUP	Access to water
WCMC	World Conservation Monitoring Center
WDPA	World Database on Protected Areas
WfP	World Food Programme
WQI	Water quality index
WRI	World Resources Institute
WSI	Water scarcity index

PART ONE

1 Introduction

Today, Egyptian peasants experience serious economic, social, environmental and institutional conditions, which explain the decline in the share of agriculture in the Gross Domestic Product (GDP). The share of agriculture in the GDP declined from 16 percent in the 1990s to almost 14 percent in 2010. Meanwhile, those employed in agriculture as a percent of the total labor force are declining since 1960 to 2006, Figure 1.

Figure 1: Agricultural labor as percent of total labor power, 1960-2006



Source: Central Agency for Public Mobilization and Statistics, compiled from several censuses.

Despite losing labor and share of the GDP, agriculture still is, and will continue to be, among the major economic activities in Egypt, and a generator for economic growth. Industries such as manufacturing, and extracting oil and natural gas are another significant economic activities. Tourism is another booming industry. All of these economic activities require spatial planning where land is central to the overall national development.

There are number of reasons for this unfortunate situation. Globalization and adopting neo-liberal policies, such as Economic Reform and Structural Adjustment Programme (ERSAP), are among the reasons for the hardships that Egyptian peasants experience. Among the measures of ERSAP was to cut down on subsidizing inputs for agricultural production. Measures of ERSAP included favoring other economic sectors, such as availing tax holidays to manufacturing establishments.

There are, however, other reasons for hardships that challenge the agricultural sector including, but not limited to, unclear property rights over land; lack of physical and social infrastructures; scarcity of fresh water and rising costs of energy. Mismanagement and inefficient utilization of natural resources and environmental degradation, including land, is a direct outcome of malfunctioning market mechanisms.[1] One of the reasons for market malfunctioning is unsecured, disrespected property rights. Property rights over all resources must be clear and secured. Much of the mismanagement and inefficient utilization of natural resources, particularly land, can be traced to such malfunctioning, distorted or totally absent markets. A fundamental condition for the efficient operation of land markets is to have well-defined, exclusive, secure, transferable and enforceable property rights over all resources, goods and services, particularly land. Property rights are a prerequisite and a necessary condition for efficient use of resources. Well defined, secured, transferable and enforceable property rights is a precondition for the flow of both trade and investments necessary to advance economic growth; and induce efforts for environmental conservation against pollution and better resource management as well.

Part (I) of this report concentrates on the issue of land tenure in Egypt. It is a part of a regional assessment that the FAO Region Office in Cairo initiated.

[1] Panayotou, Theodore (1992) "The Economics of Environmental Degradation: Problems, causes and Responses," in Environmental Economics: A Reader. D. Markanya and J. Rishardson (editors), pp. 316-63, New York: St. Martin's Press

2 Land Tenure Policies and Regulations: An Overview

Land policy formulation and management in Egypt have been transforming in close association with institutional transformations. Since the 1950s, the State worked on setting a ceiling over property ownership and re-distributing excess land among landless peasants. The aim was of two folds: a) to establish state capitalism, which was central to the agenda of President Nasser and his administration, and b) eliminate the political power of landlords, i.e., the elite of the pre-1952 revolution.
Land property right is the result of common factors, such as occupation and religion (i.e. Islam as common religion) and agro-climatic conditions, Land property rights are multiple and complex. They are inherited from pre-Islamic rules (*Orf*), Islamic (*Sharia*) and colonial as well as post-colonial legislation. All these rules are co-existed. There are number of land status (regimes) such as private ownership (*melk*), collective land (*waqf*). Furthermore there is a dichotomy (rural-urban).

Egypt has an extended experience in the sphere of land policies and management. Until 1855 only about one-seventh of Egypt's cultivated land was under private ownership. The Government owned the remaining parcels of land and distributed it periodically among farmers. Each village had to collectively be responsible for the taxes and debts. From 1855 to 1858, new laws came to introduce principles of private property and Muslim inheritance to Egyptian rural areas. By 1896, the great bulk of Egyptian agricultural land was privately owned.[2]

Egypt's land reform since 1952 was the first large-scale reform in the Middle East and probably the most influential in the region and beyond. The 1952 revolution retained the sanctity of private property, and individual family farms remained the center-piece for rural development. Land reforms during 1952-1975 helped to reduce poverty and promote growth. Land reforms benefited from a broader context of labor migration. There were also benefits for the rural poor accruing from extensive government food subsidies and agricultural input aid, and improved the provision of both health and education services. Nevertheless, it is the case that benefits from land reforms could have been more impressive and sustainable. While the regime trumpeted the reforms for being impressive in the delivery of rural growth and improved standards of living; the ceilings on land holdings remained high, thereby not substantially undermining the interests of major property owners. When challenged regarding their continued large holdings, the landowners simply signed land ownership to family members or used local or national patron-client links to influence policy implementation and keep the State off their backs.[3,4]

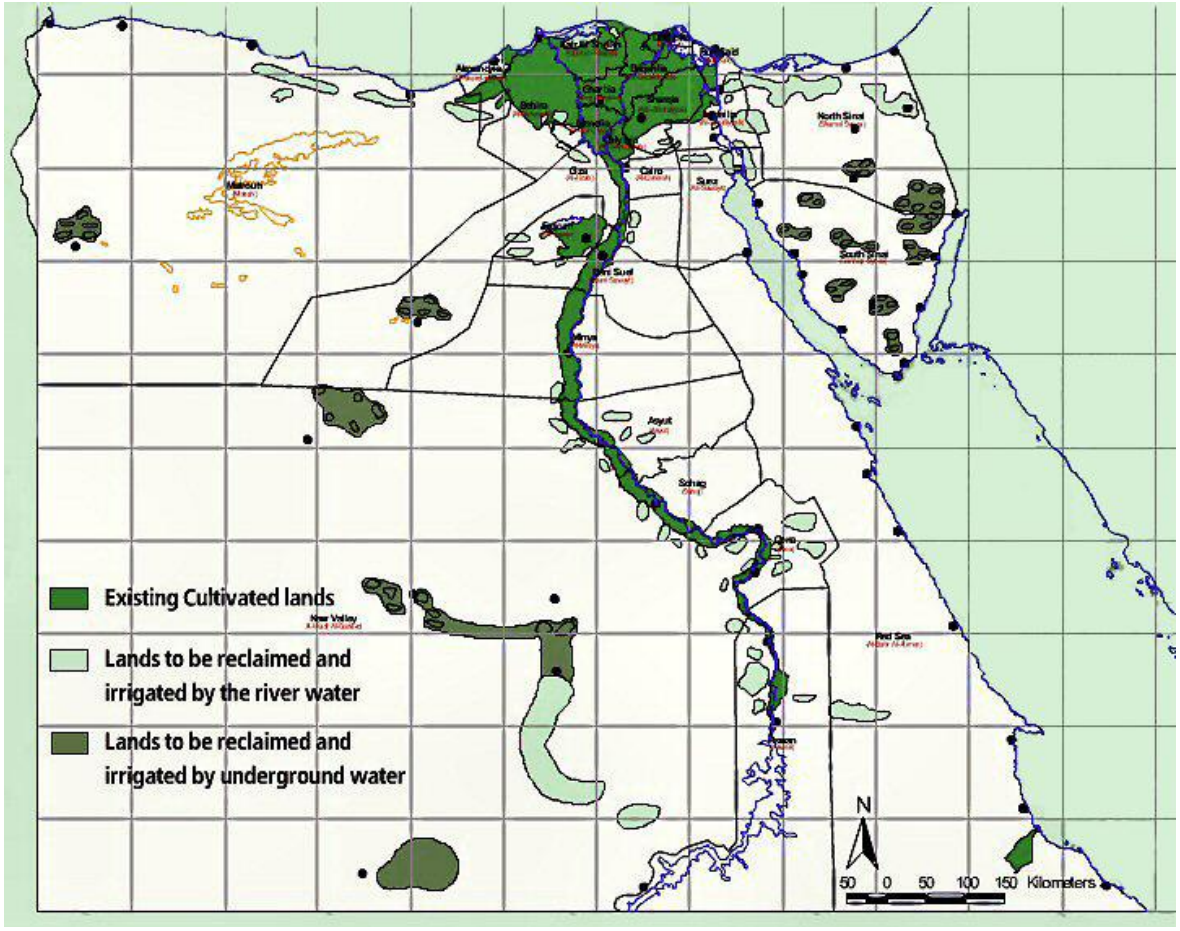
Policies mentioned above were initially seeking better livelihood in the rural areas, but due, in part, to the processes of globalization and privatization, the role of the public sector in this endeavor has been shifting toward policies favoring the more competitive activities. In the late 1990s, Egypt put together a plan for investment opportunities, 2017. The result is favoring regions with comparative advantages, thus widening regional disparities and raising questions concerning social equity within nationally defined boundaries.[5]

In the late 1990s, the Government of Egypt prepared a number of strategies and plans for development. The Ministry of Planning prepared a National Spatial Strategy with the support of UNDP, which divided Egypt into seven regional plans for the seven economic regions: Greater Cairo, Alexandria, Delta, Suez Canal, Central Egypt, Asyut and New Valley, and Upper Egypt. Based on these regional plans, the Government embarked on preparing a number of national mega projects, such as Toushki, West of the Gulf of Suez and Sharq El-Tafree'a, as well as irrigation canals such as El-Salaam water canal. In the meantime, the Ministry of Housing, Utilities and Urban Communities prepared a plan for the development of Egypt 2017, Figures 2 and 3. As a result of uncoordinated actions, and for the sake of national security, the Armed Forces gathered all studies, and then collected from the respective ministries and central agencies[6] the sites for their activities that do not conflict or jeopardize national

[2] Waterbury, John, 1978, Egypt Burdens of the Past, Options for the Future, American University Field Staff in Association with Indiana University Press, Bloomington and London.
[3] Waterbury, John, 1983, (op. cit.)
[4] Bush, Ray and AbdelAal, Mohamed, "Land and Conflict in the Middle East and North Africa," Mediterranean Programme, 5th Mediterranean Social and Political Research Meeting, Workshop 11, Florence 24-28 March 2004
[5] Zaibet, L. and El-Kholei, A. "Land Policy Formulation and Implementation in North Africa," AUC-ECA-AfDB Consortium, 2010 Addis Ababa, Ethiopia, 2010.
[6] For example, the Supreme Council for Antiquities (SCA), Tourism Development Authority (TDA), Egyptian Environmental Affairs Agency (EEAA), etc.

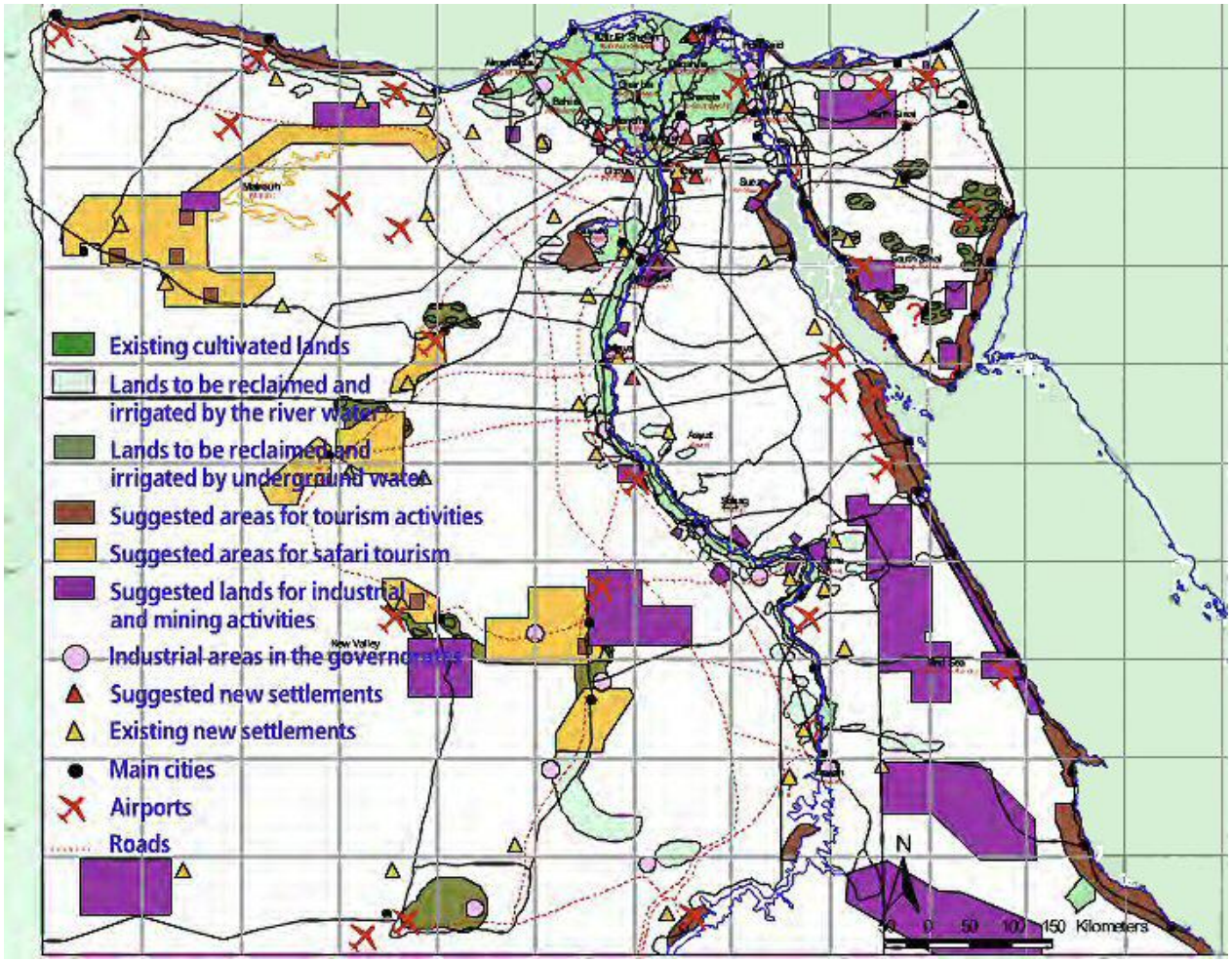
security. The result of these layers of maps came out in the late 1996 as the Investment Map of Egypt, Figures 4 and 5. The investment map to the year 2017 indicates the areas allocated for mining, new human settlements, tourism development, natural protectorates. The State-owned land with specific and no specific uses reaches about 36.30 and 34.38 percent, respectively. The area of 363 thousand sq. km. of the State-owned land is allocated for land reclamation, tourism development projects, and new human settlements. The Cabinet of Ministers administers the uses of the State-owned land.

Figure 2: Egypt, Land allocated for agricultural production, 2017



Source: General Organization for Physical Planning, Development Map of Egypt 2017, Cairo, Egypt, 1997

Figure 3: Egypt: Land uses 2017



Source: General Organization for Physical Planning, Development Map of Egypt 2017, Cairo, Egypt, 1997

Figure 4: Egypt: Investment Opportunities for Agricultural Development, 2017

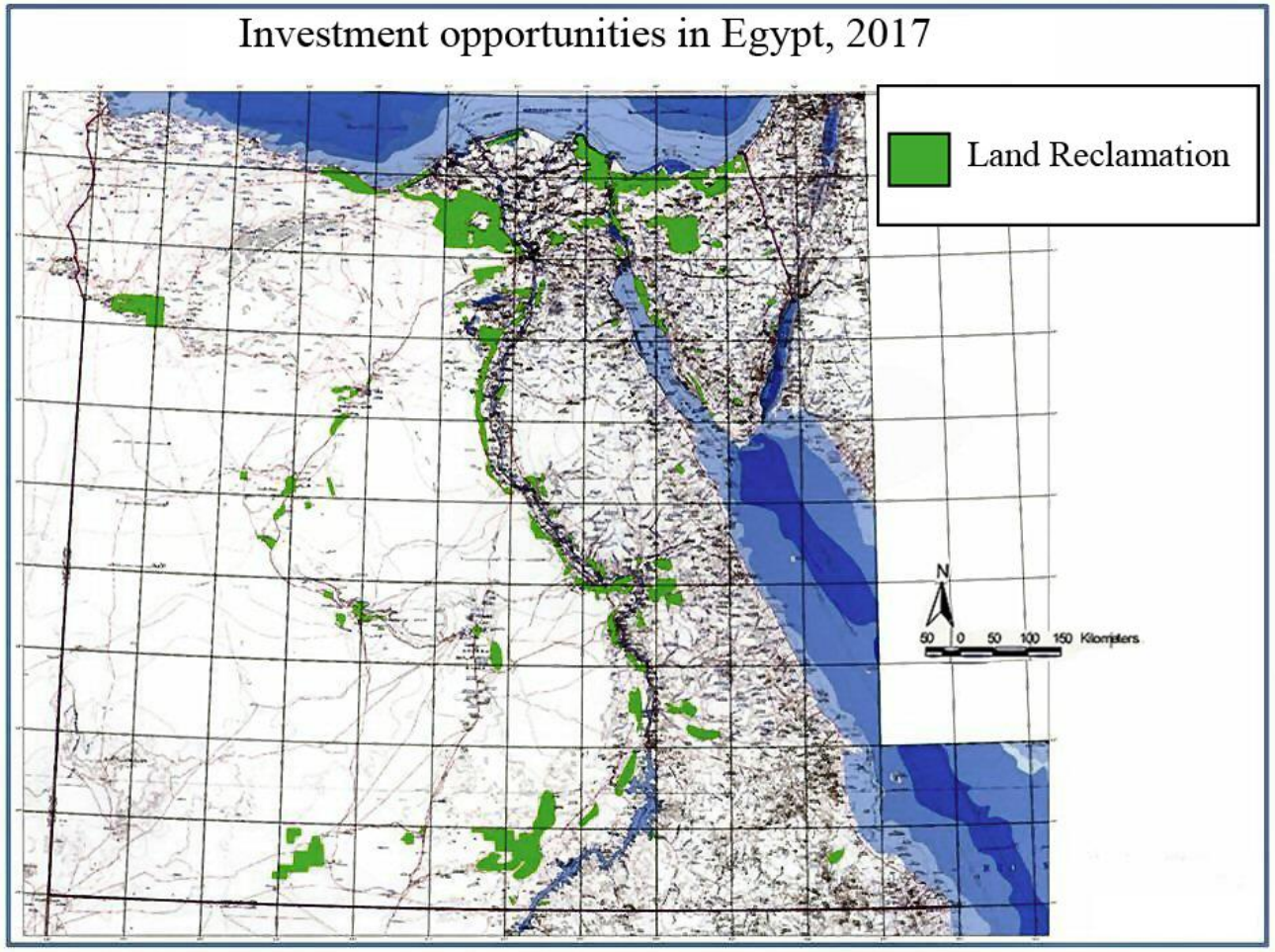
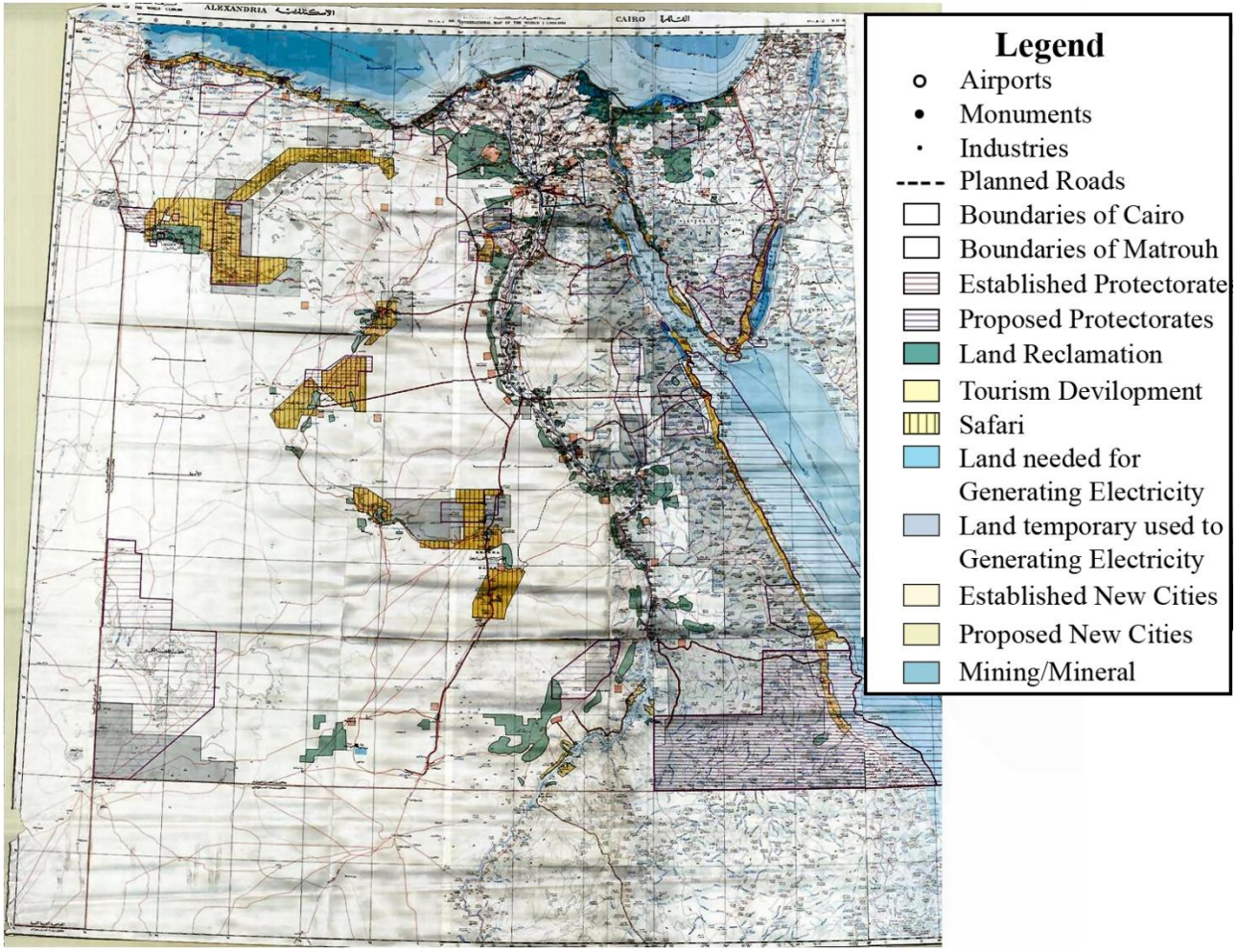


Figure 5: Egypt: Investment Opportunities, 2017



3 The Land Tenure Question

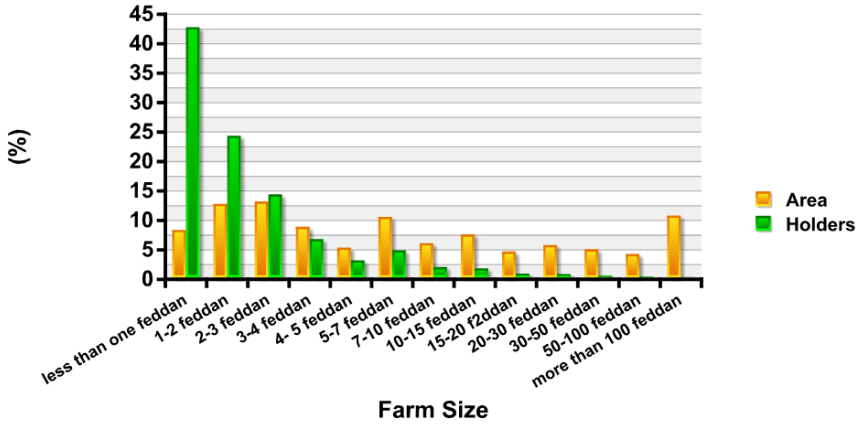
Land tenure and security is essential for efficient, effective land market mechanisms. Without secured, acknowledged property rights, the economy lacks necessary capital, and many environmental losses result.[7]

3.1 Status: Dwarf and Fragmented holdings

In Egypt, farms tend to be small and fragmented. This dispersed farming has for decades prevented economies of scale in production, inputs, and marketing, raising the cost of production and keeping agriculture relatively inefficient.[8]
Land ownership is fragmented. Usually an individual holds small parcels of land in multiple tenures. "The reasons for this are twofold: firstly, land is mostly accessed through complex combinations of interrelated tenure relationships due to the parallel existence of Islamic principles, colonial legacies, custom, informal and statutory norms. And secondly, Islamic inheritance rules allocate fixed specified shares to a number of individuals within the deceased's extended family." [9]

Dwarf holding is an impediment to agricultural development. Figure 6 shows that 45 percent of the holders of less than one feddan[10] hold less than 10 percent of the agricultural land. The Information and Decision-Support Center (IDSC), Cabinet of Ministers, Egypt, confirms these findings. According to IDSC, those who hold less than one feddan are about 43 percent of the land holders in Egypt; those who hold more than one feddan and less than five feddans, and those who hold more than five feddans are 47 and 10 percent of the land holders, respectively. Figure 7 shows that the majority of holders hold one parcel of land. This is probably the outcome of almost fixed supply of agricultural land versus population growth, and continuous subdivisions of land for inheritance and sale. This situation inhibits the possibility of returns from economies of scale, and thus the persistence of poverty in rural areas.

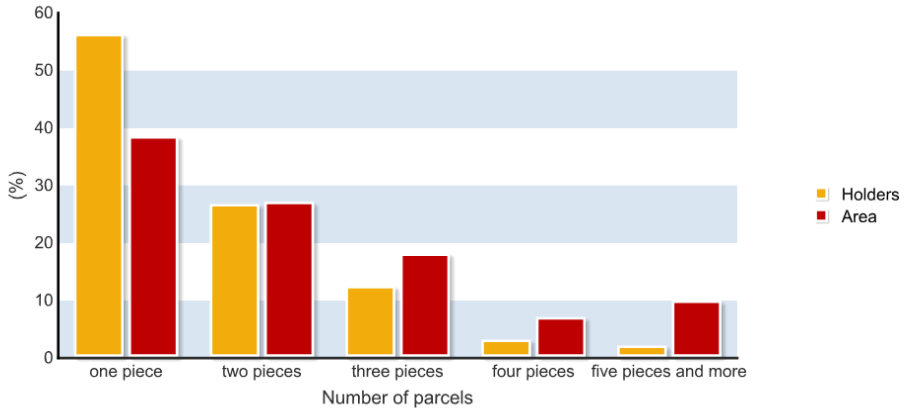
Figure 6: Egypt, agricultural land stratified by holders and farm size, 2000, %



Source: Based on the 2000 Agricultural Census, Ministry of Agriculture and Land Reclamation, Cairo, Egypt

[7] Zaibet, L. and El-Kholei, A. (Ref. Op. Cited)
[8] Kurizig, Michael, "Imports Rising in Middle East and North Africa," World Agriculture and Trade, Agricultural Outlook, Economic Research Service/USDA. June-July 1999
[99] Sait, Siraj, and Peters, Britta, et als. "Islamic Principles and Land: Opportunities for Engagement," Islamic Principles and Land, p. 10, United Nations Human Settlements Programme (UN-HABITAT), Nairobi, Kenya, 2011.
[10] One feddan is about 4,200.83 sq. meters

Figure 7: Egypt, agricultural land stratified by holders and number of parcels, 2000, %



Source: Based on the 2000 Agricultural Census, Ministry of Agriculture and Land Reclamation, Cairo, Egypt

3.2 Causes: Complicated procedures to secure property rights

In Egypt there is a legal difference between holding a parcel of land (*Heyazah*) and its ownership (*melk* and/or *Eslah*). This dichotomous is the *raison d'être* for many problems. A parcel of land held through holdings (*al Heyazah*) is not tradable on the market and cannot be used as collateral for a loan, and thus is a dead capital. Owners are reluctant to register their properties for number of reasons, atop of these reasons is the fees[11] and complicated procedures for registering a property, for a cadastral, for public notary and the like.

Usually the holding (*al-Heyazah*) of a parcel of land from the buyer to the seller takes place in the registry of the agricultural association (*al Gameyia al Zerahiya*), thus transferring the taxes on land (*al Maal*), and rights to get supplies of fertilizers (*al Kemawi*).

Often a contract written between a seller and a buyer is just a primary contract (*Akd Ebtidayee*), i.e., a customary contract. The next step is to register this contract at the public notary. To avoid fees, which is a percent of a nominal price that the public notary in each governorate sets, buyers reckon to a court of law to validate the signature of the seller (*Sehat Tawqee*). This step does not mean the contract is registered and property rights are acknowledged – the verdict does indicate the properties of the parcel of land, it just acknowledges the validity of the seller's signature.

The other alternative is to establish at a court of law a case of validity and execution (*Sehat wa Nafaz*) of the customary contract, which is equivalent to registering the contract at the public notary. The first step is to submit a request to the public notary including the information about the parcel of land. The public notary sends the request to the surveying authority to prepare a cadastral, and then provide a report indicating the attributes of the parcel of land such as the dimensions, slope, etc. then sends it back to the public notary. The seller takes the matter to a court of law. Once a verdict is reached, the seller submits a copy of the verdict to the public notary for stamp (*Khetm al Lotus*). These steps are costly, and time consuming – it requires at least one year going through the process to assure that the property rights have been transferred to the new owner(s). This process is also applicable to subdivision of inherited land, which explains informality particularly among small land owners as will be indicated later.

3.3 Consequence: Persisted rural poverty

The multidimensional and dynamic nature of poverty-land linkages poses two fundamental challenges for planning and management of land uses: 1) The need to manage and sustain the long-term capacity

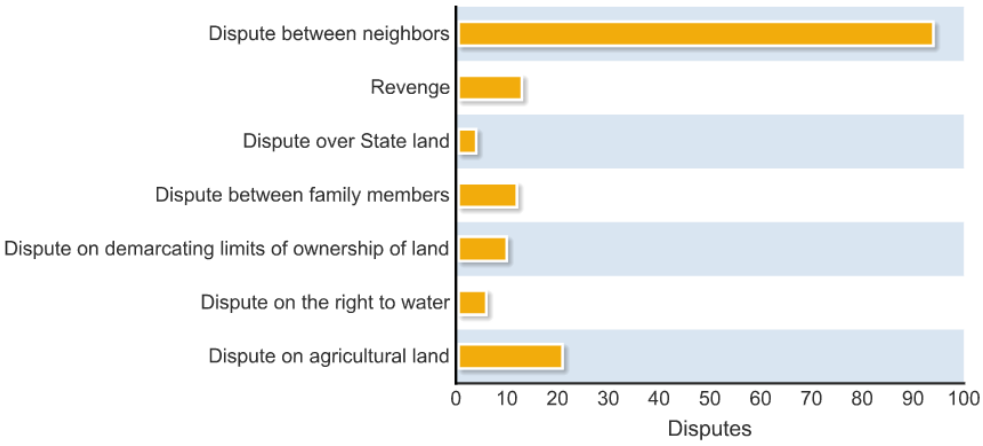
[11] According to a land surveyor in Delta, in the past the fees used to be assessed according to the price of parcel of land, where the buyer will pay one percent of the price mentioned in the contract. For this reason, buyers would write a nominal price in the contract, not the market price, to avoid paying more fees. Approximately six years ago, a new system was established to assess fees for registering a parcel of land dependimg on its annual levy, and number of subdivisions per parcel of land on the map. According to his recent experience, the fee for one parcel of an area of one feddan is about EGP 440, the fees to register another parcel of land of an area of 2.08 feddan was EGP 590. He claims that to register a feddan in new land the fee ranges from EGP 400 to EGP 600. HE also said that most of the old land in the Delta are not registered for complicated procedures.

of the environment, particularly land resources, to provide the goods and services on which sustainable human development depends, and 2) The need to ensure a secure and equitable access of the poor to land resources and the benefits that they can derive from them.[12]
Poverty in rural areas is relatively high. Facing policies in favor of market liberalization in terms of removal of subsidies, market competition, imports, etc. the rural poor may abandon their small farms; or develop affection to land as a refugee, and consequently the process of land fragmentation will continue.

3.4 Consequence: Violent disputes

An unclear property right of land is the cause of many disputes and conflicts. In July 2010, the Land Centre for Human Rights (LCHR) reported 160 cases of disputes[13] during the first six months of 2010 of which 21 cases were on ownership of agricultural land,[14] 10 on demarcating agricultural land,[15] 12 family disputes on land;[16] four disputes on State-owned land;[17] and six disputes on the right to water.[18] The remaining cases are revenge and disputes between neighbors, Figure 8. As a result of these disputes and accidents, the total number of death reached 130 casualties, and 850 injuries, while 1,234 were arrested.

Figure 8: Egypt, Disputes on Agricultural Land January -June 2010



Source: Land Centre for Human Rights, "Disputes on Agricultural Land during the first half of 2010," Cairo, Egypt, July 2010, www.lchr-eg.org (text in Arabic)

3.5 Consequence: Informality

In 1997, Hernando de Sotto estimated the total value of agricultural land at US$ 99,200 million divided into US$ 64,500 million and US$ 34,700 million for Lower and Upper Egypt, respectively. He classified agricultural properties according to the number and size of holding for each governorate; then estimated the property value of these agricultural areas using the average price of agricultural products cultivated in these properties. He then applied informality coefficients differentiated by the size of holding. Finally the total value of informal rural holdings in Egypt was then obtained by

[12] UNDP, A Global Capacity, Development Network on Poverty and Environment Linking Participatory Research, Dialogue and Action; Poverty and Environment Initiative, Partnerships to Fight Poverty and Sustain the Environment; http://www.undp.org/wssd/docs/PEI-Brochure.pdf
[13] LCHR collected the data from accidents reported in daily newspapers
[14] At the Governorate of Qena, the District of Deshna, the Village of Soumtta, two families, Abu Youssef and Taha, used machine guns to settle a dispute on purchasing a parcel of land. The fight extended for three hours. Police forces were not able to enter the village. One was killed and three were seriously wounded. Only seven persons were arrested and the rest fled to the Eastern Mountain.
[15] For example, at the Governorate of Menofia, the District of Ashmoun, 16 persons of two families engaged in a fight using guns as a result of a dispute on demarcating disputed boundary of an agricultural land.
[16] These are disputes on inheritance.
[17] In El-Wahat El-Bahariya, five farmers and Bedouins opened fire at each other over a parcel of land of an area of three feddans that the State owns in an attempt to establish a case of adverse position (*Wad Yad)*.
[18] A dispute occurred at the Village of the Beneficiaries (*al-Mountafeen*) Area 16/17, Fanous, the District of Tamiya, the Governorate of Faiyum (it seems to be new land), because of directing water for irrigation to a special private canal of major landlords with access to power at the Irrigation Directorate at the District.

summing the values for each category, Table 1, where 47 percent of the total value of agricultural property in Egypt is informal.[19]

According to information that resident specialists in Egypt provided de Sotto, informality negatively affects the smallholders, with properties of less than three feddans. This is largely due, in part, to the nonexistence of an adequate titling and registration system for agricultural property, as well as to the following reasons:

1. Complications that arise from subdividing property as a result of inheritance processes;
2. The high costs of the titling and registration process;
3. The legal impossibility to use property as collateral, reducing the incentive for smallholders to register; and
4. Frequent migration of smallholders because of work-related opportunities, making it difficult to formalize property rights.

Box 1: Farmers of agricultural reform, Kafr el Sheikh, are threatened by re-possession of their land

The small farmers of agricultural reform, Sidi Salem district, Kafr el Sheikh, are depressed as a result of unpleasant surprise. They hold parcels of land from the agricultural reform since 1956 (three feddan per farmer). Today they are required to pay EGP 170 thousand per feddan. They have been paying the required monies regularly. Originally they held that land by adverse possession, and their holdings were legalized and formalized according to Article six, Law 3/2004. The price of feddan was EGP 10 thousand. In 2008, this article was canceled, and the price of a feddan reached EGP 26 thousand to be paid over 15 years. Today, they are told that the price of a feddan today is EGP 170 thousand. They either pay or the land will be repossessed.

Source: Al Ahram, 11 July 2011

Based on the aforementioned argument, de Sotto considered all small holdings (less than three feddans) to be informal. Land holders with property between three to five feddans is similar to the previous group; where about 60 percent of these holdings are informal. The next category is those landlords with five to 15 feddans, where de Sotto estimated about 20 percent of these holdings to be informal. For holdings of greater than 15 feddans, de Sotto concluded they have enough economic resources to resolve any problem related to poorly defined property rights. For this reason, it was assumed that almost all of these holdings are formal. Notice that the policy of commercial banks is to extend credit only to holdings greater than 15 feddans.[20]

To acquire a desert land for development, de Sotto found it requires 217 steps that could last for 14 years of paper work, lawyers, etc. The process starts by buying the land from a governmental entity, and then paying to those who hold the land, then start the processes of reclamation. Others buy the land from the holders directly, and then proceed to the State-owned Properties (*Amlak al Dawlaa*) at the local administration to pay a certain fee according to the estimate of the local administration. Most owners, particularly small owners, do not proceed to registering the property to avoid hefty fees that the Public Notary requires, which explains why there is significant size of 'dead capital' in the hands of the poor as presented earlier.

[19] de Sotto, Hernando, Dead Capital and the Poor In Egypt (Appendices), Distinguished Lecture Series 11, Publication of the Egyptian Center for Economic Studies (ECES), Cairo, Egypt, 1997.

[20] de Sotto knew from the Agricultural Census that the majority of land holders hold one feddan or less, as indicated in Section 1.1 earlier, those who hold 15 feddans and over are minority, as Figure 6 indicated, and they are the individuals who can afford to register their holdings, i.e., formalize their holding of land that can serve as a collertral.

