Governorate of Qena

Qena Governorate Environmental Profile

Ministry of State for Environmental Affairs

Egyptian Environmental Affairs Agency

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GLOSSARY & LIST OF ACRONYMS

AGL	Above Ground Level
AMSL	Above Mean Sea Level
BOD	Biological Oxygen Demand
CDA	Community Development Association
COD	Chemical Oxygen Demand
DFID	Department for International Development
EEAA	Egyptian Environmental Affairs Agency
EIA	Environmental Impact Assessment
ELO	Environmental Liaison Officer
EMU	Environmental Management Unit
Feddan	Unit of Land Area (4,200 m^2)
GDP	Gross Domestic Product
GEAP	Governorate Environmental Action Plan
GIS	Geographic information System
kg	Kilogramme
km	Kilometre
LE	abbreviation for Egyptian Pound
M	metre
Markaz	Administrative District
MDG	Millennium Development Goal
MSMEs	Micro, Small and Medium Enterprises
NEAP	National Environmental Action Plan
NGO	Non-Government Organisation
NOPWASD	National Organisation for Potable Water and Sanitary Drainage
NO_x	Nitrogen Oxides (common air pollutants)
Piastre	Egyptian Curency Unit (100 Piastres = 1 Egyptian Pound)
PPM	Parts Per Million
RBO	Regional Branch Office of EEAA
SEAM	Support for Environmental Assessment and Management
SMEs	Small and Medium Enterprises
Wadi	Dry River Valley (may flood after very heavy rain)

PART I
INTRODUCTION AND OVERVIEW
OF
QENA GOVERNORATE

1 INTRODUCTION

The Governorate of Qena is preparing a Governorate Environmental Action Plan (or GEAP), in partnership with the Egyptian Environmental Affairs Agency (EEAA) and with technical support from consultants funded by the UK's Department for International Development (DFID). Preparation of Qena's GEAP is part of a broader programme to improve environmental management and access to environmental services in selected governorates in Egypt which is being implemented by EEAA and supported by DFID (the SEAM Programme).

Environmental action plans represent a well-established process to identify environmental issues and priorities and agree how resources should be allocated to address them (see *Box 1.1*). They provide a framework for integrated planning of resource use that:

- promotes sustainable development within governmental planning and management;
- enables a full cross-section of civil society to play a meaningful role in identifying and managing priority environmental issues; and
- facilitates implementation of actions that are targeted at the poorest, who suffer most from poor environmental conditions and have the least access to environmental services.

Box 1.1 The Environmental Action Planning Process

Environmental action planning is a participatory process that:

- Assesses the existing state of the environment and identifies trends;
- Diagnoses the pressures which are causing degradation of the environment (e.g. poorly planned or regulated economic development, population growth), the underlying enabling factors that allow the pressures to cause harm to the environment, and estimates the impacts and costs of the degradation;
- On the basis of the above information, engages with representatives of a wide range of stakeholders to identify key environmental issues and to prioritise them so that resources (financial, human, and institutional) can be allocated;
- Through the continuing participatory involvement of stakeholders, develops actions which target the environmental priorities and groups of beneficiaries (such as the very poor), prepares investment and financing proposals and assign responsibilities for implementation; and
- Develops monitoring mechanisms for the actions undertaken, and activates supporting programmes to enhance the prospects for successful outcomes (e.g. awareness, training).

1.1 *EGYPT'S NATIONAL ENVIRONMENTAL ACTION PLAN*

The National Environmental Action Plan (NEAP) which was completed in October 2003 sets out Egypts National environmental agenda and provides a framework that supports the implementation of locally prioritized environmental strategies and actions at Governorate level through GEAP's. It is expected that lessons from the GEAP experience will be used to continually inform the NEAP process. To date GEAPs have been implemented in 2 governorates, Sohag and Dakahleya, and are currently being prepared in another 4 governorates (including Qena). The GEAP process reflects the Egyptian Environmental Affairs Agencies (EEAA) aim to encourage the decentralisation of environmental management.

The relationship between Egypt's NEAP and the various GEAPs is that the NEAP sets out a framework for Egypt's national level strategic priorities and actions and in doing so provides a framework for the preparation and implementation of specific actions at governorate level through the GEAPs. The GEAPs, in turn, then feeds information and results back into the NEAP , which itself will be updated on a periodic basis.

1.2 *THE QENA GEAP*

The Governorate Environmental Action Plan or GEAP is a practical action plan which allows environmental problems and concerns to be addressed at a local level. The GEAP process aims at integrating environment, social, economic and planning issues into a plan of action that will benefit all. The plan is developed on a highly participatory basis and stakeholder consultation and participation is key to the success of the process.

In identifying issues from different perspectives it is possible to consider the nature of solutions required to address the problems, not only at a technical level, but so from the differing points of view of the different players involved, from industry and farmers to the general public. This is an important facet of the GEAP process, which must neither impose solutions in a wholly demand or supply led fashion ("top-down" or "bottom-up"). The GEAP must recognise the needs of the wide spectrum of stakeholders if it is to succeed.

The result of the GEAP process should be a practical action plan that all parts of the community, whether in the public or private sector, at city or village level – has been involved in and recognises as a response to its own needs. The GEAP process reflects the policy of the Egyptian Environmental Affairs Agency (EEAA) in decentralising environmental management and enabling governorate institutions in environmental management.

In Qena, the GEAP process is being supported by EEAA through the SEAM programme, which is building the capacity of the governorate administration – and other stakeholders such as CDAs (1) and the private sector – to implement the priority actions identified in the GEAP.

1.3 THE ENVIRONMENTAL PROFILE AND THE GEAP PROCESS

This document, the *Environmental Profile of Qena Governorate*, forms the basis for the identification of the key issues affecting the environment of Qena, as the first part of the governorate's GEAP process. It is the foundation upon which the participatory planning that is at the heart of the GEAP approach can be developed. By presenting an outline of the status of the environment in Qena and defining the major environmental issues and priorities, it provides a basis for the effective involvement of key stakeholders in developing the actions that the GEAP will address.

This profile is based on technical reports, most of which have been prepared by Egyptian experts. To validate the analyses and conclusions of these technical reports, they will be supplemented by extensive consultation with a wide range of stakeholders from Qena, including large numbers of individuals from a geographic cross-section covering every Markaz in the Governorate. By adopting information collection and analysis using this dual approach, it will be possible to involve a large number of people and to identify a wide range of issues from a number of different perspectives. As well as ensuring the accuracy and representativeness of the profile, this approach also develops ownership of the GEAP process and outputs amongst stakeholders in Qena.

There is no central source or database of environmental information at the local or Governorate level in Egypt. Systematic monitoring data for many environmentally significant parameters are also lacking. Data compiled for this environmental baseline report or environmental profile comprised principally the following:

- Baseline study reports on different sectors commissioned by the SEAM Programme from recognised local and national experts;
- Outputs from the sectoral GEAP Working Groups;
- National statistics;
- Information from the local line Ministries;

[1] Community Development Associations

- Information from Governorate statistics and the Qena Governorate Information Centre;
- Outputs from the GEAP Questionnaire survey; and
- Data specifically collected by SEAM staff.

The *Environmental Profile for Qena Governorate* is divided into four parts, as follows:

- *Part I – Introduction* (introductory remarks, and overview of Qena)
- *Part II – Status of the Natural Environment* (geology, geomorphology and landscape; water resources hydrology and hydrogeology; land resources; ecological resources; cultural heritage)
- *Part III Economic Activities* (agriculture and fisheries; mining and mineral extraction; Industry; Tourism)
- *Part IV – Provision of Environmental Services and Infrastructure* (water supply and sanitation and solid waste management)
- *Part V – Environmental Issues and Priorities* (environmental quality and degradation in Qena; policy, legislation and adminstration, and priorities for the GEAP)

1.4 DEVELOPMENT, POVERTY AND THE ENVIRONMENT: HOW DO GEAPS CONTRIBUTE?

Box 1.2 Protecting our Planet - Securing our Future

"The Earth's physical and biological systems provide humans with essential goods and services. A set of physical, chemical and biological processes link global environmental problems so that changes in one have repercussions for the others. Actions taken to meet human needs have local, regional and global consequences. The same driving forces - population size, consumption levels and choice of technologies – underlie all global environmental problems. All people affect the environment and vice versa, but the rich have a disproportionately higher impact and the poor tend to be the most vulnerable to the effects of environmental degradation." (1)

1.4.1 The Millenium Development Goals (MDGs)

Egypt has approved the UN Millennium Declaration, which committed the international community towards a number of goals (see *Box 1.3*). These goals address a number of development, poverty and environmental issues.

[1] Source: 'Protecting our planet, securing our future' (UNEP, NASA, World Bank, November 1998).

Progress is being measured through a variety of targets and indicators, most of which are quantifiable.

Box ١.3 The Millennium Development Goals

Goal 1:	Eradicate extreme poverty and hunger
Goal 2:	Achieve universal primary education
Goal 3:	Promote gender equality and empower women
Goal 4:	Reduce child mortality
Goal 5:	Improve maternal health
Goal 6:	Combat HIV/AIDS, malaria and other diseases
Goal 7:	Ensure environmental sustainability
Goal 8:	Develop a Global Partnership for Development

The targets are challenging, and will require significant commitment and allocation of resources for a country such as Egypt. The NEAP/GEAP processes and outputs can help:

- in view of the significant links between poverty and the environment, by ensuring that efforts to promote sustainable development and eradicate poverty are effectively coordinated, and are mutually supportive;
- by providing a very good framework within which Egyptian agencies can monitor progress against the targets and indicators for a number of the millennium development goals;
- by building the capacity of national and local staff during identification of priorities and implementation of the actions to address them.

Environment is one of the three pillars of sustainable development (the others being social and economic). In comparison with the other two pillars, environment is often neglected. As a result, most environmental trends are negative: and as the clear linkages between environment and poverty are increasingly recognised, the need to integrate environmental management with poverty reduction is emphasised. Environmental action plans provide an important framework for planning and managing sustainable development. Increasingly, they are a key tool in ensuring that the poor can identify issues and priorities, and play an active and effective role in managing and monitoring the activities which are implemented to address the priority areas of concern.

Therefore effective environmental management is critical in securing sustainable development, and is particularly important for poor people and other vulnerable groups. Key environmental concerns are associated with three broad but interrelated aspects of development:

- Quality of Life - especially with respect to the livelihoods, health and vulnerability of the poor;
- Quality of Growth; and
- Quality of the Commons.

1.4.2 *The Quality of Life*

Falling rates of infant mortality and increasing life expectancy are important indicators of the substantial progress made over the last four decades in reducing the burden of disease associated with poor environmental conditions. Even so, environmental factors have major effects on people, often falling disproportionately on the poor. The effects of environmental conditions on poor people may be grouped into three categories: livelihoods, health and vulnerability.

Threats to Livelihoods

Nearly a billion rural households worldwide rely directly on services of natural capital stocks and intricately interdependent ecosystems - water resources, land, soils, forests and fisheries for their daily livelihood. As the availability of these resources declines and their quality deteriorates, these livelihoods become threatened. The major threats to livelihoods of poor households that often depend on natural resource services for up to 50% of their total income include:

- Overuse, mismanagement and contamination of freshwater resources;
- Degradation of soils; and
- Rapid depletion of fisheries, forests and biodiversity.

Threats to Health

Environmental degradation is an important contributing factor to the burden of disease, influencing the quality of life and economic activities for many people. Premature death and illness caused by environmental factors may account for one fifth of the total burden of disease in some countries [(1)], which is comparable to the toll from malnutrition. Millions of children and adults die every year from diseases that could be avoided by improving environmental quality. Primary environmental hazards of concern include:

- Water-related diseases - caused by lack of access to clean water and adequate sanitation;

[1] Making Sustainable Commitments – An Environmental Strategy for the World Bank , The World Bank, 2002

- Exposure to indoor air pollution - caused by burning dirty fuels in inefficient stoves with inadequate ventilation;
- Exposure to urban air pollution - primarily down to fine particles emitted by burning of dirty fuels, from poorly maintained motor vehicles and from the burning of agricultural residues;
- Exposure to agricultural and industrial chemicals and wastes.

The burden of disease associated with limited access to clean water and sanitation and with indoor air pollution falls disproportionately on poorer households. In both rural and urban areas the poor are less likely to be served by water and sanitation infrastructure and are more likely to rely on dirty fuels for cooking. Urban air pollution affects all urban inhabitants, however the poor tend to suffer more severely because its effects are worse for those in poor health and because poor people have limited opportunities to protect themselves or move to less polluted areas.

Vulnerability

Poor people are particularly vulnerable to natural disasters and changes in environmental conditions. Changing patterns of resource use have often undermined traditional systems for managing and sharing natural risks such as droughts, floods, fires and earthquakes. Pressures on resource stocks have prompted many poor households to live and work in vulnerable zones such as floodplains, or areas prone to drought or earthquakes. Vulnerability is increased by specialisation in the use of particular natural resources, so that households have few alternatives when disaster strikes. Furthermore, the poor have less capacity to cope when disasters occur. Access to credit is more difficult than for better-off households, and the poor have fewer assets to sell or consume in times of hardship.

1.4.3 The Quality of Growth

Economic growth is essential if poverty is to be reduced and welfare is to be improved. However it is a mistake to imagine that the scenarios are restricted to "growth" and "no growth". Growth may take a variety of forms and it is the quality of growth that matters. A focus on maximising growth - narrowly defined in GDP terms to the exclusion of all other considerations - often imposes substantial costs and is unsustainable.

Improving the quality of growth is far from simple. In the case of environmental issues, improving incentives for the sustainable use of environmental and natural resources is a key issue. When markets work well, economic theory and experience both tell us that resource use will be efficient. However, in practice, markets do not always work well. This is particularly true in the case of environmental goods and services, which may have special characteristics (see *Box 1.4*). Environmental problems are usually caused by market failures, policy failures or a combination of both of these factors.

Box 1.4 ***What Makes Environmental Problems Different?***

Environmental problems have several unique characteristics:

- *Delayed Impacts:* Many potential environmental changes have significantly delayed impacts. This dictates long lead times in implementing appropriate prevention or mitigation measures.
- *Spatial Impacts:* Causes of environmental impacts and locations of the actual impact are often geographically distinct, making it necessary to adopt a framework that can address diverse stakeholder interests.
- *Cumulative Impacts:* Individual actions often have little effect on the environment, however the cumulative impacts of many such actions may be substantial.
- *Irreversible Impacts:* A significant number of environmental outcomes are fundamentally irreversible, and the implications of such impacts are hard to predict.
- *Need for Government Interventions:* Environmental problems are often a consequence of market failures. Without government intervention to introduce regulations and create markets where they do not exist, the private sector alone cannot achieve optimal environmental outcomes.
- *Multi-sector Links:* Environmental problems reverberate across a range of sectors and through many pathways, requiring co-ordinated policies and concerted efforts.
- *Regional and Global Implications:* Many environmental impacts have broad cross-boundary and global effects that require international frameworks and agreements to manage them effectively.

1.4.4 The Quality of the Commons

Many environmental services are global public goods, and their degradation affects people across the world. Ecosystems and the environmental impacts of development do not respect administrative boundaries. Many pollutants travel long distances and affect people's health and the environment in neighbouring countries and regions. The successful pursuit by individual countries of environmentally sustainable development, including poverty alleviation, will ultimately depend on the protection of the global commons, such as climate, the diversity of life and shared water resources.

The management of the world's shared river basins, groundwater aquifers and large marine ecosystems poses a challenge for riparian and littoral states. The major threats to the health, productivity and biodiversity of these shared resources come from human activities on land. Some 80% of marine pollution originates from land-based activities. In order to combat pollution and arrest degradation, it is essential for countries to find effective ways of co-operating in the management of these shared resources.

The poorest countries are often the ones that are most threatened by the degradation of the regional and global environmental commons. Climate change is projected to cause significant increases in famine and hunger in many of the world's poorest places, in part because of decreasing precipitation in many arid and semi-arid areas. It could also displace millions of people in low-lying delta areas; increase the incidence of vector-borne diseases such as malaria and dengue fever; and lead to rapid shifts in the distribution and productivity of ecosystems resulting in a loss of biodiversity and livelihoods.

These outcomes occur because, in the absence of enforceable international regulatory and incentive systems, individual countries are unable to capture the economic value of conservation or environmental protection measures that generate regional or global benefits.

At a more local level, Common Property Resources such as wild foods, building materials, medicines and fuels are of great significance, particularly to poor and vulnerable groups, who often are increasingly dependent on common property resources as they are the only resources that are 'free'. In urban areas this may be scavenging on municipal waste dumping sites. In rural areas it may be access to common land for livestock grazing or fuel wood collection. Often restricted access to such resources may lead to temporary and permanent migration of people.

In developing an implementing the GEAP for Qena, all stakeholders groups throughout civil society need to bear in mind these broader sustainable development issues. They provide a context for the targeted, governorate- and markaz-level actions that will be implemented within the GEAP. By bearing these issues in mind, it will help to focus actions on addressing the **causes** of environmental degradation and poverty – not on the **consequences**.

2 AN OVERVIEW OF THE GOVERNORATE OF QENA

2.1 GEOGRAPHICAL LOCATION AND PHYSICAL CHARACTERISTICS

The Governorate of Qena is located in Upper (southern) Egypt north of the Governorate of Aswan and south of the Governorate of Sohag. To the west lies the New Valley Governorate and to the east the Red Sea Governorate. Qena City, the main city, located in the north of Qena Governorate is approximately 500 km south of Cairo. The location of Qena Governorate in Egypt is shown on *Map 1*, and the location and extent of the Governorate is shown in more detail on *Map 2*.

Qena is characterised physically by the very large arching easterly meander in the River Nile. The River Nile flows through the Governorate in a predominantly northerly direction, at times in a very narrow valley bordered by steep limestone cliffs or escarpments. Beyond the valley itself, to the east, are the desert plains and wadis of the Eastern Desert, which meet the mountains of the Red Sea on the eastern boundary of the Governorate. To the west lies the limestone plateau area of the Western Desert, which stretches on into the New Valley Governorate.

The Nile River is the main geographic feature in Qena Governorate and runs from south to north through the Valley. The Nile is a dividing line separating areas to the east and west, and on both sides of the River fluvial deposits accumulated over the millennia to form what is effectively a fertile elongate oasis, some 10-20 km wide, which meanders through the desert. The Nile River takes a distinct detour in the central part of Qena Governorate from its strait north–south direction, making a wide arching curve (known as the Qena Bend). The Qena bend has been described as an ecological transition zone between the northern and southern Nile Valley in Egypt[(1)].

The landscape west of the Nile Valley is simple with very little relief. A low Eocene limestone ridge fringes the Valley from the west. On top of the ridge a flat monotonous plateau extends westwards into the Western Desert. Some sandy accumulations are found near ridges and in shallow depressions on the limestone plateau.

[1]Baha El Din – Biodiversity of Qena Governorate, 2001

Map 1 Location of Qena Governorate in Egypt

Map 2 The Location and Extent of Qena Governorate

The section of the Eastern Desert encompassed within the Qena Governorate is much larger than that of the Western Desert, and in contrast it has a much more complex landscape and more resources. The topography is hilly with numerous wadis draining towards the Nile Valley. The largest of these is Wadi Qena, which is about 250 km long; the terminal quarter of its length falls within the Governorate. Other important wadis of the region include Wadi Markh, Wadi Gurdi, Wadi Hamamat and Wadi Matuli.

The total area of the Governorate is some 10,265 km^2. Approximately 15% of the land lies in the Nile Valley, the remainder being split between the Western Desert and the Eastern Desert. Of the total area only approximately 1,600 km^2 is cultivated and inhabited, the rest being desert areas outside the main river valley. Qena Governorate is divided into 11 districts or Markazes, which are shown in detail on *Map 3.*

Luxor is located between Qus and Armant and was originally part of Qena Governorate. Due to the global interest in the cultural heritage sites in the Luxor area and the significant visitor numbers to the area and allied tourist development, Luxor was given a separate administrative status in 1989. This separate administration, unique in Egypt, is known as the 'Supreme Council of Luxor'. For the purpose of this report and the GEAP, Luxor is excluded except where noted.

2.2 POPULATION CHARACTERISTICS

Based upon the 1996 census data [(1)], the population of Qena Governorate was 2,442,016 with a growth rate estimated at 2.2% [(2)]. This compares to Egypt as nation with a total population of 59,313,000 and a growth rate estimated at 2.1%. *Table 2.1* gives the 1999 estimates by the Information and Decision Support Centre (IDSC) for the population of Qena Governorate by Markaz and the respective estimates for population growth rates.

[1] Central Authority for Public Mobilisation and Statistics (CAPMAS)

[2] Institute of Nation Planning - Human Development Report, 1998/1999.

Table ٢.1 ***Estimated Population and Population Growth Rates in Qena Governorate (1999)*** [1]

Markaz	Estimated Population	Annual Population Growth Rate (%)
Qena	461,479	2.39
Naga Hammady	390,240	2.26
Qus	304,070	2.56
Abu Tesht	297,360	2.82
Isna	294,390	2.57
Dishna	220,410	2.89
Armant	167,400	1.69
Farshut	124,600	2.69
Naqada	122,340	2.12
Qeft	104,630	2.40
El Waqf	58,120	2.32
Total	2,454,030	2.10

Approximately 21% of the population may be described as living in urban areas with 79% living in rural areas. In common with most areas of Upper Egypt, Qena is an area of net out-migration and for 1996 the migration rate for the proportion of the population moving from the Governorate was estimated at 7.1%.

[1] Information and Decision Support Centre (IDSC)

Map 3 Local Administrative Boundaries in Qena Governorate

Population density in Qena Governorate is up to 1,581 individuals/km^2. This figure is made significantly greater by the fact that only 15% of the Governorate is inhabited and cultivated, of which only about 5% is devoted to residential areas and dwellings. The majority of the population is thereby constrained by the physical nature of the landscape and may utilise less than 5% of the land area.

2.3 SOCIAL CHARACTERISTICS

2.3.1 *Household Structure*

The average number of individuals per household in Qena Governorate is 5.0, varying from 4.8 in urban areas to 5.2 in rural areas. The residential density rate or the number of individuals per room may be negatively correlated between socio-economic conditions and standards of living. The average for Qena Governorate is 1.41, varying between 1.44 in rural areas and 1.31 in urban areas. Approximately 11% of households are estimated to be female-headed households, a social group considered to be particularly vulnerable.

2.3.2 *Age and Sex Structure*

The data for age structure in Qena shows that most half the population (51%) are in the 15-59 age group, and just over 42% under the age of 14. Approximately 19% of the population are in the 0-6 years age group. Approximately 66% of the population are married.

The sex structure of Qena Governorate is quite keenly balanced with approximately 49.7% of the population being female. There are small variations between Markazes and between urban and rural areas.

2.3.3 *Education*

In Egypt, adult illiteracy rates decreased from 55.4% to 39.2% over the period 1976 to 1996. This downward trend is matched in Qena Governorate as shown in *Table 2.2*.

However illiteracy rates in the Governorate remained on average slightly over 50% in 1996; Central Agency for People Mobilisation and Statistics (CAPMAS) figures from 1999 also indicate that levels of illiteracy in Qena are still slightly over half the population with the average for the Governorate at 51.76% and ranging from 65.13% in Abu Tesht to 37.49% in Qeft. In all parts of Qena, illiteracy rates are markedly higher in rural areas than in urban areas. Illiteracy rates across the Governorate are illustrated on *Map 4*.

Map 4 Illiteracy as a Percentage of Population Over 10 Years Old in Qena Governorate

Table ٢.2 *Comparative Education Data (1976, 1986 and 1996)*[1]

Number of Population (> 10 years old)	1976	%	1986	%	1996	%
Illiterate	880,297	72.1	1,014192	63.0	878,747	50.1
Read & Write	190,825	15.6	336,764	21.0	449,856	25.7
University Graduate	141,397	11.6	230,422	14.3	386,142	22.0
University Post-Graduate	7,633	0.6	24,726	1.7	37,760	2.2
Total	1,220,152	100	1,606,104	100	1,752,405	100

2.3.4 Housing Conditions and Access to Services

Housing conditions are key indicators of socio-economic development. Poor and vulnerable communities and households often lack access to utility services. A brief summary of people's access to the key utility services is given below.

Access to Water

In Qena approximately 60% of water supplies are derived from the River Nile and approximately 40% from groundwater sources. The provision of water supply is described in more detail in *Section 3*. This section will describe people's access to water in or near the home.

Generally, people's access to water may be through treated, piped water (either in their home, in their building or outside their building), from a hand pump or from "other" sources i.e. from a well, directly from the Nile or from irrigation canals etc. The distribution of people with no access to water in the home is shown in *Map 5*. A summary of different modes of access to water is given in *Table 2.3*:

[1] Central Statistics Department

Table ٢.3 Access to Water by Markaz in Qena Governorate (% of population) [1]

Markaz	Piped Water Inside Home	Piped Water Inside Building	Piped Water Outside Building	Piped Water Total	Hand-Pump	"Other"	Non-Piped Water Total
Qena	52.22	15.00	4.23	71.45	26.39	2.17	28.56
Naga Hammady	44.69	15.89	4.54	65.12	31.91	2.98	34.89
Qus	42.85	15.55	4.35	62.75	36.19	1.05	37.24
Abu Tesht	32.37	12.71	3.03	48.11	50.05	1.84	51.89
Isna	57.77	26.00	7.00	90.77	7.76	1.47	9.23
Dishna	27.33	15.07	4.04	46.44	52.08	1.48	53.56
Armant	55.81	9.62	7.96	73.39	22.55	4.06	26.61
Farshut	42.64	18.21	3.10	63.95	32.37	3.69	36.06
Naqada	42.50	12.85	2.77	58.12	39.57	2.31	41.88
Qeft	63.77	26.40	3.52	93.69	5.80	0.51	6.31
El Waqf	22.28	20.37	1.82	44.47	53.65	1.88	55.53
Average	44.02	17.07	4.21	65.30	32.57	2.13	34.70

[1] CAPMAS, (1999)

Map 5 No Water Access (in house) as a % of the Population in Qena Governorate

Access to electricity

Every village in Egypt has access to electricity and electric light. However, not every household has access to electricity in their homes. In Qena nearly 94% of the population has access to electricity in their homes. A summary of access to electricity in the home across the different Markazes is given in *Table 2.4* :

Table ٢.4 Access to Electricity in the Home by Markaz in Qena Governorate (% of population)[1]

Markaz	Access to electricity (%)
Qena	95.11
Naga Hammady	94.55
Qus	94.57
Abu Tesht	91.89
Isna	96.34
Dishna	92.32
Armant	95.20
Farshut	95.38
Naqada	93.10
Qeft	96.64
El Waqf	87.01
Average	93.83

Access to Sanitation

At present, the only sewerage network of any substance in Qena Governorate is in Qena City itself. The network in Qena is so connected to a Municipal Sewage Treatment Works, the only centralised sewage treatment works in the Governorate. Other smaller sewerage networks do exist, however, they are connected to communal septic tanks or partial treatment and soak away systems.

Approximately 73% of the Governorate's population are not connected to any type of sewerage network. The figure ranges from nearly 86% of the population in El Waqf to just under 38% in Qena.

2.3.5 Poverty Indicators

Poverty is not simply an issue of income. When asked, the poor people themselves highlight a range of other issues such as health, safety, education food and basic services. They also talk about their vulnerability and their

[1] CAPMAS (1999)

exclusion by state and society. People's experience of poverty may also vary greatly.

Issues such as illiteracy and access to water may be used as poverty indicators and give an indication of relative poverty rather the actual income. Combining just two indicators, illiteracy and no access to water in the home, the distribution of poverty in the Governorate of Qena is illustrated on *Map 6*.

2.3.6 Health

Life Expectancy

Life expectancy at birth is so one of the basic indicators of human development. At a national level, life expectancy in Egypt in 1998 was 66.9 years. This figure increased markedly from 1976 when the average life expectancy was 55.0 years, reflecting the improvement in health status. For Qena Governorate, life expectancy in 1998 was slightly below the nation average at 65.8 years, compared to 53.6 years in 1976.[1]

Mortality

Mortality rates in Qena Governorate in 1999 were 6.96 per 1000 for the total population, comprising 6.76‰ for urban areas and 7.43‰ for rural areas. These compare to a crude death rate in 1998 for Egypt of 6.5‰ and for Upper Egypt of 7.2‰.

If data for Qena is disaggregated, the highest rate was in Armant (9.16‰) followed by Farshut (9.14‰) and Naqada (8.49‰), whereas lowest rates were represented in Dishna (1.87‰) and Qus (1.99‰). The variability between highest and lowest rates within Qena Markazes appears high, although the reliability of the data is not known and differs from data collected at the Markaz level. *Table 2.5* summarises the rates across all the Markazes in Qena.

[1] EHDR, 1998/99, p.148.

Table ٢.5 Mortality Rates (‰) by Markaz in Qena Governorate (1999) [1]

MARKHAZ	Urban	Rural	Total
Qena	1.01	2.02	3.03
Naga Hammady	1.01	2.04	3.05
Qus	0.83	1.16	1.99
Abu Tesht	1.23	1.15	2.38
Isna	1.00	1.10	2.10
Dishna	0.32	1.55	1.87
Armant	4.04	5.12	9.16
Farshut	3.01	6.13	9.14
Naqada	3.26	5.23	8.49
Qeft	2.20	4.51	6.71
El Waqf	1.02	3.13	4.15
Total	6.76	7.43	6.96

Child Mortality

According to EHDR 1998/99, Child mortality rate per 1000 live births dropped to 39.1 in 1998, from 80.0 in 1961. In Qena, female child mortality rates were lower than males in the age group less than 28 days, but higher in the age group 28 days to one year. Child mortality rates for age one to five years as well as total child mortality rates in Qena are approximately equal for females and males.