Table 1: Egypt Rural Areas Overall Estimation of Asset Values Of Rural Holdings, 1997

Governorate	INFORMAL HOLDINGS			FORMAL HOLDINGS			TOTAL HOLDINGS		
	Number	Area (feddans)	Value (US$ million)	Number	Area (feddans)	Value (US$ million)	Number	Area (feddans)	Value (US$ million)
Lower Egypt									
Cairo	2,252.0	2,862.0	n/a	962.0	3,229.0	n/a	3,214.0	6,091.0	
Alexandria	8,267.0	24,800.0	374.0	7,517.0	135,382.0	2,284.0	15,784.0	160,182.0	2,658.0
Port Said	519.0	4,002.0	47.0	2,119.0	36,901.0	435.0	2,638.0	40,903.0	483.0
Suez	2,667.0	6,652.0	79.0	990.0	14,913.0	181.0	3,657.0	21,565.0	260.0
Damietta	24,830.0	51,042.0	605.0	9,430.0	67,634.0	852.0	34,260.0	118,676.0	1,457.0
Daqahlia	227,396.0	364,769.0	5,928.0	43,798.0	306,162.0	5,210.0	271,194.0	670,931.0	11,138.0
Sharqia	270,094.0	409,211.0	5,466.0	44,771.0	455,790.0	7,221.0	314,865.0	865,001.0	12,687.0
Qalyubia	107,983.0	122,342.0	1,816.0	25,694.0	79,980.0	1,783.0	133,677.0	202,322.0	3,599.0
Kafr El Sheikh	111,913.0	235,416.0	2,085.0	37,924.0	290,576.0	2,607.0	149,837.0	525,992.0	4,692.0
Gharbia	186,814.0	266,619.0	4,336.0	29,308.0	139,350.0	2,618.0	216,122.0	405,969.0	6,955.0
Menofia	196,787.0	228,665.0	3,380.0	17,361.0	88,170.0	1,637.0	214,148.0	316,835.0	5,016.0
Behera	192,439.0	390,814.0	3,498.0	71,482.0	917,852.0	9,238.0	263,921.0	1,308,666.0	12,736.0
Ismailia	19,815.0	37,647.0	462.0	9,500.0	154,055.0	2,400.0	29,315.0	191,702.0	2,862.0
Sub-Total	**1,351,775.0**	**2,144,840.0**	**28,076.0**	**300,857.0**	**2,689,995.0**	**36,465.0**	**1,652,632.0**	**4,834,835.0**	**64,541.0**
Upper Egypt									
Giza	98,542.0	120,870.0	1,806.0	17,134.0	136,544.0	3,040.0	115,676.0	257,414.0	4,846.0
Beni Suef	122,237.0	171,430.0	1,771.0	14,329.0	105,669.0	1,125.0	136,566.0	277,099.0	2,896.0
Faiyum	104,426.0	179,930.0	2,932.0	29,836.0	187,951.0	3,386.0	134,262.0	367,881.0	6,317.0
Minya	206,466.0	269,954.0	3,190.0	23,727.0	219,519.0	2,737.0	230,193.0	489,473.0	5,927.0
Asyut	155,486.0	192,311.0	2,274.0	19,779.0	132,295.0	1,690.0	175,265.0	324,606.0	3,964.0
Suhaj	193,955.0	226,997.0	2,679.0	16,077.0	102,002.0	1,225.0	210,032.0	328,999.0	3,904.0
Qena	136,929.0	188,791.0	2,508.0	24,822.0	186,285.0	2,518.0	161,751.0	375,076.0	5,026.0
Aswan	46,745.0	80,102.0	946.0	8,123.0	70,468.0	846.0	54,868.0	150,570.0	1,792.0
Sub-Total	**1,064,787.0**	**1,430,386.0**	**18,106.0**	**153,826.0**	**1,140,732.0**	**16,566.0**	**1,218,613.0**	**2,571,118.0**	**34,672.0**

Governorate	INFORMAL HOLDINGS			FORMAL HOLDINGS			TOTAL HOLDINGS		
	Number	Area (feddans)	Value (US$ million)	Number	Area (feddans)	Value (US$ million)	Number	Area (feddans)	Value (US$ million)
Desert									
Red Sea	18.0	103.0	n/a	58.0	407.0	n/a	76.0	510.0	
New Valley	3,992.0	14,551.0	n/a	5,646.0	44,843.0	n/a	9,638.0	59,394.0	
Matruh	2,287.0	12,364.0	n/a	12,721.0	175,320.0	n/a	15,008.0	187,684.0	
North Sinai	1,372.0	6,095.0	n/a	11,750.0	178,258.0	n/a	13,122.0	184,353.0	
South Sinai	239.0	589.0	n/a	951.0	10,678.0	n/a	1,190.0	11,267.0	
Sub-Total	**7,908.0**	**33,701.0**		**31,126.0**	**409,507.0**		**39,034.0**	**443,208.0**	**0.0**
Total	**2,424,471.0**	**3,608,928.0**	**46,182.0**	**485,808.0**	**4,240,233.0**	**53,032.0**	**2,910,279.0**	**7,849,161.0**	**99,213.0**
%	**83.3**	**46.0**	**46.5**	**16.7**	**54.0**	**53.5**	**100.0**	**100.0**	**100.0**

Source: de Sotto, Hernando, "Dead Capital and the Poor in Egypt (Appendices)," Distinguished Lecture Series 11, p. 14, Publication of the Egyptian Center for Economic Studies (ECES), Cairo, Egypt, 1997.

Table 2: Estimation of Assets Values of Rural Informal Holdings in Egypt, 1997

Size of Holding	Total area Cultivated (Feddans)	Weighted Average Price (US$/feddans)	Total value of Rural Property (US$ million)	Extent of Informality (%)	Total Value of Rural Informal Holdings (US$ million)	Number of Rural Informal Holdings (Thousand)	Average Value of Informal Holdings (US$)
Less than 3 Feddans	2,535,639	12,991	32,940	100	32,940	2,174	15,152
Between 3 less than 5	1,234,551	12,481	15,408	60	9,245	205	44,878
Between 5 less than 15	1,662,789	12,019	19,985	20	3,997	46	86,956
Equal to or greater than15	2,416,181	12,781	30,881	0	0	0	0
Total	**7,849,160**		**99,214**		**46,182**	**2,425**	**19,044**

Source: de Sotto, Hernando, "Dead Capital and the Poor In Egypt (Appendices)," Distinguished Lecture Series 11, p. 15, Publication of the Egyptian Center for Economic Studies (ECES), Cairo, Egypt, 1997

4 Laws and Regulations

The Egyptian legal system stems from the Islamic laws and French Civil Law. Land tenure in Egypt is customary and statutory. Some land is not titled. Forms of access to land include, but not limited to, adverse possession; setting ceiling on ownership of agricultural old land, and distributing excess land over the landless; eminent domain actions to implement projects in the public interest, selling State land and farms (privatization), allocation of land for cooperatives/major investors, and the like.[21]

4.1 Islamic Principles and Land

Islamic principles are relevant to land. "Islamic principles and practices influence many aspects of everyday life in Muslim society. This includes the perception of property and land rights. Since Islamic principles are based on an obligation towards God and the Muslim society as a whole, they can be influential in promoting land access and re-distribution for marginalized groups."[22] In fact, often Islamic principles and practices are in accord with widely accepted universal approaches, and thus can be used to enhance tenure security. Many Islamic principles, mechanisms and processes provide legitimacy for specific land interventions and durable solutions. A plain land belongs to "Allah," the State that represents the will of "Allah" holds the land in trust for the nation (*umma*), with power to change the use of land to deserving grantees. Rights of possession, however, are conditional upon the continued use of land and the proscription of boarding. A landowner who leaves the land uncultivated loses the right to retain it.[23] Islamic law also protect private ownership that is obtained through transaction (sale or give away); reviving a fallow land; or inheritance. Islam acknowledges contractual rights. Number of versus in the Quran commands the believers to fulfill their contractual agreements (4:33, 16:91-2.)[24]
Islamic law recognizes the protection of property rights, and it is a priority that the State has to promote. There are references to land in the Quran, where number of verses clearly stresses the importance of respecting private property rights, yet make clear that the Earth (Land) belongs to Allah (God). Those who enjoy the benefits are accountable to Allah. Thus, Islam provides the right to use and possession of land linked to its uses.

"Unlike freehold under the Western concept, land in full ownership (*melk*) faces one barrier in regard to transaction through sale: the pre-emption (*shuf'a*) gives co-inheritors or neighbors a privileged option to purchase a parcel of land when it is for sale. This process can keep strangers to communities on the outside while it can limit or prevent certain kinds of economic development that may ensue from external investment. Many customary land systems in Africa and elsewhere used to follow, and some still apply, such practices." [25]

From an Islamic viewpoint, land ownership must be fair and in accord with the overall social responsibility. Despite that the Quran recognizes the right of several marginal populations, such as women, the youth and children to access land. However, in reality, women face serious hurdles in accessing land rights. Women have restricted access to courts or legal assistance. Children's right to access land is usually ignored although there are specific legislations that protect the rights of children and youth. Another marginalized group that lacks access to land despite the recommendations of the Quran is the migrants and displaced persons. The victims of forced evictions, refugees, and excluded individuals are among this disadvantaged population that are deprived of the right to access land, although the Quran recommends just and fair treatment to these subpopulation groups.

Islamic principles are applicable to land in a number of ways. In the sphere of land management, the Quran stresses the issue of accountability especially against the misuse of power and corruption. Thus, the State has to supervise land for the benefit of the community. A Land Information System (LIS) is a condition necessary for proper land management. The Ottomans sponsored systems for land registration to generate revenue to the State, and to resolve land disputes. The Quran includes a number

[21] Zaibet, L. and El-Kholei, A. (Ref. Op. Cited)
[22] Sait, Siraj, and Peters, Britta, et als. "Islamic Principles and Land: Opportunities for Engagement," Islamic Principles and Land, p. 9, United Nations Human Settlements Programme (UN-HABITAT), Nairobi, Kenya, 2011.
[23] According to hadith of the Prophet (PBUH) "Land belongs to Allah, whoever leaves it uncultivated for three consecutive years will have it taken away and given to someone else.
[24] Sait, Siraj and Lim, Hilary, Land, Law and Islam: Property and Human Rights in the Muslim World, 2006, London, UK: Zed Books in association with UN-HABITAT
[25] Sait, Siraj, and Peters, Britta, et als. "Islamic Principles and Land: Opportunities for Engagement," Islamic Principles and Land, p. 6, United Nations Human Settlements Programme (UN-HABITAT), Nairobi, Kenya, 2011.

of verses, such as *al-Nessa*, which describes in details the division of an individual's property upon death.

"Islamic endowment (*waqf*) is a highly significant legal mechanism and a key Islamic institution. Under the waqf an owner permanently settles property, its usufruct or income, to the use of the general welfare or for the benefits of certain groups or even family members." [26] Over time the waqf has involved the contributions of rulers, families and ordinary citizens. Waqf mounted to about one third of the Islamic Ottoman Empire. Today there is growing interest in the revival of existing waqf adapted to modern management and regulatory frameworks. [27]

In Egypt, the process of legislation to issue a law is complex. The responsible Minister presents to the Legislation Division (*Qism Al Tashree*) within the State Council (*Maglis Al Dawlaa*) a draft of the law (*Mashrou Qanoun*) for revision, wording, avoid repetition and conflict. The State Council forwards the draft law to the President, who then forwards the draft law to the Parliament, i.e., People's Council (*Maglis Al Shaab*). The specialized sub-committee of the Council reviews the draft before forwarding it for approval via an open vote. The law requires the acceptance of at least half of the attending members. Furthermore, a member of the People's Council can prepare a draft law, and then submit it to the Parliament, where the specialized sub-committee reviews the proposed law before voting for approval.

4.2 Processes for issuing laws and Regulations

By definition, a law is general abstracted rules that organize relationships in a society that all members have to observe and respect. The individual is subject to penalties in case of violating a law. The rule of Law is one of the measures and elements of good governance. There are two groups of laws. First, public law where the State is a party dealing with other states and/or individuals, or in case of regulating a relationship between public authorities, such as the Constitutional Law (*Al Qanoun Al Distouri*) and Administrative Law (*Al Qanoun Al Edari).* Second, private law that regulates the relationship between individuals and each other; or between a group of individuals and the State, such as the Civil Law (*Al Qanoun Al Madani*), Commercial Law (*Al Qanoun Al Tougari*), etc.

4.3 Regulations Governing Land Ownership, Holding and Management

There are ten clusters of laws and regulations. Each group of laws and regulations is responsible for an aspect of land ownership, holding and management as follows:[28]

4.3.1 Urban development

There is a set of laws and decrees that govern urban development processes. The first subset of these laws and decrees is that regulating processes of developing a parcel of land for urban purposes. Law 119/2008 for unified construction (*al Benna al Mowahed*) includes articles for physical planning (*el Takhteet el Omrani*) that define the mandate and mission of GOPP, and confer authorities and powers on local administrations to assume their responsibilities through technical units or specialized consulting firms. This legislation applies to land within the boundaries and limits of cities and villages, and land devoted for projects that serve the public interest, such as transportation, agricultural production. The legislation is also applicable on land subject to subdivision.[29] The law contains all provisions administering the renewal (*Tagdeed*) of communities (*Al Ahiyaa*). Once again, the local administration unit is responsible for investigating and preparing a project for re-planning areas of high population densities where the majority of its buildings are crumbling; or areas in need for physical and social infrastructures.

Law 10/1990 for eminent domain actions (*Naz'aa Melkiya*) seeking to satisfy public utilities defines the modality for eminent domain to implement and execute plans for urban renewal. Eminent domain is for availing green areas and parking lots for vehicles, in addition to developing social and physical

[26] Sait, Siraj, and Peters, Britta, et als. "Islamic Principles and Land: Opportunities for Engagement," Islamic Principles and Land, p. 16, United Nations Human Settlements Programme (UN-HABITAT), Nairobi, Kenya, 2011.
[27] Sait, Siraj, and Peters, Britta, et als. (Ref. Op. Cited).
[28] Prof. Abdulwahab Helmy devised this taxonomy in his background paper "Urban Planning and Institutional & Regulatory Development: Introduction to the Law and Local Administration," General Organization for Physical Planning (GOPP), Ministry of Housing, Utilities and Urban Development, prepared for the Korean Research Institute for Human Settlements, Cairo, Egypt, July 2006, (unpublished research; text in Arabic).
[29] Presidential decree issued on 25th of February 1982, The Official Gazette, No. 8

infrastructures. Article 24, Law 119/2008 explains the use of eminent domain action on land that strategic plans and/or detailed plans, which the Supreme Council for Planning and Urban Development approves, identify based on the request of the Governor. The Governor will then issue a decree identifying these parcels of land along with priority projects, such as water treatment plant, schools, etc. The local administration then starts negotiations with the owners (holders) of the land. In case no agreement is reached, then based on the request of the Governor, the Supreme Council for Planning and Urban Development issues a decree for eminent domain and sets the value of land according to its use. The owners (or holders) either receive their money immediately, or wait until planned improvements take place and get their money according to the new value of land. In case of demolishing dwelling units, the State has to provide the dwellers (not necessary the owners) with new dwellings. Eminent domain actions are also applied in cases of upgrading informal human settlements, most of which develop on agricultural land, Article 25, Law 119/2008.

Laws No. 124/1960, 43/1979 and 84/1996 regulate the functions of local administration. They include articles and provisions that complement and integrate with Law 119/2008 for unified construction. Local administration units are responsible for preparing master plans, detailed physical plans, land subdivision, and upgrading and renewal of neighborhoods, because a local administration is the connection between the central authorities and the locals.

Furthermore, Law 53/1966 that regulates the agricultural sector contains provisions for protecting agricultural land from sprawl of human settlements. The law specifically forbids the construction on an agricultural land without the permission of the Minister of Agriculture according to the regulations and conditions that the Ministry of Agriculture has set.

As a result of granting exceptions, and under the pressing needs for housing, informal expansion of human settlements was at the expense of valuable agricultural land. In 2007, the National Democratic Party (NDP), which ceases to exist after the January 25th, 2011 revolution, developed a series of papers that serve as the framework for action, including a paper concerned with protecting agricultural land and managing human settlements. The paper admits that significant development in past decades was at the expense of agricultural land. The paper estimates the lost agricultural land in the past four decades by one million feddan[30]. Most of these developments are informal, unplanned settlements. The paper estimates urban informal settlements built on agricultural land by 80 percent of the total informal settlements in Egypt.[31] At that time, the Party and its Government intended to apply proactive multidimensional measures that balance providing Egyptians with decent housing and conserving valuable agricultural land using progressive planning modalities by upgrading informal areas; and redefining the city limits and boundaries that permit planned expansion; and in the meantime, elaborate and implement plans for regional development that add new communities to the Egyptian urban system.

Law 119/2008, Article 18 prohibits announcing any land subdivision projects without the owner submission to the survey authorities and public notary authorities a copy of the project with the decree approving the project issued from the responsible public body (*Al-Gehaa Al Edariya Al Mukhtasaa*), usually the local administration. No Governmental body will announce a subdivision of a parcel of land without a decree approving the project for land subdivision. Based on the studies of the Directorate for Planning and Urban Development, the Governor is responsible for approving land subdivision, Article 20, Law 119/2008.

Law 59/1979 stipulates the rules for establishing new communities. The law sets five kilometers to surround the new community. The Authority for New Communities (ANC) is the sole, responsible entity that permits the sale, subdivision and/or development of this land. In its third article, the law forbids the development of new communities on agricultural land.

4.3.2 Building and construction

The second set of regulations is that laws and regulations that organize the processes of erecting and demolishing buildings. Atop of this set is Law 119/2008 that administers the processes of building and construction.

[30] One feddan is about 4 200.83 square meters.

[31] It is not clear 80 percent of the population living in informal areas; or 80 percent in terms of areas measured in feddans?

Defining land uses

There is a list of laws, regulations and decrees that govern land development and uses in cities of Egypt. Law 119/2008 for unified construction and Law 43/1979 and the Presidential Decree No.43/1989 for local administration (*Al Edarat Al Mahaliya*) govern the processes of land-use planning and means for executing these plans. Equally important are legislations governing the development of new communities (Law No. 59/1979), development of publicly-owned land (Law No. 7/1991) and desert land (Law No. 143/1981), and preserving agricultural land (Law 116/1983, Law 53/1966, Ministerial Decrees No. 124/1984 and 12/1985 concerning licensing construction on agricultural land). Also included in this cluster of laws, regulations and decrees are those responsible for protecting monuments (Law No. 117/1983), founding and running both manufacturing and commercial, and recreational establishments (Laws No. 371/1956, 372/1956 respectively); quarries (Law No. 86/1956), electricity (Law No. 63/1964) and general improvements, such as cemeteries (Law 5/1996), traffic (Law No. 66/1973 adjusted by Laws No. 78/1976, 210/1980, 1/1988, 155/1999), sanitation (Law No. 93/1962) and public cleansing (Law No. 38/1967).

In addition, there are several provisions in other laws that determine land uses in Egypt. Article 10, Law No. 84/1968, defines uses for land along the major roads and highways. Article 20, Law No. 117/1983 for protecting monuments, prohibits the development of land surrounding monumental buildings and/or areas demarcated for excavation. Law No. 28/1981 regulating civil aviation forbids the erection of buildings in an area neighboring airports, unless there is a prior license from the authorities for civil aviation.

Development of desert land

One of the major national goals that Egypt has, and continues to, pursuit is to extend the habitat from 4-5 percent of the gross area to 12-25 per cent by 2022. The only means to achieve this goal is to develop desert land. Law No. 143/1981 and Annex 2 of Law No. 96/1995 in addition to Ministerial Decrees No. 198/1982 and 305/1983, and Ministerial Decrees No. 29/1990 and 255/1992 regulate initiatives to develop desert land.

These legal provisions are applicable on land outside city limits[32] by two kilometers as follows:

1. Article 2 clearly states that the Minister of Defense determines strategic areas of military importance;
2. The Authority for New Communities (ANC) (*Hayat Al Mougtam'at Al Omraniya Al Gadeedah*), in collaboration with Ministry of Defense, is responsible for developing the remaining land for human settlement;
3. The General Authority for Reclamation Projects and Agricultural Development (GARPAD) (*El Hayat Al Amma Le Mashrouat Al Ta'ameer*) is the executing agency for agricultural development. This institution, in collaboration with Ministry of Defense, is responsible for developing land for reclamation and agricultural development; and
4. Tourism Development Authority (TDA) (*Hayaat Al Tanmiya El Siayhia*) is in-charge of land earmarked for tourism development.

The Cabinet of Ministers, based on the request of Minister of Defense, can issue eminent domain for public interest (including, but not limited to, national security) and the owners receive compensation for their expenses in developing this land.

Reclamation and tourism developments in desert land are subject to Law 59/1979 that governs new communities in terms of tax holidays and development fees. Article 5, the state is responsible for developing major infrastructures and services. It is worth noting here that Law No. 143/1981 came to complement Law No. 100/1964 that governs state-owned land, which includes:

1. Agricultural land and islands within the Nile and lakes,
2. Added land to the bank of the river and canals (*Tarh Bahr*),
3. Vacant, utilized land,
4. Built properties, and
5. Uncultivable, fallow land (*Bour*).

The law prohibits changing the use of land, or subdividing it before reclamation or without permission from the authorities.

Law No. 5/1996 stipulates that it is possible to write-down desert land for free or leased for a nominal fee (no more than 40 years). The law specifically denies the purpose this write-down is to develop or

[32] City limits contain land surveyed in detail, registered and is subject to property taxes.

expand projects of both financial and economic value. This is in accord with Law 29/1958 concerning the principles regulating writing down land for free.

Other state-owned properties

Law No. 7/1991 governs state-owned properties. The General Authority for Reclamation Projects and Agricultural Development (GARPAD) is responsible for management and use of land around lakes (Article 3), where the local administrations are responsible for management of land prepared for urban development and/or cultivation within city limits. The Governor sets the rules for developing this land. The Local Popular Council (*al Maglis al Shaabi al Mahalee*) approves these rules elaborated within the regulations that the Cabinet of Ministers set (Article 4). The use of this land cannot be changed without a Presidential decree and approval of the Cabinet of Ministers according to the recommendation of the specialized Minister (Article 5). The proceedings of the sale of this land are public funds.

Law No. 31/1984 permits the State to transfer the property of state-owned land to individuals and companies through acknowledging adverse possession action (*Wada'a al-Yad*). The law however, gives the State the authority to evacuate the occupants through administrative means. The Prime Minister's decrees No. 857/1985 and 1107/1995 forbid transferring the ownership of a State-owned land to occupants without observing the provisions of Law 31/1984.

The Government issued Law No. 3/1986 to resolve contradictory conditions resulting from laws governing the agricultural reform (*Eslah Zera'ai*). Article 6 states that excluding land that Law No. 50/1969 governs, the Board of the General Authority for Agricultural Reform (*Maglis Al Hayat Al Ammaa Lel Eslah Al Zera'ai*) has the power to sell land to occupants by adverse possession (*Wada'a al-Yad*) by the prices that a Higher Committee for Assessing Prices of State-owned Land (*al Lagnaa al Ouliya le Tathmeen Aradie Amlak al Dawlaa*) sets according to the conditions and regulation that the executive regulations of Law 3/1986 provides.

The Presidential decree No. 153/2001 established the National Centre for Planning State Land Uses (NCPSLU) under the auspices of the Cabinet of Ministers. The Minister of Agriculture and Land Reclamation heads the Board of Directors of NCPSLU. It is responsible for planning the uses of land outside the limits (*al Zemam*), which is about 900 thousand sq. km that is subject to continuous attempts of adverse possession action (*Wada'a al-Yad*); assigning all areas and transferring the responsibility of that land to the responsible institution to develop it according to the plans of the State by 2017. NCPSLU, so far, has prepared an inventory list of undeveloped land; and the local administration has to protect this land from attempts of adverse possession action (*Wada'a al-Yad*). NCPSLU has no powers to protect State-owned land. It also lacks trained cadres. Thus, the Centre informs the responsible authority (*Al-Gehaa Al Edariya*) about a violation; and in several cases very little is done. For this reason, there is a new proposed law that empowers NCPSLU, a decree that the Prime Minister issued to formulate a committee to unify laws governing land, and State-owned land in one. The Minister of Justice issued a decree formulating this committee. The law will seek to unify the sales of State-owned land from one outlet, and the pricing through a committee where no one ministry will have the authority to prepare and sell state-owned land. The proposed law also determines means for issuing timed licenses for land uses to avoid the change of these uses in the future. All these actions were before the outbreak of the January 25th, 2011 revolution. Now everything is on halt.

The Presidential decree No. 154/2001 has defined the uses of State-owned land till 2017 based on the investment opportunities map that the Armed Forces prepared. The decree defines members of the board of NCPSLU.

4.3.3 Roads, public squares and built environment

There are three major laws that govern roads and highways: Laws No. 140/1956, 84/1968 and 66/1956 concerning occupying (*Eshghalaat*) public roads, public roads and organizing bill boards. Law No. 140/1956 arranges licensing occupying public roads and squares to development of man-hole for sanitation, extending wires and pipes, extending merchandise outside the shop on the sidewalks, and so forth. Article 3 prohibits planting tree on the sidewalk without permission, after paying a fee, and considers these trees public property. The law penalizes violators with a fine within LE 100-300. The executive regulation of the law states specific conditions and means to punish violators. Today, many of the fines are of meager monetary value.

Law No. 84/1968 and its executive regulation define levels and types of roads within Egypt. Chapter three of the law determines the restrictions on the land on both sides of the road (50 meters for highways, 25 meters for major roads and 10 meters for local roads). The only permitted activity on this land is agriculture. The authorities can permit erecting bill boards within this land, in accordance with the specifications and conditions that the executive regulation sets.

4.3.4 Owner-renter relationships

This set of laws, regulations and decrees regulate renting and selling real estate properties. During the President Nasser's administration, the State intervened in the relationship between the owners and renters by slashing down the rent of an apartment in an urban settlement. These interventions were in parallel with application of Law No. 178/1952 for agricultural reform that sets a ceiling for holding/owning agricultural land. Amid adopting measures for economic reform and structural adjustment, the State issued Law No. 4/1996, which regulates new rental housing and units not previously rented. Accordingly, rent associates with the Civil Code that calls for freedom of contract between the property owner and tenant based on supply and demand.

4.3.5 Property taxes, public notary and registering a property

Law No. 116/1946 regulates the work of the public notary, registering a property and fees. Documents that require public notary include contracts and deeds that prove ownership, and to whom the property was exchanged on the market or through inheritance. The request for public notary has to render needed information concerning the reality, such as location, area, whether an agricultural land, the number of the parcel, name of the street, neighboring properties/owners. In many cases, Egyptian laws approve adverse possession (*Wada Yad*) of properties according to the provisions of the Civil Law. Exceptions include: vacant land that is not on the records of property taxes (*Al A'awayid*), cases mentioned in Article 970 of the Civil Law, and realities that laws prohibit ownership by time. Each registering office is responsible for the realities within its vicinity. The registry is a record containing the description of the reality, its legal status, rights and obligations, and alterations.

4.3.6 Protecting the natural environment

Egypt has a number of laws to protect the environment and natural resources. Among them is Law No. 102/1983 caring for natural protectorates that include wild life, natural aesthetics, etc. Law No. 38/1967 is another law that belongs to this set. Its concern is public health, and regulates collection of refuse, and overall municipal solid waste management. The provisions of the law extend to treatment of ponds (*Berrak*) and collection of wastewater. Law 9/1999 for protecting the environment is also one of the laws that belong to this group concerned with environmental management systems.

4.3.7 Local Administrations--Managing human settlements

Constitutional amendments to the 1971 Constitution[33] sought decentralization to widen the scope and avail authorities to the Governors in decision-making. These amendments gave local popular councils more freedom and potentials to question, follow up and monitor the executive body in its works and plans. Accordingly, local popular councils participate with the executive body in mobilizing resources with the participation of the civil society.[34]

Laws No. 43/1979 and 144/1988, and their regulations and procedures aim to organize development management of Egyptian cities and the functioning of local administrations. These regulations give local popular councils some autonomy, but little strategic decision making in their hands. Key actors in development management currently are at the central government. The framework for decision making that current legislations set is highly centralized and sector oriented. This framework constrains the local residents. Local administrations suffer from underutilization of information in decision-making process is a result of traditional mechanisms of decision-making and limited managerial capacities that do not generate effective demand on information; lack of internal institutional mechanisms for coordinated decision-making, planning, policy making and development management; lack of an adequate and stable institutional framework for partnership in decision-making

[33] before the 25th of January 2011 revolution

[34] State Information Service (SIS), Modernizing the Constitution of Egypt, Local Development Minister: Constitutional amendments guarantee wider authority to governors, decentralization 13/1/2007 http://www.sis.gov.eg/VR/conts/en/new37.htm

and implementation management between local administration and other development partners (private sector, investors, NGOs, CBOs, think tanks and research bodies ...etc.), and the roles of some partners in development, such as investors and NGOs, are rapidly expanding but with a limited niche for effective participation; limited consideration and integration of the "spatial dimension" in the decision-making process; and last but not least, the relative absence of multi-sectoral and comprehensive planning function. Immediate pressures are the generator of long-, medium- and short-term planning and implementation initiatives. The current situation reflects "operation management" rather than "management of transformation," which is increasingly needed to guide future growth and development due, in part, to rapid transformations in both economic and social contexts.[35]

Today administrations responsible for the development of human settlements in Egypt need new cadres who are able to utilize modern technologies in planning and managing human settlements, such as Geographic Information System (GIS). They should be trained on strategic thinking; understanding the dynamics of markets; and be able to develop a constructive discourse with the private sector and non-government entities. Skills and capacities must be developed in the use of economic and social modeling, goal articulation and targets setting; and alternative scenarios for development and evaluation. These cadres are responsible for generating information necessary for decision-making. Their responsibilities extend to transferring their knowledge and information to other development partners. In the past, USAID funded a major program for Local Development (LD), and it seems that the impact of the project is limited. Trained cadres left local administrations to a better paying jobs in the private sector, donor funded projects, or abroad. Thus, there is a need for a system that retains these trained, qualified cadres.[36]

4.3.8 Regulating Planning profession

This group of laws is among the private laws. The group includes laws managing and regulating the Syndicate of Egyptian Engineers; Union of Egyptian Contractors, and the like. As mentioned earlier, these laws arrange and organize the relationships between individuals, as well as individuals and the State.

4.3.9 Other related laws and regulations

These include laws and regulations to assure the safety of the community. Among these laws, regulations and decrees are those regulating civil protection (*al Hemaya al Madani*a); protection from epidemic diseases; working conditions and industrial safety (*al Amn al Sina'ai*); penalizing violence against women; and fighting youth delinquency. This set of laws and regulations also include measures governing investment guarantees, the general budget of the State, public accounts, etc.

4.4 Institutional Framework

Based on the above review, the Armed Forces reserve the right to approve development of land outside the limits (*al Zemam*). There are number of central agencies that have land, outside the areas reserved for national security purposes, to allocate:

1. The General Authority for Reclamation Projects and Agricultural Development (GARPAD), Ministry of Agriculture and Land Reclamation (MALR), as Laws No. 143/1981 and 7/1991 provide;
2. Tourism Development Authority (TDA), Ministry of Tourism;
3. The Authority for New Communities (ANC), Ministry of Housing, Utilities and Urban Development (MHUUD);
4. Industrial Development Authority (IDA), Ministry of Industry and Trade, is responsible for allocating land for manufacturing purposes; and
5. Local administrations, i.e., the Governorates, manage land within the limits and boundaries (*al Zemam*). However, after the approval of the Armed Forces, the Governor can extend his/her authority outside the limits (*al Zemam*) by two kilometers for horizontal agricultural expansion only, and after the approval of the Minister of Agriculture and Land Reclamation.

[35] UNDP and Governorate of Ismailia, SIGP project document.

[36] El-Kholei, Ahmed, "Preliminary study on the political framework conditions for participatory development in Egypt," Background Paper, Participatory Development Programme in Urban Areas, GTZ, Cairo, Egypt, May 2007

In addition, the Presidential decrees No. 152/2001 defines the strategic sites; 153/2001 establishing the National Centre for Planning State Land Uses (NCPSLU); and 154/2001 for the map of investment opportunities presented earlier. Figure 9 is a schematic presentation of the institutional framework that governs desert land.

On 21st of May, 2011, the Supreme Administrative Court (*al Mahkama al Edariya al Ouliya*) ruled that Presidential decrees that gave certain authorities, such as the Armed Forces, the Intelligence, and the Ministry of Interior, the right to sell State-owned land and keep the proceedings are all unconstitutional and against the law. The proceedings of selling State-owned land have to enter the State Budget through the Ministry of Finance. According to the verdict, the law has given that right to specific central bodies such as the Ministries of Housing and Agriculture, and the Governorates as well. The court emphasized that Presidential decrees are less powerful than a law, thus the President cannot overrule a law or issue a decree that is not in accord with laws, and the court called on the Supreme Council of the Armed Forces to cancel these Presidential decrees.

Illegitimate decree is not the only institutional issue that hampers an effective, efficient system of land management in Egypt. There are number of issues such as overlap of authorities. For example, the General Organization for Physical Planning (GOPP), according to Law No. 119/2008, Article 5, is the public body responsible for preparing the general policy for planning and sustainable urban development. The Presidential decree No. 153/2001 establishing NCPSLU mandates it to prepare an inventory of State-owned land outside the limits (*al Zemam*) and prepare plans for this land in collaboration with respective authorities

5 Land Use Systems

5.1 Characteristics

Most of Egyptian land is desert. Alluvial soil suitable for agricultural production is in the Nile Valley and Delta. The soil in Western desert is both sand dunes and sand barren soils. The Eastern desert and most of the Sinai Peninsula features rugged mountains of chalky soil, Figure 9.

5.2 Inventory of Agricultural Land Uses

The Agricultural Research and Development Council (ARDC), Ministry of Agriculture and Land Reclamation, published a report on January 2009 assessing the areas of agricultural land in the Nile Valley and Delta using remote sensing and GIS technologies.
The agricultural land in Egypt is that within the Nile Valley and Delta, and new land to both east and west of the Delta, Figure 11. The total area, according to the study, is 8,560,078 feddans. The source of irrigating this land is both groundwater and surface water. There is another 332,098 feddans under reclamation. Most of this land is within the vicinity of Al-Salaam Canal, Sahel el Teena; east of the lakes and Suez Canal; on the hinterlands of Delta and Valley, particularly al Wadi el Farregh, west of Nattroun and Toushki. The area of human settlements is about 1,029,570 feddans that cities and villages occupy. The area of the Nile River starting from Aswan High Dam to both Dumyat and Rasheed is around 155,704 feddans. Roads and railways, and drains and canals (wider than 20 m) use an area of land that mounts to 290393 feddans, as detailed in Table 3.

Figure 9. Institutional Framework Governing the Management of Desert Land

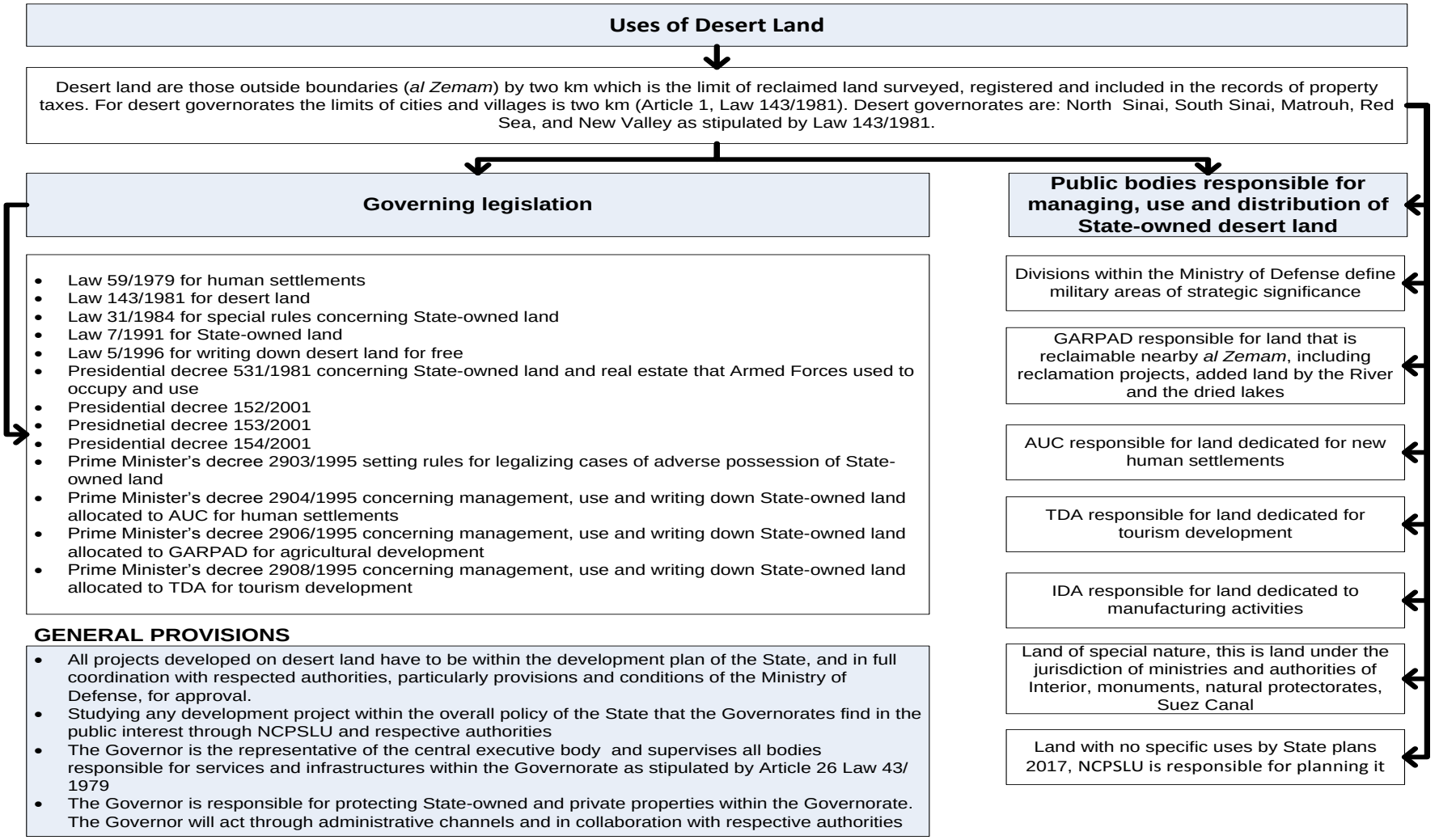
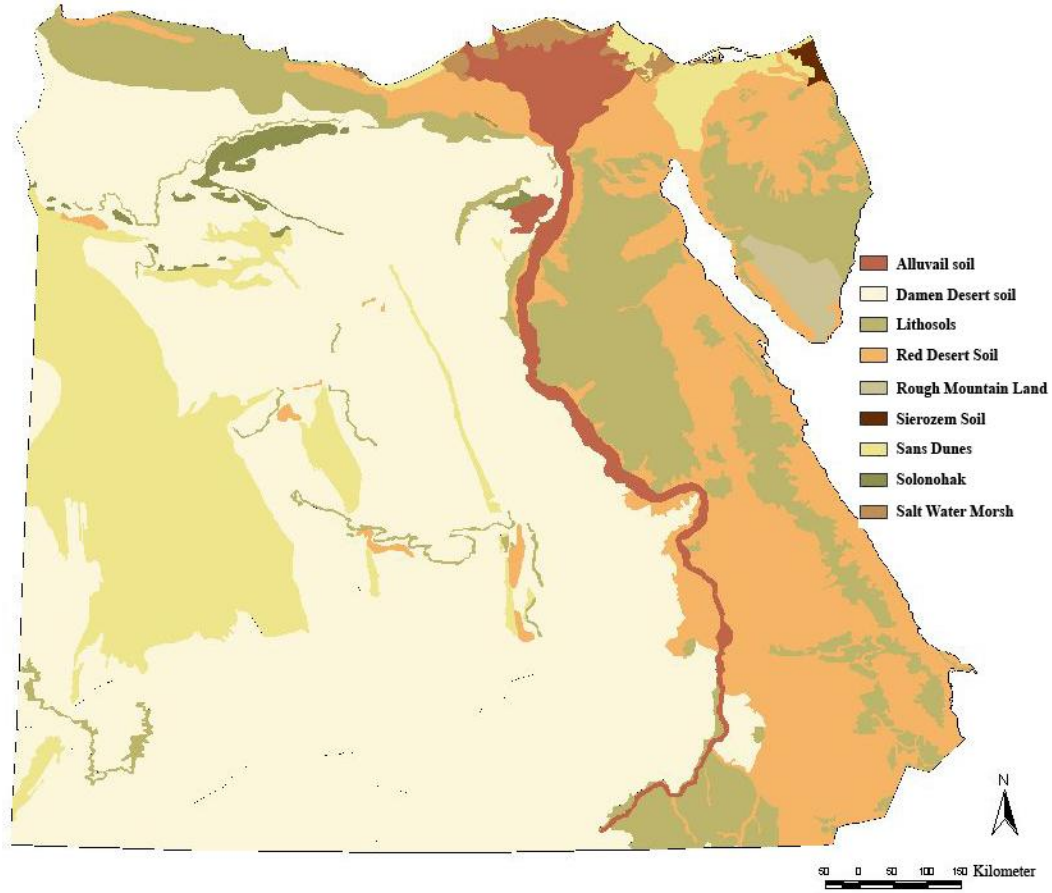


Figure 10: Egypt: Map of Soil



Source: Map published by Agricultural Potential in The Middle East based on data from World Soil Geography Unit, US Department of Agriculture, American Elsevier Publishing Co, 1971

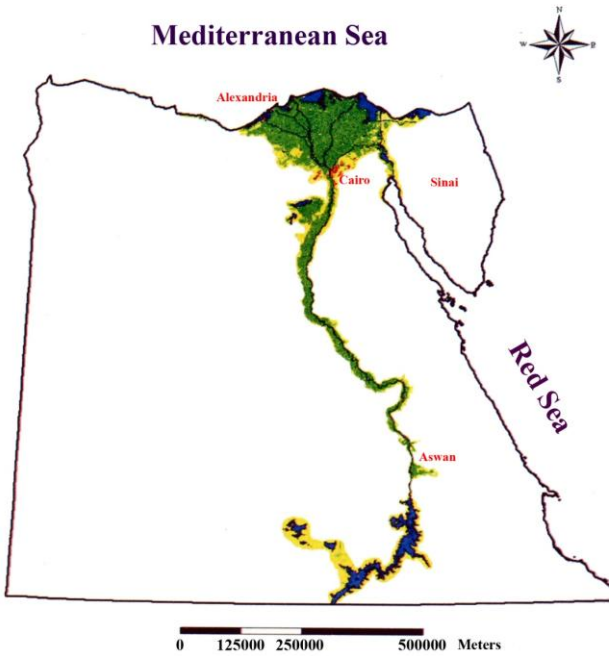
Table 3: Areas of land allocated to different uses in the Nile Valley, Delta and hinterland to the east and west.