[1] IDSC - 1999

Map 6 ***Poverty Indicators (Illiteracy and No in House Access to Water) in Qena Governorate***

Table ٢.6 Comparative Child Mortality Rates (‰ Live Births) by Age in Qena Governorate [1]

Qena Governorate	1998	1999	2000
< 7 days	3.30	3.80	3.80
7 – 28 days	3.08	3.09	3.80
28 days – < 1 year	28.90	26.20	24.50
1 year - < 5 years	13.22	11.52	9.70

The highest rate (over 4 ‰) is in Naga Hammady (4.19 ‰), whereas the lowest rate is in Qeft (2.09‰). The highest total female child mortality rates were in Naga Hammady and Dishna (2.1 ‰ each) followed by Abu Tesht (2.0 ‰), whereas the lowest rates were represented in Qeft and Armant (1.1‰).

Table ٢.7 Child Mortality by Markaz in Qena Governorate (2000) [2].

MARKAZ	Live Births (Total)	Mortality < 28 days (%)	Mortality 28 days - 1 year (%)	Mortality 1 year - 5 years (%)	Mortality Total (%)
Qena	15,363	0.944	1.419	0.696	3.059
Naga Hammady	13,212	1.143	2.157	0.893	4.193
Qus	10,843	0.682	1.872	0.867	3.421
Abu Tesht	11,388	0.255	2.520	0.913	3.688
Isna	10,092	0.139	2.259	0.931	3.329
Dishna	11,529	0.373	2.472	1.050	3.895
Armant	4,506	0.755	1.332	0.666	2.753
Farshut	4,599	0.674	2.066	1.065	3.805
Naqada	3,902	0.538	2.255	0.589	3.382
Qeft	3,693	0.433	1.164	0.487	2.085
El Waqf	2,046	0.538	1.857	0.684	3.079
Total	91,173	0.624	2.007	0.847	3.478

Maternal Mortality

No data are available for maternal mortality rates at a Governorate level, however the average for Upper Egypt was 92 per 100,000 live births in 1998, slightly lower than the nation average of 96, (91 in Lower Egypt and 122 for Urban Governorates).

[1] Department of Health – Qena Governorate

[2] IBID

Morbidity

According to Health Directorate of Qena Governorate for the year 2000, some diseases were recorded in addition to their associated mortality cases. Among 587-recorded cases of Hepatitis, 7 people died, and from 2214 cases of Pneumonia there were 6-recorded deaths. In addition there were 337-recorded cases of Typhoid and 430 of BCG.

Table ٢.8 Morbidity Data by Markaz in Qena Govornorate (July 2000) [1]

Disease	Qena	Naga Hamm-ady	Qus	Abu Tesht	Isna	Dishna	Armant	Farshut	Naqada	Qeft	El Waqf	**Total**
Leprosy	18	339	8	33	23	9	4	25	1	2	9	471
Hepatitis C	39	70	19	13	43	17	24	0	18	0	2	245
TB	35	29	13	26	5	15	8	0	2	1	3	146
Typhoid	18	2	23	14	33	21	10	0	4	2	0	130
Measles	2	2	0	31	0	1	0	9	1	0	0	37
Dysentery	0	0	7	0	2	0	0	0	19	0	1	29
Tetanus	2	2	3	0	0	4	0	1	0	0	0	12
Polio	0	1	2	1	1	1	0	1	0	0	0	7
Brucelosis	2	0	0	0	0	1	0	3	0	0	0	6
Meningitis	0	0	0	0	0	3	1	0	0	1	0	5
Cholera	0	0	0	0	0	0	0	0	0	0	0	0
Diphtheria	0	0	0	0	0	0	0	0	0	0	0	0
Mumps	0	0	0	0	0	0	0	0	0	0	0	0
Rubella	0	0	0	0	0	0	0	0	0	0	0	0
Malaria	0	0	0	0	0	0	0	0	0	0	0	0
Rabies	0	0	0	0	0	0	0	0	0	0	0	0
HIV/AIDS	0	0	0	0	0	0	0	0	0	0	0	0

2.4 ECONOMIC CHARACTERISTICS

2.4.1 *Gross Domestic Product, Income Distribution and Poverty*

Gross Domestic Product (GDP), gives an indication of the total value of goods and services produced within an economy, in this case within Qena Governorate, utilising both nation and foreign resources. There is great difficulty in obtaining GDP figures, segregated by sector, for Governorates in Egypt. In case of Qena there is an addition problem, in that all the figures available regarding GDP and income for Qena are inclusive of Luxor city, in spite of the fact that it is administratively independent. This gives a somewhat misleading picture of the Qena economy, as Luxor city generates a significant income from the tourism sector. There is only one record of GDP in Qena by sector (inclusive of Luxor) for the year 1997 and it is presented in *Table 2.9*:

[1] Department of Health - Qena Governorate

Table ٢.9 ***GDP Segregated by Sector in Qena Governorate (1997)*** [1].

Sector	Total Value (Million L.E.)	Total Adjusted Value (Million L.E.)[2]	% Of GDP3
Agriculture (A)	1,366.8	1,366.8	36.60
Manufacturing (M)	584.6	584.6	15.66
Construction (C)	137.1	137.1	3.67
Transportation and Communication (T&C)	295.9	295.9	7.92
Financial Services (FS)	212.3	212.3	5.69
Government & Person Services (G&PS)	697	697	18.67
Electricity and Water (E&W)	249.1	249.1	6.67
Trade, Restaurants and Hotels (T&R&H)	957	191.4	5.13
Total	4,499.8	3,734.2	100

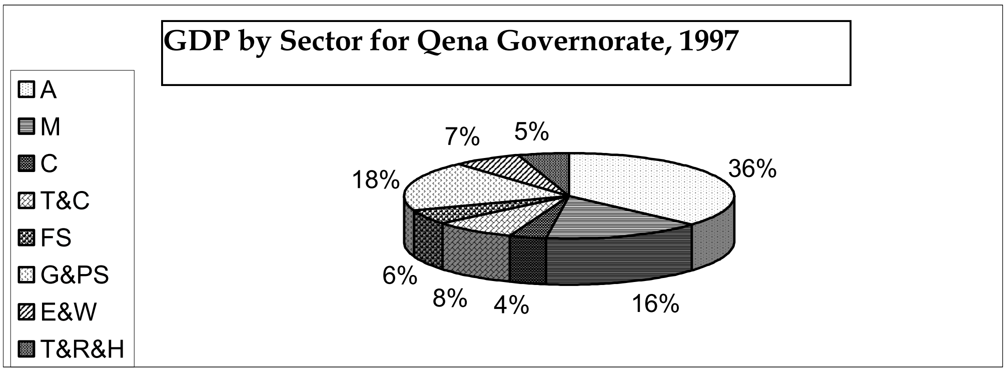
According to the previous table, GDP in Qena Governorate amounted to 4,499.8 m E£ in 1997. However in an attempt to acquire a more realistic estimation of the GDP in Qena Governorate only, we may assume that around 20% of the income from trade, restaurants and hotels is obtained from economic activities in Qena, while the rest is generated within Luxor city (as a result of tourism activities). This will reduce the figure associated with this sector to 191.4 million. According to this assumption, an adjusted calculation of the GDP in Qena will yield a total of E£ 3,734.2 m.

According to this new calculation, agriculture is the major sector contributing approximately 36.6% of GDP, followed by government & personal services 18.67% and then manufacturing 15%. Construction contributes only 3.6% of GDP, followed by trade, restaurants and hotels (5.13%). The following pie-chart illustrates GDP by sector.

[1] El-Kelany El-Sayed, Evaluation of Regional Incomes in Egyptian Governorats – Instiitute of Naional Planning, Unpublished study

[2] Assumed more realistic estimation of GDP

Figure 1 *GDP by Sector in Qena Governorate (1997)*



The Human Development Report of Egypt (1998/1999), provides an account of GDP per capita at the Governorate level which is shown in *Table 2.10*.

Table ٢.10 ***Income Distribution and Poverty in Egyptian Governorates*** [1]

Governorate	GDP/Capita (L.E.)	Ranking
Port-Said	10536	1
Cairo	8854.3	2
Suez	7974.2	3
Alexandria	7024.7	4
Damietta	5443.5	5
Giza	5358.5	6
Ismailia	5215.7	7
Qalubia	4695.4	8
Gharbia	4628.3	9
Kafr El–Sheikh	4387.1	10
Aswan	4163.1	11
Beheira	4069.3	12
Dakahleya	3808.7	13
Minoufia	3668.5	14
Sharkia	3641.7	15
Minya	3627.1	16
Qena	**3422.6**	**17**
Fayoum	3146.1	18
Beni Suef	2900.9	19
Sohag	2854.6	20
Assiut	2620.2	21
Red Sea	NA	NA
New Valley	NA	NA
Matrouh	NA	NA
North Sinai	NA	NA
South Sinai	NA	NA

In terms of GDP/ capita - and in spite of the fact that Luxor city is included in the data for Qena Governorate (in the above table), Qena ranks number 17 out of 21 other Governorates in Egypt (data is not available for 5 Governorates as indicated in the table) with GDP/capita of 3,422.6 Egyptian Pounds or approximately $US 1,000 using approximate exchange rates for the time. In terms of GDP and income, Qena Governorate is one of the lowest among all of the 26 Egyptian Governorates.

[1] Human Development Repornt on Egypt (1998-1999)

PART II

STATUS OF THE NATURAL ENVIRONMENT

3 GEOLOGY, GEOMORPHOLOGY AND LANDSCAPE

3.1 REGIONAL GEOLOGICAL SETTING

The Governorate of Qena is located in the Nile Valley area of Upper Egypt and occupies a portion of a sub-regional sedimentary basin known as the Assiut Basin. The sedimentary basin has a depth of over 3 km above the basement rocks. The basin is a portion of the western structure of the Arabian-Nubian Massif and the regional dip is in a western direction.

In the Assiut Basin, carbonate rocks belonging to the Eocene and Upper Cretaceous period dominate the top portion of the sedimentary section. The lower section is mainly composed of clastic rocks belonging to the Mesozoic and to the Paleozoic - the Nubian sandstone complex. The sedimentary section is locally overlain by Neogene clays from the Pliocene and Quaternary fluviatile deposits of sand, gravels and silty clays. The discontinuous uplifting of the sedimentary and the underlying basement rocks caused several cracks and fissures to the west of the uplifting. The basin is affected by tensile stresses that are responsible for the formation of a complex fault system.

3.2 GEOLOGY OF THE QENA AREA

Map 7 shows part of the geology of the Qena "quadrangle" of Egypt, including most of the Governorate. In the Qena area, the stratigraphy of the surface and near-surface sedimentary succession is differentiated into the following units (from the surface):

3.2.1 *Holocene Unit: Silty Clay (Neonile deposits)*

This unit is represented by the top silty clay layers of the Nile in addition to the young outwash deposits of the desert wadis. The silty clay layer has a thickness varying from 1 m to 14 m in thickness, which acts as a semi-confining medium to the main aquifer of the Nile Valley or an aquitard. The present wadi beds becoming locally mixed with shifting sands form the outwash deposits. They extend to the present flood plain and become intercalated with the silty clay. Locally, these may become developed into playa-like deposits.

3.2.2 Late Pleistocene Unit (Prenile deposits)

Composed of sands and gravels with clay interbeds with an exposed thickness of about 30 m (Qena Formation) and extends into the subsurface bow the silty-clay layer. In the Isna area, this unit has a maximum reported thickness of about 120 m and forms the main Quaternary aquifer in the Nile valley. This unit is widely exploited for sand in the Qena area.

Map 7 Geological Map of Qena Governorate

3.2.3 Plio-Pleistocene Unit (Protonile-Prenile deposits)

Composed of clays, sands and gravels and locally capped by travertine beds. The exposed thickness of this unit is about 60 m and continuing into the sub-surface, becoming dominated by clay and sand. This unit acts as another aquifer, but is of secondary importance because of the low productivity and the relatively high salinity of the water.

3.2.4 Pliocene Unit (Paleonile deposits)

Dominated by clays with some inter-bedded sands, mainly in the sub-surface. Overlies the eroded surface of the Eocene carbonates and acts as an aquaclude for the overlying Quaternary aquifer.

3.2.5 Eocene Unit

Made up of karstified chalky and dolomitic limestone and marls with flint bands and nodules, having an exposed thickness exceeding 200 m. Generally exposed more in the western direction. The sedimentary section has a thickness of about 2000 m and is underlain by basement rocks. The section is dominated by carbonate beds in the upper portion and by sandstone and shale beds in the lower portion. Unconsolidated Quaternary deposits dominate the surface. The limestone is fissured and acts as another aquifer, however, it has not been well assessed and is consequently not well exploited.

3.2.6 Palaeocene-Late Cretaceous Unit

Dominated by shales with thin interbeds of chalk and phosphate. Generally acts as an aquaclude separating the Eocene fissured carbonate aquifer from the Nubian aquifer bow (the Upper Cretaceous fissured carbonate aquifers are missing in the south of the Governorate). This unit has a thickness of about 400 m.

3.2.7 Upper Cretaceous-Paleozoic

Sandstone with shale interbeds having an exposed thickness of about 300 m. In the sub-surface the thickness may reach 1000m. Locally exploited via small scale quarrying.

3.2.8 Pre-Cambrian

Composed of highly fractured igneous and metamorphic rocks with a very limited distribution at the surface, however very widespread at depth.

3.3 GEOMORPHOLOGY

Qena comprises two main geomorphological units: the alluvial plain and the structural plateaux.

3.3.1 *Alluvial Plains*

The alluvial plains may be divided into the young alluvial plains and the old alluvial plains. The young alluvial plains occupy much of the present flood plain of the Nile and are underlain by a silty clay layer. The surface of this plain is generally flat and slopes very gently in a northerly direction with a ground elevation of about 80 m Above Mean Sea Level (AMSL). The present river channel of the Nile is incised into the silty clay layers, generally to the eastern side of the valley.

Erosion of Nile banks and deposition of eroded material has become a major problem on the Nile in recent years. Increased human intervention in the river channel and the flood plain includes constructing bank protection measures and other structures such as new road bridges and has lead to the instability of the river channel with some areas actively eroding and others becoming areas of deposition. The construction of the Aswan High Dam and barrages along the course of the Nile has greatly influenced the stability of the channel.

The old alluvial plain occupies the outer portions of the valley and extends to the foot slopes of the surrounding escarpments. The surface of the plain is underlain by mixed sand and gravels and is developed into successive terraces rising more than 25 m above the present level of the flood plain. The complex drainage channels or wadis dissect these terraces. The surface is undulating and occasionally covered by shifting sands.

3.3.2 *Structural Plateaux*

The plateaux constitute a portion of the extensive calcareous plateaux on the western side of the Red Sea hills. The Nile valley or trough incises through these plateaux with a difference in relief of over 100 m. The surface of these plateaux is rough and is underlain by weather resistant limestone forming a typical hamada or rocky desert. The plateaux terminate with fault-controlled escarpments, which may rise abruptly or gently from the alluvial plains. The surface of the plateaux is dissected by dry drainage lines, which were active rivers during the wet climatic of the late Tertiary and so during the pluvial phases of the Quaternary. The alluvial fans developed by such drainage network are essentially hidden under the present floodplain.

3.4 LANDSCAPE

Map 8 is a topographical map of Qena Governorate and indicates the main physical features. The Qena area may be divided into three main physiographic units:

- The Nile Valley;
- Neogene and Quaternary sediments; and
- The Upper Cretaceous and Lower Tertiary sequence.

Map 8 Topographical Map of Qena Governorate

3.4.1 *Nile Valley*

The Nile Valley separates the Eastern Desert and the Western Desert and has two main components, the river channel itself and the flood plain. The Nile Valley is bounded on both sides by norm faults and is in effect a rift valley with the River Nile occupying the deepest part of the valley. The complex geologic history of faulting and tectonic activity was so responsible for the formation of the Qena bend, or the giant meander-like deviation in the River's course from its predominantly north-south direction. The modern course of the river is characterised by a meandering topography and inter-channel islands. Very few of these islands existed prior to construction of the Aswan High Dam and they now cover large areas above the annual high water level, are cultivated and many of them are still enlarging. The majority of islands have formed since the construction of the high dam and vary in size from 200 m^2 to over 1,500 m^2. The modern flood plain is represented by the fertile silt layers of agricultural land on both the eastern and western banks of the Nile. The land is at an elevation of between 3m and 6 m above the mean level of the Nile. The width of the flood plain varies from less than 2 km in the south to over 20 km in the north. The vast majority of people have settled in the Nile Valley. Low terraces and small hills lie alongside the cultivated area of the valley; these terraces and hills are covered in Neogene and Quaternary sediments.

3.4.2 *Plateaux*

The Upper Cretaceous and Lower Tertiary sequence characterises the plateaux either side of the Nile from the oldest Nubian Sandstone to the most recent limestone of the Thebes Formation. This is best represented by the steep and dramatic limestone cliffs to the north of Naga Hammady, which are one of the most striking landscape features in Upper Egypt. To the north east of Qena City further precipitous cliffs are found which bound the broad plain of Wadi Qena. Wadi Qena is one of the largest wadis in the Eastern Desert and stretches from outside the northern boundaries of the governorate over 150 km southwards to Qena City. The wadi consists of a broad flat valley with well-developed drainage patterns from sub-dendritic to sub-trellis in pattern, which coalesce into relatively few master wadis that flow towards the River Nile. The main road between Qena City and Safaga travels along the southern margins of wadi Qena and then east towards the Red Sea mountains. The Qena-Safaga road area has a long history of tectonic activity dating back to Pre-Cambrian times and fractures range in size from a few millimetres to those, which may be thousands of metres long. The activity has caused problems in the area, damaging telephone lines, water pipes and overhead pylons.

4 WATER RESOURCES, HYDROLOGY AND HYDROGEOLOGY

4.1 SURFACE WATER RESOURCES

4.1.1 Introduction

Water resources in Egypt are restricted to the River Nile, rainfall and flash floods, deep groundwater in the Desserts and Sinai and potential desalination of seawater or brackish water.

4.1.2 Rainfall and Flash Floods

In the majority of the Upper Egypt region, rainfall is extremely scarce. In Egypt, rainfall on the Mediterranean coastal strip decreases eastward from 200 mm/year at Alexandria to 75 mm/year at Port Said. It also declines inland to about 25 mm/year near Cairo. Rainfall occurs only in the winter season in the form of scattered showers and cannot be considered as a dependable source of water, especially in Upper Egypt.

Tables 4.1 & 4.2 show the monthly average meteorological parameters at Aswan (to the south of Qena Governorate) and Luxor (located between Qus and Armant) as a representative for Upper Egypt region. The air temperature reaches over 45 °C during summer season while the rate of rainfall is negligible. The evaporation losses and the rate of evapo-transpiration in Upper Egypt region are higher than those in the Delta region due to the much higher air temperature.

In Upper Egypt, flash floods may occur due to short duration heavy storms that produce large volumes of surface runoff with a high peak discharge value concentrated in a short time. These flood events are considered a significant natural hazard particularly in the Red Sea area and southern Sinai. Many studies have been made to determine possible measures to avoid hazards caused by flash floods and mechanisms have so been developed to harvest floodwaters. This water could be directly utilised to meet part of the water requirements or it could be used to recharge the shallow groundwater aquifers.

There are approximately 266 wadis draining to the Nile Valley in Qena Governorate and these may be divided into two main groups, the eastern group, originating in the Red Sea Mountains and the western group originating from the western desert. The eastern wadis are the most significant with 157 wadis and a total catchment area of about 30,000 km^2 with elevations of up to 1000 m above sea level. The most significant single wadi is

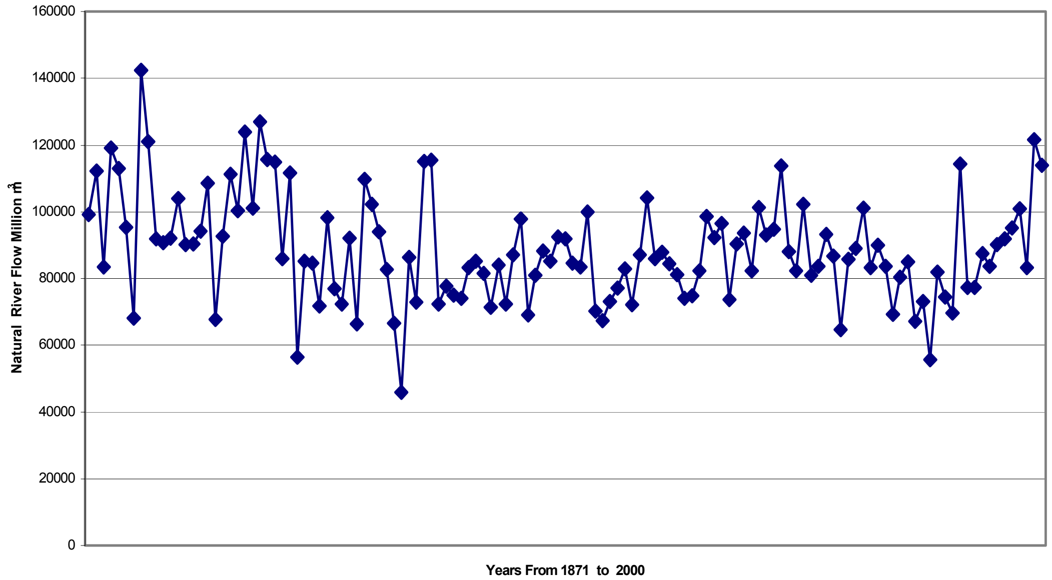
Wadi Qena, one of the largest wadis in Egypt with a catchment area in excess of 16,300 km^2. The wadi drains from the Red Sea Mountains in the east southwards until it meets the Nile, actually draining through Qena city itself. The presence of such a large wadi has necessitated engineering works to form an emergency drainage channel or flood relief channel through the city. Nevertheless, Qena City has been impacted by flash flooding in the past with the most recent significant event occurring in 1996 when widespread flooding of the City occurred after a storm event. *Map 9* shows some of the major wadis and where they meet the Nile Valley.

4.1.3 An Introduction to the Hydrology of the River Nile

Egypt receives about 98% of its freshwater resources from outside its international borders and the River Nile satisfies more than 95% of the various water requirements. The River Nile is the second longest river in the world and is over 6,800 km in length with a basin area of about 3 million square kilometres. The river travels through ten African countries being fed by the two main tributaries, the Blue Nile originating from the Ethiopian Plateau and the White Nile originating from the Equatorial Plateau. *Map 10* shows the extent of the Nile basin or catchment area in Africa.

The average annual yield of the River Nile is estimated at 84 BCM at Aswan, however the discharge of the River is subject to wide season variation. *Figure 2* illustrates the annual river flow for the period 1871 - 1996. The natural river flows may be divided into two main periods, a short 3-month long high flow season characterised by very turbid water and a 9-month long season with lower flows and clear water.

Figure 2 The Nile's Annual River Flow at the High Aswan Dam (1871 -2000)



According to the 1959 agreement with Sudan, Egypt is entitled to 55.5 BCM of the water resource available with 18.5 BCM located to Sudan and an amount of approximately 10 BCM allowed for water losses from the impounded area of the dam.

The HAD was constructed approximately 6 km south of Aswan and commenced operation in 1968. The HAD is the major flow-regulating structure on the River Nile. Downstream from the HAD, the Nile water is diverted from the main channel into an intensive network of irrigation canals to provide water for agricultural use. The surplus drainage water is collected through a network of tile drains and open drains. In Upper Egypt, the majority of the drainage water is returned to the main river channel whereas in the Delta region drainage water is pumped in to the Mediterranean Sea and the northern lakes.

Map 9 Major Wadis in Qena Governorate

Map 10 The Extent of the Nile Catchment Area in Africa

Table ٤.1 Average Monthly Meteorological Data for Aswan City[1]

Parameter	January	February	March	April	May	June	July	August	September	October	November	December
Average Air Temperature (°C)	15.0	17.0	21.8	27.3	31.4	33.5	33.8	33.3	31.4	27.5	21.7	17.1
Maximum Air Temperature (°C)	21.4	23.6	28.7	34.3	38.5	40.6	40.5	39.9	38.4	34.3	28.3	23.3
Minimum Air Temperature (°C)	9.0	10.4	14.8	19.8	24.0	25.9	26.9	26.6	24.4	20.8	15.4	11.4
Relative Humidity (%)	44	34	27	21	19	18	20	22	24	29	37	44
Wind Speed (@2m agl ms^{-1})	3.6	3.6	3.7	3.5	3.5	3.5	3.4	3.1	3.4	3.4	3.4	3.5
Solar Radiation ($C/cm^2/day$	399	479	591	654	649	703	695	659	601	503	431	393
Rainfall (mm)	1.1	0	0.2	0	0	0	0	2.7	0	0.7	0.8	0.2

[1] Baseline study for water resources in Qena Governorate (SEAM Document - 2001)

Table ٤.2 Average Monthly Meteorological Data for Luxor City[1]

Parameter	January	February	March	April	May	June	July	August	September	October	November	December
Average Air Temperature (°C)	13.6	15.5	20.2	25.7	29.9	32.1	32.3	31.9	29.8	25.6	19.8	15.1
Maximum Air Temperature (°C)	22.6	24.9	29.5	35.4	39.3	41.5	41.1	40.5	39.0	34.8	29.1	24.0
Minimum Air Temperature (°C)	5.9	6.9	11.5	16.4	20.7	23.0	23.9	23.6	21.5	17.3	11.7	7.6
Relative Humidity (%)	58	48	40	32	29	28	31	33	37	42	52	58
Wind Speed (@2m agl ms^{-1})	1.3	1.4	1.4	1.5	1.4	1.5	1.4	1.3	1.2	1.1	1.1	1.1
Solar Radiation (C/cm^2/day	374	461	544	613	640	690	685	652	573	491	410	361
Rainfall (mm)	0	1.0	4.0	0	0	0	0	0	0	0	0	0

[1] IBID

Egypt's current water irrigation systems were developed over the last 150 years and a series of barrages have been developed to control water levels commencing with the completion of the Old Delta Barrage in 1861. Seven major operation control structures now exist downstream of the HAD and serve about 13 principal gravity canals which account for about 80% of irrigation water delivery from the main river channel. Virtually l of the rest of the water is pumped. *Table 4.3* below summarises the main regulatory structures that exist on the River Nile.

Table ٤.3 Regulatory Structures on the River Nile Downstream of the High Aswan Dam [1]

Structure	Chainage D/S of HAD (km)	Date of Completion	Date of Modification
Old Aswan Dam	6	1902	1912 & 1933
Old Isna Barrage	170	1908	1948 (now obsolete)
New Isna Barrage	171	1994	-
Naga Hammady Barrage	359	1930	-
New Naga Hammady Barrage	363	** Construction due to Commence 2002**	
Assiut Barrage	549	1902	-
Old Delta Barrage	950	1861	1901 (now obsolete)
New Delta Barrage	950	1939	-
Zifta Barrage	1045 (Damietta Branch)	1902	1954
Edfina Barrage	1170 (Rosetta Branch)	1950	-

Each of the structures is significant in controlling both water and hence volumes of water discharged downstream. Water sourced from the Nile is ultimately l controlled from HAD, however each individual structure maintains levels for users with water intakes upstream as well as discharging sufficient water for users downstream.

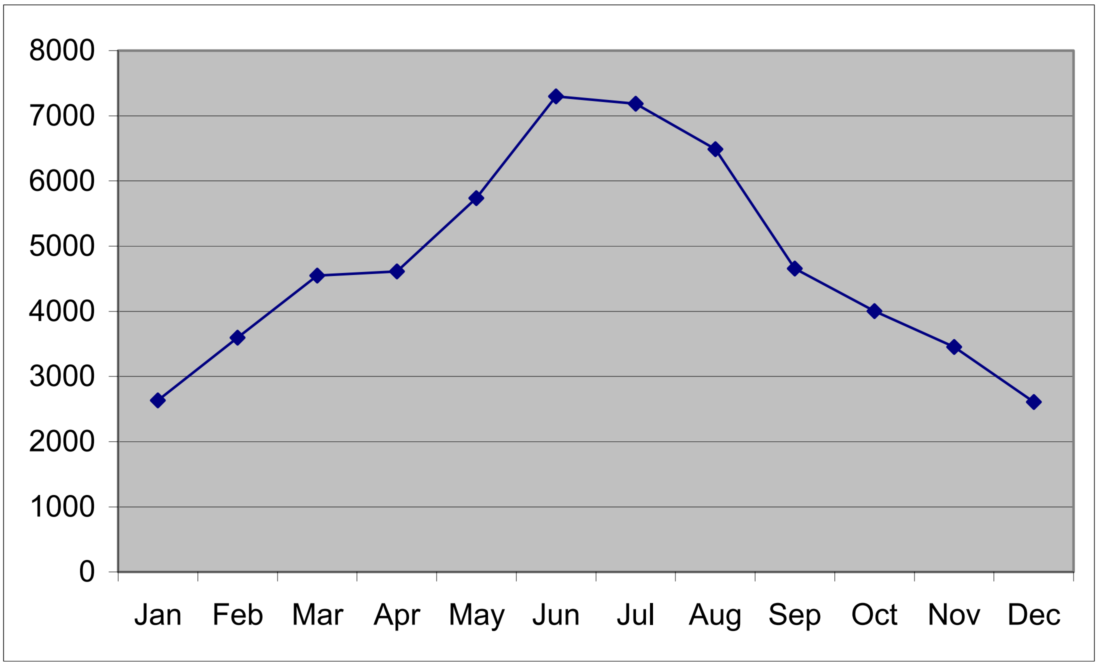
The flow of water in the Nile has been fully controlled by Egypt since construction of the HAD and the average annual releases are managed in order not to exceed the agreed quota. In some periods, such as 1998-1999 the Nile basin received high floods and more water was released in order to ensure safe storage levels in the impounded area of the dam were not exceeded. More than 66 BCM of water was released in 1999. The excess water was used to flush the Nile River channel.

Figure 3 shows the monthly variation in releases from the HAD, from 2.6 BCM/month during the low demand period (December-January), to more than 7 BCM/month during the high demand season (June-July).

[1] Baseline Study for Water Resources in Qena Governorate (SEAM Document – 2001)

Water levels fluctuate in Lake Nasser according to the inflow to the lake from the upper Nile basin and the volume of water released downstream of the

Figure 3 *Average Monthly Discharges (BCM) Downstream of the High Aswan Dam*



HAD. Lake Nasser reached its lowest recorded level in 1988 of 150.5m. The lake level fluctuates during the year generally reaching its minimum level during July or August when demand is at its highest and reaching its peak storage capacity during November to January when resource requirements are at a minimum. The annual variation between the maximum and minimum levels varies from 5 to 20m.