No.	Land Use	Area in feddan
1	Cultivated area in Nile Valley and Delta, and hinterland	8,560,078
2	Areas under reclamation	332,098
3	Total areas (Cultivated and under reclamation)	8,892,176
4	Area of Nile River and both branches	155,704
5	Areas of land allocated for human settlements	1,029,570
6	Area of land for roads, railways, canals and drains	290,393
	Area of Egypt	238 million
	Percent of cultivated land and land under reclamation	3.74
	Percent of cultivated land and land under reclamation and human settlements	10.38
	Percent of land for human settlements to land for both agricultural production and human settlements	10.74

Source: Agricultural Research and Development Council (ARDC), Estimating the Cultivated Areas in Valley , Delta and the hinterlands using remote sensing and GIS, Ministry of Agriculture and Land Reclamation, Cairo, Egypt, 2009

The study confirmed the need to estimate areas of various land uses, and the need to define the transformations using remote sensing and GIS technologies, particularly to monitor the sprawl of human settlement over agricultural land. The study also recommended extending the analysis to remote areas, such as oases, the north coast and the Sinai Peninsula. The study concluded that the cultivated areas do not exceed 3.74 percent of the gross area of Egypt. The study also concluded that the average population density (persons per feddan) is 77.7 persons per feddan assuming the population was 80 million at the time of the study. Accordingly, the study recommends intensifying land uses in human settlements. However, the gross density is a misleading indicator. The net density, i.e., Population divided by area of land dedicated to residential uses, is used for physical planning purposes. It should not exceed 150 persons per feddan, and in many human settlements the net densities can be more than twice this standard.

Figure 11: Geographic distribution of Agricultural Land



Source: Agricultural Research and Development Council (ARDC), Estimating the Cultivated Areas in Valley , Delta and the hinterlands using remote sensing and GIS, Ministry of Agriculture and Land Reclamation, Cairo, Egypt, 2009.

5.3 Changes in Land Uses

The Ministry of Agriculture and Land Reclamation in collaboration with the Ministry of State for Scientific Research produced a study in 2010 monitoring the changes in land uses in Delta and Nile Valley between 1984 and 2007. The study estimated an increase in cultivated land during this period to mount to about 1,742,481 feddans. Meanwhile, Egypt lost 586,705 feddans to the sprawl of human settlements. The study also estimated an increase of areas of land allocated to roads and irrigation canals and drains to about 695,037 feddans during the same period.
The agricultural land extends from Aswan to the South to Cairo to the North, plus the Delta region and hinterlands to both the east and the west. Table 4 summarizes the results of the study. An estimated one and half-million feddan was added to the cultivated land between 1984 and 2007. An estimated 0.33 million feddan was under reclamation during 2007. Meanwhile, the area of human settlements extended to reach 103 thousand feddans by 2007 marking an increase of almost 600 thousand feddans since 1984. During the same period, the area of roads, and major canals and drains increased by almost 0.6 million feddans.

Table 4: Changes in Land Uses 1984-2007

No.	Land Use	Area (feddan) 1984	Area (feddan) 2007	Change in area (feddan) 1984 to 2007
1	Cultivated land in Nile Valley and Delta (East and West hinterlands)	71,496,95	8,560,078	+1,410,383
2	Land currently under reclamation		332,098	
3	Total area of land cultivated and under reclamation	7,149,695	8,892,176	+1,742,481
4	Area of Nile River and two branches		155,704	
5	Area of human settlements (cities, villages, hamlets)	442,865	1,029,570	+586,705
6	Area of roads, major canals and drains	182,061	290,393	+108,332
	Total area of Egypt	238 million	238 million	
	Percent of land used for agricultural use	3.004	3.74	
	Percent of land used for human settlements	5.830	10.740	

Source: Agricultural Research and Development Council (ARDC), Monitoring Transformations in Land Uses of Nile Valley and Delta Using Remote Sensing Technologies and GIS, 1984-2007, Ministry of Agriculture and Land Reclamation and Ministry of State for Scientific Research, the National Authority for Remote Sensing and Space Sciences, Cairo, Egypt, 2010

In the Nile Delta, the cultivated land increased to about 1,368,441 feddan. Most of this added land is to the west and east of Delta. Human settlements expanded using 393,136 feddan. The study showed the decline in the areas of the five northern lakes that mounted to 229,484 feddan, and an increase in fish farms to reach about 89,723 feddan. The study found erosion of the coastal zones at the two branches of the Nile (Dumyat and Rasheed) that reached about 3,159 feddan, where the eroded land reached 2,119 and 1,041 at Dumyat and Rasheed (Rosetta), respectively.

Comparing the data of 1984 to that of 2007, the study concluded that the gross area of cultivated land in the Delta declined to 297,981 feddan, and the increase of built areas (human settlements) to 297,764 feddan, which indicates a serious issue, Table 5 then Figures 12 and 13. Most of these developments were in the Govern orates of Qalubia and Menofia, Table 6.

Table 5: Changes of land uses Delta region, 1984-2007.

Uses	Area (feddan) 1984	%	Area (feddan) 2007	%	Difference in area (feddan)
Cultivated land	4,610,808		4,312,827		-297,981
Human settlements	301,571	6.10	599,335	12.00	+297,764
Total	4,912,379		4,912,162		

Note: (+) means added area of land while (-)means lost area of land

Source: Agricultural Research and Development Council (ARDC), Monitoring Transformations in Land Uses of Nile Valley and Delta Using Remote Sensing Technologies and GIS, 1984-2007, Ministry of Agriculture and Land Reclamation and Ministry of State for Scientific Research, the National Authority for Remote Sensing and Space Sciences, Cairo, Egypt, 2010

Table 6: Changes in uses of land in two Governorates of Delta, 1984-2007

District (*Markaz*)	Area of land used 1984			Area of land used 2007		
	Agricultural land	Human Settlements		Agricultural land	Human Settlements	
	feddan	feddan	%	feddan	feddan	%
Qussna, Menofia	48,656.40	2,466.80	4.80	44,281.70	6,841.50	13.40
Qalub, Qalubia	27,152.00	1,735.00	6.00	12,526.00	4,245.30	25.30
Al Khanka, Qalubia	24,914.00	3,772.00	15.10	15,088.00	8,411.90	36.60
Shubra el Khema, Qalubia	2,406.00	4,564.00	65.40	1,352.00	4,938.80	78.50

Source: Agricultural Research and Development Council (ARDC), Monitoring Transformations in Land Uses of Nile Valley and Delta Using Remote Sensing Technologies and GIS, 1984-2007, Ministry of Agriculture and Land Reclamation and Ministry of State for Scientific Research, the National Authority for Remote Sensing and Space Sciences, Cairo, Egypt, 2010

The area of the Northern lakes, i.e., Manzala, Bourolous, Maryut and Edko, also witnessed changes during 1984 to 2008, Table 7. The decline in the area of lakes, and the continuous dumping of solid wastes and release of all sorts of wastewater have both negative impacts on the ecosystems of the lakes and of course, the services these ecosystems provide, such as the decline in the production of fish, which in turn affects the livelihoods of the locals.

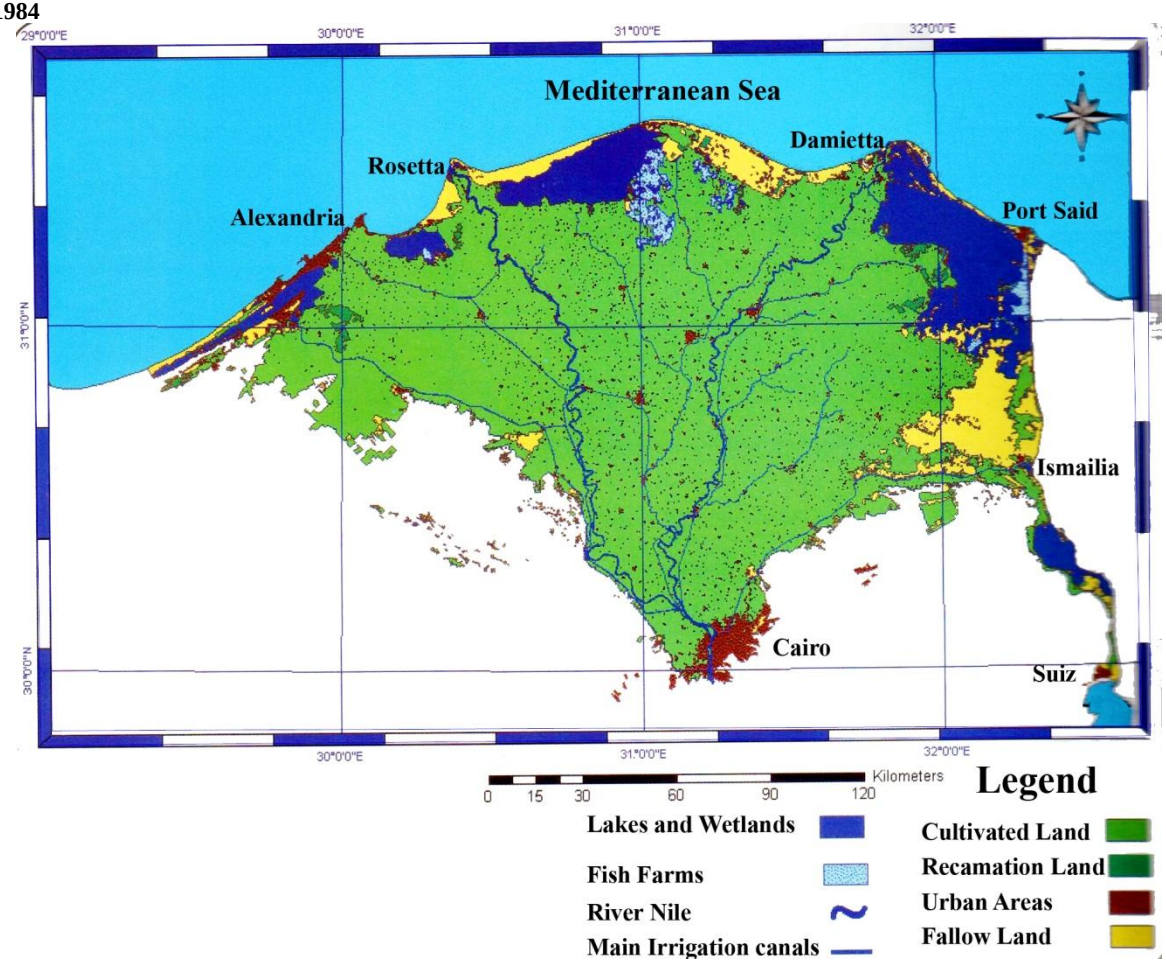
Table 7: Total changes in area of Northern Lakes, 1984-2008

No.	Land uses	Area (feddan) 1984	Area (feddan) 2008	Change in area (feddan)
1	Fish farms	81,789	171,512	+89,723
2	Northern lakes	654,074	424,590	-229,484

Note: (+) means added area of land while (-) means lost area of land

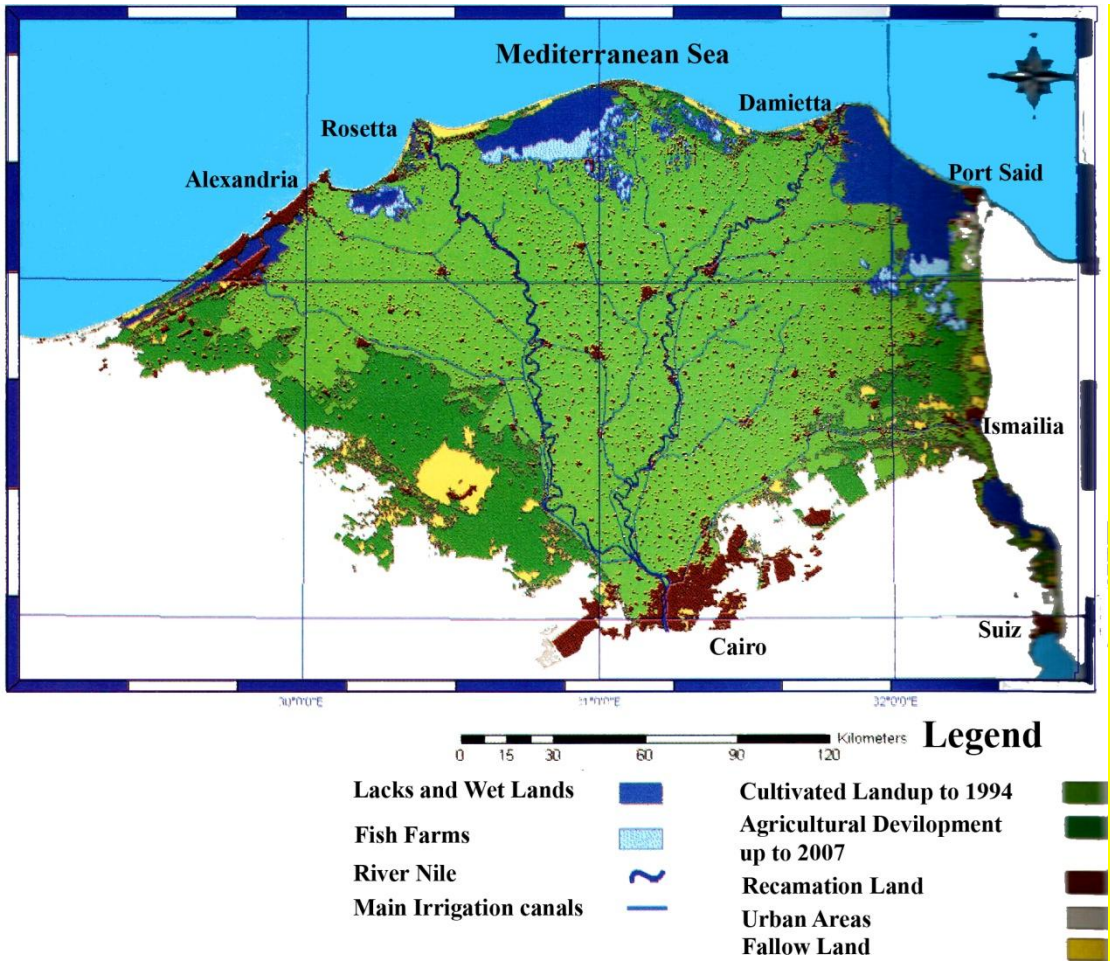
Source: Agricultural Research and Development Council (ARDC), Monitoring Transformations in Land Uses of Nile Valley and Delta Using Remote Sensing Technologies and GIS, 1984-2007, Ministry of Agriculture and Land Reclamation and Ministry of State for Scientific Research, the National Authority for Remote Sensing and Space Sciences, Cairo, Egypt, 2010

Figure 12: Nile Delta Land Uses 1984



Source: Agricultural Research and Development Council (ARDC), Monitoring Transformations in Land Uses of Nile Valley and Delta Using Remote Sensing Technologies and GIS, 1984-2007, Ministry of Agriculture and Land Reclamation and Ministry of State for Scientific Research, the National Authority for Remote Sensing and Space Sciences, Cairo, Egypt, 2010

Figure 13: Nile Delta Land Uses 2007



Source: Agricultural Research and Development Council (ARDC), Monitoring Transformations in Land Uses of Nile Valley and Delta Using Remote Sensing Technologies and GIS, 1984-2007, Ministry of Agriculture and Land Reclamation and Ministry of State for Scientific Research, the National Authority for Remote Sensing and Space Sciences, Cairo, Egypt, 2010

6 Land Markets

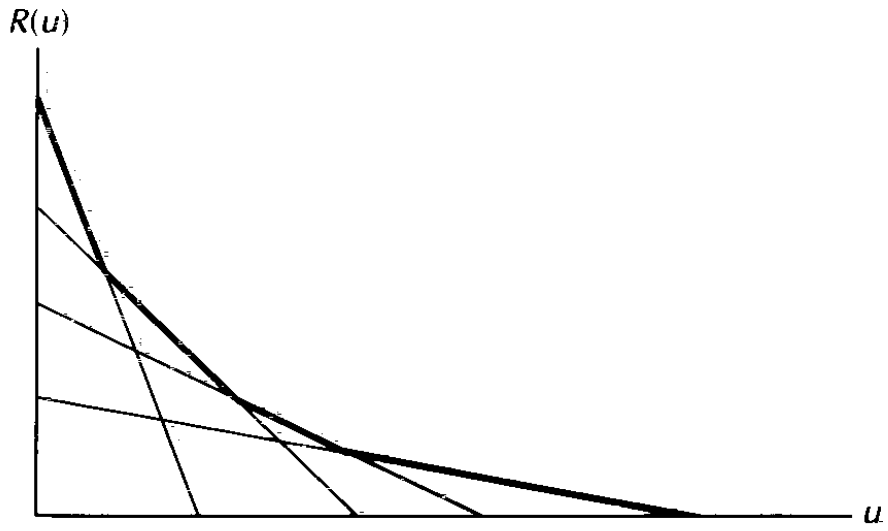
6.1 Conceptual analysis

According to theories of location and space economy, the decision where to locate a business or residence is to minimize location costs by trading-off rents for land against transportation costs. Notice these theories assume that human settlements are in a featureless plain with a single Central Business District (CBD), which is the only employment center, and perfect competition in the market as well.
The rent for land, height of buildings, and net population densities all are inversely related to the cost of transportation. All these variables will be the highest at the center of the human settlement, and decline in all other directs will decrease as the distance from the center increases. Therefore, the land rent function is negatively sloping away from the center towards the hinterlands. Three factors govern the slope of the rent function:

1. Maintaining contact with the center: The greater the contact with the center the steeper the slope of the rent function.
2. Size of output produced at the center: The larger the number of units of outputs, the greater the steepness of the rent function; and finally,
3. Capital: The more inputs used in the production process, the less land is needed and used.

Then, corporate activities, such as banks and law firms, will prefer to locate at the center of the metropolis, since they require personal contact. Manufacturing establishments will utilize proximity to transit terminals, such as ports and railway stations, by locating on major routes. Other non-urban activities, such as growing crops and raising livestock, will be beyond the limits of the metropolis, Figure 14.

Figure 14: Distance from Center (*u)* explains land rent function *R(u)*



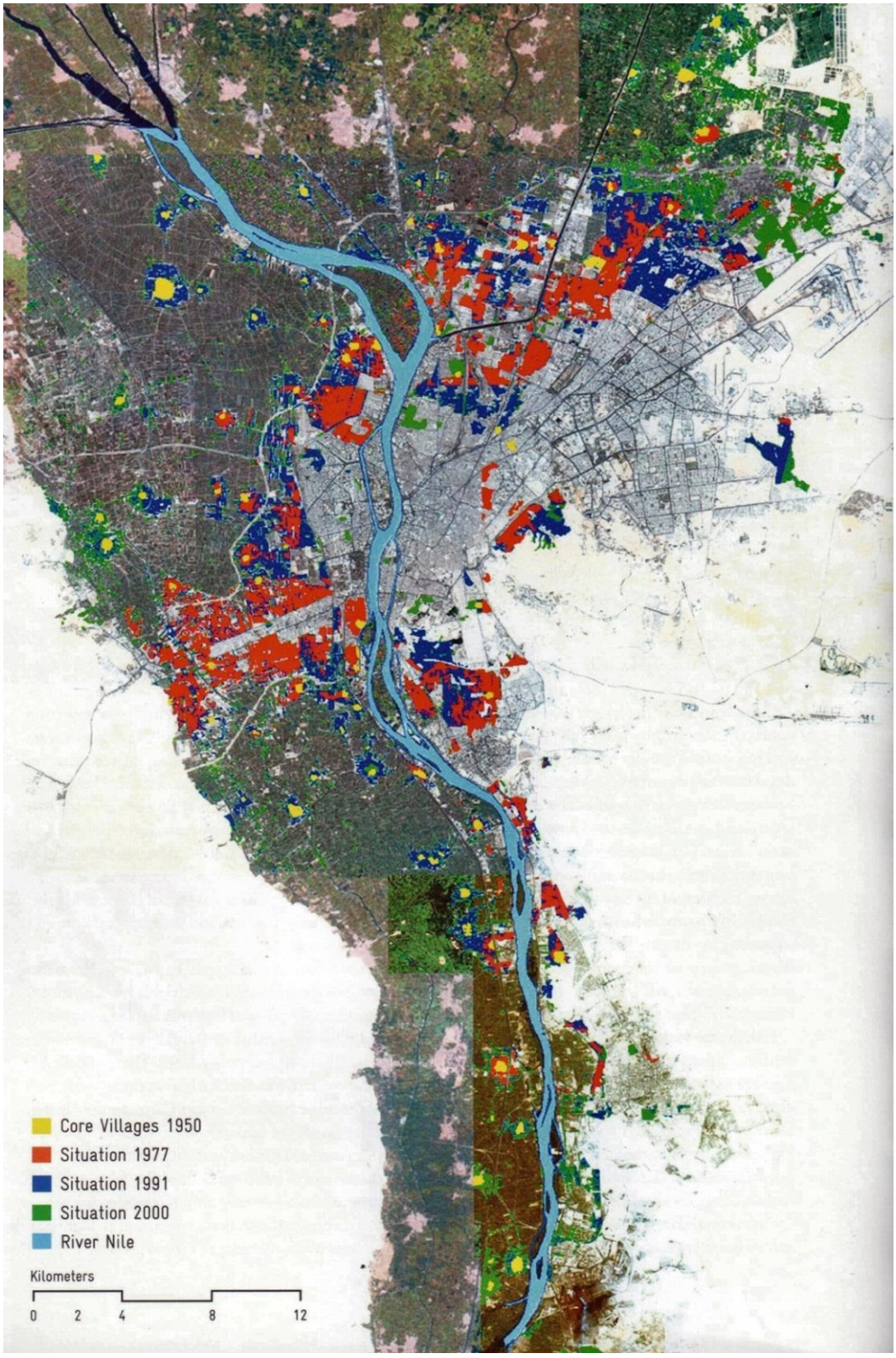
Source: Mills, E. and B. Hamilton (1989), Urban Economics, Fourth Edition, p. 109, Glenville, Illinois: Scott, Foresman and Company.

6.2 The Case of Egypt

Losing valuable agricultural land to sprawling human settlements is a serious matter. Once a road is developed, human settlements extend along that road. For example, the Northern arc of the Greater Cairo Ring Road was at the expense of almost three thousand feddan, but the informal areas that extended around that road are probably at least twice or probably more.
The Greater Cairo metropolitan area extended to the north over agricultural land. The human settlements within Shubra al-Khema, as the study that the Agricultural Research and Development Council (ARDC) published, grew from 65.4 to 78.5 percent of the agricultural land during 1984 to 2007. Villages nearby the Pyramids plateau, such as Kerdasa and Saft el Laban, lost their agricultural

land to urban uses, Figure 15. The figure shows that villages extended to provide residents (polygons in yellow, red and blue) with shelter and non-agricultural working space, such as stores, workshops, etc.

Figure 15: Developments of the Greater Cairo Region



Source GIZ, Cairo's Informal Areas: Between Urban Challenges and Hidden Potentials, Facts, Voices, Visions.

The development of these informal areas was along the boundaries of the agricultural parcels, Figure 16, with no detailed planning that respects street width and length to provide settlers with a) necessary physical infrastructures, such as piped water and a network to collect wastewater, b) social services, such as schools; and c) access to ambulances and fire stations in case of an emergency.

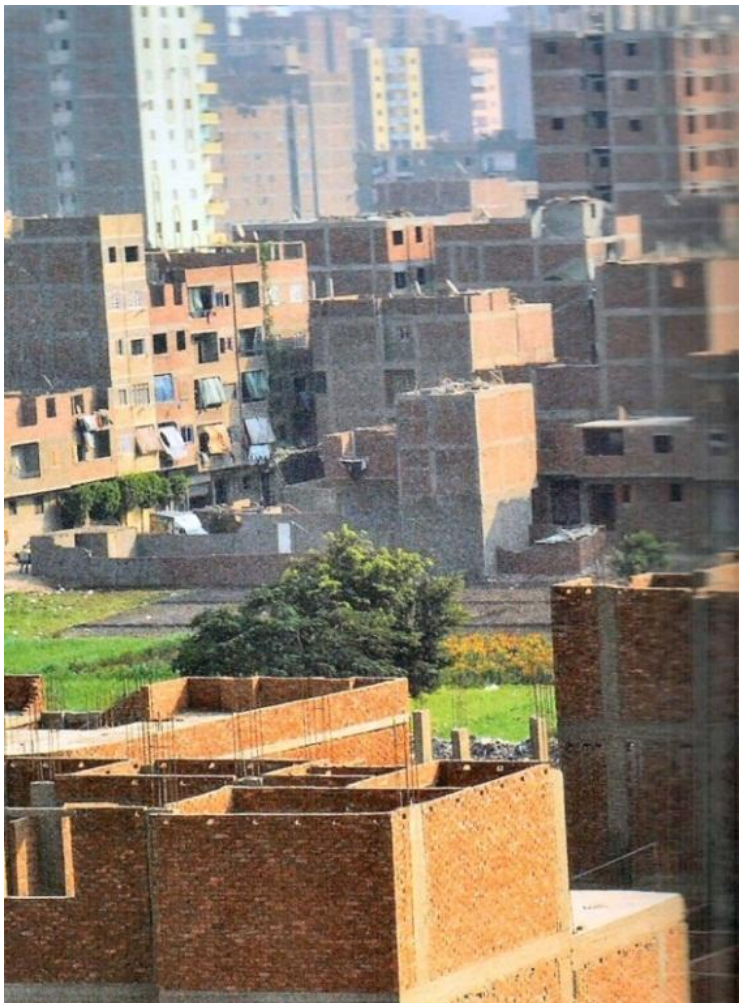
Figure 16: Satellite image of an informal settlement on agricultural land

Source GIZ, Cairo's Informal Areas: Between Urban Challenges and Hidden Potentials, Facts, Voices, Visions

This type of "invasion" of agricultural land means there is demand for these substandard communities where agricultural land uses are now transformed into urban land uses as the rent of land for urban uses is higher than that of agricultural uses. Invasions of spontaneous developments are the most active informal housing market in Egypt. In this case, the occupants construct a dwelling that meets building requirements but on illegal subdivisions and/or violates zoning regulations. Examples of this type of spontaneous developments include, but not limited to, Boulaq al Dakrour and Shoubra El Khema.

The Government responded by command and control measures. In January 1996, a decree by the Martial Ruler (*al Hakem al Askari*) was to demolish buildings developed over agricultural land. However, when the matter was discussed in a court of law, the verdict was to fine the violator. Boulaq el Dakrour, Giza is an example of an invasion sprawl of human settlements over agricultural land, Figure 17. Figure 18 shows the spontaneous developments around the Ring Road and the 26th of July axis over agricultural land. Notice that developments are along the boundaries of agricultural parcels of land, the drains and canals.

Figure 17: Rising housing pressure, Boulaq al Dakrour



Source GIZ, Cairo's Informal Areas: Between Urban Challenges and Hidden Potentials, Facts, Voices, Visions

Figure 18: Invasive informal settlements around the ring road and the 26th of July, Giza

Source: Google Earth

During the first months of 2011, and amid security vacuum and chaos that accompanied the January 25th revolution number of violations were committed. In Aswan violations in the form of developing buildings on agricultural land and state-owned land mounted to about 714 feddan. In Luxor, there were 102 cases of informal developments over State-owned land. In Qalubia, another 320 feddan was the subject of informal construction and development over agricultural land and State-owned land. In Matruh, records show there are about 77 cases of violations of adverse passion of State-owned land and construction without permits or license.[37]

6.3 Challenges and Opportunities

6.3.1 Challenges

There are challenges that face Egypt in the area of land tenure. Atop of these challenges is protecting and conserving limited available agricultural land from the sprawl of human settlements. The case of Greater Cairo metropolitan area expanding over agricultural land indicates that the theory for location and space economy is valid; more important, the market mechanisms are functioning. The role of the State is a regulator,[38] where it intervenes in the following cases to:

1. ***Mitigate for market imperfections*** as a result of lacking one or more conditions for perfect competition. These conditions include having a large number of buyers and sellers; perfect information on prices and available goods and services; and secured and acknowledged property rights to enable trade and access financial capital; and finally, individuals' decision is rational, i.e., utility maximizer; cost minimizer and often seeking profit.
2. ***Provide public goods***, which are jointly consumed and not exclusive to a specific group of people. Public goods include, but not limited to, clean air, national defense, etc. Notice that private-sector companies can provide some public goods, such as TV and radio broadcasting, solid waste management.
3. ***Mitigate for externalities***, i.e., the external impacts of the economic activity of an individual on others. For this reason, zoning and land-use planning are the function of governmental bodies. Zoning, which is the control of land use, and building height, footprint and use, is a legal matter. Violating zoning ordinances is a serious matter.
4. ***Assure social justice*** through safety nets, and programs for the marginalized population; and
5. ***Induce necessary institutional transformations*** to assure the sustainability of an intervention. These measures include, but not limited to, adopting principles of good governance, such as transparency, accountability, rule of law, participation, etc. Measures for institutional transformation extend to include redefining the mandates and mission of institutions, capacity development, and so forth.

The Government of Egypt has first to evaluate the experiences of protecting agricultural land, and expanding into the desert for agricultural and manufacturing activities, given the threat of inundation of the Nile Delta as a result of Sea Level Rise (SLR) that climate change cause. Next is to elaborate a long-term strategy for the land uses of Egypt that assures diversification of the economy, generate job opportunities, and above all provide a solution that is sustainable.

The second challenge is formalizing the ownership and holdings of land and real estate at large. The Egyptian Authority for Survey (*Hayat al Messaha al Masriya*) started the cadastral work to establish a registry of real estate (*al Segil al Ayini*). This step is to assure the generation and flow of State revenues resulting from property taxes. Hopefully, each parcel of land, building, etc. will be registered indicating attributes and owner(s) with a national number. In this case the titles to these assets will be computerized, secured, and acknowledged. The problem of State-owned land outside the limits and

[37] Informal interviews with local officials

[38] The State has many functions. One of these functions is to serve as a "regulator" by constraining rights and allocating responsibilities. Regulation can take many forms: legal restrictions promulgated by a government authority, self-regulation by an industry such as through a trade association, social regulation(e.g. norms), co-regulation, or market regulation. One can consider regulation as actions of conduct imposing sanctions, such as a fine, to the extent permitted by the law of the land. This action of administrative law, or implementing regulatory law, may be contrasted with statutory or case law.
Regulation mandated by a state attempts to produce outcomes which might not otherwise occur, produce or prevent outcomes in different places to what might otherwise occur, or produce or prevent outcomes in different timescales than would otherwise occur. In this way, regulations can be seen as implementation artifacts of policy statements. Common examples of regulation include controls on market entries, prices,wages, Development approvals, pollution effects, employment for certain people in certain industries, standards of production for certain goods, the military forces and services. The economics of imposing or removing regulations relating to markets is analysed in regulatory economics.

boundaries (*al Zemam*) will continue to persist so long there are overlapped of responsibilities or lack of coordination between public bodies as discussed earlier.

The third challenge is the fragmented and dwarf holdings of agricultural land. As discussed earlier, there are various reasons for this situation. First, while the supply of land is almost constant, inheritance over time leads to subdivision of parcels of land among the heirs. Second, with almost fixed supply of land, and increased competition between the various uses at the outskirts of human settlements, land available for cultivation becomes expensive as well. Some owners who inherited their land and live away from the village depend on renting it, particularly after freeing the relationship between the owner and renter since the mid-1990s. Others thought of trading their property in old land (Nile Delta and Valley) into another form of asset, such as new land along the Cairo-Alexandria Desert road, for example. Since the price of land increased, the peasants subdivide the parcel of land into fractions of a feddan (*kerat* and *sahm*), thus leading to dwarf and fragmented holdings.

This situation is a barrier to improving and enhancing the processes of agricultural production. This situation often leads to the situation of diseconomies of scale.[39] "Dispersed farming has for decades prevented economies of scale in production, inputs, and marketing, raising the cost of production and keeping agriculture relatively inefficient."[40]

6.3.2 Opportunities

ARDC of MALR, in collaboration with FAO and IFAD, has elaborated the Sustainable Agricultural Development Strategy (SADS) towards 2030. The strategy aims at striking a balance between expansion of the agricultural sector for economic gains, and social justice through programmes tailored for gender equality and rural development, while maintaining natural resources.
SADS has number of targets. The first is the sustainable use of agricultural natural resources; improving agricultural productivity; increasing the productivity of agricultural products in both local and foreign markets; achieving higher rates of food security in strategic goods; improving opportunities for agricultural investment; improving livelihood of rural inhabitants; and last but not least, investments needed to achieve the strategic objectives.

The strategy includes a proposed mechanism for implementing the strategy. Reforming institutions of the agricultural sector; reviewing and developing different agricultural policies; and number of programs and projects are the elements of the mechanism for implementing and executing the strategy.

The national program for maximizing the use of water in old land (Nile Valley and Delta) is formulated within the overall framework of SADS. The aim is to conserve water for horizontal expansion by enhancing the efficiency of water use via replacing on-farm traditional irrigation technologies with modern irrigation technologies, such as drippers. The project will cover on-farm water ways, which will add approximately 0.5 million feddan (about 10 percent of the cultivated land). Increasing the efficiency of irrigation will save around 35 percent of water used to irrigate the old land. This program is an opportunity to internalize the negative impacts of fragmented, dwarf holdings.

Another program that SADS includes is to introduce contractual agriculture. The program rests on the idea of contracting the purchase of agricultural products that the farmer will produce according to certain specifications. The contract between the farmer and the contracting company, whether a trader, an exporter, etc. can include extension services. This program will improve infrastructures for marketing agricultural products; and make use of the economies of scale, which will take care of problems that result from fragmented, dwarf holdings.

The fact that the Egyptian Authority for Survey started preparing cadastral for villages is another opportunity that needs to be grabbed. These cadastral along with the strategic plans that GOPP prepared for the villages can be an opportunity to provide rural dwellers with needed social services and infrastructures, given that valuable agricultural land will be conserved.

[39] Diseconomies of scale are the forces that cause larger firms and governments to produce goods and services at increased per-unit costs. They are less well known than what economists have long understood as "economies of scale", the forces which enable larger firms to produce goods and services at reduced per-unit costs.
[40] Kurizig, Michael, "Imports Rising in Middle East and North Africa," World Agriculture and Trade, Agricultural Outlook, Economic Research Service/USDA. June-July 1999

The legal acknowledgments of informal holdings will have a positive impact on the national economy. It will: a) Revitalize the dead capital, b) put credit at the dispose of the poor, and c) Enhance tax revenues and lower inflation. These informal holdings are "dead capital," because the poor cannot trade this land and dwellings on the market; and cannot use them as collateral to access funds formally to finance their small and micro enterprises.

7 Issues to Address

There are issues that need to be addressed for an effective, efficient system of land management. First is to revise the mandate of various institutions. Overlapping and lacking of coordination between central institutions is an issue that needs attention. Also there is a need for a system of collaboration between both central and local public bodies. Equally important is the collaboration of the Government and non-governmental bodies, such as private sector companies, NGOs, etc. Furthermore, there might be a need for revising the legislations, rules, decrees and laws that govern the framework of land management by harmonizing customary and civil codes, and address the issues that hamper swift verdicts to settle disputes in a court of law. The fact that customary and civil laws exist next to each other should not be the source of conflict. Instead, most of the disputes are settled through negotiations under the auspices of natural community leaders. The institutional reform also will include simplifying procedures and fees to acquire and register a parcel of land.

Gender and the right to owning land is another issue that needs attention. Islam honored women, and gave ladies and girls the right to possession of land and other assets through direct purchases and inheritance. The Government of Egypt has taken serious measures to enable women. However, according to Human Development Reports (HDR), male-female gap still persists particularly in rural and frontier governorates, where customary rules govern daily life, including land subdivision practices that discriminate against women when distributing their right to inheritance.

8 Conclusion, Recommendations and Planning Implications

8.1 The need to protect valuable limited, old agricultural land

The inhibited area has increased as the study of ARDC using satellite images indicates. The analysis also shows that despite adding new agricultural land, the sprawl of human settlement, particularly in the Nile Delta area, was at the expense of valuable old agricultural land.

Accessibility is among the reasons for the loss of agricultural land. Extending a road means a parcel of land is now accessible. Due, in part, to land rent differences between agricultural and non-agricultural uses, where the latter is often higher than the former, land use will change to that of highest returns.