Water is distributed downstream the HAD through a vast irrigation network covering most of the Nile Valley and Delta. The water is released either through a main canal taking its water from the Nile and then feeding secondary canals or through direct abstraction from the Nile through pump stations.

The River Nile downstream HAD can be divided into 4 main reaches before it is divided at Cairo into the two main branches of Rosetta and Damietta. The first reach is from the HAD to Isna Barrage with a length of 167 km. There are no irrigation canal intakes on this reach as the water is pumped directly from the river via 69 pumping stations.

4.1.4 *The River Nile in Qena Governorate*

Qena Governorate covers a large area of the Nile Valley and extends more than 350 km along the Nile River from Isna to Naga Hammady. The Ministry of Water Resources and Irrigation divides the area into 3 main irrigation inspectorate, Isna, Qena and Naga Hammady, in order to optimise management of water resources and demands.

There are two main canals in Qena that take water directly from the Nile upstream of Isna barrage, these are the Asfoun Canal and the Kalabaya canal. These two canals are used to irrigate the agriculture land between Isna and Naga Hammady barrages together with 9 pumping stations directly on the main channel of the River Nile.

Isna Barrages

The old Isna barrage was constructed in 1908 on the Nile 170 km downstream of Aswan, and 61 km upstream of Luxor, to guarantee basin irrigation in the southern reaches of Upper Egypt. The barrage is composed of 120 gates, each 5.00 m in width separated by piers 2.0m thick to enable the conversion of the surrounding area to a perennial irrigation regime. The barrage was remodelled between 1945 and 1947 to increase the available head from 2.5m to 5.0m.

In 1994 The New Isna barrage was constructed 1.2 km downstream of the existing structure and. The objectives of the new Isna barrage were:

- To ensure improved water regulation for irrigation purposes;
- To avoid discharges through the old barrage and sustain the permissible head (not more than 4.9m);
- To avoid major repair works and maintenance on the old barrage;
- To maintain upstream water levels required for feeding both Asfoun and Kalabaya canals without the requirement for pumping;
- To generate electric energy by utilizing the discharges and the corresponding heads on the barrage;
- To improve navigation facilities by constructing a modern lock with large dimensions (160 x 17m);
- To construct an alternative access road.

For the new barrage, the power plant dimensions are about 92m long x 59.5m, with six turbines and a maximum power output (installed capacity) of 13 MW each. The water levels upstream of Isna barrage fluctuate between 79.50 m and 77.0 m during the year while the down stream levels fluctuate between 75.50 m and 74.60 m.

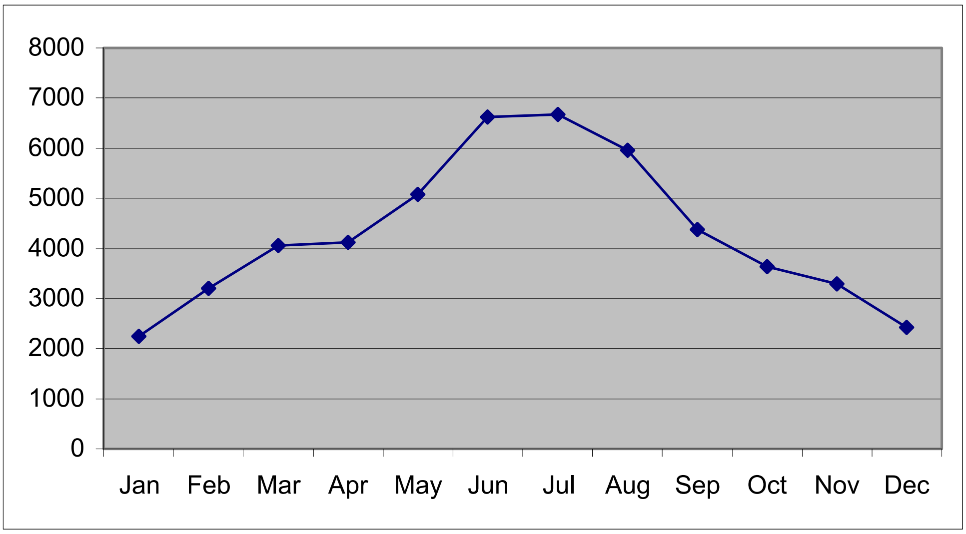
Figure 4 shows the monthly discharge at Isna barrage where it varies from 2.2 BCM/month during the December to January period to 6.6 BCM/month during June and July.

Naga Hammady Barrage

Naga Hammady Barrage was constructed between 1927 and 1930 with the objective of further developing and expanding the cultivated areas of Upper Egypt. It is located midway between Isna and Assiut barrages (360 km north of Aswan). Two head regulators for two main canals called East Naga Hammady and West Naga Hammady were also constructed.

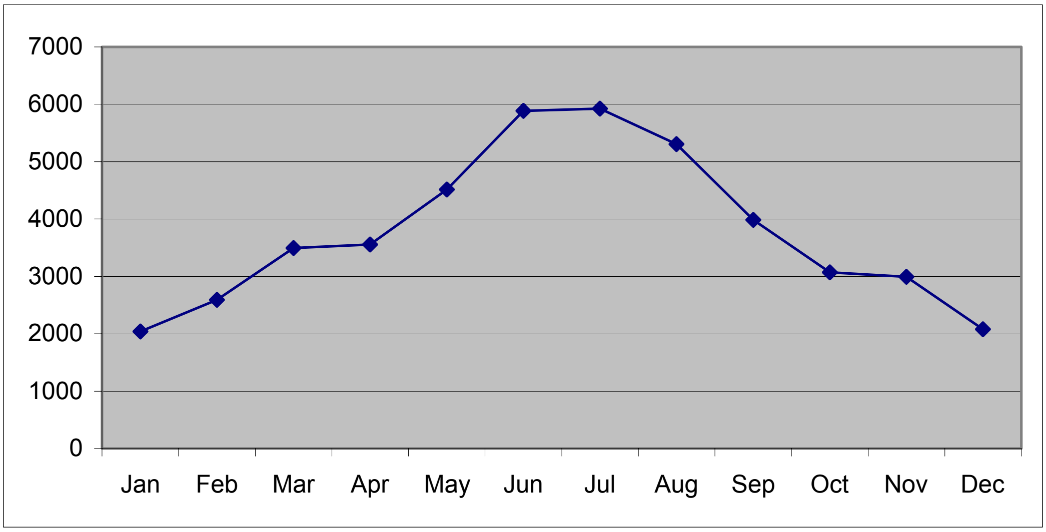
The barrage was designed to sustain a maximum head of 4.5m and consists of 100 gates of 6m width each separated by piers of 2m thick.

Figure 4 ***Average Monthly Releases Downstream of the Isna Barrage (1991-99)***



The bed level at the barrage intake is 60.5m above MSL. The water levels upstream of the barrage fluctuate between 65.50 m and 61.0 m during the year while the down stream levels fluctuate between 62.20 m and 58.50 m. The monthly average discharges at Naga Hammady barrages are shown in *Figure 5*.

Figure 5 *Average Monthly Releases Downstream of the Naga Hammady Barrage (1991-99)*



Due to degradation and the drop of downstream levels after the construction of the HAD, a new lock was constructed in 1990 on a diversion next to the existing one. The new lock is 150 m long and 17m wide with a sill level of 55.40m (lower than the floor level of the old one by 3.1m) to cope with the present and any future drop of water levels due to degradation and allow easy access for navigation purposes.

Naga Hammady barrage has functioned for over 70 years providing an irrigation water supply for a very large agricultural area with significant economic benefit estimated in excess of US$500 million. The structural condition of the barrage was investigated and declared in need of refurbishment and MWRI have commissioned the construction of new barrage with the added benefit of hydropower generation rated at 65 MW.

The location of the new barrage was selected some 3.2 km downstream of the existing barrage, in a narrow bend of the river. The selection of this site resulted from geotechnical investigations that revealed that only this site had a clay layer at depth suitable for the area of the construction pit required. The new barrage will consist of a sluiceway , a powerhouse with 4 bulb turbines and a navigation lock. A public road bridge will also be established on the barrage.

The main environmental effects of the project are that the presently lower head pond level will be re-established at 65.9 Above Mean Sea Level (AMSL), which is equivalent to the design level of the original barrage. The groundwater levels and drainage are being monitored and improvements will be made to eliminate any negative effects after project implementation. The water level between the old barrage and the new structure will be increased to 65.9 AMSL. There will be a net gain of approximately 100 hectares of agricultural land from the project from the backfilling of an old flood channel branch of the River to the east of Dom Island. However, permanent and temporary land acquisition will require mitigation measures and permanent re-location of people.

4.1.5 Asfoun and Kalabaya Canals

Qena Governorate is supplied with Nile water through the two main canals, the Asfoun Canal and the Kalabaya Canal which both abstract water from the main river channel upstream of the Isna Barrages. *Map 11* shows the irrigation system for the Governorate.

The Asfoun Canal is located on the western side of the River Nile to irrigate approximately 68,879 Feddan of agriculture land west of the Nile. Its total length is about 126 km with 5 regulators dividing it into 6 reaches:

- The Nile intake to El Rayaina Regulator (38.0 km);
- El Rayaina Regulator to El Faddaliya Regulator (18.10 km);
- El Faddaliya Regulator to Danfiq Regulator (19.7 km);
- Danfiq Regulator to Toukh Regulator (14.76 km);
- Toukh Regulator to Taramsa Regulator (22.24 km); and
- Taramsa Regulator to the end of the canal (13.0 km).

The Kalabaya Canal runs parallel to the eastern bank of the Nile for a length of 163 km and irrigates approximately 174,515 Feddans of agricultural land east of the Nile. The canal may be divided into 8 reaches:

- The canal intake to Kebah Regulator (28.0 km); a secondary canal abstracts water from this reach via the El Mahala Pumping Station;
- Kebah Regulator to El Hebail Regulator (24.8 km); a secondary canal abstracts water from this reach via the El Hebail Pumping Station;
- El Hebail Regulator to Shanhur Regulator (22.8 km); two secondary canals abstract water from this reach: Hegaza Canal and Abu El Goud Canal;
- Shanhur Regulator to Qeft Regulator (14.84 km);
- Qeft Regulator to El Ashraf Regulator (14.11 km);
- El Ashraf Regulator to Ghousa Regulator (27.45 km);
- Ghousa Regulator to Dishna Regulator (14.77 km) and
- Dishna Regulator to Taref Regulator (17.52 km) including the Hammady Pumping Station.

Map 11 The Irrigation System in Qena Governorate

4.1.6 *Pumping Stations*

There are 2 irrigation pumping stations take its water directly from the Nile upstream of Isna Barrage just on the border between Aswan and Qena Governorates:

- El Namasa Pumping Station on the western side of the Nile supplies El Ramady Canal (26.6 km) which irrigates 49,975 Feddans; and
- Old El Kalabaya Pumping Station on the eastern side of the Nile supplies the Old Kalabaya Canal (12.15 km), which irrigates 6,570 Feddans.

A further 7 pumping stations on the reach Isna – Naga Hammady reach abstract water directly from the Nile for irrigation purposes, 5 of them on the west bank and 2 on the east bank:

West Bank

- El Ghorera and El Malaha pump stations feed the Asfoun can;
- El Marashda supplies El Ranan Canal;
- El Derbi supplies the East El Ranan Canal; and
- Abu Hommar supplies Tarad Abu Hommar Canal.

East Bank

- El Bayadia supplies El Alyaa Canal; and
- El Shanhourya supplies El Kalabaya Canal.

Two main canals abstract water upstream of Naga Hammady Barrage and chiefly supply the irrigated areas of Sohag governorate. However, a small area in the north of Qena Governorate adjacent to the border with Sohag governorate is supplied from West Naga Hammady Canal.

The total annual volume of water abstracted from the Nile in Qena Governorate is 3.593 Billion cubic metres per year, *Box 4.1* summarises the different sources of this water.

Table ٤.4 Total Annual Surface Water Abstraction in Qena Governorate

Kalabaya Can	1.306 BCM/year
Asfoun Can	0.524 BCM/year
Pumping Stations (Upstream Isna Barrage)	0.718 BCM/year
Pumping Stations (Isna - Naga Hammady)	1.045 BCM/year
Total Surface Water Abstraction	**3.593 BCM/year**

4.2 GROUNDWATER RESOURCES

The Geology of Qena was described in *Section 3* and *Map 7* illustrates the main geological units in Qena Governorate and the main geological boundaries of the various groundwater aquifers. The following is a brief description of the characteristics of each aquifer and its potential for development in terms of a water resource.

4.2.1 *The Nile Valley Aquifer System*

The Nile Valley aquifer system is composed of Quaternary and Late Tertiary sand and gravel beds intercalated with clay lenses. The aquifer thickness decreases from 300 m at Sohag to a few meters near Cairo (north) and near Idfu (south). Pliocene clays, generally considered as the impervious base of the aquifer, underlie the aquifer.

The existence of a hydraulic connection between the Nile Valley aquifer and the Nubian sandstone aquifer is still under investigation. The hydraulic contact between both aquifers may exist through fault zones. The same holds for the hydraulic connection between the Nile Valley aquifer and the bordering limestone later boundaries.

The Nile Valley aquifer is most separated from the Nile Delta aquifer as the thickness of the water bearing formation reduces to few meters at Cairo. This is due to continued up folding activity in the post-Eocene times.

The Nile Valley aquifer and the southern part of the Nile Delta aquifer are highly productive and contain generally fresh water (TDS<l000 ppm).

4.2.2 *Nubian Sandstone Aquifer System*

The Nubian Sandstone aquifer system is part of a regional hydrogeological system with extensions into Libya, Sudan, and Saudi Arabia. Within Egypt, the aquifer can be distinguished into five sub-basins:

- In the Western Desert, the Nubian Sandstone aquifer system consists of alternating beds of sandstone and clay, separating the aquifer into a multi-layer aquifer. Groundwater flow is towards the north with an average gradient of 0.5 m/km;

- In Aswan area and its extension southward, the Nubian sandstone aquifer is exposed and is considered a portion of the regional aquifer system in the Western Desert. To the north, the aquifer is concealed underneath a cover of sedimentary rocks.

- In the Eastern Desert, the Nubian sandstone complex is not yet explored. Available data indicate artesian conditions with salinity ranging from 1,000 to 10,000 ppm.

- In the Gulf of Suez/Red Sea region, available data indicate artesian conditions of the aquifer with high groundwater salinity (TDS>100,000 ppm).

- In Sinai Peninsula, the Nubian sandstone aquifer complex has groundwater storage of about 100 billion m3. Groundwater is basically fossil water (Late Pleistocene), with minor recharge from rainfall at the uptake areas in South Sinai. The regional flow pattern is to the north. In Central Sinai, the groundwater piezometric head is about 200 m AMSL with salinity of about 1,500 ppm, increasing to more than 5,000 ppm in North and West Sinai.

4.2.3 *Carbonate Aquifer Complex*

The fissured and karstified carbonate aquifer complex is the least explored aquifer in Egypt, though it occupies about 50% of the total area of the country. It is generally divided into three horizons:

- A lower horizon from the Upper Cretaceous;
- A middle horizon, belonging to the Lower and Middle Eocene; and
- An upper horizon, belonging to the Middle Miocene.

These three horizons are separated by impervious clay media: the Isna Shale, having an average thickness of 100 m; and the Daba Shale, having a thickness in excess of 200 m.

The carbonate rocks generally overly the Nubian sandstone complex. Recharge is from upward leakage from the sandstone and from local rains.

4.2.4 *Groundwater Flow, Recharge and Discharge*

Groundwater heads fluctuate during the year with differences that may change from few centimetres to more than one metre. The average groundwater heads decreases gradually from 78 m (AMSL), at Isna, to 62 m (AMSL), at Naga Hammady. The general flow direction is north. The main deviations from the general flow direction are found at the borders of the Nile Valley with the flow direction is generally from the aquifer to the River.

The Nile aquifer system at Qena is recharged mainly from irrigation (seepage from canals and percolation from irrigation applications). Recharge from irrigation water varies according to the type of soil and irrigation method. In sandy areas (Valley fringes) with basin irrigation, losses from irrigation vary between 1 and 2.5 mm/day. In areas underlain by semi-confined aquifers, average recharge from irrigation is about 1 mm/day.

Discharge from the aquifer takes place along the River course from the groundwater to the River, especially at the low demand seasons where seepage takes place from groundwater to the River Nile.

Groundwater extraction by wells is another important discharge component. The total annual groundwater extraction for drinking water in Qena Governorate was estimated at 51766 m^3/year in 1991 while it reached about 102,042 m^3/year at 1999. Abstraction for industrial water uses is around 3131 m^3/year mainly consumed by the aluminium smelter, Misr Aluminium Company in Naga Hammady. The total water abstraction for irrigation was estimated at 145,704 m^3/year at 1991 from approximately 1276 wells.

4.2.5 Potential for Groundwater Development

In order to determine the potential for groundwater development, the type of aquifer and land use need to be assessed. The Nile River aquifer has a high potential near the Nile river stem and it decreases to reach limited potential at the fringes of the aquifer. The Nubian Sandstone aquifer has low or zero potential especially in the desert areas where no land reclamation has occurred and the aquifer is non-renewable.

The existing total annual groundwater abstraction in the Nile Valley Aquifer is about 1.5 BCM/year and the potential extraction is estimated at 3.2 BCM/year. This potential increase will be utilised with 0.6 BCM/year extracted for the new land reclamation projects, and 1.2 BCM/year will be extracted for conjunctive use, tube-well drainage and domestic uses.
The total potential groundwater extraction in Qena governorate is estimated to be 450 MCM/year, 120 MCM/year from the desert fringes and about 337 MCM/year from the flood plain.

4.3 "UNCONVENTIONAL" WATER RESOURCES

The River Nile is the main source of fresh water in Egypt. However, other sources of water exist that may be utilised to meet demand. These alternative resources are known as unconventional resources, and include:

- The renewable groundwater aquifer in the Nile basin and Delta;

- The reuse of agricultural drainage water; and
- The reuse of treated sewage effluent.

These water sources cannot be considered independent resources and so cannot be added to Egypt's total available fresh water resources. These sources are merely recycling previously utilised resources in such a way that improves the overall efficiency of the water distribution system.

The level of improvement of the overall efficiency depends on the amount and number of times the water is reused. Furthermore, these sources should be used and managed with care in order to avoid adverse environmental impacts and any potential deterioration in water or soil quality.

4.3.1 Reuse of Agricultural Drainage

The amount of water entering drainage channels from irrigated areas is relatively high (about 25 to 30% of the water supplied). *Map 12* shows the main irrigation drainage systems in the Governorate. This drainage flow comes from three main sources:

- Tail end and seepage losses from canals;
- Surface runoff from irrigated fields; and
- Deep percolation from irrigated fields (particularly where salt leaching is being carried out).

None of these sources is independent of the Nile River. The first two sources of drainage water are considered to be fresh water of relatively good quality. The deep percolation component is more saline.

The agricultural drainage of the southern part of Egypt returns directly to the Nile River where it mixes with the Nile fresh water and utilised by downstream users. The amount of such direct reuse was estimated to be about 4.07 BCM/year in 1995/96. The return flow in the reach Isna-Naga Hammady was estimated to be about 0.72 BCM/year through the 16 main drainage channels, from an area of approximately 285,000 Feddans.

4.3.2 Reuse of Treated Waste Water

One method of augmenting water resources is the reuse of treated domestic wastewater for irrigation purposes with or without blending with fresh water. The increasing demand for water for domestic use due to population growth and improvements in living standards and the growing industrial demand for water will increase the total amount of wastewater potentially available for reuse.

The existing amount of treated wastewater in Qena Governorate is 38,000 m^3/day from wastewater treatment plants in Qena and Luxor. A further 12 new treatment facilities are planned in the Governorate which will release approximately 600,000 m^3/day by the year 2017. This resource could potentially be utilised for irrigating non-food crops such as trees, as is the case with the effluent from Qena wastewater treatment plant, which is reused at the "Man-Made Forest" in El Salihia.

Wastewater treatment could become an important source of water reuse and should be considered in any new water resources development policy. However, particular attention needs to be focussed on issues associated with effluent reuse including potential public health and environmental hazards, and related technical, institutional, socio-cultural and sustainability aspects.

Map 12 Irrigation and Drainage Infrastructure in Qena Governorate

5 LAND RESOURCES

5.1 LAND USE

The total area of Qena Governorate is approximately 10,265 km² of which over 85% is uninhabited desert. Approximately 10% area is agricultural land with the remaining area being occupied by urban areas, villages, roads, the River Nile and drainage canals and drains. These figures are approximate and derived from IDSC figures for 1999.

The SEAM Programme purchased LANDSAT 7 satellite imagery for Upper Egypt, which comprised composite images sampled on 23/8/00 and 1/09/00. *Map 13* shows the LANDSAT 7 image superimposed with an outline of the Governorate. By superimposing the revised Qena boundaries on the image and analysing reflectance levels, the total area of the Governorate was recalculated and divided into five main land use types. *Map 14* shows the Governorate once it is divided into these main land use types. The results of these analyses are summarised in *Table 5.1*.

Table ०.1 Land Use from LANDSAT Satellite Imagery in Qena Governorate [1]

Description of Land Use	Land Use Code	Total Area (km²)	Total Area (%)
Desert areas, rocky outcrops & barren land	1	13,225	88.6
Vegetated areas	2	1,121	7.5
Urban areas, industrial areas, rural housing, roads, rail.	3	59	0.4
Water: River Nile, canals, drains, flooded areas	4	130	0.9
Unclassified/Mixed: scrub, sandy areas, etc.	5	388	2.6
	Total	14,933	100

The results from the satellite imagery indicate that when the new boundaries are included and all the desert areas are also included the size of the Governorate is actually much larger than the official statistics indicate. The proportion of desert increases, and the proportion of agricultural land decreases. However, it is interesting to note that the area for agricultural land published by IDSC in 1999 is 1,312 km², which compares closely to the figure of 1,121 km² for vegetated areas as derived from the satellite image – nearly all vegetated areas in Qena are agricultural in nature.

[1] LandSat7 (September 2000)

5.1.1 Land Reclamation

Egypt has a nation strategy to try to reclaim desert areas and transform them into productive agricultural lands. Prior to 1998 approximately 42,600 Feddans were reclaimed in Qena Governorate of which about 75% are located on sandy soils and the 25% on saline soils. According to the national strategy for land reclamation a further 218,500 Feddans of land will be reclaimed from desert areas and other marginal lands in Qena Governorate. The location and extent of the areas to be reclaimed are illustrated on *Map 15* and in *Table 5.2*.

Table ٥.2 Priority Areas for Land Reclamation in Qena Governorate [1]

Code	Location	Area (Feddan)
79	Wadi Samanhud	8,000
80	EL Marashda	32,000
81	West El Marashda	50,000
82	Wadi Qena	9,000
83	Wadi Hagara	370
84	Wadi Lakita	60,000
85	Qeft	5,500
86	East Luxor and West Luxor	45,000
87	Wadi Naseem	3,300
88	South Isna	2,000

[1] National Land Reclamation Strategy 2017.

Map 13 LANDSAT Image of Qena Governorate (2000)

Map 14 Land Use Map of Qena Governorate

Map 15 Priority Areas for Land Reclamation by 2017 in Qena Governorate

6 ECOLOGICAL RESOURCES

6.1 ECOLOGICAL HABITATS

Qena Governorate has a fairly good diversity of habitats resulting from the variety of landscapes and topography of its terrain. Four primary habitat types may be distinguished within the Governorate: wetlands, arable and urban landscapes and deserts, each with its own unique set of fauna and flora. On closer examination, each habitat type may be further subdivided into smaller more specific units. The descriptions in the following section are derived from a series of field surveys carried out by local consultants during 2000-2001.

6.1.1 Wetlands

The Nile River and the numerous canals and drains connected to it form a fairly extensive patchwork of wetlands. The most important of these is the river itself. Several primary wetland habitat types can be identified in Qena Governorate, mainly associated with the Nile.

The River

The Nile River forms a longitudinal water body with an average width of about 1 km, extending the entire length of the Governorate. This large water body is the primary fishery in the Governorate. The seasonal fluctuations of the Nile play an important role in the ecology of the Nile ecosystem though having substantially fewer impacts than in the past when the Nile flooded in the winter months and dropped to very low levels during the summer months. The fluctuations of the water level constantly change the topography and morphology of the river, creating and altering habitats for wildlife. The flooding in the autumn leads to significant reductions in wildlife habitat along the shoreline of the river and an increase in reed beds and a reduction in areas of muddy and sandy banks.

In winter, many parts of the river are very shallow often supporting dense growths of aquatic weed such as *Ceratophyllum demersum.* Mats of floating vegetation, usually from canal clearings, often form at such shallow areas of the river; creating favourable microhabitats, particularly for birds and amphibians.

Islands

Some 30 larger islands are found in the Nile within Qena Governorate formed by alluvial deposits of the river and many have formed since the construction of the High Aswan Dam. The islands change their shape and size readily according to water level and erosion and deposition regimes. Many of the larger islands are inhabited and cultivated. Quite a few islands are covered with dense reeds and other wetland vegetation representing rare enclaves of wilderness in the centre of one of the most heavily populated part of the country.

Two distinct types of islands may be recognised: one low and sandy with sparse vegetation, disappearing totally or partially during summer; the other is higher, muddy and usually cultivated, often with some settlement. The latter has a good fringe of reed beds and other swampy vegetation. Most muddy islands have eroded southern margins (facing the prevailing current), forming a steep ridge, while the northern end is flat slanting gently into the river. Here shallow mudflats and sandy shores often attract the large numbers of wading birds. Islands often do not lie in the centre of the river, but close to one side where a narrow channel is formed; these are usually the richest areas, in terms of biologic diversity, on the entire river. Many islands of both types are utilised, primarily for grazing livestock. These grazed islands contain short grassy habitat, which is rare in Egypt.

R*eed swamps*

Fairly extensive reed beds form along certain stretches of the riverbanks canals and islands. Since the completion of the HAD, the Nile downstream from Aswan experiences water level changes of only small amplitude. This has allowed dense swamp vegetation, mainly *Phragmites* and *Typha,* to become established in many places along the riverbanks, which were previously largely devoid of vegetation. Bare sandy or muddy banks come into existence seasonally depending on water level (Baha El Din 1999).

Ecologically, the reed swamps probably contribute the most to local biodiversity. Though islands are regarded as biodiversity “hotspots”, it is in fact the reed swamp component, which supports the most diversity. The importance of reed swamps is further emphasised when one considers that it is probably the single most important habitat for native breeding birds, a refuge for many mammals and a critic nursery for fish. Muddy and sandy shorelines

The eroded banks of the Nile, now provide extensive nesting sites for birds that nest in burrows, most prominently the Pied Kingfisher *Ceryle rudis,* hence the dramatic increase of this species along the Nile River in recent decades. These steep banks are likely to provide some microhabitats for a variety of small mammals and reptiles, which are otherwise scarce in the intensively utilised Valley.

"Protected" shorelines

Fairly extensive stretches of the Nile banks have been engineered with concrete and limestone or sandstone blocks to protect them from erosion, or are occupied by urban areas. In both cases the shoreline is transformed into an almost lifeless landscape with the lowest biodiversity on the river.

Canals and drains

Water from the Nile is conveyed through an intricate network of canals and drains that crisscross the Valley. These man-made wetlands are extensions of the Nile River with a very similar fauna and flora. Reeds become rapidly established along even the smallest canals, creating small corridors of wild habitats in the midst of cultivation and providing refuge to many wild animals. Most of the canals and drains of the region are subjected to regular mechanical clearing to remove submerged, floating and fringing vegetation, in order to facilitate the efficient flow of water through the system.

6.1.2 Arable and Urban Environments

The Egyptian section of the Nile Valley is one of the world's oldest continuously settled areas and has been transformed from a natural to a cultural landscape for over 7000 years (Goodman and Meininger 1989). The large-scale conversion of agricultural land from basin to perennial irrigation began after 1800, currently arable land is utilised on an almost continuous basis.

Agriculture is the prevailing activity in the Nile Valley. The cultivated area in Qena Governorate is estimated at 333,480 Feddans (IDSC 1997). The landscape within the Valley is flat and subdivided into intricate plots of varying sizes, which are constantly worked. Cultivation reaches to the edge of the desert and no transition zone can be found in most areas.

The agricultural lands are dominated by sugar cane, which is the main crop in the Governorate. Sugar cane deserves special note for its importance as a habitat for wildlife during its various stages of growth. The recently cut sugar cane fields are flooded, forming large tracts of temporary wetlands. Half grown cane creates a marsh-like habitat, which provides ideal breeding sites and refuges for various birds and other animals. The taller sugar cane makes thicket-like densely vegetated patches that are known to have importance for harbouring wildlife, even larger mammals like the Jackal (*Canis aureus)*. The fact that the cane is dense and only cut once a year makes it an ideal location for animals to hide and breed.

Land use in the Nile Valley is intensive and nearly all arable land is either cultivated or built upon; the only substantive feral lands observed were near antiquities, cemeteries and desert margins with smaller patches along canals, roads, railroad tracks and field edges. These feral patches, though of limited proportions, usually contain only native vegetation, thus act as a reservoir for native species. They so represent vital habitats and refuges for many wild animals.

Some native plants are relatively dominant in arable lands in the Valley and are more prominent than elsewhere in the Egyptian agricultural landscape. Common native flora includes Date Palms *Phoenix dactylifera*, Dom Palms *Hyphaene thebaica* and *Tamarix aphylla*. Most of these native plants are in fact cultivated, which is a very positive aspect of the agricultural practices in this section of the Nile Valley in terms of biodiversity maintenance and conservation. *Tamarix aphylla* almost outnumbers Casuarina trees (introduced from Australia), which are now ubiquitous elsewhere in the Egyptian agricultural setting used as windbreakers around fields. *Acacia nilotica* and the Date Palm are native plants that make a prominent contribution to the landscape and play an important role in the local economy.