Box 2: Corruption prohibits access to land

DAMAC, a real estate development company from the UAE, is putting outside Cairo a development of four million square meters, nestled with a one million square meter landscaped park, the biggest private park in Egypt. Emmar, another UAE based company, is pumping EGP 31,670 million (US$ 5,759 million) in the form of residential developments around and within Cairo, and a resort at the Northern coast.

To protect old agricultural land, there is a need for a regional plan that avails opportunities for investment in both agricultural and non-agricultural productive sectors. Within this proposed regional plan, existing human settlements have to be limited to specific settlement size, while directing investments outside the Delta to the hinterlands, thus developing new settlements and expanding the inhibited area. There are various tools to achieve this aim. First is to apply property trade-off program. Activities under this program, the State will provide the owners of old agricultural land with new reclaimed desert land. The package includes registered contracts and a deal with the Principal Bank for Development and Agricultural Credit (PBDAC) to provide owners with finance to develop on-farm infrastructures, such as water-well, drippers, etc. Now the State can lease the protected old agricultural land to major corporations to grow produce and avail green areas around human settlements. This land can serve as a green belt that physically contains the expansion of the human settlement.

8.2 The need to address the issue of dwarf and fragmented holdings

The supply of agricultural land is limited, and in several cases, its availability is declining as a result of sprawl of human settlements. The competition on agricultural land will raise its rents, which in turn

will raise the price of crops losing their competitiveness in both global and local markets. Given the limited incomes in the countryside, the price of parcel of land is beyond their financial abilities, and thus more than a farmer will purchase a parcel of land in a fraction of a feddan (*kerat* or *sahm*) thus leading to both dwarf and fragmented holdings.

The programs within the SADS are the proper response to the issue. On-farm irrigation improvements and contractual agricultural can both assure small farmers that their property rights are secured, and minimize risks that associate with agricultural production, such as marketing produced crops, losses due, in part, to post-harvest practices, fluctuation of prices as a result of instabilities of global markets, etc.

8.3 The need to address market imperfections and the need to adopt principles of good governance

The analysis shows that land markets are not perfectly competitive. For markets to be competitive there are a number of conditions including, but not limited to, perfect information concerning land, prices, decisions, etc. Information concerning a parcel of land is available to all agents.
State intervention in land markets has to aim at availing information for all agents and prohibiting monopolistic practices in land markets. Lacking good governance in land markets is among the reasons for imperfect land markets. The recent cases of corruption that courts of law are reviewing following the 25th of January 2011 reveal that many parcels of land were allocated to persons in the circle of President Mubarak, his sons, in-laws, friends and members of his administration. This shows that access to land is impossible to all Egyptians, which reflects monopolistic practices that hamper competitiveness of land markets.

Without good governance, Egyptian land is the subject of new scramble. The verdicts of courts of law that indicated the illegality of contracts selling land in Toushka to el-Zahraa Company of UAE to grow Alfa Alfa, which seems a waste of natural resources, and to el Mamlaka of Saudi Arabia is an example of this scramble for resource by the name of FDI. The courts also issued verdicts that annulling contracts to sell land for Madinity to Talaat Mostafa Company to develop new communities east of Cairo. The verdict that canceled the Presidential decree that enables Armed Forces to sell land and keep the money instead of depositing at the State treasury is another example of lacking good governance in land markets.

Box 3: Examples of the new scramble of land resources in Egypt under the name of Foreign Direct Investments (FDI)

The January 25th Revolution revealed number of cases of corruption and mismanagement of accessing land. Companies, such as SODIC that Mubarak's in-law owns, and Palm Hills that the Minister of Housing owns a significant share of its stocks, acquired hundreds of feddans of desert land earmarked for land reclamation, but were developed as luxurious housing for the upper class and foreigners.

Recently, a former Prime Minister and a former Head of GARPAD were jailed for selling al Bayadiya island in the Nile River nearby Luxor, which was declared a natural protectorate, to Hussein Salem, a close friend to Mubarak for the price of eight million Egyptian Pounds, while the actual price was EGP 208 million. Upon concluding the sale, the locals were immediately evicted.

For perfectly competitive land markets, there is a need for updated cadastral and registry of land by which each parcel of land has a national identification number. The registry has to include specification of each parcel, information concerning the owner(s), sub-divisions, etc. This registry has to be updated periodically. This registry has to be linked with the census results to determine the characteristics of both land and housing as well as attributes of population.

Aside of these corrective and preventive measures, there is a need for a wide range of supportive measures. Educating and enlightening the public with their rights and means to access land is essential for perfectly competitive markets. Apply taxes on wind-fall gains is another measure to control freezing savings and money in the form of land and vacant dwellings. Furthermore, levying an annual tax on unused land and closed dwellings is prone to divert money needed for investment away and curb the tendency to speculative practices.

8.4 The need for institutional transformations

The institutional framework that governs land tenure in Egypt needs revision. There is a need for measures to reform the institutional framework that governs land tenure in the country. The mandate and mission of various institutions need to be revised to avoid duplication, overlapping, smooth coordination and collaboration and assure synergies at both the central and local levels. Institutional reforms have also to address issues pertaining gender issues, and empowering women, youth, displaced persons and the like to access land and secure their property rights.

Adopting principles of good governance in land markets is central to the proposed institutional transformations. The aim is not adopting these principles, rather is to apply them hoping that measures for enabling and empowering the marginalized population to access wealth, resources and the processes of decision-making.

PART TWO

1 Introduction

Part II is a report on land management in Egypt. This part of the report consists of six sections. Following this introduction, Section 2, is a presentation of an inventory of land resources and ecosystems in Egypt. Land, water and energy are three natural resources that affect efforts for sustainable agricultural development, and sustainable rural development at large. For this reason, the discussion of the inventory of natural resources extends to include water bodies, coastal zones, marine environment and biodiversity. Competition for location is central to land-use planning and management, and thus the section examines mining activities and mineral resources. In addition, Explosive Remnants of War (ERW) is another hindrance to unfreeze land for development. Section 3 presents Egypt's agricultural zones, land uses and desertification. This section draws on the National Action Plan for combating desertification that Egypt elaborated, adopted and currently is implementing. According to the plan, Egypt consists of four agricultural eco-zones: 1) the North coastal belts, 2) the Nile Valley and Delta, 3) the inland Sinai and the Eastern desert, and 4) the Western desert oases and Southern remote areas. The section discusses the major characteristics, and reasons for desertification. Section 4 discusses the challenges related to land and development, and Government policies. It presents the Sustainable Agricultural Development Strategy (SADS) towards 2030 elaborated in 2009 and currently is under implementation; and the Strategy for Physical Development elaborated early 2011, and currently has entered the stage of detailed plans. Section 4 concludes with discussion and critique. Section 5 is about practices. It addresses the main reasons for land degradation, and types of land degradation. Section 6 concludes this part of the report. These are recommendations based on information and discussion that Sections 2 to 5 presents.

2 An inventory of land resources and ecosystems in Egypt

This section presents available information of the main land resources and ecosystems of Egypt, including their current uses and land use systems. It is an overview of the status of the resources in regard to their management.

2.1 Basic Statistics and Population

Egypt is located at the northeastern corner of the African continent. Its total area is about one million km^2. The Mediterranean and the Red Sea are natural borders at the north and the east. Libya and Sudan are neighbors to the west and south, respectively. Its north-south extent is about 1080 km, and its maximum east-west extent about 1,100 km[41], Figure 19.
The Egyptian terrain consists of a vast desert plateau interrupted by the Nile Valley and Delta which occupy about four percent of the total country area. The land surface rises on both sides of the valley reaching about one thousand meters above sea level in the east and about 800 m above sea level in the west. The highest point of the country, at Mount Catherine in Sinai, is 2,629 m above sea level and the lowest point, at the Qattara Depression in the northwest, is 133 m below mean sea level.

"The majority of the country area is desert land. Most of the cultivated land is located close to the banks of the Nile River, its main branches and canals, and in the Nile Delta. Rangeland is restricted to a narrow strip, only a few kilometers wide, along the Mediterranean coast and its bearing capacity is quite low. There is no forest land. The total cultivated area (arable land plus permanent crops) is 3.4 million ha (2002), or about three percent of the total area of the country. Arable land is about 2.9 million ha, or 85 percent of the total cultivated area, and permanent crops occupy the remaining 0.5 million ha,"[42] Table 8.

[41] FAO, Irrigation in Africa in figures – AQUASTAT Survey 2005
42 FAO, Irrigation in Africa in figures (Op. cited)

Table 8: Basic statistics and population

Physical areas[1]			
Area of the country	2008	100,145,000	ha
Cultivated area (arable land and area under permanent crops)	2008	3,422,178	Ha
Population[1]			
Total population	2008	81,527	1000 inhabitants
Rural population	2008	46,741	1000 inhabitants
Population density	2008	81.4	inhabitants/km^2
Population economically active in agriculture	2008	6906	1000 inhabitants
Economy and development			
Gross Domestic Product (GDP)[2]	2010	218,912,422,332	US$ (current)
▪ Agriculture value added per worker[2]	2009	997	(constant 2000 US$)
▪ GDP per capita[2]	2008	2,685.15	(constant 2000 US$)
Human Development Index (highest = 1)[3]	2010	0.620	
Infrastructures			
Access to improved water sources			
Total population (broad definition)[4]	2008	99.0	%
Urban population[5]	2008	99.8	%
Rural population[5]	2008	96.7	%
Access to improved wastewater services			
Total population (connected to sewerage network)[4]	2008	43.60.0	%
Urban population[5]	2008	98.8	
Rural population[5]	2008	37.0	

Source:
1) FAO, AQUASTAT, Generated 20 Sept 2011 at 10:12 CEST;
http://www.fao.org/nr/water/aquastat/data/factsheets/aquastat_fact_sheet_egy_en.pdf
2) World Bank Database, http://data.worldbank.org/country/egypt-arab-republic
3) UNDP, Human Development Report, 2010 http://hdrstats.undp.org/en/countries/profiles/EGY.html
4) CAPMAS
5) El-Zanaty, Fatma Egypt Demographic Households Survey http://www.measuredhs.com/pubs/pdf/FR220/FR220.pdf

Figure 19: Map of Egypt

2.2 Geophysical Conditions

Geographically, the country consists of four major parts: the Nile Valley and Delta, Western Desert, Eastern Desert and Sinai Peninsula., Figures 20, 21 and 22 are exhibits of the topography of Egypt, the soil classification and the main drainage basins.

1. The area of the **Nile Valley and the Delta** reaches about 33 thousand sq. km.
2. The **Western Desert** stretches westward from the Nile Valley to Libya and embraces an area of about 681 thousand sq. km, which are more than two-thirds of the whole area of Egypt.

3. The **Eastern Desert** consists essentially of a backbone of high rugged mountains running parallel to, and at a relatively short distance from the Red Sea Coast, and a rocky plateau dissected by numerous drainage systems (*wadi*).
4. The area of the **Sinai Peninsula** amounts to about 61 thousand km^2. It is triangular and separated from Egypt's mainland by the Suez Canal and the Gulf of Suez. The core of the peninsula, situated near its southern end, consists of an intricate complex of high and very rugged igneous and metamorphic mountains. The highest peak of these mountains is Mount (*Gebel*) Katherine, which attains an altitude of 2,641 m above sea level. In contrast to these mountainous terrains, the middle part of Sinai is a low-level plateau breached by erosion. The greater part of Sinai is drained by Wadi El-Arish, a 310 km-long system that reaches the Mediterranean at the town of El-Arish. The *wadi* is the largest ephemeral stream in Sinai with a catchment area covering almost one-third of the entire area of Sinai. The northern coastal plain has notable sand dune formations.

Egypt lies within the dry tropical region, except for the northern parts that lie within the warm moderate region, with a semi-Mediterranean climate. A hot-dry summer and a moderate winter with little rainfall though potentially heavier along the coast characterize the climate of Egypt.

Rahim (2006) argued that according to SOTER program[43] and the soil map of Egypt, the soils can be classified into eight SOTER units, [44] Table 9, Figure 23. As a result of homogeneity in landform each unit contains one terrain component and one soil component except SOTER unit No.1, which contains three soil components. Also every terrain component contains only one soil component. The sand dunes in the north of the Delta (SOTER unit 2) do not contain a soil component because there is no soil in these active dunes. Rahim derived the DEM maps (slope, relief intensity, elevation, potential drainage density and the combination between them) using SRTM 90m data to generate a terrain model for this database Figure 24. Rahim linked the database of SOTER and the DEM maps to show information for any area in the Nile delta in Egypt, such as slope, relief, elevation, PDD and all soil characteristics. This might help land managers and planners in the development of the Nile delta. He concluded that SOTER contributes to improving knowledge about natural resources on a national and regional scale. The data readily available in the database enables analysis of land use systems which is the basis for decisions in land-use planning to increase the efficiency of land use and decrease land degradation.

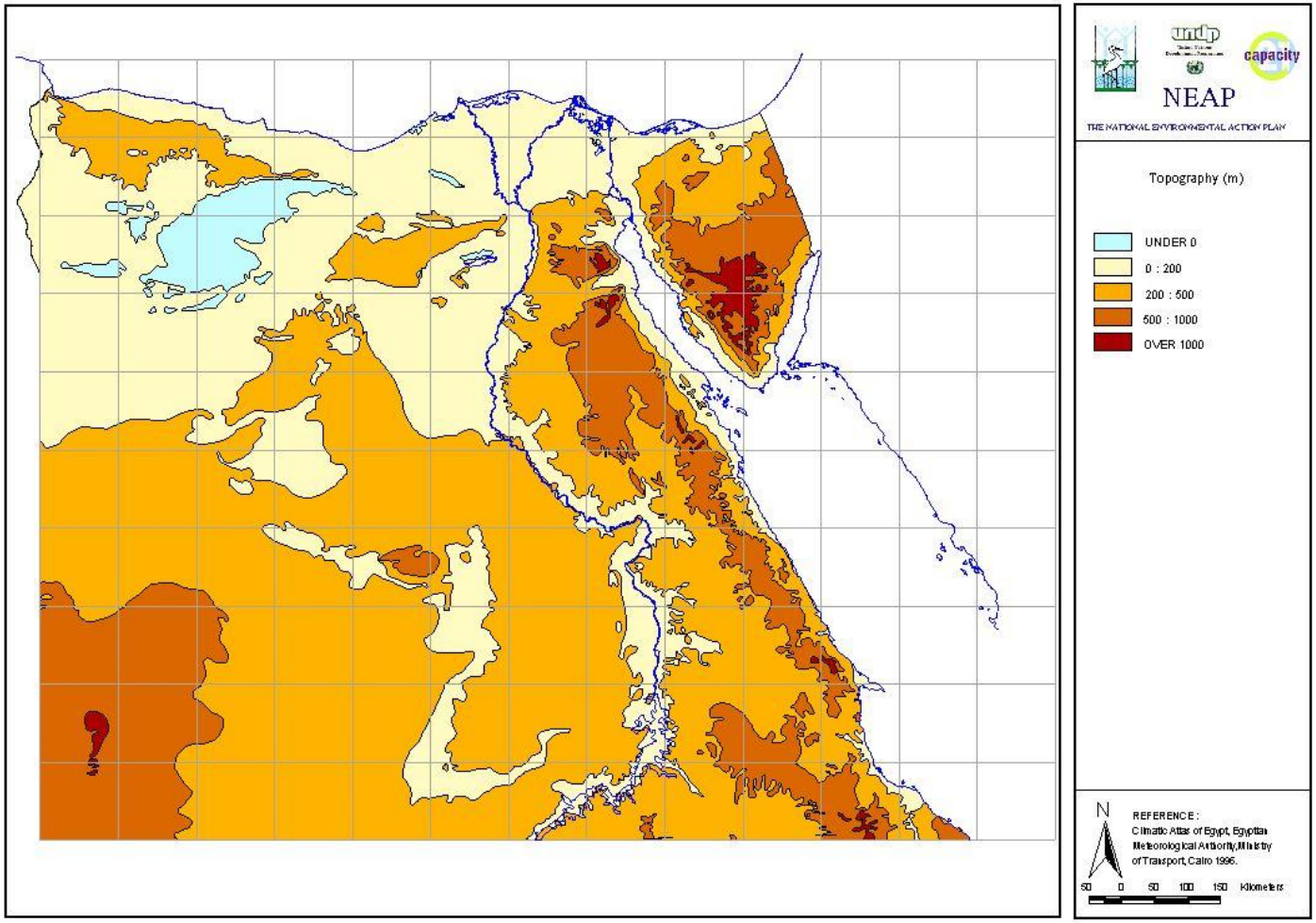
Table 9: Characteristics of SOTER units

SOTER unit	Characteristics	Classification[1]	Classification[2]
1	Sandy to clay, Highly saline, 1-2% slope	Gleyi-Salic Fluvisols	Aquolic Salorthid
2	Sand dunes	Sand dunes	Sand dunes
3	Fluviomarine, clay, highly saline, 1-2% slope	Hapli-Sodic Fluvisols	Vertic Ustifluvents
4	Fine loamy, highly saline, 1% slope	Sodi-Salic Fluvisols	Typic Usifluvents
5	Sandy, slightly saline, 2% slope	Hapli-Eutric Fluvisols	Typic Quartzipsamments
6	Clay, non-saline, 1-2% slope	Hapli-Eutric Vertisols	Typic Torrerts
7	Sandy loam, non-saline, 1-2% slope	Hapli-Eutric Fluvisols	Typic Torrifluvents
8	Clay, highly saline, 1-2% slope	Eutri-Salic Vertisols	Typic Salitorrerts

Notes: 1) FAO, 1988. Soil Map of the World, Published by ISRIC, Wageningen, 1997 Organization of the United Nations, Rome.
2) Soil Survey Staff, 2003. Keys to Soil Taxonomy, Ninth edition, SMSS tech., Mono, No.6, Blacksburg, Virginia, USA.
Source: Rahim, I.S., "Compilation of a Soil and Terrain Database of the Nile Delta at Scale 1:100000," Journal of Applied Sciences Research 2(4): 226-231, 2006

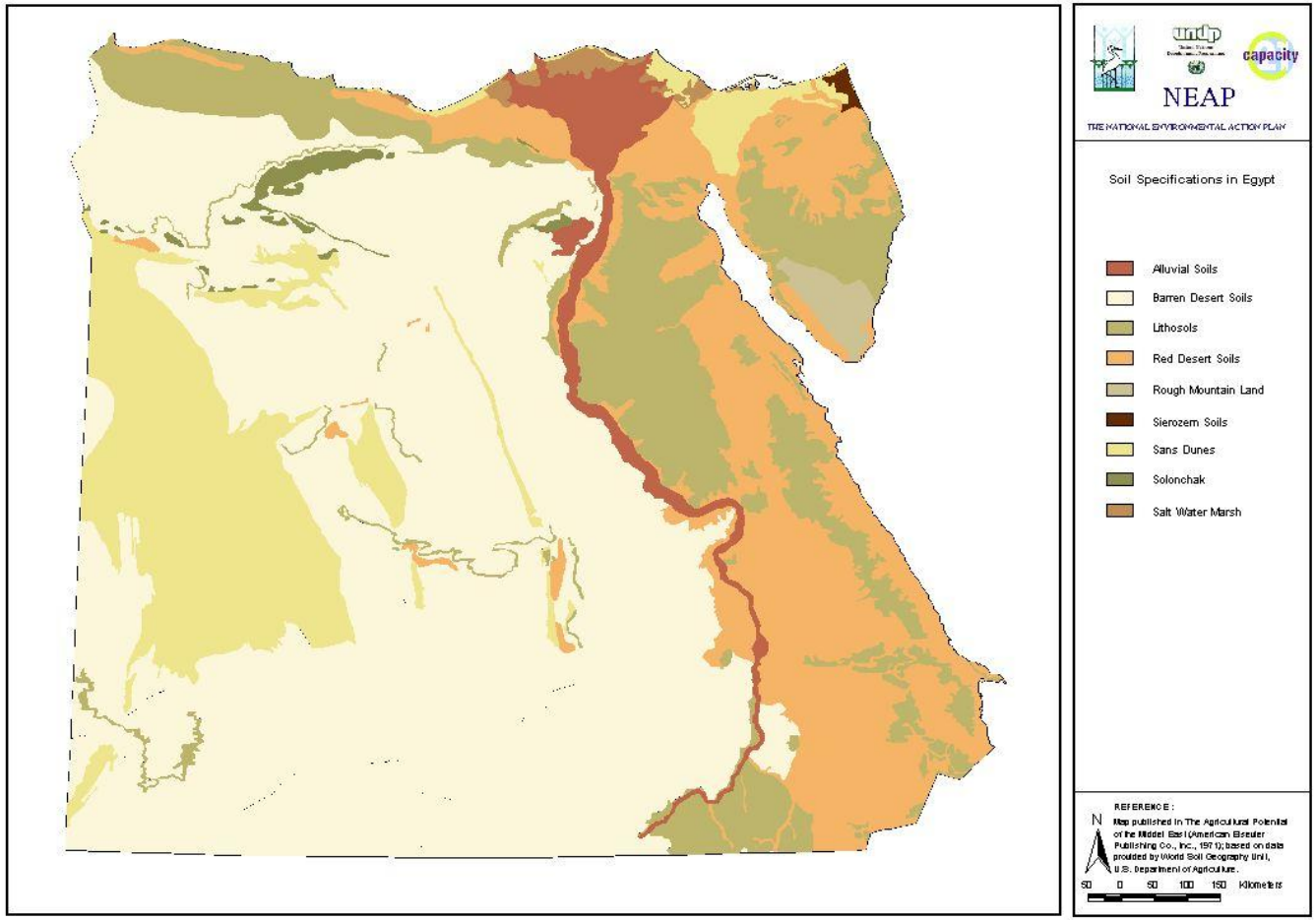
[43] SOTER is Soil and Terrain an international methodology developed by ISRIC - World Soil Information in Wageningen, The Netherlands SOTER is used for the storage of spatial soil and terrain information which enables the production of various types of maps.
[44] The SOTER unit is defined by its, often reparative pattern of physiography, parent material and soils.

Figure 20: The Topography of Egypt



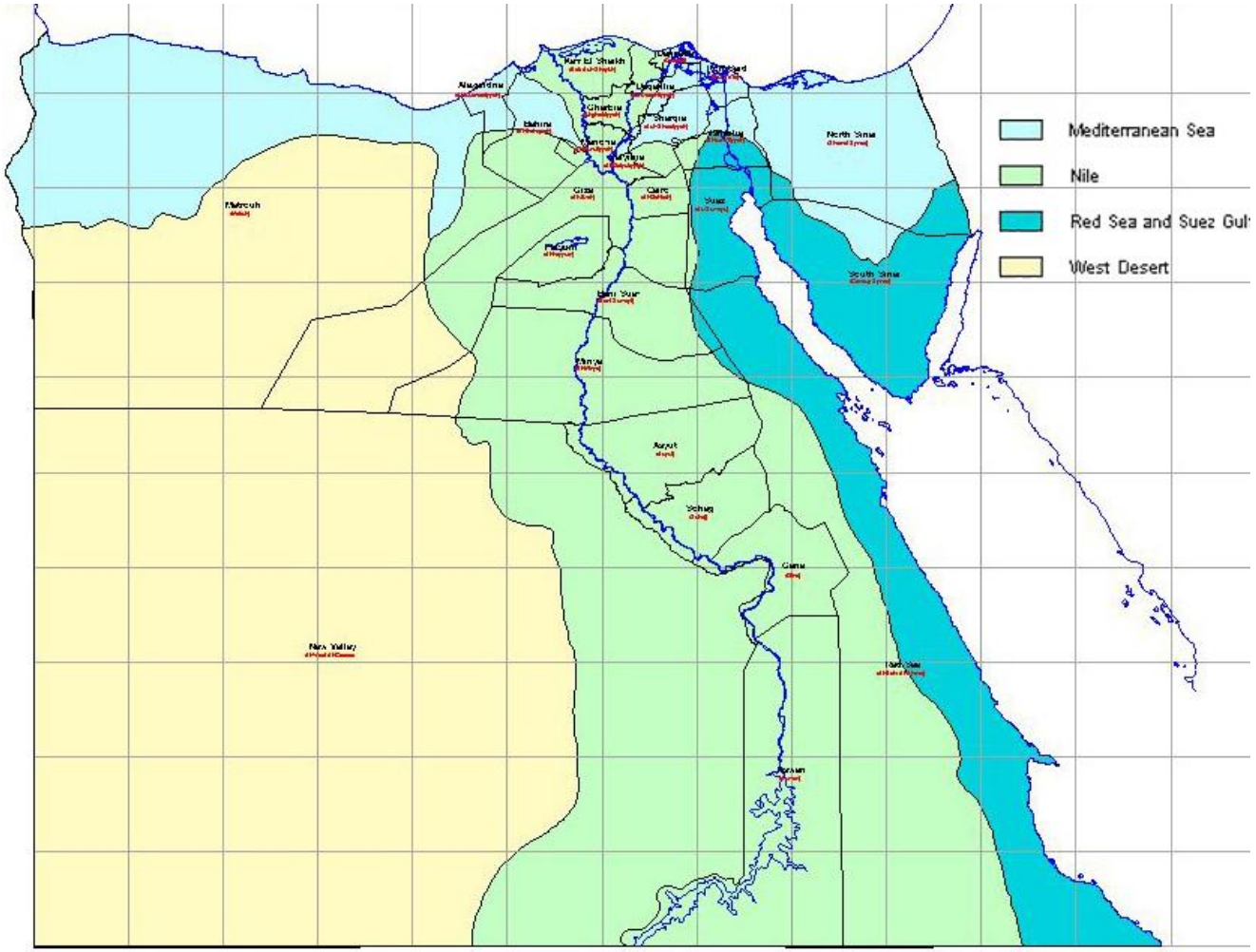
Source: Capacity 21 Unit, 2001, National Environmental Action Plan, 2002-2017, Environmental Profile, EEAA and UNDP, Cairo, Egypt

Figure 21: Soil Specification



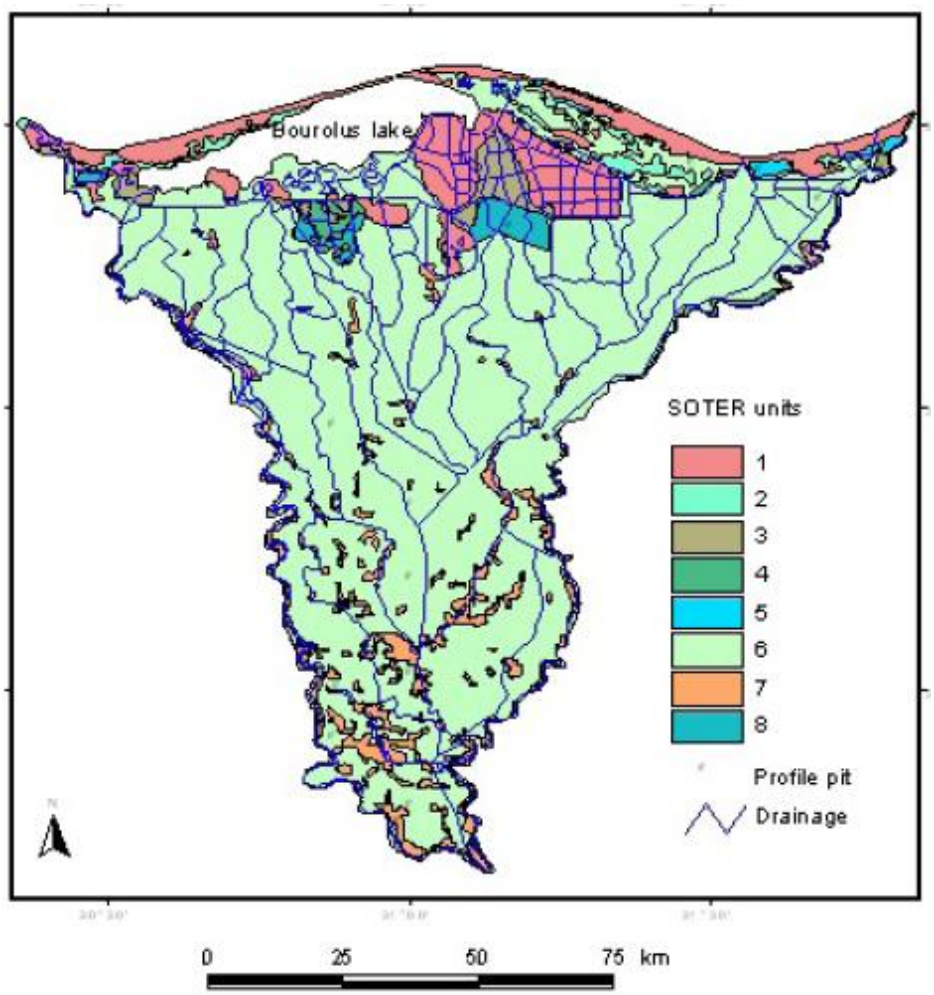
Source: Capacity 21 Unit, 2001, National Environmental Action Plan, 2002-2017, The Environmental Profile, EEAA and UNDP, Cairo, Egypt

Figure 22: Main Drainage Basins



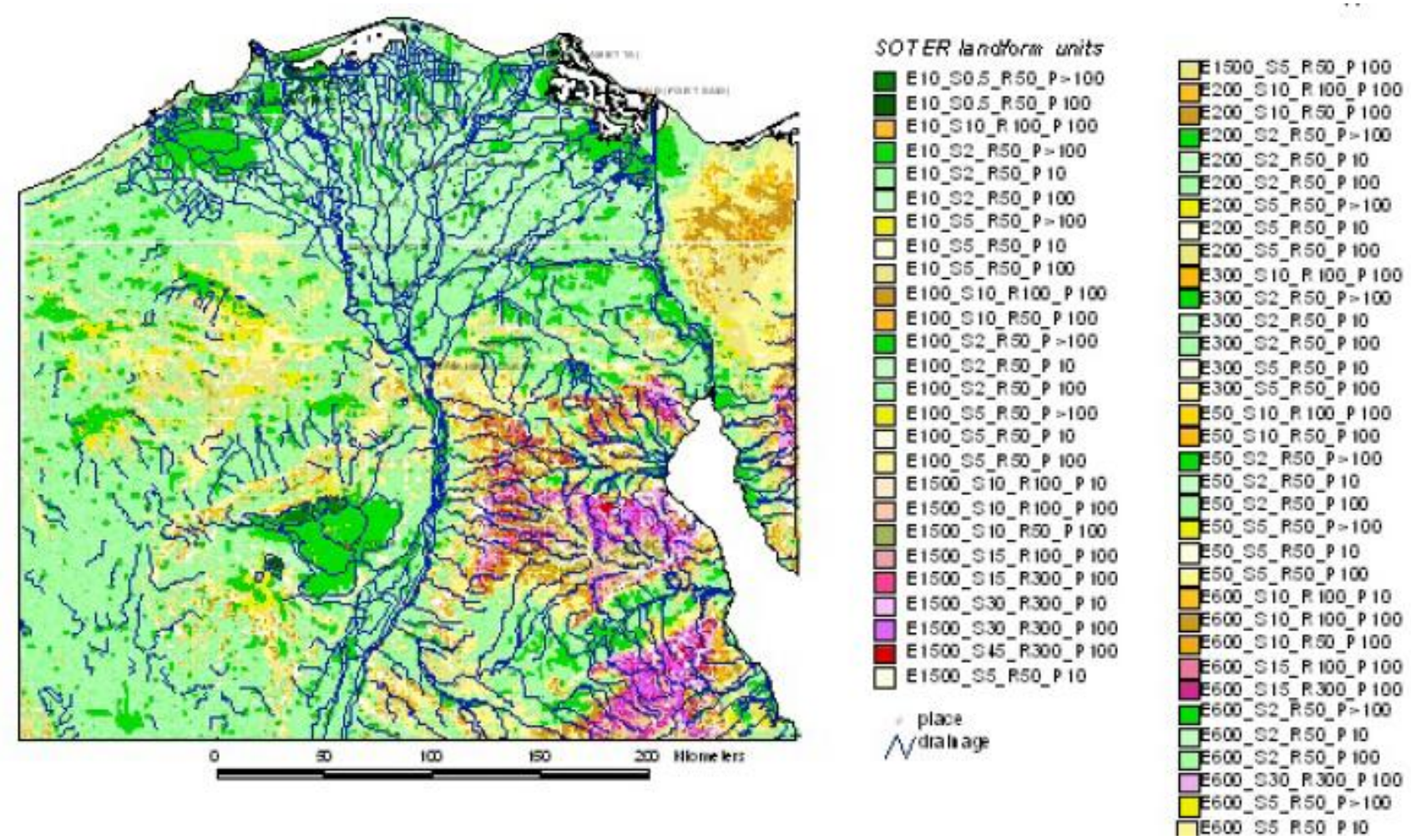
Source: Capacity 21 Unit, 2001, National Environmental Action Plan, 2002-2017, Environmental Profile, EEAA and UNDP, Cairo, Egypt

Figure 23: SOTER units in Nile delta



Source: Rahim, I.S., "Compilation of a Soil and Terrain Database of the Nile Delta at Scale 1:100,000," Journal of Applied Sciences Research 2(4): 226-231, 2006

Figure 24: SOTER landform units of the Nile delta derived from SRTM 90mDEM



Source: Rahim, I.S., "Compilation of a Soil and Terrain Database of the Nile Delta at Scale 1:100,000," Journal of Applied Sciences Research 2(4): 226-231, 2006

2.3 Food, Agriculture and Cultivated Land

The agricultural land base consists of old land in the Nile Valley and Delta; rain fed areas; several oases; and reclaimed land from the desert since 1952, Table 10. Due, in part, to good climatic conditions (maximum sunlight, mild winters) and reasonable quality of land and water resources, Egypt is ideally suited to cultivate a wide variety of crops as presented earlier. The most notable fact from the figures is cultivating two water-demanding crops during the summer, namely, rice and sugarcane. This poses pressure on the limited amount of water available for irrigation.

Table 10: Agricultural Land

	Egypt	Middle East & North Africa	World
Total cropland (000 ha), 1999	3,300	100,430	1,501,452
Hectares of cropland per 1,000 population, 1999	49	252	251
Arable & permanent cropland as a percent of total land area, 1998	3.3%	8.0%	11.3%
Percent of cropland that is irrigated, 1999	100.0%	27.8%	18.3%

Notes:

a) The index of agricultural production is a ratio of country's net agricultural output in 1996-98 relative to the base period 1989--91. This ratio is then multiplied by 100 to obtain an index number.

b) Negative values, indicating a net export of grain, are not shown. Cereal consumption is defined as production plus imports minus exports

c) Data are for the most recent year available within the given time range.

Source: Earthtrends, WRI earthtrends.wri.org

The strategies for agricultural development aim at increasing cultivated land and crop production by three to four percent annually, Table 11 and Figure 25. Cultivated and cropped areas increased in the past few years. The cultivated area in 1990 was only 6.92 million feddan, while the cropped area was 12.43 million feddan. In 1995, the cultivated area reached 7.814 million feddan of which 6.205 million feddans were in the old land of the Nile Valley and Delta, and the rest (1.609 million feddans) in newly reclaimed land. The cropped area reached 13.814 million feddan with 1.77 cropping intensity.

Table 11: Agricultural Production and Yields

	Egypt	Middle East & North Africa	World
Cereals, 1999-2001			
Average production (000 metric tons)	19,657	78,527	2,075,387
Percent change since 1979-81	142%	31%	32%
Per capita production (tons per person)	290	193	343
Percent change since 1979-81	56%	-21%	-4%
Average crop yield (kg per ha)	7,238	2,585	3,096
Percent change since 1979-81	79%	51%	41%
Roots and tubers 1996-1998			
Average production (000 metric tons)	2,439	16,012	638,438
Average crop yield (kg per ha)	19,278	X	12,958
Pulses, 1996-1998			
Average production (000 metric tons)	545	3,702	55,469
Average crop yield (kg per ha)	3,025	X	808
Meat, 1999-2001			
Average production (000 metric tons)	1,395	8,069	233,218
Percent change since 1979-81	217%	120%	71%

Notes:

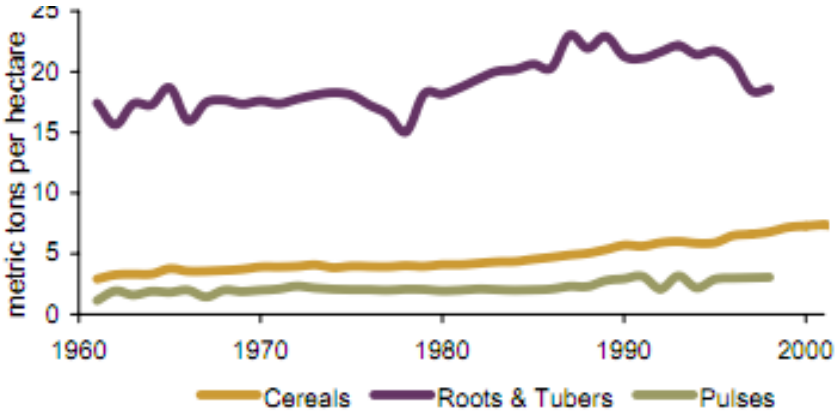
a) The index of agricultural production is a ratio of country's net agricultural output in 1996-98 relative to the base period 1989--91. This ratio is then multiplied by 100 to obtain an index number.

b) Negative values, indicating a net export of grain, are not shown. Cereal consumption is defined as production plus imports minus exports

c) Data are for the most recent year available within the given time range.

Source: Earthtrends, WRI earthtrends.wri.org

Figure 25: Yields of cereals, roots and tubers, and pulses, 1961-1998



Source: Earthtrends, WRI

In spite of an increase in cultivated land of Egypt, the arable land area per person decreased as population grew at rates higher than those of cultivated and cropped land. One of the attributes of agricultural land is dwarf and fragmented holdings (*heyazat*), as discussed in Part 1 of this report.

The distribution of cultivated land varies widely among the Governorates of Egypt. Only 2.4 percent of urban Governorates area is cultivated, while 56.6 percent of the total area in the Governorates of Lower Egypt is cultivated. In Upper Egypt, cultivated area reaches about 85.3 percent of the total area whereas in the Frontier Governorates, which are mainly desert land; 0.1 percent of that area is cultivated. Most cultivated land requires special treatment to increase their productivity.

The use of fertilizers, pesticides and herbicides has declined since adopting Economic Reform and Structural Adjustment Program (ERSAP), where State subsidies have been minimized, and prices of inputs for agricultural production have been subject to market mechanisms, Table 12 and Figure 26. The percent of agricultural labor has also declined as mentioned earlier in Part 1.