While the agricultural landscape in Qena is fairly uniform, distinctions could be made between areas west and east of the Nile. The west bank is wider on the whole, and appears to have more native trees and shrubs. Differences were also noted between the northern and southern parts of the Governorate. North of Naga Hammady the valley is wider, with more open fields less shrubs and sugar cane. This area is similar to Sohag-Assiut region to the north, with visibility less diversity and densities of birds. The areas south of Naga Hammady have more affinity with the Aswan region and are much richer in native flora and fauna. The Nile Valley in this area is for the most part narrower and more native scrub including *Tamarix aphylla* and date groves are found.

Most of the human population resides in towns and villages scattered throughout the Valley. Settlements are often located in marginal areas such as desert fringes. Houses are usually built close together creating fortress-like villages to exploit the limited space and conserve arable land.

Although for the most part devoid of natural habitats or green areas, towns and villages are situated in or adjacent to agricultural, wetland or desert environments and thus, are closely integrated with their surroundings sharing many similar elements. Exotic vegetation is often grown in gardens and along streets, but native flora may also be found.

Towns and villages are home for a small number of wildlife species that have adapted to life with man and are often strongly associated with human activity and structures and even dependent on it. Examples include House Sparrow *Passer domesticus*, Palm Dove *Streptopelia senegalensis*, House Mouse *Mus musculus*, various bats, Fan-toed Gecko *Pyodactylus hasselquisttii*, Egyptian Gecko *Tarentola annularis* and a multitude of invertebrates. Also, of note is the Cattle Egret, *Egretta ibis* that often locates its colonies in or near human habitation.

6.1.3 Desert

Desert represents the larger proportion of Qena Governorate (more than 85%), and falls within one of the world's driest deserts. The Nile divides the desert into two distinct regions, the Western Desert and the Eastern Desert. Except for areas along or near the Nile Valley, the deserts are virtually unpopulated and represent large expanses of natural, largely unspoiled wilderness.

The edges of the Nile Valley represent a transition area between the desert and fluvial habitats of the Valley. Formerly this zone was fairly broad, made of a patchwork of various habitats and feral lands. Today, along most the entire length of the Valley, land reclamation is taking place and extending agriculture into the desert margins and adjacent wadis, making the transition from arable to desert habitats very sharp. The ridges and plateaus on either side of the Valley generally act as natural barriers to further expansion.

Two primary microhabitats may be distinguished in the deserts: mountains and wadis, and plains. No oases or substantial sandy areas or dunes are known.

The mountain and wadi habitat is largely confined to the territory east of the Nile. In this habitat the scant vegetation is restricted to the major wadis and their main tributaries. The few ridges that overlook the Nile Valley on both sides provide refuge for some species that utilise the resources of the Valley and then retreat to the relative security of the neighbouring desert. Several bats, birds of prey and larger carnivorous mammals follow this strategy, for which these ridges are an important part of their habitat.

Open gravel and sand desert occupy large parts of the Governorate. This, however, is the least productive of its habitats. West of the Nile the habitat is largely of this type, with almost non-existent vegetation.

Western Desert

A gravel covered plain of variable width fringes the Nile Valley from the west and rises gradually to reach a ridge, forming the eastern edge of the plateau of the Western Desert. This plateau, reaching up 450 m altitude, is covered with a sharp limestone surface, dissected by numerous deep wadis, which drain towards the Nile.

A transect was made through the limestone ridge fringing the western side of the Nile Valley during the spring visit. Several large and medium-sized wadis cut deep through this ridge, which reaches an elevation of most 500 m. These wadis take the form of impressive winding canyons, with towering cliffs. Deeply cut canyons provide ample shade within and a fair amount of vegetation grows in this relatively sheltered environment. Vegetation increases in density towards the down stream parts of the wadi, with the highest density found at the mouth of the wadi, where it opens on to a wide plain fringing the Nile Valley. Here sand accumulates into small mounds and dunes. Most of the wildlife was found in this down stream portion. On top of the plateau most no vegetation is found, and conditions are very exposed, with only a limited number of species inhabiting this habitat.

Eastern Desert

In contrast with the Western Desert, the Eastern Desert hills encroach very closely onto the Nile Valley, with many wadis draining into the Valley, Wadi Qena being the largest. The desert just east of the Valley is made of limestone hills, leading eastwards into sandstones and eventually to igneous rocks. Each of these geologic strata creates a distinctive landscape with characteristic ecologic properties. Vegetation is more plentiful than in the Western Desert, but similarly restricted to wadi beds. Several water sources, such as El Lakita, attract fairly dense growths of vegetation.

The Qena desert east of the Nile is situated at a juncture of several geologic zones that influence the plant diversity of this region and adds much to its complexity. The Governorate falls within two distinct sections of the Eastern Desert recognised by Kassas et al. (1993): the Middle and the Idfu- Kom Ombo sections. The Middle Section represents a transition between the predominantly limestone country to the north and the non-calcareous terrain to the south; *Leptadenia pyrotechnica* is a notable plant in this area (Kassas et al. 1993). The Idfu-Kom Ombo Section largely encompasses Nubian Sandstone country and is characterised by a plant community dominated by *Acacia raddiana* and *Acacia ehrenbergiana*. The characteristic plant community of the igneous eastern most reaches of the Governorate is dominated by *Acacia raddiana* and *Zilla spinosa*. While in Wadi Qena open scrub dominated by

Acacia ehrenbergiana is replaced by Tamarix thickets on the heavy fluvial substrate of the downstream portion of the Wadi. The few water sources in this terrain are man-made and are largely inaccessible to wildlife.

Small numbers of Bedouins inhabit the Eastern Desert. The Ma'aza tribe is found in the area north of the Qena-Safaga Road, while the 'Ababda tribe inhabit the area to the south. El Lakita situated along the Qeft-Quseir road is the largest settlement of some 60 individuals. There are said to be scattered settlements in remoter desert areas, particularly in wadis near permanent water sources. Nomadic herders still occur in the Governorate and graze their cams, sheep and goats in desert areas depending upon the availability of food resources.

6.2 SPECIES

6.2.1 Flora

In terms of surface area, there is little non-domesticated indigenous vegetation in the Nile Valley (Goodman and Meininger 1989), most are exotic species cultivated for food. About 126 species of indigenous wild plants occur in the Upper Nile Valley, some are not recorded elsewhere in the country (Zahran 1992).

The flora of the Nile River in this region is dominated by *Phragmites* and *Typha* reed swamps on its banks, along canals and on islands. Small clusters of Water Hyacinth *Eichhornia crassipes,* are found on the river, in isolated, sheltered inlets where the current is weak. *Ceratophyllum demersum* was the only species of aquatic flora found. River and canal banks are normally covered with Halfa Grass (*Desmostacia bipinnate*).

Several native plant species are dominant in the agricultural landscape of the region. Fields are doted with *Acacia nilotica*, while *Tamarix aphylla* is a common and widespread windbreaker on the periphery of cultivations, largely south of Naga Hammady, but disappeared in the northern part of the Governorate, being largely replaced by Casuarina and Eucalyptus. Dom Palm, *Ziziphus spina-christi* and Ficus are rather less widespread trees, the latter being less common. *Tamarix nilotica*, *Cotropis procera* occur intermittently in marginal lands and on the desert edge. Salix fringes canals and drains sporadically. *Alhagi graecorum* and *Desmostacia bipinnata* are the commonest non-woody native species occupying marginal lands, canal banks and fallow fields. Date Palm is widely cultivated and is an important crop and many birds appeared to be strongly associated with and benefit from native flora, particularly Nile Valley Sunbird (*Anthreptes platurus*), Turtle

Dove (*Streptopelia turtur*) Cattle Egret and Common Bulbul (*Pycnonotus barbatus*).

Most desert areas were devoid of vegetation. The little natural vegetation that exists is usually found in wadis or other catchment areas where surface water from scant rains or other sources accumulates. Desert vegetation consists of perennials (trees and bushes) that are found year round and annuals (usually small shrubs) that occur seasonally when there is sufficient rainfall.

In the Eastern Desert the western lime stone section is characterised by *Tamarix nilotica*, *Zilla spinosa*, *Salsola spp.*, *Zygophyllum album* and *Calotropis procera*. Further eastwards in the sandstone *Acacia ehrenbergiana*, *Salsola spp.* and *Zilla spinosa* are dominant. While the eastern most limited igneous section within the Qena Governorate is dominated by *Acacia raddiana* and *Zilla spinosa*.

The Western Desert is more sparsely vegetated than the Eastern Desert. Nearly l vegetation is restricted to wadi beds, the most prominent flora in the areas visited were: *Cornulaca monacantha*, *Fagonia spp.*, *Zygophyllum album*, *Schouwia thebaica*, *Leptadenia pyrotechnica*, *Tamarix nilotica*, *Acacia ehrenbergiana*, and *Acacia raddiana*.

6.2.2 *Fauna*

Qena Governorate has reasonable vertebrate fauna diversity due to its size and fairly broad spectrum of habitats. Birds are the most prominent and diverse of vertebrate fauna.

Mammals

Wild mammals are seldom observed largely due to the fact that most are nocturnal, shy and probably relatively scarce. Bats and rodents are the best represented (in terms of number of species) and are the most numerous mammals in Qena Governorate with twelve species each. A small number of large mammals occur in the Governorate, of which at least two species, Barbary Sheep (*Ammotragus lervia ornata*) and Nubian Wild Ass (*Equus asinus africanus*), are thought to have been extirpated during the last two hundred years. Given the few surveys of mammals, it is likely that there are addition species still to be reported.

Birds

Qena has a relatively high diversity of avifauna amounting to several hundred species. Residents comprise less than 30% of the total species recorded; the majority are transit populations of passage migrants, winter visitors and summer breeding visitors.

Resident breeding birds are for the most part dominated by species inhabiting wetland and arable habitats, followed by the species adapted to life in the desert. Several birds are transit breeders occurring in Qena during the summer months, moving further south during the colder months.

A number of birds, particularly water birds spend the summer months in the Governorate, but do not seem to breed. Grey Heron (*Ardea cinerea*), for example, is a fairly common visitor in the summer, but nesting has not been recorded. Many birds winter in the Governorate, including significant concentrations of water birds wintering along the Nile River. Other bird species include two globally endangered species: Greater Spotted Eagle (*Aquila clanga*) and Ferruginous Duck (*Aythya nyroca*).

Qena Governorate is situated on a major migration route for birds travelling between their winter quarters in Africa and summer breeding grounds in Europe and Asia. Migrants pass through the area twice annually during spring and autumn.

Qena is of special importance for migratory soaring birds (species of birds, which depend on rising hot air thermals for their flight, such as large birds of prey and storks). Significant proportions of the world population of White Stork (*Ciconia ciconia*), probably more than half of the 500,000 storks passing through Egypt, biannually migrate through the Governorate. The Governorate is so located on the migration routes for several birds of prey.

Reptiles and Amphibians

At least 27 species of reptiles and four amphibians have been reported from the Governorate to date. The greatest diversity of reptile species is found in the desert.

All four amphibians known from the Governorate are confined to wetlands and cultivations, though the Green Toad (*Bufo viridis*) is capable of withstanding relatively arid conditions. All amphibians are fairly common or abundant. The Nile Valley Toad (*Bufo kassasii*), previously thought to be restricted to the Delta and Fayoum, was first recorded in the Nile Valley south of Cairo in Qena Governorate. Very dense populations exist in swampy vegetation along the Nile River banks and in recently flooded sugarcane fields throughout much of the Governorate. The status of the Marsh Frog (*Rana bedriaga*) is not clear, and no positive observations have been made in the Governorate.

Fish

Around 56 species of fish have been reported in literature from Upper Egypt. Of these some 70% are now either locally extinct or are rare. A number of factors have contributed to the disappearance of these species, mainly factors related to changes in the flow regime of the River.

6.2.3 *Ecological Change*

Drastic ecological changes have taken place in the Nile Valley over the past hundred years, as a result of intensive human interventions and manipulation of the natural environment. Many species of animals and plants have either greatly changed their distribution or disappeared completely from the Nile Valley in Egypt. While many of these changes reflect alterations in habitat structure, some so reflect environmental quality and the impact of pollution.

Arable Lands

There have been notable ecologic changes in arable lands. Species, which have apparently declined, include: Yellow-billed Kite (*Milvus aegyptius*), Little Owl (*Athene noctua*) and Sand Martin (*Riparia riparia*). Yellow-billed Kite has been in decline since the beginning of last century, Little Owls are nocturnal and difficult to observe, however are known to be experiencing declines in other parts of the country for unknown reasons. Sand Martin are notably lacking along the Nile, and nesting colonies absent.

At least one species has increased in number, the Cattle Egret. Colonies may be observed scattered throughout the Governorate. These colonies are often in natural vegetation, such as Acacia and palms or sometimes Eucalyptus trees in the middle of towns or villages along the Nile or canals. In addition, the relative abundance of Black-shouldered Kite (*Elanus caeruleus*), Kestrel (*Falco tinnunculus*) all indicates relatively good environmental quality and low use of toxic pesticides in the countryside.

Nile River

Since the construction of the HAD there have been considerable changes in species diversity and abundance, particularly in terms of wetland flora, birds and amphibians. Birds, as the most visible faunal element are good indicators of environmental changes.

There has been an obvious extension southward of some Nile Delta species, including birds such as Squacco Heron (*Ardeola ralloides*), Purple Swamphen (*Porphyrio porphyrio*) and Painted Snipe (*Rostratula benghalensis*). Some of these were possibly uncommon residents that increased in number and spread, such as Black-crowned Night Heron (*Nycticorax nycticorax*) and Little Egret (*Egretta garzetta*). At least one Afro-tropical species, the Striated Heron (*Ardeola straiata*) has penetrated the Valley from the south. Similarly, the Nile Valley Toad (*Bufo kassasii*) has spread southwards along with reed swamp vegetation.

These changes in species distribution substantiate that ecologic changes have taken place in the Nile River as a result of the construction of the various structures on the River. The curtailment of the annual flood has led to a proliferation of reed beds and marshes along the river resulting in the spread of species associated with that habitat type. Sand banks, which had previously been the prevailing habitat along the shores of the river, have virtually disappeared; along with several associated species, most notably the Egyptian Plover (*Pluvianus aegyptius*). The net effect of these changes is that the Nile is now like a vast marshland not dissimilar to the Delta Lakes. It is presumed that these changes have effected other aquatic life as well, including fish and insects.

Desert Environments

As with agricultural lands and wetlands, some changes have also occurred in desert areas. Land reclamation along the desert margins seems to be affecting desert wildlife. The impacts are variable, some species continued to survive and even flourish, while others have disappeared as their origin habitats were destroyed. Sand Grouse populations probably benefited from marginal land reclamation efforts, as well as water pipelines. However, several species seem to be in decline or completely absent including Lanner Falcon (*Falco biarmicus*), Barbary Falcon (*Falco pelegrinoides*), Stone Curlew (*Burhinus oedicnemus*) and Pale Crag Martin (*Ptyonoprogne obsoleta*). The disappearance of the first two species may be a result of falcon trapping, while Stone Curlew may be affected by land reclamation. It is not known why Pale Crag Martin numbers were lower than expected.