Table 12: Agricultural Inputs

	Egypt	Middle East & North Africa	World
Average annual fertilizer use, 1999			
Total (thousand metric tons)	1,188	6,613	141,360
Intensity (kg per hectare cropland)	360	66	94
Number of tractors, 1997	90,000	1,610,773	26,334,690
Agricultural workers as a percentage of the total labor force, 1990	40.3%	X	X
Percent of GDP generated from agricultural activities, 2000	16.6%	X	5.0%

Notes:

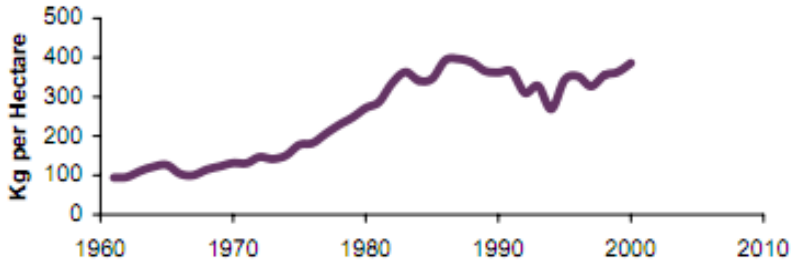
a) The index of agricultural production is a ratio of country's net agricultural output in 1996-98 relative to the base period 1989--91. This ratio is then multiplied by 100 to obtain an index number.

b) Negative values, indicating a net export of grain, are not shown. Cereal consumption is defined as production plus imports minus exports

c) Data are for the most recent year available within the given time range.

Source: Earthtrends, WRI earthtrends.wri.org

Figure 26: Fertilizer consumption per hectare of cropland, 1961-1998



Source: Earthtrends, WRI

With population growth around two percent per annum[45] associates with a decline in fertility of land and shrinking agricultural land, the resultant is food insecurity. During the last two decades of the 20th century, food aid and imports of cereals represented 66 percent of total consumption of cereals, Table 13 and Figure 27.

Table 13: Food Security

	Egypt	Middle East & North Africa	World
Variation in domestic cereal production, 1992-2001 (average percent variation from mean)	10.7%	6.7%	3.5%
Net cereal imports and food aid as a percent of total consumption {b}, 1998-2000	33.7%	39.0%	X
Food aid as a percent of total imports, 1998-2000	0.3%	1.3%	X
Average daily per capita calorie supply, 1999 (kilocalories)	3,323	3,003	2,808
Average daily per capita calories from animal products, 1999 (kilocalories)	241	301	460
Percent of children that are underweight, 1995-2000 {c}	12.0%	15.0%	27.0%

Notes:

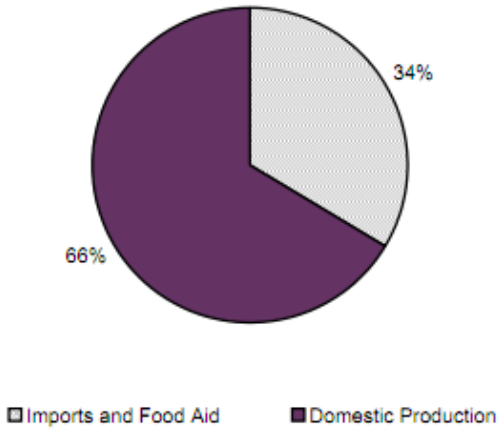
a) The index of agricultural production is a ratio of country's net agricultural output in 1996-98 relative to the base period 1989--91. This ratio is then multiplied by 100 to obtain an index number.

b) Negative values, indicating a net export of grain, are not shown. Cereal consumption is defined as production plus imports minus exports

c) Data are for the most recent year available within the given time range.

Source: Earthtrends, WRI earthtrends.wri.org

Figure 27: Net cereal imports and food aid as a percent of total cereal consumption, 1981-1999



Source: Earthtrends, WRI earthtrends.wri.org

[45] as the results of the 2006 census suggest.

2.4 Water

The Nile is the main and almost exclusive source of fresh water in Egypt. The country relies on the available water stored in Lake Nasser to meet the needs of the population within the annual share of water, which is fixed at 55.5 Billion Cubic Meters (BCM) annually, as per agreement with Sudan in 1959.
Groundwater in the deserts and Sinai, rainfall and flash floods, and desalinization of seawater are other complementary sources of fresh water. Each source has its limitations on use concerning quantity, quality, space, time and/or cost. Groundwater in the Western Deserts is found in the Nubian sandstone aquifer that extends below the vast area of the Governorate of the New Valley, particularly its sub-region East of Owaynat. This aquifer stores about 200 thousand BCM of fresh water. However, groundwater occurs at great depths; the aquifer is generally non-renewable. Utilizing such water, therefore, depends on pumping costs and its depletion rate versus the potential economic return, on the long run.

Groundwater in Sinai is mainly formed in three different water-bearing formations: the shallow aquifers in northern Sinai, the valley aquifers and the deep aquifers. Shallow aquifers in the northern part of Sinai consist of sand dunes that hold the seasonal rainfall, which helps in fixing these dunes. The aquifers in the coastal area are subject to salt-water intrusion. Total dissolved salts in this water ranges from two thousand to nine thousand part per million (ppm).

Rainfall on the Mediterranean coastal strip decreases eastward from 200 mm/year at Alexandria to 75 mm/year at Port Said and declines inland to about 25 mm/year near Cairo. Rainfall occurs only during the winter season in the form of scattered showers and therefore, cannot be considered a dependable source of water. Nevertheless, some seasonal rain-fed agriculture is grown in the northern coast to the west of Alexandria and in Sinai utilizing these small amounts of water. Floods occurring due, in part, to short periods of heavy storms are considered natural hazards, especially in Upper Egypt, Red Sea area and Southern Sinai. This risk could be a development opportunity if properly utilized.

Non-conventional water resources include renewable groundwater aquifers in the Nile basin and Delta, agricultural drainage water, and treated wastewater. Each resource has its limitations on use. These limitations relate to quantity, quality, space, time, and/or cost of use. It is worth mentioning that such water sources cannot be considered independent resources and cannot be added to Egypt's fresh water resources. In fact, using these sources is a recycling process of the previously used fresh Nile water in a way that improves the overall efficiency of the system for water distribution. These types of sources should be used and managed with care, after the proper evaluation of their environmental and health impacts.

Desalinization of seawater in Egypt as a source of water has received a low priority due, in part, to its high cost that ranges between LE three to $7/m^3$. Nonetheless, sometimes it is feasible to use this method to produce and supply potable water, particularly in remote areas where the cost of constructing pipelines to deliver Nile water is relatively high.

It is worth noting that these water sources cannot be considered independent resources, and cannot be added to the fresh water resources of Egypt. These types of sources should be used and managed with care, and their environmental and health impacts must be evaluated carefully.

Table 14 is a quantitative summary of water resources and uses in Egypt. There are various observations to be made from the table. First, limited fresh water resources are serious issue, particularly other Nile basin countries, such as Ethiopia are considering mega projects on the Nile for agricultural development and generation of energy, thus increasing the capacity of dams is not the answer. The recommended solution is to establish partnerships with these countries and reach a win-win agreement. The solution has to be within a regional framework that satisfies the needs of Nile basin countries efficiently and equitably. Agriculture is the major user of water, where 59 thousand cubic meters out of 68.3 thousand cubic meters are dedicated to irrigation and production of livestock, Figure 28. In the meantime, there are other growing economic sectors; such as manufacturing and tourism, with considerable share in the GDP, are growing and will compete with agriculture for fresh water. Third, so long population is growing and the supply of fresh water is almost constant, then the per-capita share of water will decline. Fourth, almost 80 percent of the produced wastewater is treated, and reused to meet growing needs. This practice requires cautious handling to avoid the outspread of water-borne diseases. The solution then is an integrated framework that enables managing the supply

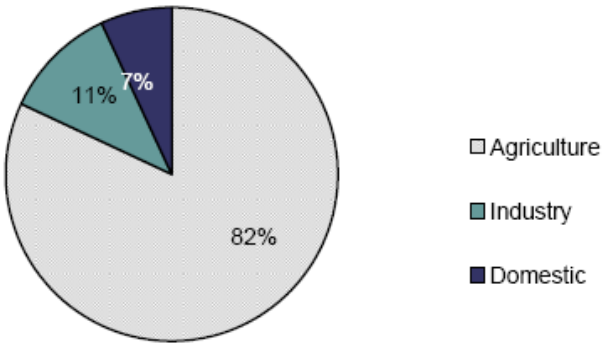
side and the demand side through packages of economic incentives that penalizes water wasters, encourages the use of non-conventional water sources, such as desalination, and above all protects water resources from pollution to sustain the services that the ecosystems, particularly the Nile, its branches and lakes, provide in the form of fresh water fish, Figure 29.

Table 14: Water: sources and use

Variable	Year	Value	Unit
Renewable water resources			
Average precipitation		51.00	mm/yr
		51.07	109 m^3/yr
Internal renewable water resources[46]		1.80	109 m^3/yr
Total actual renewable water resources		57.30	109 m^3/yr
Dependency ratio		97.00	%
Total actual renewable water resources per inhabitant	2004	794.40	m^3/yr
Total dam capacity	2002	169,000.00	106 m3
Water withdrawal			
Total water withdrawal	2000	68,300.00	106 m^3/yr
- irrigation + livestock	2000	59,000.00	m^3/yr
- domestic	2000	5,300.00	m^3/yr
- industry	2000	4,000.00	m^3/yr
• per inhabitant	2000	1,008.00	m^3/yr
• as % of total actual renewable water resources	2000	117.00	%
Water use for navigation and hydropower	2000	4,000 60	10 m^3/yr
Non-conventional sources of water			
Produced wastewater	2001	3,760 .00	106 m^3/y
Treated wastewater	2001	2,971.00	106 m^3/yr
Reused treated wastewater	2000	2,971.00	106 m^3/yr
Desalinated water produced	2002	100.00	106 m^3/yr
Reused agricultural drainage water (including seepage to groundwater)	2001	967.00	106 m^3/yr
Use of fossil water	2000	825.00	106 m^3/yr

Source: Earthtrends, WRI earthtrends.wri.org

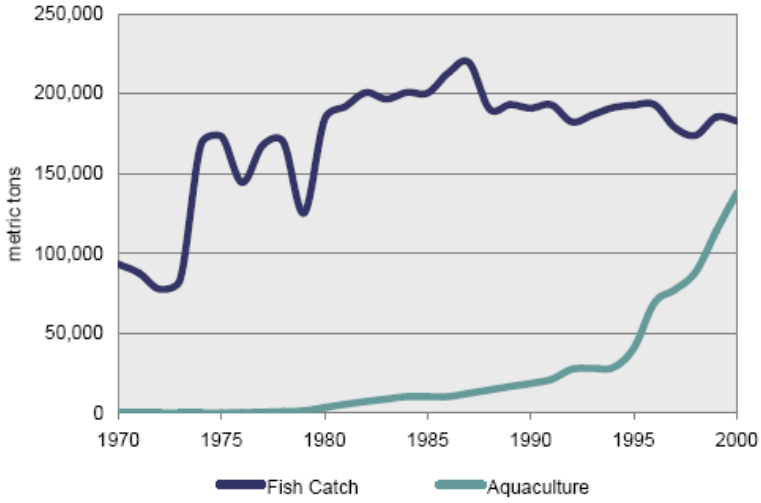
Figure 28: Surface water withdrawals by sector, 1996



Source: Earthtrends, WRI earthtrends.wri.org

[46] Internal renewable water resources (IRWR) include the average annual flow of rivers and the recharge of groundwater (aquifers) generated from endogenous precipitation, i.e., precipitation occurring within a country's borders. IRWR are measured in cubic kilometers per year (km^3/year). Since data were collected in different years for different countries, they may not be directly comparable.

Figure 29: Freshwater Fish Catch & Aquaculture Production, Egypt, 1975-2000



Source: Earthtrends, WRI earthtrends.wri.org

The Nile is the main source of fresh water in Egypt, Table 15. Based on the Water Balance of 1996 that the Ministry of Water Resources and Irrigation (MWRI) developed, natural renewable water resources are extremely limited, Table 16. Agriculture is the major consumer of fresh water, Table 17.

Table 15: Internal Renewable Water Resources (IRWR), 1977-2001, in cubic km

Variable	Egypt	MENA Region
Surface water produced internally[47]	1	374
Groundwater recharge[48]	1	149
Overlap (shared by groundwater and surface water)[49]	0	60
Total internal renewable water resources (surface water + groundwater - overlap)	2	518
Per capita IRWR, 2001 (cubic meters)	26	1,223

Source: Earthtrends, WRI earthtrends.wri.org

Table 16: Natural Renewable Water Resources (includes flows from other countries)

Total, 1977-2001 (cubic km)	58
Per capita, 2002 (cubic meters per person)	830
Annual river flows:	
From other countries (cubic km)	67
To other countries (cubic km)	0

Source: Earthtrends, WRI earthtrends.wri.org

[47] Surface water produced internally includes the average annual flow of rivers generated from endogenous precipitation and base flow generated by aquifers. Surface water resources are usually computed by measuring or assessing total river flow occurring in a country on a yearly basis.

[48] Groundwater recharge is the total volume of water entering aquifers within a country's borders from endogenous precipitation and surface water flow. Groundwater resources are estimated by measuring rainfall in arid areas where rainfall is assumed to infiltrate into aquifers. Where data are available, groundwater resources in humid areas have been considered as equivalent to the base flow of rivers.

[49] Overlap is the volume of water resources common to both surface and groundwater. It is subtracted when calculating IRWR to avoid double counting. Two types of exchanges create overlap: contribution of aquifers to surface flow, and recharge of aquifers by surface run-off. In humid temperate or tropical regions, the entire volume of groundwater recharge typically contributes to surface water flow. In karstic domains (regions with porous limestone rock formations), a portion of groundwater resources are assumed to contribute to surface water flow. In arid and semi-arid countries, surface water flows recharge groundwater by infiltrating through the soil during floods. This recharge is either directly measured or inferred by characteristics of the aquifers and
piezometric levels.

Table 17: Water Withdrawals 1996

Total withdrawals (cubic km)	66.0
Withdrawals per capita (cubic m)	1,055.0
Withdrawals as a percentage of actual renewable water resources (%)	127.2
Withdrawals by sector (as a percent of total)[(1)]	
Agriculture	82.0
Industry	11.0
Domestic	7.0

Note: Totals may exceed 100 percent due to groundwater drawdowns, withdrawals from river inflows, and the operation of desalinization plants
Source: Earthtrends, WRI earthtrends.wri.org

According to the data that Table 18 presents, all cultivated land is equipped for irrigation. Most of the cultivated land is watered through surface irrigation, about 83 percent of the cultivated land. The table presents the different crops and their consumption of fresh water. Drained area (3.024 thousand ha) is slightly less than the irrigated area (4.420 thousand ha). Rice and sugar cane are among the crops that significantly use water, and of importance to industry and domestic consumption. Both represent a significant share of both annual and permanent crops, as the table indicates.

Table 18: Irrigation, land, crops and water management

Variable	Year	Value	Unit
Irrigation potential Water management		**4,420, 000**	**ha**
Full or partial control irrigation: equipped area	2002	3,422,178	ha
- surface irrigation	2000	3,028,853	ha
- sprinkler irrigation	2000	171,910	ha
- localized irrigation	2000	221,415	ha
• % of area irrigated from groundwater	2000	11	%
• % of area irrigated from surface water	2000	83	%
• % of area irrigated from mixed sources	2000	6	%
Total area equipped for irrigation	**2002**	**3,422,178**	**ha**
• as % of cultivated area	2002	100	%
• average increase per year over last 9 years	1993-2002	0.6	%
• power irrigated area as % of total area equipped	2002	86	%
• % of total area equipped actually irrigated	2002	100	%
Total water-managed area	**2002**	**3,422,178**	**ha**
• as % of cultivated area	2002	100	%
Irrigated crops in full or partial control irrigation schemes			
Total irrigated grain production	2003	19,230,797	tonnes
• as % of total grain production	2003	100	%
Total harvested irrigated cropped area	2002	6,027,115	ha
• Annual crops: total	2002	3,773,462	ha
wheat	2002	1,029,180	ha
rice	2002	650,026	ha
barley	2002	96,201	ha
maize	2002	827,949	ha
sorghum	2002	156,155	ha
potatoes	2002	82,588	ha
sweet potatoes	2002	8,388	ha
Other roots and tubers (taro, yams, etc.)	2002	3,001	ha
sugar beets	2002	64,596	ha
pulses	2002	164,013	ha
vegetables	2002	472,062	ha
other annual crops	2002	219,303	ha
• Permanent crops: total	2002	2,253,653	ha

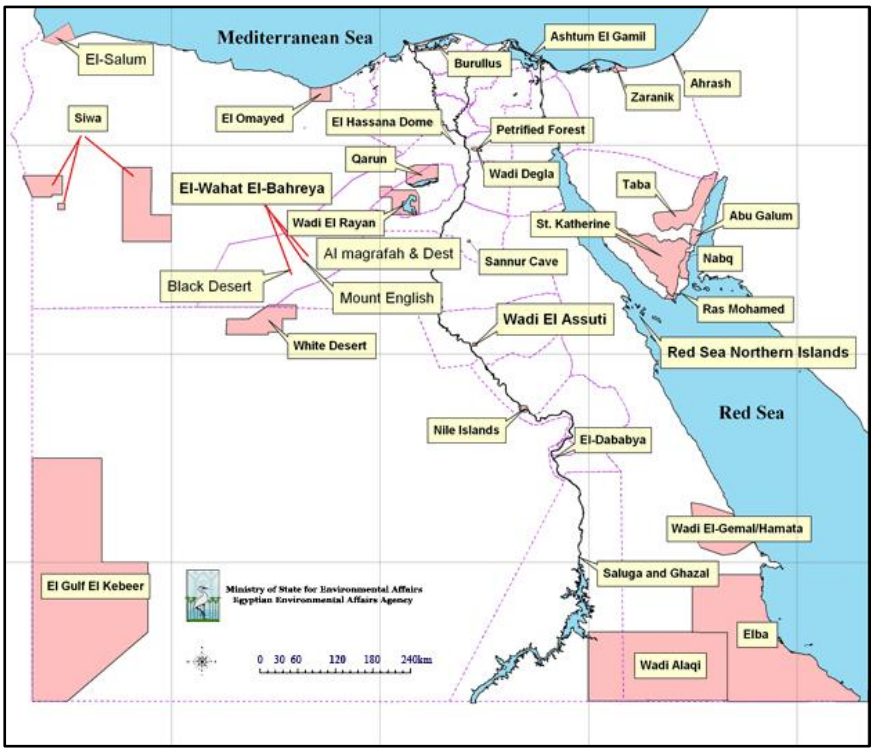
Variable	Year	Value	Unit
sugar cane	2002	135,815	ha
bananas	2002	24,165	ha
citrus	2002	145,421	ha
cotton	2002	296,693	ha
fodder	2002	1,195,903	ha
soybeans	2002	5,914	ha
groundnuts	2002	59,241	ha
sunflower	2002	15,493	ha
sesame	2002	30,284	ha
flowers	2002	26,055	ha
Other permanent crops	2002	318,669	ha
Irrigated cropping intensity	2002	176	%
Drainage - Environment			
Total drained area	2003	3,024,000	ha
- part of the area equipped for irrigation drained	2003	3,024,000	ha
- other drained area (non-irrigated)	-		ha
• drained area as % of cultivated area	2002	88	%
Flood-protected areas	-		ha
Area salinized by irrigation	2005	250,000	ha
Population affected by water-related diseases	-		inhabitants

Source: FAO, Irrigation in Africa in figures – AQUASTAT Survey 2005

2.5 Biodiversity

Law No. 102 of 1983 empowered the Prime Minister to designate certain areas to be declared as protectorates. A Prime Minister's decree defines the limits of each protected area and sets the basic principles for its management and for the preservation of its resources. Until now, 29 protectorates are declared, 15 percent of the total area of Egypt, Table 19 and Figure 30.

Figure 30: Egypt, Protected areas



Source: Nature Conservation Sector (NCS), Egyptian Environmental Affairs Agency (EEAA), www.eeaa.gov.eg

Table 19: Egypt, List of protectorates

No.	Protectorates Names	Declaration Date	Area Km^2	Governorate
1	Ras Mohamed National Park	1983	850	South Sinai
2	Zaranik Protectorate	1985	230	North Sinai
3	Ahrash Protectorate	1985	8	North Sinai
4	El Omayed Protectorate	1986	700	Matrouh
5	Elba National Park	1986	35600	Red Sea
6	Saluga and Ghazal Protectorate	1986	0.5	Aswan
7	St. Katherine National Park	1988	4250	South Sinai
8	Ashtum El Gamil Protectorate	1988	180	Port Said
9	Lake Qarun Protectorate	1989	250	El Fayoum
10	Wadi El Rayan Protectorate	1989	1225	El Fayoum
11	Wadi Alaqi Protectorate	1989	30000	Aswan
12	Wadi El Assuti Protectorate	1989	35	Assuit
13	El Hassana Dome Protectorate	1989	1	Giza
14	Petrified Forest Protectorate	1989	7	Cairo
15	Sannur Cave Protectorate	1992	12	Beni Suef
16	Nabq Protectorate	1992	600	South Sinai
17	Abu Galum Protectorate	1992	500	South Sinai
18	Taba Protectorate	1998	3595	South Sinai
19	Lake Burullus Protectorate	1998	460	Kafr El Sheikh
20	Nile Islands Protectorates	1998	160	All Governorates on the Nile
21	Wadi Degla Protectorate	1999	60	Cairo
22	Siwa	2002	7800	Matrouh
23	White Desert	2002	3010	Matrouh
24	Wadi El-Gemal/Hamata	2003	7450	Red Sea
25	Red Sea Northern Islands	2006	1991	Red Sea
26	El Gulf El Kebeer	2007	48523	New Valley
27	El-Dababya	2007	1	Qena
28	El-Salum	2010	383	Matrouh
29	El-Wahat El-Bahreya	2010	109	6^{th} October

Source: Nature Conservation Sector (NCS), Egyptian Environmental Affairs Agency (EEAA), www.eeaa.gov.egm

The total area of Egypt that mounts to almost one million km^2 includes area of inland water bodies. IUCN defines an IUCN Management Protected Area as[50] "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means." [51]
Table 20 exhibits a summary that portrays the status of protected areas in Egypt according to international records as IUCN defines. Nature Reserves, Wilderness, Areas, and National Parks (categories I and II) include all land area protected in the following IUCN categories:

1. Category Ia. Strict nature reserve: A protected area managed mainly for scientific research and monitoring; an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species.

50 Protected Areas as a percent of Total Land Area is calculated by dividing the total land area protected under IUCN Categories I-V by the total land area in a country (see above for complete definitions). Marine and Littoral protected areas are excluded from this calculation.

[51] Since 2003 a World Database on Protected Areas (WDPA) consortium has been working to produce an improved and updated database available in the public domain. Summary information presented in the WDPA, of which UNEP-WCMC is the custodian, includes the legal designation, name, IUCN Management Category, size in hectares, location (latitude and longitude), and the year of establishment for over 100 thousand sites. IUCN categorizes protected areas by management objective. All calculations for the analyses were performed by WRI using the WDPA GIS point file containing all nationally-designated protected areas, joined with a corresponding table showing area in hectares (provided by UNEP-WCMC). Due to variations in consistency and methodology of collection, data on protected areas are highly variable among countries. Some countries update their information with greater regularity; others may have more accurate data on extent of coverage. Many countries have an underreported number and/or extent of protected areas within their borders.

2. Category Ib. Wilderness area: A protected area managed mainly for wilderness protection; a large area of unmodified or slightly modified land and/or sea retaining its natural character and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition.
3. Category II. National park: A protected area managed mainly for ecosystem protection and recreation; a natural area of land and/or sea designated to: (a) protect the ecological integrity of one or more ecosystems for present and future generations; (b) exclude exploitation or occupation inimical to the purposes of designation of the area; and (c) provide a foundation for spiritual, scientific, educational, recreational, and visitor opportunities, all of which must be environmentally and culturally compatible.

Natural Monuments, Species Management Areas, and Protected Landscapes and Seascapes (categories III, IV, and V) include all land area protected in the following IUCN categories:

4. Category III. Natural monument: A protected area managed mainly for conservation of specific natural features; an area containing one or more specific natural or natural/cultural features that are of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities, or cultural significance.
5. Category IV.[52] Habitat/species management area: A protected area managed mainly for conservation through management intervention; an area of land and/or sea subject to active intervention for management purposes to ensure the maintenance of habitats and/or to meet the requirements of specific species.
6. Category V. Protected landscape/seascape: A protected area managed mainly for landscape/seascape conservation and recreation; an area of land, with the coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological, and/or cultural value, and often with high biological diversity.

Table 20: Egypt, Protected areas and species

	Egypt	MENA
Nature Reserves, Wilderness Areas, and National Parks (categories I and II)	313	18,165
Natural Monuments, Species Management Areas, and Protected Landscapes and Seascapes (categories III, IV, and V)	4,223	18,063
Areas Managed for Sustainable Use and Unclassified Areas (category VI and "other")	1,062	82,569
Total Area Protected (all categories)	5,598	118,797
Marine and Littoral Protected Areas {a}	5,396	9,580
Protected Areas as a Percent of Total Land Area, 2003 {b}	5.7%	10.2%
Number of Protected Areas, 2003	26	1,090
Number of Areas >100,000 ha, 2003	9	56
Number of Areas > 1 million ha, 2003	1	X
Number of Sites		
Total Area (000 ha)	2	
Biosphere Reserves, 2002	106	
Number of Sites	2	22
Total Area (000 ha)	2,456	
Number and Status of Species		
Higher Plants		
Total known species (number), 1992-2002	2,076	X
Number of threatened species, 2002	2	X
Mammals		
Total known species (number), 1992-2002	98	X
Number of threatened species, 2002	13	X

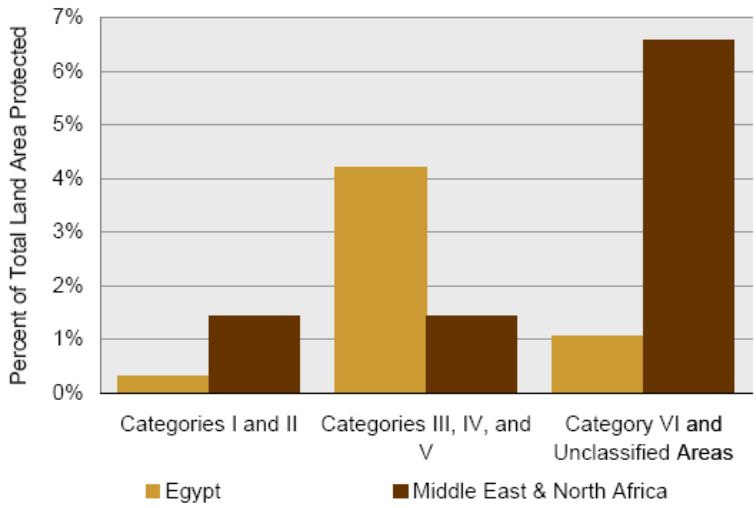
[52] Number and Area of Wetlands of International Importance, or Ramsar Sites, are defined under the Wetlands Convention, signed in Ramsar, Iran, in 1971. The Convention on Wetlands is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. In order to qualify as a Ramsar site, an area must have "international significance in terms of ecology, botany, zoology, limnology or hydrology." See http://www.ramsar.org/key_criteria.htm

	Egypt	MENA
Breeding Birds		
Total known species (number), 1992-2002	123	X
Number of threatened species, 2002	7	X
Reptiles		
Number of Total Known Species, 1992-2003	108	X
Number of threatened species, 2002	6	
Amphibians		
Number of Total Known Species, 1992-2003	11	X
Number of threatened species, 2002	X	X
Fish		
Number of Total Known Species, 1992-2003	284	X
Number of threatened species, 1992-2002	X	X

Source: Earthtrends, WRI earthtrends.wri.org

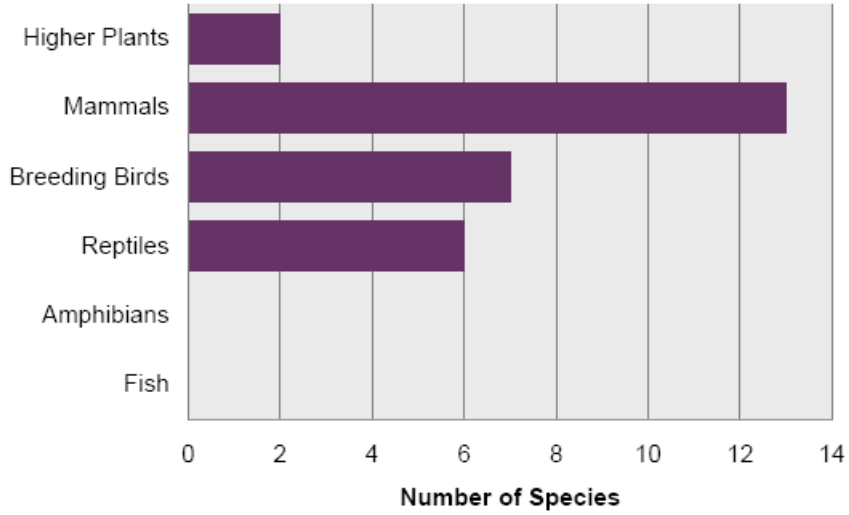
To sum up, the above information, by 2003 less than one percent of the land of Egypt was protected by IUCN category, I and II. Four percent of the land was protected as categories III, IV and V. Another one percent of the land was protected as IUCN category VI and unclassified areas, Figures 31, 32 and 33.

Figures 31: Egypt, Portion of land area protected by IUCN category, 2003



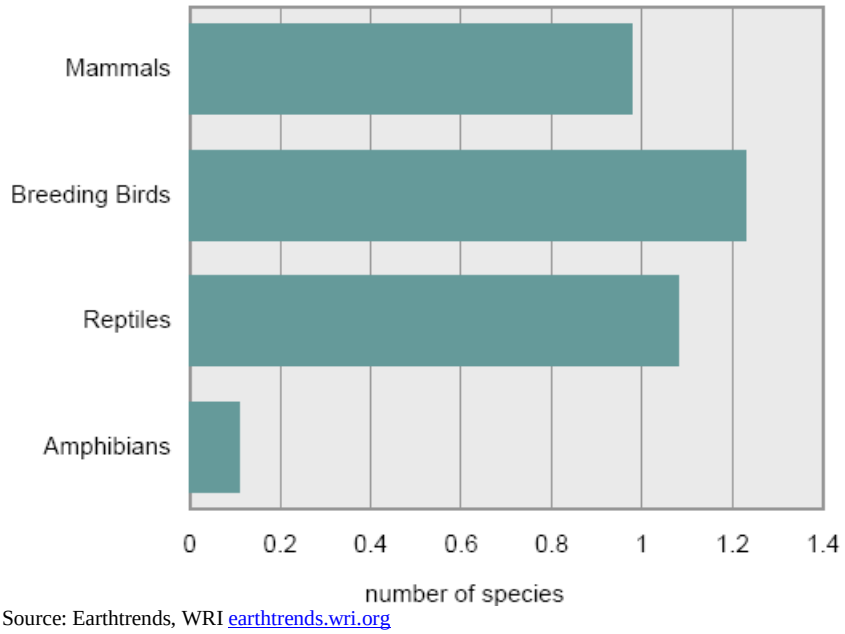
Source: Earthtrends, WRI earthtrends.wri.org

Figure 32: Egypt, Threatened species, 2002-03



Source: Earthtrends, WRI earthtrends.wri.org

Figure 33: Egypt, Unique species per 10,000 km^2, 1990s



Source: Earthtrends, WRI earthtrends.wri.org

2.6 Coastal Zones and Marine Environment

Coastal zones and marine environment are included in the total area of Egypt. Both ecosystems are of utmost importance for sustaining the lives of many Egyptians. According to Table 21, an estimated 53 percent of Egyptians live within 100 km of the coast. The table presents coastal statistics of Egypt compared to North Africa. The second section of the table presents information concerning coastal biodiversity and protected areas, and then fisheries production. The production of marine fish has been increasing as Figures 34 and 35 indicate – this might be a sign of irrational use of the ecosystem and the services it provides. Despite an increase in fishing, still imports of fish are on the rise, Figure 36.

Table 21: Egypt, Coastal and Marine Environment

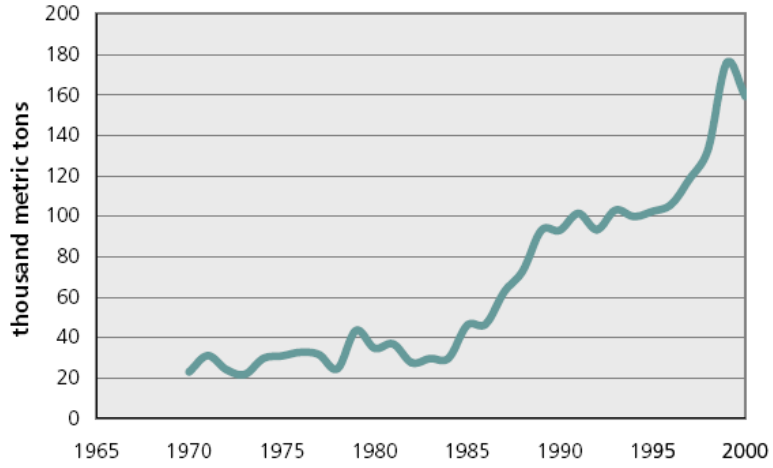
	Egypt	North Africa
Coastal Statistics, 2000		
Length of coastline {a} (km)[53]	5,898	47,282
Percent of population within 100 km of the coast	53%	X
Area of continental shelf (km2)[54] {b}	50,066	786,509
Territorial sea (up to 12 nautical miles) (km2)	56,981	649,740
Claimed Exclusive Economic Zone (km2)	185,304	2,015,990
Coastal Biodiversity and Protected Areas Data, 1990s		
Area of Mangrove Forests (km2)	0	0
Percent of Mangrove forests protected	X	X
Number of Mangrove Species	2	3
Number of Seagrass Species	9	13
Number of Scleractinia Coral General {c}	57	63
International Legal Net Trade in Live Coral, 1997 (number of pieces) {d}	X	2
Number of Marine or Littoral Protected Areas, 1999	18	126
Wetlands of International Importance, Extent (km2), 2000	1,057	17,483
Fisheries Production		
Average Annual Capture (excludes aquaculture) in metric tons:		
Marine Fish, 2000	159,354	2,461,334
Mulluscs and Crustaceans, 1997	8,341	175,995
Aquaculture Production (in metric tons):		
▪ Total (includes freshwater), 2000	340,093	506,180
▪ Marine and Diadromous Fish, 1997	X	72,517
▪ Mulluscs and Crustaceans, 1997	X	4,061
▪ Aquatic Plants, 1997	X	0

Notes: a. Figures should be interpreted as approximations. Estimates may differ from other published sources, b. Up to 200 meters depth c. Reef forming corals (i.e. "true" or stony corals). d. Imports - exports = net trade. E. Data are for the most recent available year in the listed range of years.
Source: Earthtrends, WRI earthtrends.wri.org

[53] Length of Coastline was derived from the World Vector Shoreline database of the United States Mapping Agency. The estimates presented here were calculated using a Geographic Information System (GIS) with a resolution of 1:250,000 kilometers and an underlying database consistent for the entire world. In general, the coastline length of islands that are part of a country, but are not overseas territories, are included in the coastline estimate for that country

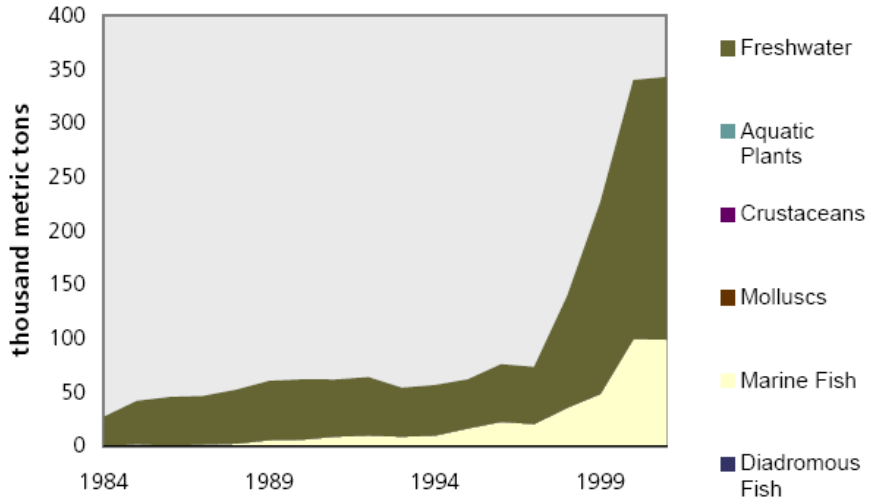
[54] According to the UN Convention of the Law of the Sea, the Continental Shelf is the area of the seabed and subsoil which extends beyond the territorial sea to a distance of 200 nautical miles from the territorial sea baseline and beyond that distance to the outer edge of the continental margin. Coastal States have sovereign rights over the continental shelf (the national area of the seabed) for exploring and exploiting it; the shelf can extend at least 200 nautical miles from the shore, and more under specified circumstances.

Figure 34: Egypt, Annual capture of marine fish



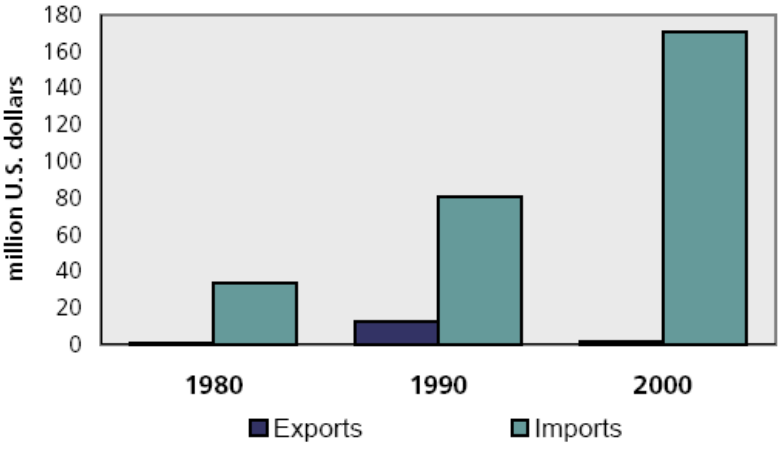
Source: Earthtrends, WRI earthtrends.wri.org

Figure 35: Egypt, Total aquaculture production, 1984-2001



Source: Earthtrends, WRI earthtrends.wri.org

Figure 36: Egypt, Fish and Fisheries products, 1980-2000



Source: Earthtrends, WRI earthtrends.wri.org

2.7 Energy

Energy is central to economic growth and social development. According to both official records and that of International Energy Agency (IEA), energy production has been growing to meet growing needs of an expanding economy, a growing population and improved living standards. Most of the generated energy in Egypt is from fossil fuels, Table 22. Depending on fossil fuels to generate energy does not seem to be conducive to sustainable development. For this reason, the Government of Egypt has put in place a strategy where renewable sources of energy will represent 20 percent of the produced energy the coming decade. The use of biomass seems to be limited in Egypt compared to other countries in the Middle East and North Africa (MENA) region.

The consumption of energy has been increasing, but with a little association with growth in GDP, Figures 37. The curve for total consumption and per-capita consumption have been increasing as indicated in the graph. To the contrary, the consumption of energy to produce a unit of GDP seems stationary, reflecting that the leading economic sectors in the Egyptian economy are services, which do not demand energy compared to other economic sectors. Figure 38 indicates that most of the consumed energy is produced using fossil fuel, which negatively affects the environment.

Industry, residential and transportation are among the major consumers of energy, Figure 39. Agriculture is among the least economic sectors use of energy. However, agriculture has both backward and forward linkages with these three economic sectors. Many manufacturing establishments, such as textiles, depend on agricultural inputs, such as cotton; other manufacturing establishments, such as fertilizers, produce the inputs to agricultural production. Households directly consume agricultural products in the form of food. Transportation is an important sector for the economy as it supports, among others, marketing agricultural inputs and outputs. Thus, energy is of utmost importance for agricultural development.

Table 22: Energy production and consumption

	Egypt	Middle East & North Africa	World
Energy Production and Consumption(in thousand metric tons of oil equivalent) {a}			
Total energy production, 2000	57,599	1,615,471	10,077,984
% change since 1980	69%	33%	37%
Energy imports, 1997	2,677	129,890	9,521,506
Energy exports, 1997	11,838	1,075,597	3,419,104
Total energy consumption {b}, 1999	44,490	518,436	9,702,786
Electricity consumption, 1999	4,857	48,289	1,040,770
Energy consumption per capita, 1997	0.61	1.39	1.64
% change since 1990	7%	20%	0%
Energy consumption per GDP {c}, 1999:	214	279	244
% change since 1990	-5%	10%	-13%
Energy Consumption by Source, 1999 (in thousand metric tons oil equivalent)			
Total Fossil Fuels	41,893	500,461	7,689,047
Coal and coal products	898	30,956	2,278,524
Crude oil and natural gas liquids	32,104	412,549	3,563,084
Natural gas	13,816	205,143	2,012,559
Nuclear	0	0	661,901
Hydroelectric	1,315	5,694	222,223
Renewables, excluding hydroelectric:	1,282	11,939	1,097,889
Primary solid biomass (includes fuelwood)	1,282	10,976	1,035,139
Biogas and liquid biomass	0	3	14,931
Geothermal	0.0	202	43,802
Solar	0.0	756	2,217
Wind	0.0	2	1,748
Tide, wave, and ocean	0.0	0	53

	Egypt	Middle East & North Africa	World
Energy Consumption by Sector, 1999 (in thousand metric tons of oil equivalent)			
Industry	12,172	121,118	2,140,474
Transportation	6,018	90,483	1,755,505
Agriculture	189	8,152	166,287
Commercial & public services	782	14,322	511,555
Residential	6,637	72,480	1,845,475
Non-energy uses and "other" consumption	1,871	60,618	333,981
Total final energy consumption {d}	27,669	367,173	6,753,276

Notes:

a) One metric ton of oil equivalent (toe) is defined as 10 Exp. 7 kilocalories or 41.868 gigajoules, equal to the amount of energy contained in one metric ton of crude oil.

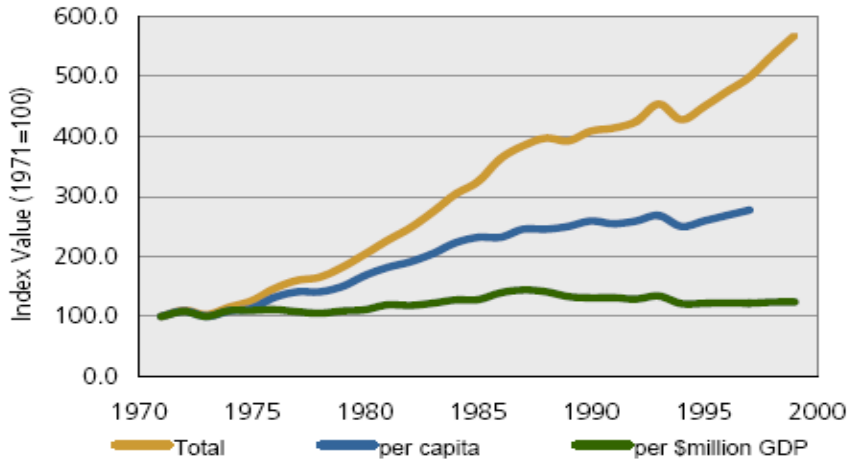
b) In metric tons of oil equivalent per million constant 1995 international dollars. TPES = Energy Production + Imports - Exports - Stock Changes - Consumption by International Marine Bunkers

c) In metric tons of oil equivalent per million constant 1995 international dollars.

d) "Total final consumption" is calculated as the sum of energy consumption by sectors.

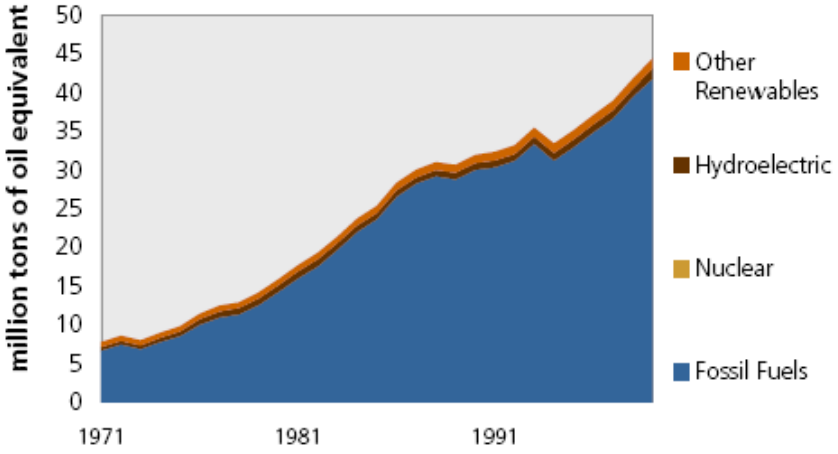
Source: Earthtrends, WRI earthtrends.wri.org

Figure 37: Relative trends of energy consumption, 1971-1990



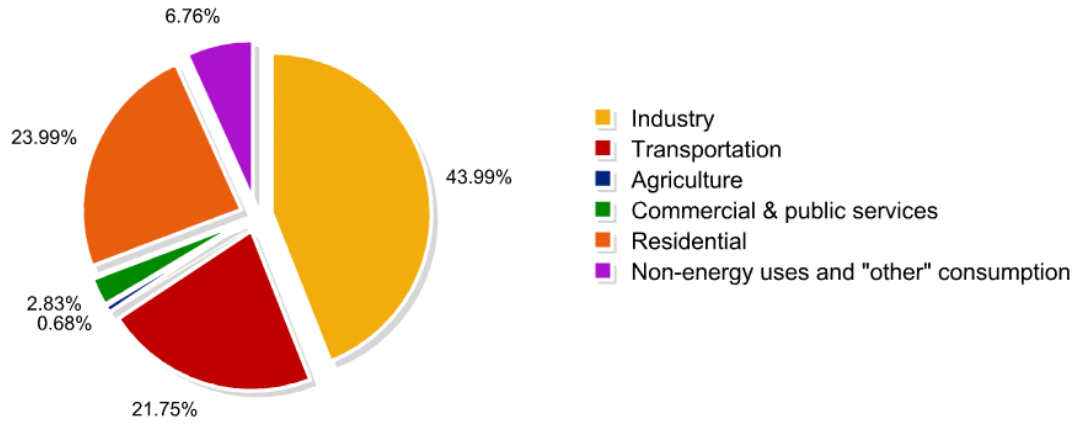
Source: Earthtrends, WRI earthtrends.wri.org

Figure 38: Energy consumption by source, 1971-1990



Source: Earthtrends, WRI earthtrends.wri.org

Figure 39: Energy consumption by sector, 1990



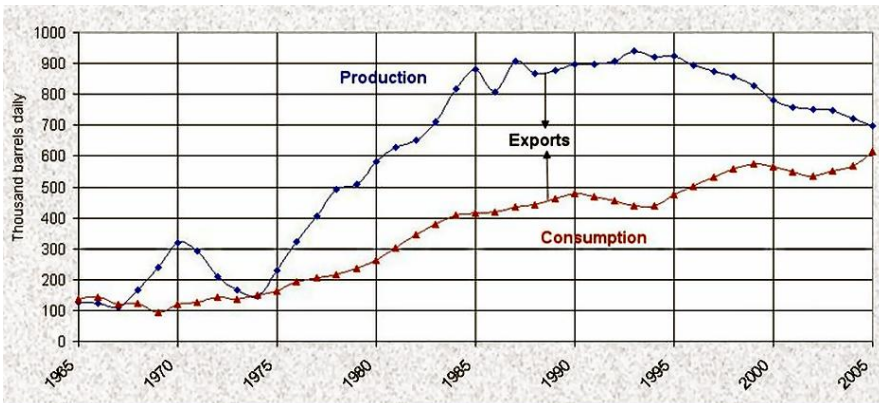
Source: Earthtrends, WRI earthtrends.wri.org

2.8 Mineral Resources

Egypt is blessed with a wide range of major minerals, particularly petroleum, phosphate, iron and manganese. It is noticeable that most of those resources are in the eastern part of the country. The most important quarry products are: granite, basalt, marble and limestone, and glass sand.

Egypt's mineral and energy resources include petroleum, natural gas, phosphates, gold and iron ore. Oil and gas accounted for approximately seven percent of GDP in fiscal year 2000/01. Crude oil production has been on the decline for several years since its peak level in 1993, from 941 thousand bbl/d (149,600 m3/d) in 1993 to 873 thousand bbl/d (138,800 m3/d) in 1997, and to 696 thousand bbl/d (110,700 m3/d) in 2005. At the same time, the domestic consumption of oil increased steadily (531 thousand bbl/d (84,400 m3/d) and 525 thousand bbl/d (83,500 m3/d) in 1997 and 2005 respectively), but in 2008, oil consumption reached to 697,000 bbl/d (110,800 m3/d). Domestic demand outpaced supply in (2008–2009), turning Egypt to a net importer of oil. To minimize this potential, the Government of Egypt has been encouraging the exploration, production and domestic consumption of natural gas. Oil Production was 630 bbl/d (100 m3/d) in 2008, and natural-gas output continued to increase and reached 48.3 billion cubic meters in 2008. Crude oil reserves as of 2009 are estimated at 3.7 billion barrels (590,000 thousand m3), and proven natural-gas reserves are 1.656 trillion cubic meters with likely additional discoveries with more exploration campaigns.[55]

Figure 40: Oil Reserves and Consumption, 1965-2008



Source: Wikipedia, from Nawar, Abdel-Hameed, The Emerging Landscape of Natural Gas in Egypt, 2005
http://en.wikipedia.org/wiki/File:Egy_oil_production.JPG

[55] Wikipedia, Energy in Egypt, http://en.wikipedia.org/wiki/Energy_in_Egypt

Egypt's excess of natural gas will more than meet its domestic demand for many years to come. In 2009 about 38 percent of local gas production was exported. As of 2009, most Egyptian gas exports (approximately 70 percent) are delivered in the form of liquefied natural gas (LNG) by ship to Europe and the United States.[56]

In line with the worldwide trend of environmental protection, the Government of Egypt (GoE) has adopted a policy for encouraging the use of natural gas as a source of cleaner energy. From 1996/97 to 1997/98, the production of natural gas increased by 3.82 percent while crude oil production decreased by 3.56 percent. The share of natural gas in the total fuel consumed in the thermal power stations has increased from four percent by the end of the seventies to about 71 percent in 1996/97. Egypt has a long history of utilizing hydropower. The installed hydropower capacity is 2,805 MW (1997/98), constituting to 21.09 percent of the total installed capacity. [57]

Gold mining is more recently a fast-growing industry with vast untapped gold reserves in the Eastern Desert. There is already a gold rush and gold production facilities that are now a reality from the Sukari Hills, located close to Marsa Alam in the Eastern Desert. Egypt's yearly revenues from gold in the future will exceed the total revenues from the Suez Canal, tourism and the petroleum industry combined. [58]

2.9 Explosive Remnants of War

Land mines and Explosive Remnants of War (ERW) are the common hurdle that faces land development. Land mines and ERW are responsible for injuries and deaths. All the victims ERW and mines are those who work on the development and repair of infrastructure; and Bedouins or farmers. Consequently, once injured ,they lose their main income.
Irrigation projects essential for land reclamation and cultivation, have experienced delays and increased costs because of the need to clear mines and ERW from prospective sites and routes.[59]

The need to remove land mines and ERW delayed large-scale "wind farm" projects in the western area and increased the costs of 500kV-power cable connecting Alexandria with the existing eastern electrical network, scheduled to be connected through the western area to the North Africa network. Mines and ERW negatively affect the petroleum sector in Egypt where 4,800 million barrels of oil and 13.4 trillion cubic meters of gas in the western area, and all petroleum areas, except for those in the sea, are in mine and ERW-contaminated or- suspected areas.

3 Agricultural Zones, Land Uses and Desertification

According to the National Action Plan (NAP) for Combating Desertification prepared in 2002,[60] Egypt, with land extending around one million square kilometers under arid and hyper-arid climatic conditions, is endowed with varied ago-ecological zones with varied and specific attributes of resource base, climatic features, terrain and geomorphic characteristics, land-use patterns and socio-economic implications. A meaningful NAP for Egypt would be comprised of sub-components, each of which is geared to address the specific attributes of each ago-ecological zone distinguished in Egypt. The zones could be identified as follows:

1. North Coastal Belts including. North West coastal areas and Northern areas of Sinai.
2. Nile Valley encompassing the fertile alluvial land of Upper Egypt, the Delta and the reclaimed desert areas in the fringes of the old Nile valley.
3. Oases and Southern Remote Desert Areas, including Owaynat, Toushki and Darb El-Arbien areas and Oases of the western desert.
4. Desert Inland, including the plateau and dry valleys of Sinai and elevated areas in the Southern Eastern Desert.

Active factors of desertification and their impacts vary. It, therefore, would not be appropriate to formulate a single unified plan to combat desertification for the four varied ago-ecological zones. It

[56] Wikipedia, Energy in Egypt)op. Cited)
[57] Wikipedia, Energy in Egypt)op. Cited)
[58] Wikipedia, Energy in Egypt)op. Cited)
[59] about 864,654acres
[60] This section is drawn directly from NAP, which DRC developed.

would be more appropriate to formulate a NAP with four sub-components to address and focus on the various natural attributes, specific desertification processes and priorities of action. This four-part approach could facilitate investigating and identifying appropriate techniques, required activities, capacity building needs, participating stakeholders, needed supportive measures, such as legislation, economic incentives, finance, as well as, social implications. This approach would also help to define institutional setups and responsible parties; and facilitate identifying suitable indicators of development, as well as appropriate techniques for monitoring ongoing and future desertification processes in each ago-ecological zone.

3.1 North Coastal Belts

3.1.1 Description of North Coastal Belts

North Coastal areas of Egypt are composed of two major sub-zones; Northwest Coast and the North Coastal Areas of Sinai.

Northeast Coast

The Northwest Coast of Egypt forms a belt about 20 km deep, which extends for about 500 km between Al-Ameriyah (20 km west of Alexandria) and El Salloum near the borders with Libya. The region can be subdivided into five physiographic areas, each with its own particular topographical features:

1. **Alexandria to Alamein:** The coastal plain is wide and includes three main ridges running parallel to the coast – a recent coastal ridge covered by sand dunes, and two old consolidated ridges – with flat depressions in between. Coastal plain rise to the Matruh Plateau at an elevation of 5-40 m asl (above sea level).
2. **El Alamein to Ras El Hekma:** This is an irregular succession of alternating low hills and closed depressions, sloping from south (60 m asl) to north (the coastline). There is an almost continuous range of dunes along the coast.
3. **Ras El Hekma to Ras Abu-Laho:** The cliffs of the Libyan Plateau run parallel to the coast. A discontinuous series of dunes develops at a distance varying from 200 m to 3 km from the coast. There are some saline depressions in the lower part of the plain, some with outlets to the sea. The escarpment of the plateau is deeply cut by a number of *wadi.*
4. **Ras Abu-Laho to Sidi Barrani:** This region is characterized by a uniform topography. The coastal belt of alluvial soils is narrow and intermittent. South of the coastal belt, a large area of gentle uniform slopes extends up to the Libyan Plateau.
5. **Sidi Barrani to Salloum:** A flat coastal band 2-4 Km wide, is found south of the dunes, starting some 10 km east of El Salloum. A few large depressions occur along the edge of the Libyan Plateau at 200 m asl. Some important wadi cut through the escarpment, especially southwest of Sidi Barrani.

The climate of the North West coast (NWC) is dry Mediterranean climate, with average high and low temp of 18.1 °C and 8.1 °C in the winter and 29.2 °C and 20 °C in the summer, respectively. Rainfall in the Northwest Coast ranges between 105.0 mm/yr at El-Salloum to 199.6 mm/yr at Alexandria. Data from eight stations situated near the coastline show that most of the rainfall (70 percent or more) occurs during the period that extends from November to February, mostly during December and January. There are significant variations in rainfall from one location to another; the orientation of the coast at these locations explains these variations. The prevailing rainfall gradient from north shows that the average mean decreases sharply from 150 mm near the coast to 50 mm at 20-70 km inland. The NWC area has the highest average wind speed in Egypt in the winter where wind speed could reach 18.5 Km/hr. Wind speed drops gradually inland.

Soil types, and properties are highly influenced by geomorphic and pedogenic factors. The main soil units could be summarized as follows: Coastal oolitic sand dunes; soils of the lagoonal depressions; consolidated dunes; deep sand and clay loam soils; moderate to limited depths of sandy to clay loam; wind-blown formations; and finally soils of the alluvial fans and outwash plains over the plateau.

Water resources are mainly that of rainfall. Groundwater resources are limited and usually of low quality especially with respect to varied salinity content.

Human Resources are diversified in distribution, background, level of education and occupations. Agro-pastoralists with tribal traditions are the main dwellers of rangelands. Lately wide-spread

construction of summer resorts spread all along the Mediterranean Sea Coast bringing human resources affiliated to these villages and summer resorts. Urban dwellers occupy several cities and small towns along the main International Road to the Libyan borders.

North Coastal Areas of Sinai

The northern strip to a depth of about five kilometers from the shore line has a very gentle slope in south/north south/north direction reaching about 20 m asl at the southern parts. Next, a medium slope develops towards inlands reaching elevations of 90 m asl. Tina Plain in the east formed of Nile alluvial deposits in the lowest lying areas of Sinai characterize the physiography of North Sinai sub-zone. In the middle is the Bardaweel lagoon (shallow lake). Desert plains extend south of Bardaeweel. These desert plains consist of large areas of sand dune belts and sand sheets. The eastern parts of the coastal areas have the highest average rainfall in Egypt. The largest wadi in Sinai, Wadi Al Arish, falls at the middle of these plains. It emerges from elevated gravelly plains and terraces at the south to a distance of about 20 km until the Mediterranean Sea coast.

The dry Mediterranean climate type with relatively rainy, cool winters and dry hot summers characterize North Sinai areas. Air temperatures are similar to those of the NWC but with large variations diurnally, seasonally and geographically. The annual wind speed is around 14.0 km/hr. The prevailing wind direction is northwest and north. The amount of rainfall in Sinai decreases from the north-east towards the south-west. The greatest amount of rainfall is found in Rafah (304 millimeters/yr.) in the north-east. The annual average along the Mediterranean coast amounts to 120 mm/yr. Rainfall decreases in the uplands to the south to about 32 mm/yr. The average annual rainfall in the entire Sinai Peninsula is 40 millimeters, of which 27 millimeters are estimated to come from individual storms that may provide 10 millimeters at a time. Rainfall occurs in Sinai, mainly during the months of November to March. Rainfall is practically absent from May to October. Along the Mediterranean Coast, 60 percent of the rain occurs in the winter, while 40 percent falls during the transitional seasons. Due, in part, to differences in water availability, growing seasons differ in the different parts of the Governorate of North Sinai.

The desert soils of northern Sinai are of three different origins: aeolian, alluvial and soil formed in situ. The latter is related to land form and is found in the plateau region of Wadi Al Arish on either calcareous or volcanic parent material. The majority of alluvial soils were formed under recent climatic conditions. They constitute the present wadi beds. A granulometric differentiation characterizes these soils according to flood intensities and sedimentation times. As a consequence, soil in the upstream of the wadi is coarser in texture compared to soils further downstream. In the dune area, the soils are generally different than in the gravel plain. Soils with almost no signs of soil forming processes dominate the dune area. Saline soils are found exclusively in the coastal zone. In the gravel plains, haplic calciosols is dominant. The Tina plain to the west is formed of alluvial Nile deposits as a natural extension of the old Nile Valley. The soils are heavy textured with high salinity contents due, in part, to water logging condition attributed to the near-sea and low lying location.

There are three sources of fresh water. First is rainfall water with possible runoffs if the rainfall exceeds 10 mm per rainy storm. When runoff occurs, wadi beds begin to carry water depending on the amount and duration of rainfall; about 60 percent of the mean rainfall in Sinai is lost to evapotranspiration. Second is groundwater that is divided into two groups: i) Shallow groundwater, occurs mainly within the weathered layer of igneous and metamorphic rocks, quaternary rock, recent deposits such as wadi fill or sediments and sand dunes; ii) Deep groundwater mainly occurs as semi – confined aquifers of per-Quaternary formation. Groundwater resources in the North Coastal areas are limited in nature and in general of low quality. The third water resource is Al Salam Canal, which will convey mixed Nile and agricultural drainage water across the Suez Canal to reclaim 400 thousand feddans in Northern Sinai.

Population is mainly tribal. Socio-economic characteristics are those of tribal systems of nomads. They depend on rain fed agricultural products, livestock and local crafts.

3.1.2 Desertification processes in the North Coastal Areas

Degradation of natural rangelands

The main land use is the marginal rangelands and associated pastoral system and animal production. It is estimated that natural rangelands occupy about 6.5 million feddan out of which 3.75 million feddan are in the NWC sub-zone while the rest is in Sinai Peninsula. The present status of these rangelands

shows serious degradation. Loss of plant cover and valuable genetic resources and biodiversity could be attributed to be physical, as well as, human-induced factors.

The amounts, distribution, inter-seasonal and inter-annual reliability of rainfall are the major physical constraints. Recorded climatic data show recurrent drought spells. Demand for sheep and goats in neighboring Libya, Saudi Arabia and the local market is the driving force for overgrazing beyond the carrying capacity of these marginal rangelands, which is another pressure that contributes to desertification. The resultant is serious degradation of the plant cover, which in turn leads to enhanced wind and water erosional processes. The Desert Research Center (DRC) reported that productivity of meat, milk and wool declined by 50, 40 and 25 percent, respectively.

Increased trends of cultivating areas of rangelands

The production system of the coastal areas is a mixed cereal, animal and fodder production system that depends on a fragile ecosystem. Traditional cultivation of cereals, especially barley and certain drought-tolerant fruit trees, including figs and olives, has been a long-standing tradition in areas with potential catchment of rain water.

Installing water harvesting and storage structures has raised total production of cereal and horticultural crops, and led to a continuing expansion of the cultivated area. However, in view of the fragile nature of the environment, it is questionable whether a continued large-scale expansion of cultivation, to a level attainable only based on the technical feasibility of water harvesting, would be sustainable over the long term. Further, expanding of cultivation eradicates plant cover and degrades the soil resource base, thus negatively affecting rangeland and would have implications for the viability of an animal production element in the mixed farming system, which in turn might harm the natives and their livelihoods. In addition, some of these practices have irreversible degradation of resource bases.

Wind and water erosion

The soils in the region face the dynamic problems of water and wind erosion. The main factors conducive to soil degradation are natural relevant to intensity and duration of rainstorms, which could be enhanced by terrain attributes as well as human over use. Conservation practices should be elaborated based on an integrated management approach, including soil, water, plant, and animal resources. The trade-off relationship between agricultural expansion and resource conservation is the subject of maximum consideration.

In conjunction with the expansion of cultivation, the level of mechanized land preparation has also increased to a point where only a few farmers continue to use animal draft power. The higher number of tractors has enabled larger areas of cereal land to be prepared. Access to additional tractors for use by groups of small farmers could improve the timeliness of cultivation, but the methods of plowing and the levels to which tractors become available, need to be carefully monitored in view of the potentially adverse effects of mechanized cultivation on soil structure which in turn could enhance wind and water erosion.

Socio-economic Constrains

The principal agricultural outputs are lambs, cull stock, fig, and olive oil. Marketing of agricultural commodities produced in this zone is poorly organized. Producers are individualized. They tend to sell on an individual basis to a trader, who often exploits the situation to his advantage. Usually producers present their wool for sale in a dirty and upgraded condition, and eventually contain sand and foreign matter. For this reason, wool producers receive lower price. There is a need to promote and encourage small-scale industries to process the rapidly expanding production of fruit, vegetable, and olives for oil. Agriculture development in the Governorate of Matrouh has been constrained due, in part, to insufficient financial support. The extent of credit for agricultural activities remains minimal.

3.2 The Nile Valley

3.2.1 Description of the zone

The vast majority of cultivated land of Egypt, as well as, most of the reclaimed desert lands, mainly, on the western and eastern fringes of the Delta in addition to relatively limited areas on the fringes of the Valley in Upper Egypt (total areas over 7.5 million feddans) is within this agro- ecological zone.

The Nile Valley system extends from the Mediterranean shores of the Nile Delta to the North until Aswan in the south over an area extending from 22 to 32 latitude North under arid and hyper arid conditions. The following geomorphic units could be distinguished:

- **Rubble Terraces:** These are the remnants of the piedmont alluvial plains, built up by gravelly or coarser soil material brought down from the slopes of the high lands. Subsequent uplifts of the land in relation to the level of the sea have resulted in a number of terrace levels, which are distinguished according to their relative age.
- **River Terraces**: These are the remnants of the old Nile deposits in the desert fringe areas. There exist three or sometimes four different levels.
- **Alluvial fans:** These are the accumulations of debris at the feet of the escarpments, brought down from the desert plateau by steep tributary streams descending through ravines thus the transported materials spread out in the shape of a fan. The fans usually consist of coarse gravelly and sandy fragments, which are neither well – sorted nor rounded. Sands are washed down and deposited at the base of the fan. These deposits cover narrower areas between higher ground, and they are described as out wash plain.
- **Wadi:** These are depressions, large or small, which may or may not have been formed by stream erosion, and many carry a flow of water on occasions. The term is commonly used for natural lines of drainage, but also for any gully or elongated depression. However, deeply incised.
- **Wind-blown sand:** given rise to such distinct geomorphic units as large sand dune areas, ripple dunes, and sand sheets of varying thickness located in the fringes of the Nile Valley.

The most pronounced feature of this agro-ecological zone is the Nile River which provides Egypt with 55.5 billion m^3/year the High Dam providing perennial storage of excess Nile water and Lake Nasser representing the largest man-made fresh water lake extending about 500 km south of Aswan beyond the Egyptian-Sudanese borders. The old Nile water conveyance system is still functioning with additional major canals conveying fresh Nile water to the newly reclaimed desert soils in the fringes of the Valley which are of relatively higher elevations. Sizable amounts of the agricultural drainage water of the old Valley are recycled in the conveyance system and mixed with the fresh Nile water to be used for horizontal expansion of cultivated areas.

Groundwater (mostly recharged by Nile water) is of relatively limited use in the Valley. However, reclaimed land at the desert fringes uses groundwater. Soils varied including the fertile deep alluvial soils of the old Nile Valley, soils of the river terraces at different reliefs, which are deep soils with gravelly and reddish sub-soils, in addition to the soils of the fringes, including desert calcareous soils of varied textures and non- calcareous soils characterized by low soil fertility and inferior soil physical, chemical and biological properties.

Most of Egyptians live in the Nile Valley and Delta. This zone includes major human settlements. Aside from urban dwellers of mega and major cities, the rural population consists of traditional farmers, graduates from varied institutions and investors of varied economic status.

3.2.2 Desertification of the Nile Valley and the Reclaimed Desert Fringes

The Nile Valley system is one of the most ancient agricultural systems in the world. It represents the most fertile lands (around 6.25 million feddan) in Egypt and probably in the whole region. It is also the most densely populated area in the Middle East region. Agricultural products are highly diversified and intensive cropping system is practiced all year around.

Despite the high significance of this sub-zone to food security, trade balance and economics, yet it has been the subject of several desertification factors and processes through the last few decades. Some of these factors and processes have been dealt with thorough technical and legislative measures, which resulted in significant decline of adverse impacts. Others are still the cause of continued processes of desertification to varied extents. The following is a brief account of these processes.

Salinity of Soil Resources

In view of the prevailing surface irrigation technique in addition to overuse of irrigation water which in turn exert large pressures on the surface drainage system which used to be the main system for drainage. The constraints in drainage coupled with the dominant heavy textured alluvial soils and seepage from the conveyance canals lead to water – logging in many areas of the old Nile Valley which in turn lead to increased soil salinity and in certain areas, soil sodicity develops. DRC reports estimate that salt – affected soils represent between 35.0-43.0 percent of the total areas in the old valley. Soil

salinity, sodicity and water logging conditions would have definite adverse impacts on soil productivity, which was estimated to be in the range of 30-35 percent of the potential productivity.

Urban encroachment and Soil Scrapping

Serious adverse and irreversible desertification process takes place in the form of losing valuable agricultural land to the sprawl of human settlement. In addition scrapping the top one to two meters of the soil for the manufacturing of red bricks was in the past a practice that contributes to desertification of this important agricultural zone.

Legislations that were passed in the year 1983 and again in 1985 imposed serious penalties on fertile soil scrapping and calling for the conservation of the fertile areas. Fortunately, soil scrapping was virtually halted. However, urban encroachment continues up until the present time with a lower rate. The continued urban encroachment is attributed to expansion of the existing villages and towns. Recent surveys from 1992-1995 showed urban encroachment to have covered around 20 thousand feddan of fertile areas. It is estimated that urban encroachment and soil scrapping may have caused the desertification of 20 thousand feddan yearly.

Pollution of soil and water resources

Few decades ago agricultural products of the old Nile Valley were renowned for their excellent quality and high productivity. Farmers' traditions of applying high doses of naturally produced organic fertilizers (animal barn yard manure) with few complementing chemical fertilizers were perfected and practiced as long standing traditions. After the construction of the High Dam, in the seventies, the sharp reduction in the load of sediments that the Nile water carried, accompanied by publicity campaign based on miss informed sources gave the impression that the use of chemical fertilizers especially nitrogenous ones should be enhanced considerably to compensate for the lack of Nile sediments.

Henceforth the consumption of chemical fertilizers increased sharply. An investigation by the Academy of Scientific Research and Technology (1971-1975) showed that the amount of chemical nutrients in the drainage water increased sharply causing water eutrophication, which meant not only overuse of fertilizers but also huge economic losses. The overuse of fertilizers continued through the nineties coupled with intensive use of pesticides and other chemical fertilizers seeking ever increased productivity, especially after the liberalization of prices of agricultural products. The use of pesticides increased in Egypt from 2,143 tons in the fifties up to 11,700 tons in 1990. The overuse of chemical fertilizers and the residues of applied pesticides were sources of pollution of soil and water resources.

Other sources of pollution are the dumping of industrial waste water in the irrigation canals. Such source of pollution was enhanced considerably after the rapid expansion of textile, chemical, vehicles, leather …etc. industries in the sixties, seventies and eighties.

The seepage of some sewage water with low treatment levels was another source of pollution, especially in the seventies. These sources of pollution caused negative impacts, particularly towards the end of irrigation canals draining in the lakes in the far north regions of the Nile Delta where pollutants were accumulated with high concentrations causing harmful chemical and biological impacts.

Mismanagement of soil and water resources

This is a major factor of desertification especially in the reclaimed desert areas in the western and eastern fringes of the old cultivated areas in the Nile Valley. Three reclaimed desert areas – in the last few decades – comprised mainly two types of desert soils; calcareous soils of varied texture and non-calcareous coarse textured soils. These soils are characterized by different physical constraints, low fertility and resilience. Their appropriate cropping pattern and management practices are quite different in many ways than those of the old Nile Valley. It is unfortunate that all the traditional farmers and the greater majority of the agricultural graduates at varied levels have their experience background and education based on cultivation practices of the old alluvial fertile lands. Lately, efforts are being made to correct this situation.

However, mismanagement practices still prevail in the reclaimed desert areas. As an example, insisting on growing corn and bananas and other crops and fruits of high nutrients and water requirements in soils of poor fertility and inferior soil-water properties.

Other practices including using organic fertilizers originating from the old alluvial areas which are not well fermented leading to the infestation of the new lands with weeds, parasites and diseases that are

not indigenous in the new lands . All in all, mismanagement practices in the newly reclaimed desert areas lead to a reduction of productivity and loss of potential economic gains.

Sand encroachment on the fringe areas
Processes of sand encroachment and mobile dunes are widespread in the desert areas due to several factors, including the arid and hyper arid climatic conditions, geomorphology and the geologic formation prevailing in these areas. It is estimated that sand formations cover more than 16 percent of the total area of Egypt. These conditions lead to active sand encroach on the fringes of the cultivated areas practically in most areas of Egypt. Several investigations were carried out to assess the impact of sand encroachment on the cultivated areas. In 1986, an estimate of 1.8 million feddan was affected by sand encroachment and active dunes. Again, a rough estimate report that the reduction in productivity could reach 25 percent of the potential productivity of the affected areas.

Sand encroachment and active dunes do not affect the cultivated areas only, but also it threatens the infrastructure, strategic installation and means of communication in most areas. These processes have adverse impacts on transportation of inputs and produced agricultural commodities, as well as, the marketing processes and the living habitats.

Shoreline erosion
The erosion rates of shorelines of the Nile Delta have been enhanced in the last two decades. Satellite imagery estimated the areas lost to the sea to be several thousand feddan. This attributes to the lack and change of sediment load of the Nile water discharged to the Mediterranean Sea at the end of Dumyat and Rashid Nile main branches. Other investigations warn of the impacts of climate change on the coastal areas of the fertile valley. These could present more serious and adverse impacts than the present erosion rate of shorelines.

3.3 The Inland Sinai and the Eastern Desert

3.3.1 Description of Inland Sinai and the Eastern Desert zone

The inlands of Sinai Peninsula are distinguished into varied geomorphic units including the following:

High land
The southern mountainous region**:** It consists of igneous and metamorphic rocks, forming high patches. This region has a triangular shape with its base facing north. It is deeply dissected with numerous narrow and long wadi bounded by steep cliffs. The *wadi* act as water collectors; some wadi has reasonable groundwater potentials.

Central dissected table land.
El Tinh table land*:* It extends to north of the southern region, from which it is separated by huge excavation stretches in a N- SE trend as far as about 60 km. This excavation which averages 10 km width is opened from northwest. It is influenced by several drainage systems. These systems include Gulf of Suez system at the western and south western sides. Gulf of Aqaba system is at the eastern and south-eastern fringes. Perennial channel over flow takes place at several wadi passes through the western and south western fringes of El Tinh table land.

El Egma table land: It occupies the central portion of El Tinh table land. To the west, it is limited by the upstream portion of W-Al Arish and its tributaries. This excavation stretches in a NW-SE direction for about 40 km attaining about 15 km width at El Malha area. Due, in part, to this excavation, both El Egma and El Tinh table land are completely separated. The surface of this table land is intensively dissected with drainage lines, flow towards the north, and joining together into W. Al Arish.

Morphotectonic depressions
These depressions stretch in a NW-SE trend (Gulf of Suez trend); among them are El Qaa, W. Arab and El Malha. The floors of these depressions are mostly capped with gravels and mesas of gravels, which rise up above these floors.

Out wash plain
It is found in different locations of Sinai Peninsula. It constitutes gently sloping expanses covered with alluvial deposits. These expanses are developed at the wash slopes of central and southern table land. The majority of these resulted from the coalescence of several alluvial fans.

Sand dunes
In south Sinai, sand dunes have been recently accumulated at several isolated patches. The Eastern Desert extends from the Nile Valley to the Red Sea; it consists of a backbone of coastal mountain ranges flanked by plateau, intensely where steep wet and dry valleys go through it that drain either to the Nile River or to the Red Sea.

The eastern desert is comprised of the following landforms:

- ***The high rocky mountains:*** Generally, the surface of the Eastern desert is very rugged and rises in some places to more than 2000 m asl especially in the southern areas.
- ***The desert floor:*** it is covered with countless sounded highly polished pebbles of brown flint or white quartz; materials brought down by ancient streams and spread out near the former shore-line.
- The drainage channels: They are intensely dissected by valleys and ravines, and all their drainage is external. Most of the drainage lines run along major fault lines, and it is noticeable that while the eastward drainage lines runs to the Red Sea by numerous independent wadi. The westward drainage lines run to the Nile Valley.

The soils of inland Sinai could be categorized as follows:

- ***Wadi Soils:*** They represent the main wadi founded in the central and southern portions of Sinai. El Bruk , El Giddi, Feiran, Sudr, Nakhl and Wadi Al Arish. These soils are different according to the local formation; terraces (fine to coarse materials intermixed by calcareous formation), main channels (coarse to fine sand materials) and deltas (covered essentially with fine materials).
- ***Plains Soils:*** They represent the plain distributed along the whole area of Sinai; El-Gifgafa, El Qaa and the plain located east of Suez Canal. They have a fine to moderate, texture, moderately saline and have agriculture utilization potential.

The soils of Eastern Desert differ widely according to their contribution in the land forms. The soils are outlined in the following:

- ***Soils of the beach deposits:*** They are dominated by sands and gravel and extend at the present sea level and rise in places few meters above that levels.
- ***Soils of the coastal sabkhas:*** These soils occupy vast areas in the inland portions of the coastal plain e.g. at Malha. These results are essentially from the accumulation of surface run-off water in the coastal depressions.
- ***Soils of the wadi filling:*** These soils consist of cobble generally mixed with varying quantities of sand and sandy loam and silt.

Despite the very low rainfall over this zone yet the geomorphic factors combine with the intensity of infrequent rain showers to form flash floods, which have definite adverse environmental impacts on infrastructure soil erosion and tourism developments before being lost to the adjacent marine areas.

Human resources are diversified with nomad pastoralists especially in Sinai and the South Eastern Desert areas. Urban dwellers are related mainly to part cities tourism villages and oil fields in coastal areas. Supporting jobs come from transportation means and few protected areas.

3.3.2 Desertification of the inland Sinai and Eastern desert

Practices inappropriate to the Quality of land and water resources
The soil resources of this zone are of fragile properties, mainly calcareous in nature with high salinity contents. In addition, the water resources for agriculture are mainly dependent on shallow ground aquifers of low qualities (inferior ionic composition with dominance of the Na^+ and Cl^-) with varied salinities.

Agricultural practices, including irrigation methods, irrigation scheduling, leaching fraction, as well as, choice of cropping pattern should be planned to suit the qualities and the constraints of the soil and water, as well as, the prevailing climatic conditions. Farmers and investors have been going into success and failure stories of trials and errors. This approach is not appropriate for sustainable productivity in addition to economic losses pertinent to invested capitals lost.

Wind and water erosion processes
The nature of surface sediments, active winds and barren lands in the region are conducive to very active wind erosion. The topographic nature (elevated areas, plateaus, dissecting wadi with deep slopes and low laying coastal areas) coupled with the rain showers with intensities (surpassing 10 mm/one shower) would lead to water erosional processes.
Wind and water erosional processes cause active erosion and deposition, which threaten the sustainability of available fragile soil and water resources. In many cases, the eroded materials and carrying water are lost to the Gulf of Suez, Gulf of Aqaba and the Red Sea. The limited and patchy soil suffers considerably from losses of soil material, loss of productive layers and/or deposition of transported materials of varied origin and qualities on top of productive layers.

Flash Floods
When terrain attributes combine with in frequent but prolonged thunder showers of intense rainfall (as one of the rainfall characteristics in this zone despite the low average annual rainfall), the resultant is the formation of gushing floods origination from higher elevation, through dry valleys and into flood plains in the narrow coastal areas and finally in most cases to the adjacent marine areas. Such serious flash floods cause serious damage to infrastructure, tourism establishments and large losses of fresh water and soil materials.

Loss of plant cover and genetic resources
Elevated and southern areas of the Eastern desert are the only areas in Egypt to receive summer rainfall due to Eastern winds. The elevated areas as mount Elba and the surrounding valleys receiving considerable runoff are rich with diversified natural plant communities. Some of these plant species considered to be highly valuable genetic resources adapted to the desert conditions. The lack of proper conservation practices, overgrazing of herds of camels ruminants, and deforestation for fuel are the causes for serious losses of plant cover and valuable genetic resources. Proper and sustainable utilization practices of plant species producing valuable commodities and products could be a viable solution to poverty-stricken nomads and local population. The potential economic returns that could be generated from appropriate agro-industrial activities are presently lost in addition to the jobs that could be initiated with such activities.

3.4 The Western Desert, Oases and Southern Remote Areas

3.4.1 Description of Western Desert, Oases and Southern Remote Areas

The Western Desert extends from the southern boarders towards the Northwest Coastal areas in the North, is a massive plateau with a general slope towards the north, starting from an elevation of about 1000 m asl to the extensive Qattara Depression with 134 m below sea level. The western plateau is distinguished with uniform flat surface 40% of which is covered with sand dunes and extensive areas of sand sheets (the sand sea). Several depressions of varied areas are scattered in the western desert, including the famous oases of Siwa to the north, Baharia and Frafra in the central section, Dakhla and Kharga in the south. These oases are distinguished with artesian wells of large discharge of fresh water, are mainly closed, and fragile ecosystems where population is concentrated.
This ecological zone is characterized by hyper-arid climatic conditions with rare rainfall and extreme temperatures. The winds over the western desert in the north western or northern direction extend from the Mediterranean over the western desert with fallen speed. These winds are the major factors of erosion and deposition processes in the western desert. A clear evidence of these processes is the formation of the great sand sea by the eroded sediments of the Qattara Depression located in the north.

The soils have been classified as weakly developed Red Desert soils, which have higher chrome than typical Red Desert soils, and they have a very thin or no A-horizon. The formations of these soils are derived from a number of parent materials, indicating that the hot dry climate was the main soil forming factor that is responsible for the characteristics of these soils as Red Desert soils. The soils are formed of sand and are calcareous in nature. However, the main soil types that distinguish the western desert, except the depressions, are related to the following:

Order Entisols Comprises the following suborders:
- Torri-psamments which could be Typic or Lithic;
- Typic Torri psamments characterized by very deep loose wind-blown sands, low ripple to medium dunes, no diagnostic horizons, gently undulating to rolling.

- Lithic torri psasmments have characteristics of the typical one except, they are very shallow to shallows soil depths.
- Orthents (Typic Torri orthents) that have deep soil of the low-lying area between consolidated dunes and rocky areas, they have gravelly sand, the gravel content is more than 35 percent, which is contaminated with lime and gypsum materials.

Miscellaneous Land types

- High sand dunes in many parts of this desert, they take the shape of parallel lines of high and almost impassable dunes extending in North-South direction.
- Rock land and very shallow soils occasionally with rock outcrop on the surface.

Water resources are mainly that of the huge Nubian sandstone aquifer that extends with varied thickness under the majority of the area of the Western Desert. This major water resource is of excellent qualities in most areas. The renewability of such a resource received many investigations with the majority of conclusions confirming a non-renewable or very slowly renewable water resource. However, in view of huge water resources available in this aquifer a macro developmental plan of East Owaynat area is being implemented.

Human resources are sparse, but diversified with valuable indigenous experience and knowledge. Population is located mainly in the Oases and the newly developed macro projects in the southern areas, in addition, too few tourism sites. Educational background is low; however, skills and handicrafts are wide–spread. Human activities are based on Oasis's agricultural activities, few grazing areas and mining of iron in Baharia Oasis. Economic instruments related to marketing and conducive to social developments need to be enhanced.

3.4.2 Desertification of Western Desert, Oases and Southern Remote Areas

Over-exploitation of soils and groundwater resources

The Oases are the significant sites of agriculture developments in the Western Desert. Agricultural activities in the Oases are completely dependent on groundwater resources, mainly, from the Nubian Sandstone Aquifer of good-quality water. Groundwater used to come up to the surface in the form of artesian wells. In view of the intensive cultivation that was practiced in the Oasis with high water requiring crops, including rice and alfalfa in addition to overuse of irrigation water the static level of water in the wells dropped considerably. Over exploitation of the soil and groundwater resources in a closed system, like that of Oasis in depressions, cause deleterious impacts on the resource base, as well as, on the environment. Over exploitation of the groundwater is the cause of deterioration of quantity and quality of well water. The static water levels in the relatively shallow wells (50-100 m depth) dropped considerably leading to expansion of the number of deep wells (1000 m). This shift required greater digging and operating costs, reduction of available water and increase of cost of production per unit of commodities produced. Over irrigation caused the formation of shallow water table leading to increased salinization and degradation of the relatively limited soil resource base.

Sand Encroachment and Mobile Dunes

Mobile dunes and sand sheets occupy vast areas of the Western Desert estimated at 149,500 km^2. Practically, all the oases suffer one way or another from sand encroachment and mobile dunes hazards. The adverse impacts of sand encroachment and mobile dunes are limited to the oases where most of the agricultural activities are located. It extends to affect the roads and railways connecting these oases to the marketing and processing centers in the old Nile Valley causing significant economic losses and large expenses to protect and maintain these means of transportation and communication. Sand encroachment hazards threaten the course of the Nile at Minya and Asyut in Upper Egypt, as well as, Lake Nasser of the High Dam. As pointed out before these hazards also cause reduction of productivity in the cultivated and reclaimed areas in the western fringes of the Nile Valley in Upper Egypt.

Additional adverse impacts are predicted for the macro soil reclamation projects in the southern areas of the Western Desert, including Toushki, East Owaynat and Darb Al-Arbien where hundreds of thousands of feddan are marked for reclamation and establishment of macro developmental plans.

Management practices and sustainability

The available land resources in this zone are of weak characteristics and low resilience with wide-spread physical, biological and chemical limitations. Most of these resources are located in a closed fragile ecosystem, which are isolated from the Nile Valley System. Management practices and

utilization of those resources for agriculture and desert development should maintain these ecosystems free from invading pests and non-desirable weeds and plant species, through the application of proper and integrated conservation practices.

Conservation of the indigenous flora and fauna with the preservation of the valuable genetic resources and species adapted to the harsh environment and hyper-aridity of this zone represent an important mean of combating desertification. Rational use and reuse of water resources are imperative due to the enclosure of the ecosystem and the need to deal with excess drainage water in non-conventional ways, other than the traditional systems of the old Nile Valley, would be of paramount significance to prevent the presently prevailing conditions of water logging and salinization of soil and water resources.

Socio-Economic Constraints

The present population and communities are scattered with low educational background. Although skills and handcrafts are available, however, technological skills to address the needs of developmental activities are rare. There are definite needs to create incentives to reverse the present migration trends toward urban centers of the Nile Valley in addition to the attraction of human resources to migrate to the newly developed areas in the Western Desert.

4 Government Policies

4.1 Challenges

Today, the most challenging future scenario for Egypt is one of the rapid declines in access to water per capita, a rapid decline in sources of fossil fuels (petroleum and gas), encroachment on arable land at an unsustainable rate, and the potential threats of climate change.[61]

4.1.1 Deteriorating Land Efficiency (Classification of Land Resources)

Total agricultural land increased from 5.87 million feddan in 1980 to approximately 8.44 million feddan in 2007, and cropped area increased from some 11.1 million feddan in 1980 to 15.18 million feddan in 2007. Areas of the first-grade land in 2001–05 have declined to less than one-third of what it was in 1996–00, while the percentage of the second-grade lands has increased from about 33.6 to 41.8 percent during this period. The third and fourth-grade lands have also increased from 1.455 million feddan to 2.936 million feddan. Handoussa and others argue this phenomenon is the driving force for reviewing government policies in the field of land maintenance and putting land improvement programs and projects as a top priority in the coming years.

4.1.2 The Challenge of Deteriorating Land Efficiency with Increased Fragmentation of Agricultural Holdings

The land availability and efficiency challenge, together with the scarcity of water and energy resources, constitute a serious constraint to both horizontal and vertical expansion. Without natural resources, the likelihood of benefiting from the evidenced liberalization of the Egyptian economy is limited. Land, water and energy scarcity as well as deteriorating quality of land and water are all expected to increase in the future. This will further limit the ability of the agriculture sector to benefit from any increases in market prices for agricultural products and will affect the specific and aggregate supply response to any improved market signals. Legislation governing land use utilization involves several institutions and ministries and there is an urgent need for their upgrading and streamlining.

4.1.3 The Challenge of Land Allocation

There are segmented and isolated land markets that are supply-driven. Accordingly, the problem is not of limited supply of public land for investment. Instead, it is the scarcity of well-located, properly serviced and adequately priced land that is adapted to the needs of development, which in turn is the result of a dysfunctional public land management system. A clear and comprehensive public land policy would reassert the role of the market in public land allocation and then help put in place a rational framework of planning and incentives that reflect current needs and priorities.

[61] This subsection is drawn from Handoussa, Heba et al. Cairo Agenda for Action: Situation Analysis, Ministry of International Cooperation and UNDP, Cairo, Egypt 2010

4.1.4 The Challenge of Strengthening Technical and Institutional Capacities for Managing Natural Resources

These capacities face serious financial, administrative and technical challenges that need to be urgently addressed at all levels. The close coordination among research, technical transfer, extension/outreach services and civil society to enhance productivity and competitiveness in agriculture is highly needed. Increased investment in public goods with special reference to research/technological transfer and infrastructure seems crucial. The existing food and agriculture institutions need to be modernized with special reference to capacities related to agricultural policy formulation, analysis and monitoring to support the agriculture sector as an engine for growth. Vertical and horizontal coordination among institutions related to food, and agriculture is weak and should be enhanced.

4.1.5 The Challenge of the Shortage of Nile Waters

This has become the leading constraint in ensuring food security and maintaining the legendary high yields and productivity of Egypt's fertile Nile Valley and Delta. With a population of 79.2 million, Egypt is the second largest country in Africa. The issue of Egypt's share of Nile waters is under difficult negotiations and the per capita availability of water plummeted from 1,893m³ in 1959 to 934m³ in 2000, which is below the recommended world standard of 1000m³ per person per year. The option of charging farmers for water usage has been consistently avoided for socio-political reasons. The implications for policy making are the urgent need to conserve water and reduce cultivation of such crops as rice and sugarcane. Other challenges related to water include the increasing population densities near the waterways and the quality of water due to wastewater disposal in these waterways.

4.1.6 The Challenge of Renewable Energy

There is a massive untapped potential and very little commercialization for renewable energy installed capacity. This includes low expansion of solar-energy application such as solar thermal and solar photovoltaic. Although biomass technology in Egypt is cost-effective in the long term, its promotion has been weak and no efforts to commercialize the technology have been made. There is a weak financial management cycle for renewable-energy technologies. Moreover, awareness remains a vital challenge for renewable energy. This includes the lack of information on the benefits of renewable energy to different categories of society and appropriate application for each category, even at the level of households in rural areas, such as the use of biogas units.

4.1.7 The Challenge of Energy Security

Domestic consumption of oil and gas has been rapidly increasing as a result of ongoing economic growth, which is a threat to Egypt's future economic development and energy security. Subsidizing energy end-use prices for a long time to maintain social justice has resulted in a major pressure point on the government budget, as it has to bear the difference between the costs of production and the subsidized end-use prices. Keeping the subsidy to its current level (approximately LE 70 billion annually) and format will drive the country to a major budgetary challenge, thereby threatening its economic growth and energy security. It is urgent to rationalize energy consumption in the demand sectors without reducing the service levels or negatively impacting economic development targets and to diversify the energy supply resources by increasing renewable resources such as wind, solar and bio energy.

"Public Land Policy: Access to public land for investment purposes represents one of the most critical development hurdles facing the Government today. The vast majority of the population still lives on only 5.5 percent of Egypt's national territory. Independent sectoral authorities affiliated to the ministries of Agriculture, Tourism, Industry and Housing were each assigned control over large areas of public land outside the so-called *Zimam* which created a set of segmented and isolated and sometimes conflicting land markets that are more supply-driven. Accordingly, the problem is not of limited supply but rather of a lack of suitably located, properly serviced and adequately priced land that is adapted to the needs of development; this, in turn, is the result of a dysfunctional public land management system. A clear and comprehensive public land policy that reasserts the role of the market in public land allocation and puts in place a rational framework of planning and incentives that reflect current needs and priorities is needed."

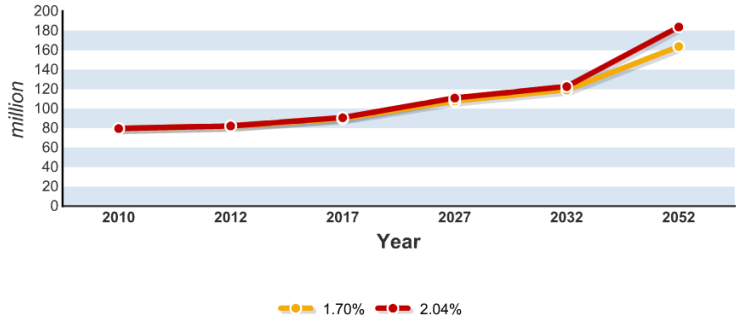
4.2 Government Response

4.2.1 Determinants

As presented in Part I, there were number of plans for elaborated land uses and management. Today, the Ministry of Housing, Utilities and Urban Development (MHUD) through the General Organization for Physical Planning (GOPP),[62] in collaboration with other Ministries and central agencies, are putting together a scheme for land use, the Strategy for Physical (*Omraniya*) Development. The scheme was presented to the Prime Minister, and currently there are steps towards more detailed regional plans.
The plan addresses a diverse range of issues, such as poverty, illiteracy, unemployment and regional disparities and ill-distribution of population, encroachment of human settlements over agricultural land, strained energy and water resources. The plan tackles the following specific problems:

Population Growth
During 1996 to 2006, the rate of population growth was 2.04 percent per annum. The target is to curb this growth rate to 1.70 percent per annum, by which the population of Egypt will reach almost 160 million, Figure 41, thus requiring 52 million job opportunity, according to the estimates of the Ministry of Labor.

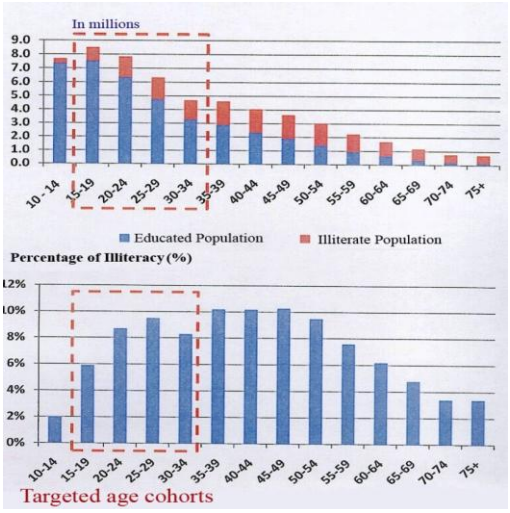
Figure 41: Two scenarios for population projection, 2010-2052



Source: GOPP, Ministry of Housing, Utilities and Urban Development,
The Strategy for Physical Development 2050, Cairo, Egypt 2011

Illiteracy
Based on the 2006 census and HDRs, there are about 17 million illiterates; 5.6 million illiterates are within the age cohort of 15-35 years old, Figure 42.

Figure 42: Illiterates (red, top, million), and targeted population (percent, below) to eradicate their illiteracy (bottom) as a percent of the population 10 years and over



Source: GOPP, Ministry of Housing, Utilities and Urban Development,
The Strategy for Physical Development 2050, Cairo, Egypt 2011

[62] According to Law 119/2008, GOPP is the central authority responsible for spatial planning.

Poverty
Based on HDRs, an estimated 22 percent of the population of Egypt is poor. The percent of poor populations in these governorates are higher than the national average. The poor in the Governorates of Asyut, Suhaj Beni Suef, Luxor, Qena and Minya represent 61, 47.5, 41.5, 41, 39 and 30.9 percent of their population, respectively.

Strained natural resources
The estimated and project available fresh water resources are strained due, in part , to population growth, improved living standards and economic expansion, Table 23. To close the gap between the available water resources, and needed fresh water, there are programs for cooperation with the Nile basin countries to increase the share of Egypt through minimizing losses. Furthermore, there are programs to improve irrigation system.

Table 23: Water Resources

Water Resources	2010	2050
Conventional Water Resources		
Nile River	55.50	55.50
Deep Groundwater	2.00	2.00
Rain and flash floods	1.30	1.50
Desalination	0.20	3.00
Sub-total	**59.00**	**62.00**
Non-conventional sources		
Shallow groundwater Nile valley and delta	6.20	8.30
Reuse of drained water	16.00	18.00
Sub-total	**22.20**	**26.30**
Total	**81.20**	**88.30**

Source: GOPP, Ministry of Housing, Utilities and Urban Development, the Strategy for Physical Development 2011

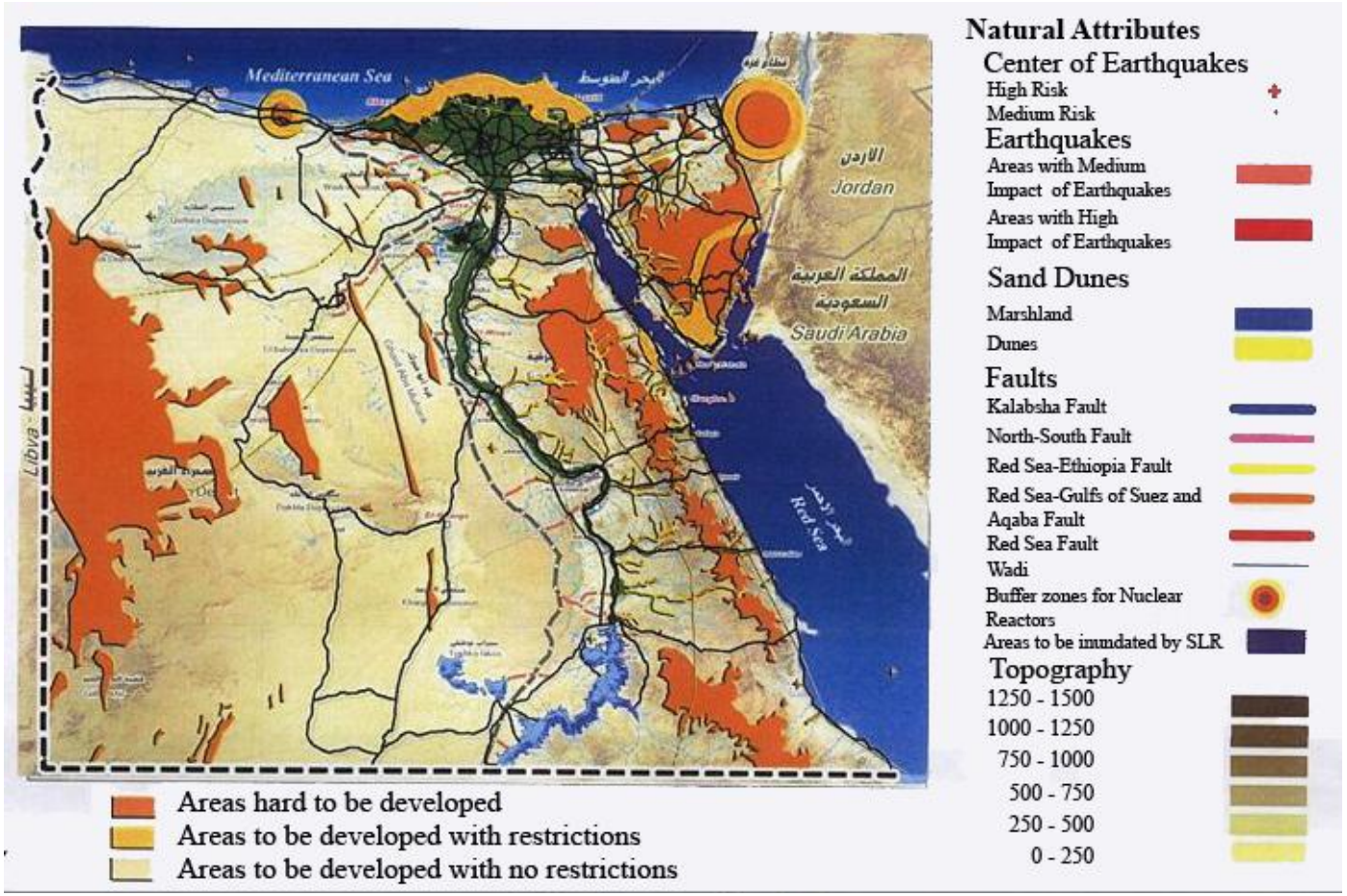
The plan calls for increasing the dependency on other sources of energy, plus conventional sources, within the coming 15 years. Specifically, the plan rests on solar, nuclear, wind, and hydraulic means of generating energy. These new sources of energy will constitute about 25 percent of the generated energy in Egypt.

Regional Disparities
Most of the population of Egypt (about 98 percent) lives on the Delta of the Nile River and the banks of the river, where the gross density is 7.2 persons per feddan. Meanwhile, the gross density in desert governorates is only 0.44 persons per feddan.

Suitability of land for development
Using applications of Geographic Information Systems, GOPP produced a number of layers describing the characteristics of Egyptian land, including, but not limited to, topography, geology, faults, sand dunes, etc. the layers also included information related to human-induced risks, such as nuclear power plants, Figure 23.

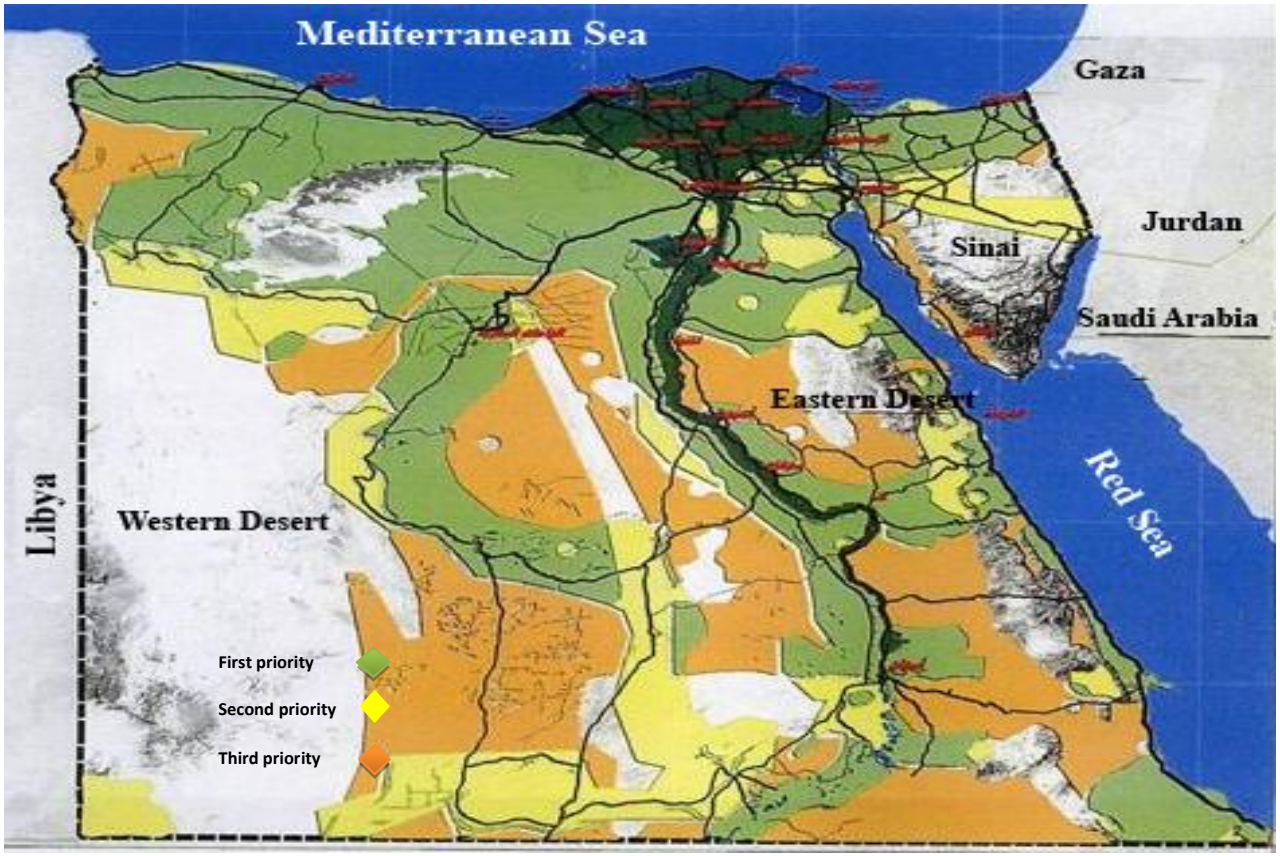
The result of the GIS analyses is a map that determines areas for interventions according to priorities, Figures 43. An estimated 40 percent of the land can be developed soon, Figure 44, while 69 percent of the gross area of Egypt is suitable for development (about 164 million feddan) in addition to the inhibited areas, i.e., Nile valley and delta.

Figure 43: Attributes of land determining its suitability for development



Source: GOPP, Ministry of Housing, Utilities and Urban Development, the Strategy for Physical Development 2011

Figure 44: Synthesized map of land suitable for development



Source: GOPP, Ministry of Housing, Utilities and Urban Development, the Strategy for Physical Development 2011

4.2.2 The Plan

The plan aims to avail 29 million job opportunity within the coming 40 years, and slashing unemployment from six to 10 percent of the total labor force. The plan attempts to develop non-conventional sources of fresh water and energy.
Activities to elaborate the plan include, but not limited to, identifying leading economic sectors to accelerate growth and employment; identifying axes and areas for development to accommodate population and economic activities; drawing a map of the determines the spatial, temporal and sectoral development of Egypt.

The vision is to sharpen the competitiveness of Egypt by a diversified economic base that rests on knowledge and advanced technology, where citizens enjoy democracy and improved living standards in a balanced society both socially and spatially. To achieve this vision, the plan rests on three building blocks: economic efficiency; social equity; and internalizing natural and security risks. The plan calls for maximizing and enhancing agricultural production and rural development; maximizing manufacturing, and improving services, particularly productive services, such as transportation and tourism. The plan projects the number of tourists to increase to 52 million within the coming four decades.

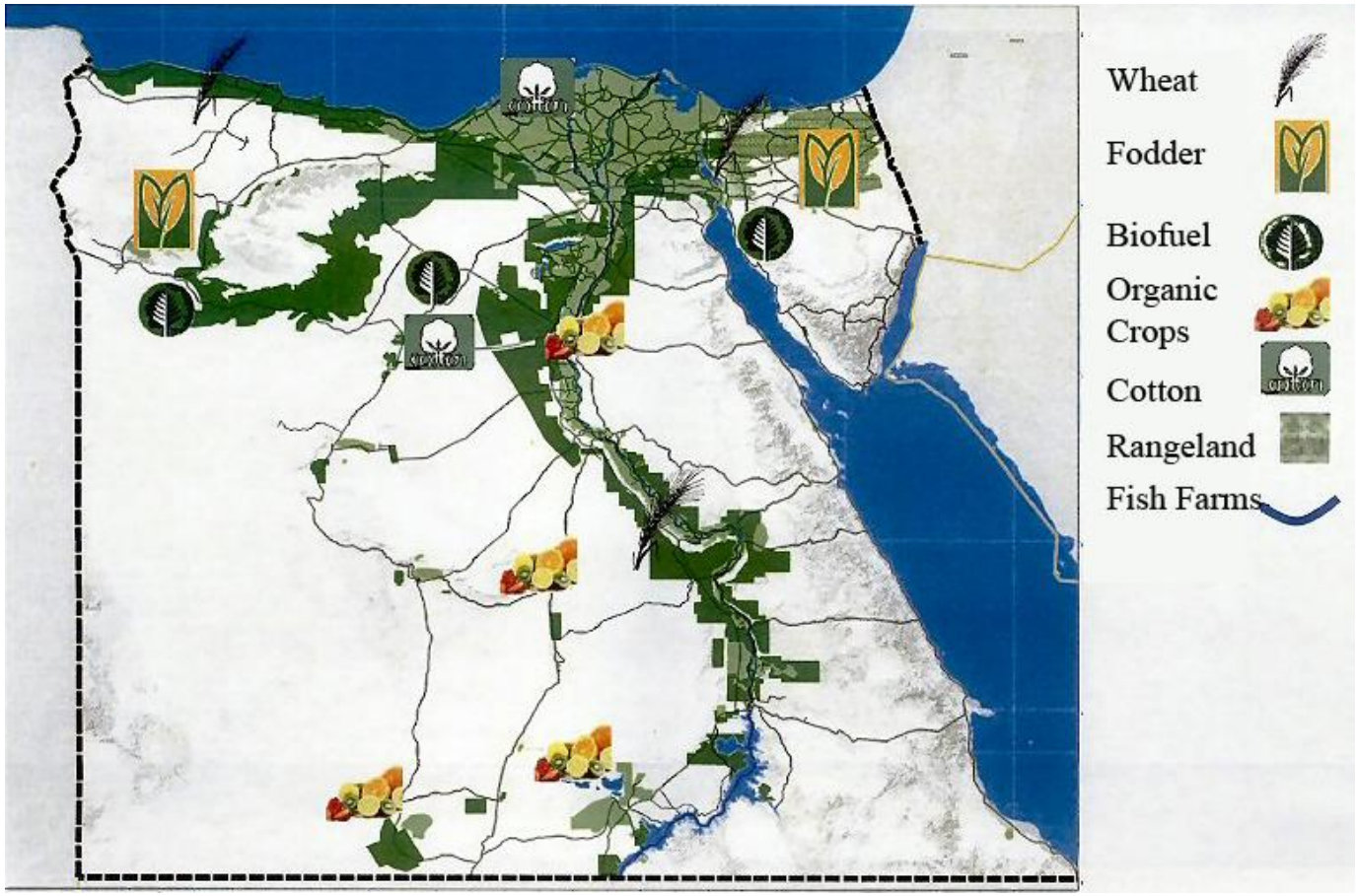
Specifically, in the sphere of the agricultural sector, the plan calls for 5.9 million feddan to be reclaimed during the coming four decades. It also calls for improving irrigation systems for 2.9 million feddan that depend on conventional fresh water resources; plus three million feddan that depend on modern technologies and expansion in desalination plants. Table 24 portrays the targeted area of agricultural land, Figure 45.

Table 24: Agricultural land targeted to be reclaimed and cultivated (thousand feddan)

Area/Axis of Development	Total area	Used area	Areas cultivated, reclaimed and left to be reclaimed by 2050		
			Under reclamation	Area reclaimed and cultivated by 2050	Total area left for agricultural development after 2050
North Coast	715	510	10	195	205
Matrouh, Siwa, Dakhla and Owaynat	420	70	100	250	350
Kharga and Darb El-Arbien	50	15	10	25	35
West Delta and Nile	1,560	300	120	940	1,260
East Delta and Nile	700	200	50	450	500
West Suez Canal	175	130	20	25	45
East Suez Canal	150	135	10	5	15
Scattered areas	500	10	20	470	490
Total	4,270	1,370	340	2,360	2,900
Area of agricultural land proposed to cultivate using non-conventional sources of fresh water (thousand feddans)					3,000
Area of agricultural land proposed to cultivate during the coming four decades, (thousand feddans)					5,900

Source: GOPP, Ministry of Housing, Utilities and Urban Development, the Strategy for Physical Development 2011

Figure 45: Proposed allocation of land for agricultural production, 2050



Source: GOPP, Ministry of Housing, Utilities and Urban Development, *the Strategy for Physical Development* Cairo, Egypt, 2011

The plan calls for using sea water to grow plants, such as Jatropha[63] and Jojoba for the production of biofuel. According to USAID LIFE Integrated Water Resources Management Project, Report No. 57, Jatropha can be grown on treated wastewater. The report warned that "Jatropha cultivation should be a government-controlled activity to protect agricultural land." The reference of the plan is a research project that the American University in Cairo (AUC) is collaborating with The Seawater Foundation (TSF) and Energy Allied International (EAI) since December 2010 on Integrated Seawater Agriculture Systems (ISAS), the closed-loop system which will produce bio-fuels, seafood, salt, protein meal and animal feed.[64] The plan predicts those employed in the agricultural sector will increase from 5.4 to 6.7 then to 8.8 million workers during, 2010, 2027 and 2052, respectively.

SADS listed number of lessons learnt from applying previous strategies. Pricing policies is central to success; of course, this includes the price of natural resources, i.e., the cost of degrading the environment and thus the possibility of applying polluter pays principle. Despite the overall success of previous strategies to achieving growth, yet limited efforts were directed to rationalizing the use of water resources. Furthermore, the sprawl of human settlement over agricultural land continued despite intentions to protect valuable agricultural land. Fragmentation and dwarf holdings continued to be a serious impediment. Finally, although Egypt succeeded in adding almost 2.5 million feddan to the cultivated area, the country failed to establish new communities outside the Nile Valley and Delta. The plans list other lessons learnt with respect to human resources, institutions, etc.

Among the strategic objectives is to sustain the use of natural agricultural resources; increase the productivity of both land and water units. This entails enhancing water-use efficiency in irrigated agriculture; sustainable expansion of reclaimed areas; sustainable development of land and water productivity; maximizing the sustainable returns of rain-fed agriculture; and maintaining and protecting agricultural land. SADS comes with a number of supportive measures. These include plans and programs to improve rural livelihoods; enhancing opportunities for agricultural investment; human resources development, and institutional reform.

SADS proposes increasing water-use efficiency in agriculture by addressing a) water losses through water conveyance and distribution systems; and b) excessive use of irrigation water as many peasants believe that more water would increase crop productivity, plus not paying for recovering the cost of the irrigation and drainage systems. The solution is improved field irrigation systems, and reducing areas allocated for producing rice. The estimated saved quantities of water could reach 5.3 and 12.4 billion cubic meters assuming that areas benefiting from irrigation improvements are about 2,250 million feddan to be increased to five million feddan by the years 2017 and 2030, respectively.

SADS aims to expand reclaimed areas through the use of water quantities conserved from irrigation improvements. It is estimated that about 1,250 million feddan will be reclaimed by 2017 to increase to 3.10 million feddan by 2030. The rate of an annual increase is of 130 thousand to 140 thousand feddan of newly developed areas. Table 25 shows the estimated areas to be reclaimed as a result of minimizing water losses due, in part, to improving irrigation systems.

Table 25: Estimated reclaimed areas as a result of improving irrigation systems, 207-2030

Description	2007	2017	2030
Quantities of water used in irrigation (million cubic meters)	58,000	61,000	64,000
Field water use efficiency (percent)	50	75	60
Areas projected to be developed (thousand feddans)	--	2,250	5,000
Total water quantities expected to be saved as a result of developing irrigation systems and reducing areas for planting rice (million cubic meter)	--	5,300	12,400
Area of land expected to be added (thousand feddans)	--	1,250	3,100
Total areas benefitting from irrigation improvement (million feddan)	2.5	6.0	10.5

[63] According to Wikipedia, Jatropha is resistant to drought and pests, and produces seeds containing 27-40 percent oil, averaging 34.4 percent. The remaining press cake of Jatropha seeds after oil extraction could also be considered for energy production. However, despite their abundance and use as oil and reclamation plants, none of the Jatropha species have been properly domesticated and, as a result, their productivity is variable, and the long-term impact of their large-scale use on soil quality and the environment is unknown.

[64] AUC enters world of local seawater agriculture, http://academic.aucegypt.edu/caravan/story/auc-enters-world-local-seawater-agriculture

Description	2007	2017	2030
Total irrigated areas (million feddans)	8.4	9.65	11.5
Percentage of developed areas to total areas	30	62	92
Average water share per feddan (thousand cubic meters)	6,900	6,320	5,565

Source: MALR, Sustainable Agricultural Development Strategy towards 2017, Cairo, Egypt, October 2009.

The sustainable development of land and water productivity can be attained via a) water-use efficiency; b) planting high-value products, which will require improving marketing capacities; and c) developing technical packages that are economically feasible. Using 2006 constant prices, Table 26 shows the expected returns under SADS on a unit per water and unit per land.

Table 26: Estimated returns per unit of land and unit of water, 2030, 2006 constant prices

Description	Measuring Unit	2007	2017	2030
Water quantities anticipated to be used	Billion Cubic Meter	58	61	64
Projected land area	Million feddan	8.4	9.6	11.5
Cropped area	Million feddan	15.4	19.2	22.9
Percentage of intensification	%	183.6	199.1	200
Average rate of return per unit of water (cubic meter)	EGP	1.91	3.2	4.17
Index of the increase in the returns per unit of water	%	100	168	218
Average rate of return per unit of land (feddan)	EGP 1,000	13.2	20.3	22.9
Index of the increase in returns per unit of land	--	100	154	174

Source: MALR, Sustainable Agricultural Development Strategy towards 2017, Cairo, Egypt, October 2009.

SADS also calls for maximizing the sustainable returns of rain-fed agriculture. Proposed interventions include providing an area of 350 thousand feddan with supplementary source of irrigation to grow drought-tolerant crops, such as barely, olives and figs. In addition, the SADS calls for accelerating clearing land from mines and ERW unfreeze locked land for development.
SADS also calls for maintaining and protecting agricultural land from a) sprawl and encroachment of human settlements, and b) degradation of soil fertility. There is a need for reviewing applied policies and regulations to address limitations and weaknesses; and conducting periodical soil surveys to regulate the use of fertilizers and soil conditioners.

4.2.3 Discussion

Those responsible for elaborating plans must foresee and shape the scope and attributes of future development by, first, identifying, existing and emerging needs, and then elaborate strategies and plans to meet these needs, and for the society to sustainably reproduce and revitalize themselves. Thus communities are more livable; ecosystems become healthier; economic development becomes more responsive to the needs of place rather than furthering the profits of the elite; and equitable distribution of the benefits of improved environmental and economic dividends. To be sustainable, strategies, policies, plans, programs and projects, therefore, have to balance the three "Es" (Economy, Ecology and Equity).

Juxtaposing the above criterion on SADS and the Strategy for Physical Development, there is little attention to environmental concerns. First, there is little, or almost no, attention to the respecting water, air, energy, biodiversity, marine environment and coastal zones. Almost half of the Egyptians live nearby coastal areas (100 km) that face serious risks resulting from climate change. Increased Sea Level Rise (SLR) is among the adverse result of climate change that threatens many Egyptian human settlements. Alexandria is the second major city in Egypt after Cairo. An estimated 45 percent of the population of Alexandria currently lives on land that water will submerge once expected SLR occurs. Water will submerge an estimated 1.3 per cent of its beaches, 26 percent of its residential areas, and more than half of the city's industrial complexes. Alexandria is a key industrial (manufacturing) city; water will flood about 54 percent of the industrial estates in a city. An estimated 17 percent of those employed in the tourism sector will lose their jobs because of SLR. Port Said will experience similar

impacts. Potential impacts of the sea-level rise on the Nile Delta include a decline in water quality.[65] Figure 46 shows the Nile Delta region in 2002, the area as it would appear with a 0.5 m and 1.0 m sea-level rise.

Second, very little consideration was paid to the environmental impacts of the proposed interventions. For example, using seawater to grow biofuel, if it is possible as the AUC project just started, what are the impacts on the soil? What are the impacts on the groundwater? Third, both schemes paid little attention to the issue of energy and wastes as well. According to the current plan of the Ministry of Electricity aims that renewable sources of energy will constitute almost 20 percent of the generated energy by 2020. Today, the share of energy generated via renewable sources is 12 percent (10 hydraulic, one-percent wind, and one percent solar, bio-mass, etc.). These figures contradict those mentioned in the Strategy for Physical Development. The wastes that the agricultural sector produces, such as rice straw, is currently a problem, but can be an opportunity if transformed into a source of energy, which in turn will require land devoted for this process. "If environmental values are not accounted for, then the basic life support process upon which a community depends cannot be sustained."

In elaborating a plan, there is always a need to apply the rule of think globally and act locally. The success of Asian tigers is not only the result of adopting export-led strategies, but also is the resultant of investing in people through progressive programs to enhance education at large, specifically technical education.

Figure 46: Nile Delta: Potential Impact of Sea-Level Rise

[65] Agrawala, Shardul et al. 2004, "Development and Climate Change in Egypt: Focus on Coastal Resources and the Nile," Working Party on Global and Structural Policies, Working Party on Development Co-operation and Environment, Environment Directorate, Environment Policy Committee, Organization for Economic Co-operation and Development (OECD), Paris, France. http://www.oecd.org/dataoecd/57/4/33330510.pdf

Source: Otto Simonett, UNEP/GRID-Geneva; Prof. G. Sestini, Florence; Remote Sensing Centre, Cairo; DIERCKE Weltwirtschaftsatlas, 2002, http://www.grida.no/climate/vitalafrica/english/16.htm

They concentrated on providing health services. Tables 27, 28 and 29 exhibit information collected from the World Bank database for selected countries. Table 27 shows the Gross Domestic Product (GDP) of Egypt compared to number of countries at different development stages. Notice the change in GDP of Brazil, India, Korea, Malaysia and Russia compared to that of Egypt. Next is Table 28 that exhibits health expenditure per capita. India, followed by Egypt, spends the least on health services. Table 29 shows that the percentage of GDP allocated to education is little compared to other countries given the size of GDP. Investing in people, in the case of Egypt, is of equal importance as investing in the place. SADS mentioned programs for developing human resources and institutional framework as supportive measures, while it should have taken more attention as a corrective measure.

Table 27: GDP (constant 2000 US$) for selected countries

	2006	2007	2008	2009	2010
Brazil	768,867,489	815,703,390	857,827,247	852,297,397	916,131,428
Egypt	126,876,017	135,868,770	145,591,924	156,010,895	164,092,259
India	704,256,487	773,393,372	811,540,036	885,430,185	971,486,068
Korea	698,799,258	734,478,718	751,359,801	753,760,393	800,205,927
Malaysia	125,138,423	133,247,633	139,521,318	137,130,265	146,942,751
Russia	378,223,528	410,505,209	432,048,332	398,287,678	414,355,712
Tunisia	25,502,733	27,117,698	28,375,592	29,264,875	30,347,628

Source: World Bank, World Databank, http://databank.worldbank.org

Table 28: Health expenditure per capita, PPP (constant 2005 international $) for selected countries

	2006	2007	2008	2009
Brazil	766	823	875	943
Egypt	247	249	261	285
India	102	113	122	132
Korea	1,479	1,660	1,806	
Malaysia	543	604	621	665
Russia	797	905	985	1,038
Tunisia	443	472	501	524

Source: World Bank, World Databank, http://databank.worldbank.org

Table 29: Public spending on education, total (% of GDP)

	2006	2007	2008
Brazil	5.0	5.1	
Egypt	4.0	3.7	3.8
India	3.1	--	--
Korea	4.2	4.2	
Malaysia	4.7	4.5	4.1
Russia	3.9	--	--
Tunisia	7.1	7.1	--

Source: World Bank, Data, http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS

Decision making and management are the root causes of the present dilemma. Both plans paid little consideration of reforming decision-making processes. In his paper on poverty in the Arab world, El-Naggar (2005) argued that management of resources in the Arab world, including Egypt, does not seem efficient. The available natural resources to the Arab people are considerably high compared to resources available to people in other areas of the globe. The gross area of land available to the Arab people, including Egyptians, is about 13.8 million sq. km., i.e., 5.1 percent of the world land resources most of which is deserts where the cultivated land is only 570.5 thousand sq. km., i.e., 4.14 per cent of the gross area of the Arab world. El-Naggar (2005) compared the total Arab production of cereals to be about 10.5 percent of that of China in 2002, given that the cultivated area with seasonal crops and orchards in the Arab world was 34.8 and 60.5 percent, respectively, of that of China for the same year. He argues that China, unlike many Arab countries, has optimally employed its natural resources, i.e., land and water, for producing agricultural goods to satisfy basic social needs of the Chinese people.

Planning and implementing plans for sustainable development is a dynamic process. SADS introduced a number of supportive measures, such as reforming institutions and paying attention to human resources. To the contrary, the Strategy for Physical Planning does not exhibit how the proposed programs will be implemented.

Compared to old land, new land does not have the necessary economies of scale to attract investments for reclamation and establishing human settlements. There is a role for the State to successfully divert population and investments outside the Nile Valley and Delta. Provision of infrastructures is a *sine quo non* prerequisite for these strategies and plans to accomplish their aim. These include, but not limited to, railways, roads, canals, etc. The Government has also to provide social services, such as education facilities, health services, etc. These infrastructures and services are essential for attracting both capital and labor to new land.

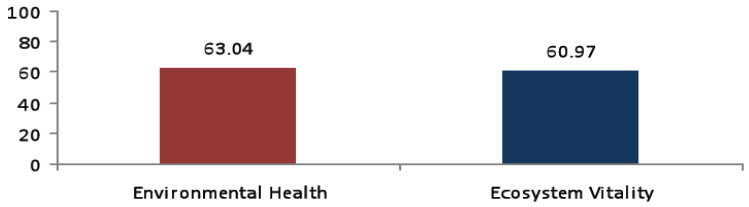
One of the serious issues that face planners when elaborating a plan is uncertainty. Lack of reliable data and information is among the reasons for uncertainty that can be the reason for serious, harmful outcomes. The Strategy for Physical Planning calls for the use of desalinated water in agricultural production. A feddan in the old land can use up to nine thousand cubic meters of water to grow rice. The estimate of the cost of a cubic meter is about EGP 0.30; to the contrary a feddan in new land requires about 1500 cubic meters when using drippers, or 4500 cubic meters when using sprinklers. The estimated cost of a cubic meter of desalinated water can reach about three Egyptian pounds. A simple calculation shows that it is not feasible to use desalinated water except for drinking.

Finally, there is a need for clear actions that portray political determination and commitment, not just a political will as expressed by the forward of the Minister. There is a need for a number of annexes that exhibit the commitments of the Government and the society to change through earmarking funds, in-kind contributions towards specific interventions.

5 Practices

The Environmental Performance Index (EPI) is an annual report Yale Center for Environmental Law and Policy publishes. The 2010 EPI for Egypt shows that the objectives for conserving and improving both environmental health and vitality are just above average, Figure 47.

Figure 47: EPI 2010: Egypt, Environmental objectives



Source: Emerson, J., D. C. Esty, M.A. Levy, C.H. Kim, V. Mara, A. de Sherbinin, and T. Srebotnjak. 2010. 2010 Environmental Performance Index. New Haven: Yale Center for Environmental Law and Policy.

There are ten EPI Policy categories. Table 30 exhibits the scores of Egypt compared to peer countries both at the geographic and income categories. The table shows, first, that with respect to the environmental burden of diseases, which is an indirect impact of environmental degradation measured in DALYs,[66] Egypt is ranked above average compared to countries of that belong to the same income group; however, Egypt is below average of the countries of the MENA region. With respect to impact of air pollution on humans and the ecosystem, the second and fourth policy category of EPI, Table 30, Egypt is below the average of both groups. This is a serious issue, as transportation, the second consumer of energy, is responsible for emissions from mobile sources of air pollution. Thermal power generation plants and manufacturing establishments are also responsible for another significant share of air pollution. In rural areas, the use of bio-mass in cooking, and poor ventilation are responsible for degraded in-door air quality. Almost all sorts of particulate matter end up on the soil, the plant and surface water bodies. The resultant is a degraded environment conducive for economic and social losses as indicated by the DALYs. The third and fifth policy category is the impact of water on both humans and the ecosystem. Compared to countries of both the region and the income group, Egypt is doing well on biodiversity, forestry, fisheries and climate change. However, it has to be clear that Egypt is a signatory to the Convention for Biodiversity, and has elaborated and is implementing an action plan for conserving biodiversity. Egypt, also, has embarked on projects for afforestation; and measures for adaptation to climate change. These efforts explain the scores of Egypt compared to countries of the region and the income group. Given the scores on environmental objectives and vitality discussed earlier, Figure 47, the country needs more attention to environmental management where land management can play a role in achieving the environmental sustainability.

Table 30: EPI 2010: Egypt, Policy Categories

	Egypt	Income Group: Low-Middle Income Countries	Geographic Group: MENA Region
Environmental Burden of Disease (DALYs)	61.32	53.3	66.0
Air Pollution (impact on humans)	50.3	63.4	62.0
Water (impact on humans) *	79.2	74.5	82.0
Air Pollution (impact on ecosystem)	41.0	49.0	45.1
Water (impact on ecosystem) *	43.9	61.9	32.5
Biodiversity	59.2	53.7	30.0
Forestry	100.0	90.4	98.9
Fisheries	76.8	75.4	67.0
Agriculture	73.5	64.3	62.32
Climate Change *	62.1	57.3	47.1

Note**:** * This indicator / policy category makes use of imputed data for certain countries.
Source: Emerson, J., D. C. Esty, M.A. Levy, C.H. Kim, V. Mara, A. de Sherbinin, and T. Srebotnjak. 2010. 2010 Environmental Performance Index. New Haven: Yale Center for Environmental Law and Policy.

Table 31 exhibits a number of indicators for 2010 EPI. The present computed DALYs are below the target, which indicate a negative impact of environmental conditions on the welfare of many Egyptians, particularly the poor who cannot afford environmental amenities and often reside in rural areas. The

[66] The disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

second indicator is indoor air quality is fine, as the target is almost met. To the contrary, indicator on out-door air quality is far from being met. Indicators concerning SO2, NOX NMVOC and OZONE associate with the indicator for out door air quality, and all are far from meeting the target. Mixed land uses are among the reasons for this situation, which makes the case for proper planning and management of land uses to avoid negative external impacts of economic activities. Access to water is a target that is almost met, however, accesses to sanitation still need more attention. According to the 2010 Report on Progress towards meeting the MDGs, Egypt has achieved the target. Most rural areas lack wastewater management (collection and treatment). The resultant is polluting water bodies, including groundwater, and the soil. WQI reflects this situation. Egypt faces a serious water shortage as the WSI indicates, and requires attention to explore non-conventional sources of fresh water. Water stress, agricultural water intensity, agricultural subsidies, and pesticide regulation indicators are all below the target reaffirming the issue of fresh water resources. Indicators for biome protection, marine protection, critical habitat protection and growing stock change indicators are all below the target indicating irrational use of natural resources and the need for serious environmental protection and management of natural resources, including land. Indicators for Greenhouse gas emissions per capita, including land use emissions, industrial greenhouse-gas emissions intensity, and CO2 emissions per electricity generation all suggest a land-energy relationship that affects the environment and the welfare of Egyptians at large. Only Greenhouse gas emissions per capita, including land use emissions indicator is within the target, given that Egypt is not a major producer of Greenhouse Gases (GHG).

Table 31: EPI 2010: Egypt, Indicators

	Value	Target	Proximity to Target (100=target met)
DALY: Environmental Burden of Disease (DALY)	33.0	0	61.3
INDOOR: Indoor air pollution (%)	5.0	100	94.7
OUTDOOR: Outdoor air pollution (µg/m3)	119.2	100	5.9
ACSAT: Access to sanitation (%)*	66.0	100	61.84
WATSUP: Access to water (%)	98.0	100	96.6
SO2: Sulfur dioxide emissions Gg/1000 sq km)	8.3	<= 0.01	30.1
NOX: Nitrogen oxides emissions (Gg/1000 sq km)	7.8	<= 0.01	29.8
NMVOC: Non-methane volatile organic compound emissions (Gg/1000 sq km)	8.5	<= 0.01	25.7
OZONE: Ecosystem ozone (ppb)	0.0	0	100.0
WQI: Water quality index *	62.4	100	62.4
WSI: Water scarcity index	0.52	0	29.15
WATSTR: Water stress index	25.5	0	21.9
PACOV: Biome protection (%)	5.9	>= 10	59.0
MPAEEZ: Marine protection (%)	3.2	>= 10	59.6
AZE: Critical habitat protection (%)	..	100	..
FORGRO: Growing stock change (ratio)	1.1	>=1	100.0
FORCOV: Forest covers change (%)	2.6	>=0	100.0
MTI: Marine trophic index (slope)	0.0	>=0	100.0
EEZTD: Trawling and dredging intensity (%)	46.4	0	53.6
AGWAT: Agricultural water intensity (%)	103.0	<=10	1.7
AGSUB: Agricultural subsidies (NRA)	0.0	0	100.0
AGPEST: Pesticide regulation	19.0	22	86.4
GHGCAP: Greenhouse gas emissions per capita including land use emissions (Mt CO2 eq) *	2.7	2.5	98.2
GHGIND: Industrial greenhouse gas emissions intensity(t CO2 per mill US$)	138.0	36.3	36.2
CO2KWH: CO2 emissions per electricity generation (CO2 per kWh) *	450.4	0	15.9

Note**:** * This indicator / policy category makes use of imputed data for certain countries.
Source: Emerson, J., D. C. Esty, M.A. Levy, C.H. Kim, V. Mara, A. de Sherbinin, and T. Srebotnjak. 2010. 2010 Environmental Performance Index. New Haven: Yale Center for Environmental Law and Policy.

5.1 Main Land Degradation Types

The NAP, as presented in Section 3, describes the various land degradation types, including, but not limited to, soil erosion by either water or wind; chemical contamination with fertilizers, pesticides and herbicides. NAP also describes the physical soil deterioration, such as the case of the land in the Nile Delta and valley, and transformations of land uses, such as the case of encroachment of human settlements over valuable agricultural land.

Egypt faces two major challenges: water quantity and water quality. The supply of water id limited, while population is growing, and the economy is expanding. Thus, the need and demand for water will increase. On the other hand, not all human settlements, particularly rural areas, enjoy wastewater amenities. Consequently, untreated, and primarily treated wastewater returns to the system. Furthermore, lacking proper schemes for managing solid wastes has impacts on both air quality and water bodies. All wastes end up on the plants, and contaminate the soil, which in turn enter the food chain and cause serious health problems.

Loss of biodiversity is a proxy of the impacts of environmental degradation. Indicators of 2010 EPI show the need to consider issues of biodiversity within an overall scheme for land uses. Unfortunately, the Strategy for Physical Planning, which is the latest governmental effort for spatial planning and locating economic activities, disregards these issues.

5.2 Direct causes of land degradation

The NAP identified number of reasons for land degradation. These reasons include improper management of soil, crop and rangeland; overgrazing; over-exploitation of vegetation for domestic use, mixed land uses, such as mining and tourism activities nearby coral reefs; and encroachment of human settlements over valuable agricultural land. Lacking proper schemes for waste management, whether gaseous, liquid or solid, is another reason for degrading ecosystems, particularly land and water. Water stresses; qualitative and quantitative aspects of fresh water resources are also among the reasons for land degradation. Lacking proper systems for irrigation and drainage is also responsible for land degradation. The excessive use of fertilizers, pesticides and herbicides are all reasons for land degradation. Last but not least, global systemic environemntal problems, particularly climate change, are responsible for land degradation.

5.3 Indirect causes of land degradation

In addition to the above mentioned direct reasons, there is a wide array of indirect reasons for land degradation. These include fragmented and dwarf holdings that hinder the likelihood of using the economies of scale in land management. Population growth, an expanding economy and transformations in the patterns of production and consumption are all among the indirect pressures and driving forces that cause land degradation. Lacking physical infrastructures, such as wastewater management, is also an indirect reason for land degradation. Poverty forces the poor to "dig" their environment, as they attempt to discount their future to meet present needs. Unclear land tenure is another reason of degrading land, as indicated in Part I. EWR hampers land development, and contributes to its degradation. Lack of awareness is a serious indirect factor contributing to land degradation. Finally, lacking political willingness and determination is one of the major indirect forces for land degradation.

5.4 Main conservation groups

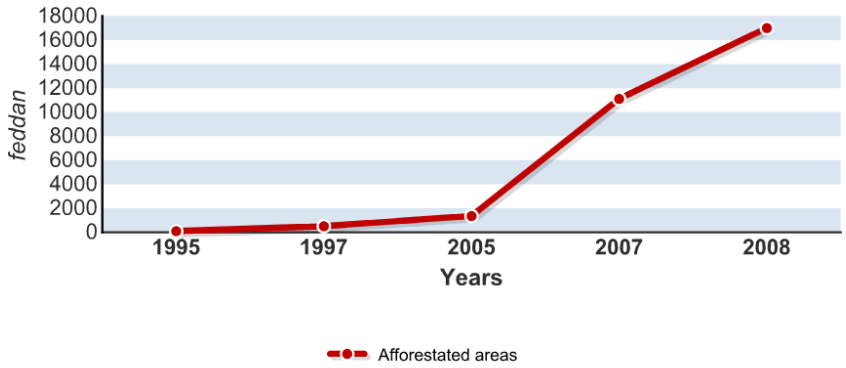
For years Egyptian used manure as fertilizer and soil conditioner. Lately, many Egyptian farmers started to use agricultural residues as fodder, or compost it into a form of fertilizer or soil conditioner.

In the MENA region, including Egypt, the "hema" (plural "ahmia") is probably the world's oldest effective range conservation program. There are five types of ahmia reserves: 1) reserves were all types of grazing are prohibited, but hay can be collected at specified times and places, and by a specified number of needy people, 2) reserves were grazing and/or cutting are allowed, but only in specified seasons, 3) reserves were grazing is allowed all year round, but the number and type of livestock are controlled, 4) reserves for beekeeping where grazing is allowed only after flowering, and 5) reserves

where certain trees are protected. However, political and legislative changes in this century have contributed to a breakdown of the systems.[67]

There are different significant interventions that need to be scaled up to the policy level. The World Food Programme (WfP) introduced to Matrouh techniques of water harvesting. Bedouins use the water to grow barely and raise sheep. Since the 1990s, the GoE embarked on implementing a plan for afforestation to stabilize soil and to use the primarily treated wastewater to grow timber trees, Jatropha and Jojoba. Afforestation efforts gained momentum in the past decade as Figure 48 exhibits.

Figure 48: Afforestation using treated wastewater, 1995-2008



Source: EEAA, Annual Environmental Data and Indicators, Cairo, Egypt, 2010 (text in Arabic)

GoE applied number of engineered interventions to protect coastal zones. In 2008, 28 locations of Mangrove trees covered an area that exceeded 700 ha along the Red Sea, and the Gulf of Aqaba compared to 525 ha in 2002.[68]
As mentioned earlier, Egypt has a strategy and an action for protecting biodiversity. Number of protectorates, such as St. Katherine Medicinal Plants Protectorate,[69] is among the sources for local economic development that sustains the livelihoods of the natives.

5.5 Institutional Approaches

Among the supportive measures of SADS is to improve extension services. SADS also emphasizes the necessity and importance of training and capacity building. SADS calls for developing agricultural cooperative, and establishing Farmers Associations as well as Water User Associations to manage natural resources, i.e., land and water, respectively. The International Fund for Agricultural development (IFAD) disbursed funds to improving on-farm irrigation systems, developing marketing facilities to avoid post-harvest losses, and supporting rural development in new land, such as West Nubariya.

Several initiatives, such as St. Katherine Protectorate, need to be scaled up to policy level, where environmental management and conservation can contribute to local development. GOPP prepared physical plans for over four thousand villages (major and satellite villages) using participatory planning techniques. GOPP also prepared physical plans for a significant number of cities using participatory planning techniques. However, none of these plans had quantitative and qualitative indicators on citizen participation in the planning process. Furthermore, there were no indicators on how citizen participation was conducive to enabling the local, conducive to building partnerships, facilitated networking between the public, private and civil-society organizations. The paramount of participation is empowering the locals and enlightening them to be able to control their destiny and the future of generations to come, which is central to the concept of localizing sustainable development.

[67] FAO, Corporate Document Depository, "Past Experience with LKMs and Development Programmes," http://www.fao.org/docrep/t6260e/t6260e06.htm#5.2 Grazing reserves and land tenure changes
[68] EEAA, Annual Environmental Data and Indicators, Cairo, Egypt, 2010 (text in Arabic)
[69] St Katherine Protectorate, now also for a part a World Heritage Site, is the largest of the seven protected areas in Sinai, covering 4300 km2 of the South Sinai Mountains.

6 Recommendations

6.1 Elaborate and Implement a Scheme for Land Uses and Management

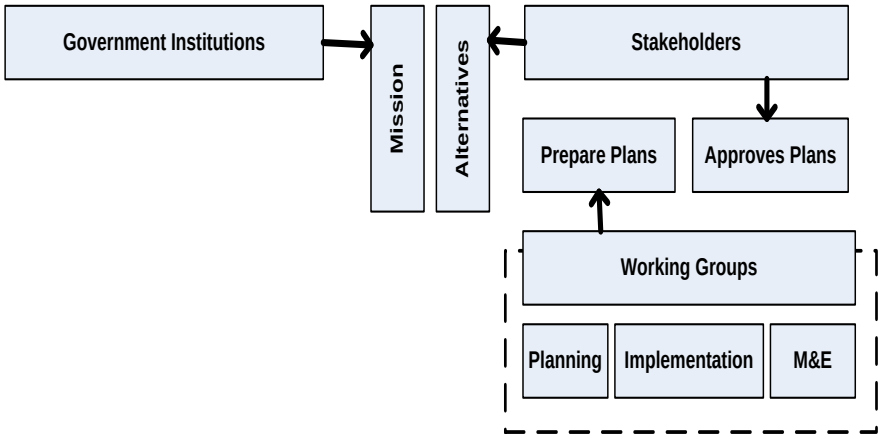
Land is a scare resource involving a wide range of rights and responsibilities. When poorly managed, it can become contentious often leading to disputes, conflict, degradation and other problem.
No doubt Egypt needs a scheme for land uses and management. Efforts so far elaborated to do not and cannot assure environmental sustainability. Without protecting natural resources from wastes and irrational use, the future of the country, at large, is questionable.

Schemes for land uses based on economic sector cannot lead to sustainable land development as they tend to pay little attention to both backward and forward linkages. The alternative is to base the planning exercise on the elements of the ecosystem: a) organism, i.e., flora and fauna; b) energy, c) reactions, i.e., chemical, physical and geological; and last but definitely not least, d) media, such as land, water, etc.

The first step, hence, is to prepare inventory lists on land, water, air, climate, cultural and social values, and ecosystems. The lists have to portray various attributes, including, but not limited to, the need, demand, prices, availability, value, etc. equally important is to investigate the institutional framework that governs land uses and management. Data have to be analyzed to be information and knowledge conducive to decision-making. Information and knowledge will render the issues in the form of strengths, weaknesses, threats and opportunities. Threats and weaknesses will reflect the triggers that led to the present situation. Accordingly, this step will lead to elaborate a "vision," which will be the basis for the objectives and targets. The vision, objectives, and targets have to be the output of a participatory planning exercise that leads to partnerships, enable and empower the stakeholders to be in-charge of their future and that of future generations. This vision in the form of a declaration will serve as the initial agreement to assure the success of pan formulation and implementation.

The second step is to establish issue-specific working groups consisting of all stakeholders, such as governmental institutions, private-sector companies, and representatives (advocates) of marginalized sub-population, i.e., civil-society organizations. Responsible public bodies have clearly to define their mission and mandate prior to launching the planning process, Figure 49. Issue-specific working groups will be responsible for preparing and implementing plans, and conducting functions of Monitoring and Evaluation (M&E). The stakeholders will be responsible for evaluating alternatives and approving plans.

Figure 49: Schematic presentation of the proposed planning process



The third step is an open-ended phase. It is the phase of resource mobilization and implementation. According to priorities, issue-specific working groups will formulate marketable investment packages to attract development partners, such as private sector, Direct Foreign Investment (DFI), donor agencies and so forth.

6.2 Mitigating for Land Market Imperfections

The above-mentioned scheme for land uses and management has to be conducive to economic growth that is considerate to the carrying capacities of the ecosystems. The process of plan formulation will generate information to enable all stakeholders to properly be engaged in land markets. An inclusive process of plan formulation and implementation is bound to avail information, which is a condition for perfectly competitive markets.

The proposed participatory planning for elaborating a scheme for land uses and management engaging large number of stakeholders is an assurance against the likelihood of any forms of monopolistic practices that might lead to imperfect land markets.

6.3 Availing Public Goods

The proposed scheme for land uses and management has to avail public goods, i.e., a commodity or service provided to all members of a society, either by the government or a private individual or organization without profit. A public good has two distinctive characteristics. The first is to be jointly consumed without affecting the utility or level of satisfaction of an agent; second, non-exclusive, i.e., it is almost impossible to prohibit or exclude an agent from consuming this commodity or service Cleaner air quality is an example of public good. Land uses and management are tools to assure cleaner air for communities.

6.4 Externalities

Externalities are the consequence of an economic activity that unrelated third parties experience. An externality can be either positive or negative. A factory emitting smoke, dumping hazardous wastes, releasing untreated wastewater to the ecosystem spoils the surrounding environment and affects the health of nearby residents is an example of a negative externality. Zoning, which is the designation and reservation under a master plan of land use for light and heavy industry, dwellings, offices, and other buildings; use is enforced by restrictions on types of buildings in each zone, is the solution to avoid negative externalities.

The proposed plan for land uses and management has to lay-out a master plan for compatible land uses that assures environmental sustainability. Economic and financial instruments, in addition to measures of command and control are the supportive measures to avoid negative externalities and encourage initiatives that lead to positive externalities.

6.5 Social Equity

No development can be sustainable without social justice. Community development via investing in the people is the solution. Allocating land and funds to provide both physical and social infrastructures, such as safe drinking water, wastewater management, green areas, educational and health facilities, all require land. Thus attracting population to new areas should not be the subject of financial evaluation, rather subject to economic evaluation. Consequently, depending on major companies to reclaim desert land alone, might not be the only solution. According to the literature, the limited success of land to graduates program can be traced to lack of physical and social infrastructures; and the limited credit of the land holders.

6.6 Institutional Transformations

Recommendations 6-2 to 6-5 are all based on the economic theory, yet problems often rise within an institutional framework. To assure sustainability of invested funds and exerted efforts, there is always a need for institutional transformation.

The plan will employ a participatory planning process that aims to enlighten, enable and empower the public. Participation is not an end in itself, rather a mean for a democratic decision-making. Issue-specific working groups, i.e., the modality employed in elaborating and implementing the plan need to be formalized, and adopted in day-to-day operations concerning land use and management.

6.7 Issues to Address

Parts I and II report present, number of issues that the proposed scheme for land use and management need to address. Of course in the process of compiling the inventory lists, and discussion of the working groups there will be other issues to address. These issues include, but not limited to, the following:

- Land Tenure
- Dwarf and fragmented holdings
- Desertification
- Drought
- Biodiversity
- Mandate, role and mission of stakeholders, particularly public agencies at both local and central levels responsible for land uses and management
- Building and developing capacities

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Annexes

Annex 1 Terms of Reference
Country Study on Status of Land tenure, Land Management and Land use planning in SNO Countries:

I - Background: The Sub-regional Office for the Oriental Near East (SNO) covers 6 countries: the Arab Republic of Egypt; the Islamic Republic of Iran; Jordan; Lebanon; the Syrian Arab Republic and Iraq. The Land Tenure and Land Management Position is being newly- established in this Office in view of the need for these countries to address land management and tenure issues stemming from the general limitations of agricultural lands in most of these countries and the problems resulting from the ways these lands are being managed.
The present study aims at providing a highlight of the current situation regarding land tenure, management and proposing potential solutions.

II - Objective: To take stock of land tenure, land management and land use planning situation and status in concerned SNO countries with a view to collecting information and data and subsequently identifying priorities for technical and policy support both with a sub-regional dimension and targeted to the different countries situations, priorities and needs.

III - Duties: Under the overall supervision of FAO Sub-Regional Coordinator for the Oriental Near East (SNO) and the technical supervision of relevant units/officers in NRC, NRL and RNE, the National Consultant (he/she) will prepare a country paper that will be divided into two parts because of the need for different expertise to lead the two components. The first part focuses on the state of land tenure in SNO countries, with emphasis on salient issues and the ways to address them. The second part aims at providing an overview on land management and land use planning in each of the SNO countries with a view to identifying key issues, constraints and opportunities, status and priorities and needs aiming at strengthening land management and land use planning as well as identifying opportunities for regional cooperation.

In particular the National Consultant (he/she) will perform the duties described under Terms of Reference (part 1 and 2) below.

IV - Terms of Reference

(Part 1):

1. Provide an overview on land tenure issues, land tenure policies and regulations in the country, including land governance issues (effectiveness of institutions, extent and difficulties of the implementation of relevant land tenure laws etc.). It includes inter alia the following:
    a. Overview of the regulations pertaining to Land Tenure, the extent of their enforcement and the related issues, including land governance.
    b. Proposed recommendations regarding the mechanisms to tackle issues identified under the above item.

The structure of this part should be as follows:

- Introduction
- Review of previous studies
- The land tenure question in the country
- Laws and regulations: Islamic, Customary, Civil….
- Land use systems
- Land markets: challenges and opportunities
- Issues to address
- Conclusions, policy recommendations and planning implications

(Part 2):

2. Based on available information, provide an inventory of the main land resources and ecosystems of the country, including their current uses and land use systems (Arable land (Cultivated, Irrigated), Forests, Rangelands, Wetlands, Lakes and Rivers, Protected areas, etc.), their extent and any significant changes in extent over the last 10 years. This should include an overview of the status of the resources in regard to management (Is the land under each of the main uses i) degraded - what are the main

degradation types, ii) well conserved/managed or ii) undergoing restoration/rehabilitation- through specific interventions). See Annex 1.

3. Provide an overview of previous and actual work and processes on agricultural zoning land use /territorial planning at the different levels (national, district/provincial and community) and the extent of their implementation mentioning constraints and opportunities in this regard.
4. Provide an overview of the prevailing government policies and legislation, strategies, action plans regarding land management and land use planning/territorial planning. Focus should be placed on the current situation as an input for identifying areas of action.
5. Provide a general inventory of the existing sustainable land management practices (traditional/local practices and recent interventions) and identify successful land use and management practices. Special attention should be given to the approach and institutional background (Is it supported by an official policy/legislation/strategy, national plan/programme, localized project, NGO efforts and/or local/community based efforts and with what level of inputs and knowledge). See Annex 1.
6. Develop proposed recommendations regarding the ways and means to address the key land management, land use/territorial planning and land policy issues, constraints and opportunities that have been identified under items 2-5, with a view to enhancing the sustainable and integrated management and planning of land resources (soil, water, vegetation) and ecosystems in the country.

V - Schedule and Timeframe

The country study is to be completed within a period of three months following signature of the contract. The first draft of the report will be submitted two months following signature of the contract, followed by the final version within one further month, taking into consideration the comments and feedbacks made by FAO on the draft.

The National Consultant shall undertake all required tasks according to the following schedule:

	Month 1				**Month 2**				**Month 3**			
Designation Week:	1	2	3	4	5	6	7	8	9	10	11	12
Part 1: Land tenure	■	■	■									
Part 2: Land management and use				■	■	■	■	■				
First draft of the report									■			
Comments and feedbacks from FAO										■	■	
Final report												■

VI - Reporting

The report will consist of an executive summary (1000 words), a full text (maximum of 50 pages for each part) in addition to annexes (figures, photos, maps, data series, references, etc.) that will be based on factual data and information as they relate to the country. It will avoid rhetoric and be concise with arguments and justifications.
The report will be produced in English, typed in Word, and submitted as a hard copy and in a CD. The ownership rights of the report produced by the Consultant are governed by FAO rules and regulations on the subject.
VII - Duty Station: Desk Work at home

VIII – Terms of payment

The payment of honorarium will be done upon submission of the final report and its approval by FAO.

IX - Qualifications

The National Consultant shall be a qualified Land management/land use planning/land tenure expert, with a Geography, Soil Science or Agronomy background or equivalent field with at least M.Sc. degree and sound knowledge of land tenure, land management and land use planning processes in the country. Minimum of ten years of practical experience in the area of land tenure, land management, land use planning and land policy. Demonstrated skills in developing concise factual reports in the area required. Level C of English.

Appendix - ToR: Degradation Types and SLM Technologies/Practices (LADA-WOCAT extract)

Main Land Degradation Types (state indicators) could include

- **Soil erosion by water:**
  - Loss of topsoil / surface erosion;
  - Gully erosion;
  - Mass movements / landslides;
  - Riverbank and coastal erosion;
  - Offsite degradation effects **(**deposition of sediments, downstream flooding, siltation of reservoirs /waterways, pollution of water bodies with eroded sediments).
- **Soil erosion by wind:**
  - Loss of topsoil;
  - Deflation and deposition;
  - Offsite degradation effects
- **Chemical soil deterioration:**
  - Fertility decline and reduced organic matter content;
  - Acidification;
  - Soil pollution ;
  - Salinisation / alkalinisation
- **Physical soil deterioration:**
  - Compaction;
  - Sealing and crusting;
  - Waterlogging;
  - Subsidence of organic soils, settling of soil;
  - Loss of bio-productive function due to land use changes (e.g. construction, mining and effects on ecological and productive function of the soil).
- **Water degradation:**
  - Aridification;
  - Change in quantity of surface water:
  - Change in groundwater / aquifer level;
  - Decline of surface water quality;
  - Decline of groundwater quality;
  - Reduction of the buffering capacity of wetland areas
- **Biological degradation**
  - Reduction of vegetation cover;
  - Loss of habitats;
  - Quantity / biomass decline;
  - Detrimental effects of fires;
  - Quality and species composition / diversity decline;
  - Loss of soil life;
  - Increase of pests / diseases

You may be able to indicate what are the main direct and indirect causes of degradation

Direct causes of land degradation (direct pressure indicators4)

- Improper management of soil, crop and pasture/rangelands
- Deforestation and removal of natural vegetation
- Over-exploitation of vegetation for domestic use (degeneration)
- Overgrazing
- Industrial activities and mining
- Urbanisation and infrastructure development
- Discharges leading to point contamination of surface / ground water resources or excess runoff
- Contamination by airborne pollutants from industrial activities, mining and urbanisation
- Disturbance of the water cycle
- Over-abstraction / excessive withdrawal of water
- Natural causes e.g due to climate, steep or fragile terrain, avalanches, volcanic eruptions, mud flows etc.

Indirect causes of land degradation (indirect pressure indicators)

- Population pressure
- Consumption pattern and individual demand
- Land Tenure
- Poverty
- Labour shortage
- Inputs and infrastructure
- Education, awareness raising, access to knowledge / support services, loss of knowledge
- War and conflict
- Governance, institutions and politics
- Other

Main conservation/SLM groups could include inter alia

- Manuring / composting / nutrient management
- Conservation agriculture (minimum soil disturbance, improved soil cover, and crop rotation).
- Rotational system / shifting cultivation / fallow /slash and burn
- Contour farming : Vegetative strips; stone bunds; terraces -level, forward/ backward sloping
- Agroforestry
- Afforestation and forest protection
- Gully control / rehabilitation
- Grazing land management
- Water harvesting
- Groundwater / salinity regulation / water use efficiency
- Water quality improvement
- Sand dune stabilization
- Coastal bank protection
- Protection against natural hazards: flood, storm, earthquake, avalanche, landslide, mudflow
- Storm water control, road runoff
- Waste management
- Conservation of biodiversity
- Other

Institutional Approaches could include for example

- Extension, advisory services and Training
- Promoting local Innovation
- Participatory Learning and action
- Particpatory land use planning
- Farmer field schools and farmers groups
- Integrated watershed management
- Territorial development/Gestion de terroirs
- Community based natural resources management
- Community development/microfunds
- Participatory monitoring and evaluation
- Payments for environmental services
- Upscaling efforts

Annex 2: Short biography of the consultant

El-Kholei has an extensive experience in planning, development and environmental management acquired through formal training, consultancies and research projects. He is Professor of Urban Planning, Menofia University, Egypt since 2002. He holds a Ph.D. in regional planning ,University of Illinois a Urbana-Champaign, 1992; and MSc degree in urban planning and policy development, Rutgers, the State University of New Jersey, 1988.

El-Kholei conducted several studies on issues related to land uses and management, and environmental management. He provided technical assistance on participatory strategic, action planning, and national environmental management programmes. He participated in designing several national and regional development projects. El-Kholei led the evaluation of several development and environmental projects.

El-Kholei possesses managerial capabilities and leadership that contribute to the successful and timely delivering of outputs and achieving aimed outcomes. He has excellent communication skills , and ability for building consensus on issues and setting directions for future actions. He acquires outstanding computer skills in data management, and competent in advanced multivariate statistical analyses; and published more than thirty referred scientific papers in urban and regional planning, environmental management, sustainable development, and planning theories, methods and models.