7 CULTURAL HERITAGE

7.1 THE SUPREME COUNCIL OF LUXOR

Egypt has a rich and diverse cultural heritage dating back to more than 7,000 years before the present. Egypt is internationally renowned for its archaeological and historic sites and a wide variety of sites are present in Upper Egypt.

Originally, Luxor was part of Qena Governorate, however the significance of the sites present in the local area, such as Luxor and Karnak temples and the Valley of the Kings, where the treasures of Tutankhamun's tomb were originally discovered has attracted great numbers of visitors. The uniqueness and numbers of sites present in close proximity of Luxor and the numbers of visitors and corresponding development pressures from hotels and tourist developments, led to the establishment of a separate administrative status of what was the former Markaz of Luxor. In 1989, Luxor was given the unique administrative status of the "Supreme Council of Luxor".

7.2 CULTURAL HERITAGE SITES IN QENA GOVERNORATE

In addition to the sites located within the Supreme Council of Luxor there are two major tourist sites in Qena Governorate that attract international and local tourists and generate income from official entry tickets, these are Isna Temple in Isna Markaz and Dendara Temple in Qena Markaz. Ticketing arrangements were also initiated for El Moalla, a Pharaonic rock-cut cemetery so located in Isna Markaz; however, to date this site has received virtually no foreign visitors. *Map 16* illustrates the major tourist sites and other major cultural heritage sites in Qena Governorate.

Dendara Temple

Dendara temple comprises components from Pharaonic, Greco-Roman and Coptic times. The necropolis contains tombs from the Early Dynastic period to the First Intermediate Period (3,100 – 2,050 BC), as well as burials of birds dogs and cows associated with the goddess Hathor, whose temple is the most important monument at the site. The surviving buildings in the temple enclosure date from the 30th Dynasty (380 – 343 BC) to the Roman Period (30 BC – AD 395), and include the main temple to Hathor, sanatorium, two shrines known as "birth" temples and a Christian basilica, all of which are preserved inside a mud brick enclosure wall. East of the Temple was the town, where there are ruins of a Roman Period temple.

Isna Temple

Isna temple comprises components from Pharaonic, Roman-Roman, Coptic and Islamic times. Isna was in important town in Pharaonic times and a centre for the worship of the Lates fish (Nile Perch). The earliest surviving record dates from the 18th Dynasty (c. 1,450 BC). In the early centuries AD, it was one of the main centres of Christianity in Egypt. In the Middle Ages the town regained its importance as a caravan station for routes from the south and Sudan.

The principal historic remains in Isna consist of the Greco-Roman temple of the ram god, Khnum, which is decorated with carved reliefs form the 1st – 3rd centuries AD. The temple which is located near the centre of the town, now lies approximately 9 metres bow the modern street level, due to the accumulation of silt and debris. The temple has never been completely excavated, as the rear portion of the building is buried under the surrounding residential buildings.

Map 16 Cultural Heritage and Major Tourist Sites in Qena Governorate

Other Cultural Heritage Sites

In addition to the sites ready described there are over sixty other identified sites in the Nile Valley in Qena Governorate including:

- Prehistoric settlements e.g. Makadma;
- Predynastic cemeteries and settlements e.g. El Adaima;
- Pharaonic temples e.g. Qus;
- Roman temples e.g. Shanhur;
- Coptic monasteries e.g. Monastery of St Michael near Naqada; and
- Islamic mosques e.g. El Hammam mosque in Farshut.

Routes across the Eastern Desert have been used since prehistoric times to travel between the Red Sea and the Nile Valley, originally by a nomadic pastoral people who used them for driving their cattle.

Gold mines and stone quarries were exploited from the Pharaonic era into the Roman and Byzantine periods. The Romans built fortified watering stations or *hydreuma* and smaller road stations along the principal routes, many at sites originally used by ancient Egyptians. Watchtowers were also constructed in elevated areas, to guide and guard trade and mining expeditions.

Numerous rock carvings and inscriptions provide evidence of the exploration and exploitation of the Eastern Desert. There are also many Predynastic rock carvings over a wide area, which record the movements of the early inhabitants of the region. Although over 100 sites have ready been documented, there are several expeditions currently surveying the Eastern Desert and further discoveries are likely.

PART III

ECONOMIC AND SECTORAL CONDITIONS

8 AGRICULTURE AND FISHERIES

8.1 MAJOR CROPS CULTIVATED IN QENA GOVERNORATE

The climatic conditions, soil characteristic and the well-developed permanent irrigation infrastructure enable a variety of crops to be cultivated in Qena Governorate. The Governorate enjoys a comparative, competitive advantage of growing sugarcane, palm trees (dry dates), wheat, vegetables, clover, sesame, peanuts and a variety of fruit. In addition some aromatic and medical plants are also grown. There are three distinct planting seasons: winter, summer and "Nile" seasons. The Nile season corresponds to late July to early November and takes its name from agricultural practices dating back before the control structures on the Nile when the River still used to flood every year. *Table 8.1* shows the most important crops for each of the three seasons and *Table 8.2* shows the areas of different fruits in 2001.

Table ٨.1 Seasonal Crops in Qena Governorate (1999) [1]

Crop & Area (Feddans)	Winter	Summer	Nile
Sugarcane	-	151,590	-
Wheat*	115,880	-	-
Maize	-	33,540	12,957
Clover	34,158	-	-
Vegetables	22,873	2,543	7,681
Sorghum	-	22,088	263
Tomatoes	18,491	-	-
Broad Beans*	12,000	-	-
Green fodder	-	5,100	4,581
Sesame	-	6,917	-
Eggplant	3,625	-	-
Aromatic & Medicinal Plants	102	2,870	-
Fenugreek	1,994	-	-
Lentil*	1,700	-	-
Alfalfa	-	962	-
Barley*	500	-	-
Lupine	375	-	-
Peanuts	-	256	-
Garlic	150	-	-
Onion	100	-	-
Chickpeas	91	-	-
Sunflower	-	25	-
Others	757	-	-

* Figures from the Agriculture Directorate in Qena for winter season 2000/2001

[1] Agricultural Statistics – Ministry of Agriculture and Land Resources (2000)

In addition to the fruits listed in *Table 8.2* there were approximately 550 Feddans growing palm trees. The total number of trees in 2001 was estimated to be 315,850 and with an average yield of 35 kg/tree, the total yield is estimated at 11,055 tonnes.

***Table ٨.2 Areas of Fruit Cultivation and Type at Markaz Level (2001)* [1]**

Markaz	Area (Feddans)	Fruit type	Area (Feddans)
Qena	2,802	Bananas	7,630
Naga Hammady	1,602	Citrus	1,890
Qus	104	Grapes	409
Abu Tesht	166	Pomegranate	136
Isna	4,259	Figs	128
Dishna	386	Mango	114
Armant	236	Guava	22
Farshut	43	Apple	21
Naqada	318	Olive	16
Qeft	107	Peach	-
El Waqf	352	Others	9
Total	10,375	Total	10,375

Sugarcane

Sugarcane is a perennial crop, and is planted as a summer and autumn crop in Qena governorate. The cane is propagated from stem cuttings called setts, which when planted are known as a planted cane crop. After the harvest of the mature plant crop, the buds on the underground rootstock germinate and this gives rise to a second crop. This crop is known as a "ratoon" crop and farmers may take up to six ratoon crops. The crop is harvested during December- May at an average age of 12 months.

Ratooning of sugar cane minimises costs as the farmer only has to plant every five to seven years and also has the advantage that the ratoon crops give better juice quality and sugar recovery in relation to the plant crop. Generally ratoon crops are quicker to mature than plant crops.

The total area under sugarcane during 1999-2001 was 151,590 Feddans of which 27,840 Feddans are planted crops and 123,750 Feddans are under ratoon crops. Average yield was approximately 50 tonnes per sedan. Some farmers intercrop the cane with legumes or vegetables.

There is no compulsory cropping pattern in Egypt and the farmer is at liberty choose what crops to grow. However, the Ministry of Agriculture and Land

[1] Agricultural Directorate – Qena Governorate

Reclamation (MALR) usually announce an annual target-cropping pattern for each governorate. There are winter, summer and Nile cropping pattern targets, which are detailed in *Table 8.3* and *Table 8.4*.

***Table ٨.3 Target Cropping Patterns (Feddans) for Winter Crops in Qena Governorate*[1]**

Markaz	Wheat	Barley	Faba Beans	Lentil	Vegeta -bles	Garlic	Onion	Total
Qena	18,662	35	1,115	17	2,550	30	25	22,434
Naga Hammady	7,897	--	1,123	--	150	15	10	9,195
Qus	9,417	30	1,016	46	250	15	12	10,776
Abu Tesht	14,233	--	1,665	--	190	5	10	16,103
Isna	21,192	160	1,935	33	2,575	35	--	25,930
Dishna	15,961	--	1,302	11	110	10	--	17,394
Armant	6,346	100	1,057	115	575	10	--	8,203
Farshut	2,590	--	631	--	--	2	5	3,228
Naqada	8,930	105	1,694	1,395	350	10	13	1,249.7
Qeft	4,242	50	402	83	1,750	--	--	6,537
El Wakf	6,410	20	60	--	--	18	25	6,533
Total	115,880	500	12,000	1,700	8,500	150	100	13,8830

***Table ٨.4 Target Cropping Patterns (Feddans) for Summer and Nile Crops in Qena Governorate*[2]**

Markaz	Sesame	Maize Summer & Nile	Summer Vegetable	Nile Vegetable	Peanuts	Total (Feddans)
Qena	260	1,500	400	-	40	2,200
Naga Hammady	640	5,550	850	50	10	7,100
Qus	910	4,150	200	100	150	5,510
Abu Tesht	1,300	8,400	150	50	100	10,000
Isna	1,320	4,900	1,250	-	200	7,670
Dishna	430	9,400	100	100	-	10,030
Armant	650	1,650	200	1,650	50	4,200
Farshut	100	1,900	50	50	-	2,100
Naqada	1,760	4,200	200	2,500	250	8,910
Qeft	260	1,500	400	-	40	2,200
El Wakf	280	3,050	40	-	-	3,370
Total	10,000	56,000	4,090	4,560	900	75,550

[1] Agricultural Directorate – Qena Governorate (2001)

[2] Agricultural Directorate – Qena Governorate (2001)

8.2 AGROCHEMICALS

Agrochemicals are used to increase or improve crop productivity. Agrochemicals may be divided into fertilizers that improve the nutrient status of the soil and thus increase productivity through improving yields, and pesticides, which reduce damage to crops from insect and fungal pests.

8.2.1 *Fertilisers*

Organic fertilizers

Farmers in Qena Governorate are utilising animal wastes as an organic soil conditioner and fertiliser and regularly add manure to the fields they are cultivating. Manure is used in land preparation for summer crops, especially maize, tomatoes and most winter and summer vegetables. The average quantity added is $10m^3$/feddan/season. For sugarcane the farmers usually adds about $40m^3$/feddan/crop in every cycle that lasts for 5-7 years. Poultry residues are often added to orchards and fruit trees at a loading rate of $5m^3$/feddan, and supplemented by farmyard manure at a rate of $10m^3$/feddan/year at springtime (February/March). From these figures, it may be estimated that over 3 million cubic meters of farmyard manure are utilised as organic fertilizers per year in the Governorate.

The advantages of this practice include building-up the organic matter content of the soil, adding trace elements and micronutrients, and helping balance the carbon/nitrogen (C/N) ratios. Disadvantages include the spread of weed-seeds, and transfer of nematodes and some soil born-diseases by microbes and bacteria. The disadvantages of using animal waste as a soil conditioner may be at least partially overcome by composting the waste prior to application to the field.

Chemical fertilizers

Nitrogen (N), Phosphorus (P) and Potassium (K) are the three major plant nutrients that are required as fertiliser. The principal element requiring addition to the soil as chemical fertilizer is Nitrogen (N). Approximately 109,876 metric tonnes of N fertiliser are used per year in Qena in the following forms: urea, ammonium nitrate, calcium nitrate and ammonium sulphate.

Phosphate is required during land preparation and approximately 4,220 metric tons are used per year in the following forms: Triple Super Phosphate, Calcium Phosphate.

Potassium fertilizers are added during the growing season for vegetables and fruit trees of the crop in 2 or 3 doses, at an application rate is 48 Kg/K/feddans. Approximately 5,301 metric tonnes are used per year, mainly in the form of potassium sulphate.

8.2.2 *Pesticides*

Pesticides use in Qena Governorate is generally low. There are several factors responsible for the low need for pesticides including:

- No cotton is grown in Qena governorate and cotton requires regular pesticide applications; and
- Biological control is used to control the majority of pests that affect sugarcane and the integrated pest management (IPM) approach has been adopted.

During the year 2000 the following pesticides were used in the Governorate:

- Zinc Phosphide (for control of rats) 960 kg;
- Fungicides (control of plant diseases) 1,275 kg;
- Powdered Sulphur (pest control on vegetables) 26,711 kg.

8.2.3 *Integrated Pest Management (IPM)*

To rationalize pesticide use in Egypt, especially in sugarcane areas, integrated pest management (IPM) is practiced. IPM includes all practices that control and limit insect populations in a given crop or given area. The approach comprises cultivation practices, mechanical methods, the use of tolerant varieties and biological control.

Cultivation practices include rotation, cropping patterns, deep ploughing, control of irrigation and drainage. Mechanical methods include such as removal of infected plants, hoeing, weeding and eradication.

Most of crop varieties grown in Qena Governorate are resistant to disease and tolerant to insects. Examples include wheat varieties that are resistant to rust, sugarcane varieties are resistant to smut, and maize resistant to powdery mildew.

Sugarcane variety G85/37 is tolerant to soft-scale insects, which often infest the commercial variety G54-C9. This will eventually lead to the replacement of G54-C9 by the new released variety G85/37. Adoption of a rotation of 5 years sugar cane followed by one year of another also assists in control of this insect pest.

The sugarcane borers of the *Chilo* species may be controlled biologically by release of the natural parasite *Trichogramma evanesces*. Pesticide use on sugar cane is normally extremely low and normally all control of the sugarcane borer is by releasing the parasite *Trichogramma evanesces* during May and June every year in over 100,000 feddans of the total area of 156,000 feddans of sugarcane in the governorate.

The release of the parasite is at the rate of 20,000 individuals/Feddan, and the total release for the year 2000 amounted to more than two billion individuals. This has lowered the infestation rates from 17.3% to 4.1%, and resulted in the saving of approximately 400 tonnes of pesticides annually.

In the last few years the soft-scale insect *Pulvinaria tenuivalvata* has been very common in the sugar cane crop and may reduce yields by more than 50%. In order to treat infected areas farmers have resorted to spraying with Malathion and other biocides in addition to using powdered sulphur. The recent prevalence of this insect pest is causing major concern to the sugar-growing farmers in the Governorate.

8.3 AGRICULTURAL RESIDUES

The agriculture residues are generated from most field crops and significant amounts are also generated from sugar cane. Residues from crops include straw from wheat, barley, stalks and leaves from Faba beans, maize stems and husks, and stalks and leaves from sesame and sorghum. Quantities of residues from vegetable cultivations are much lower in volume.

8.3.1 Field Crop Residues

Table 8.5 shows the amounts of agriculture residues generated from different field crops in different Markaz. The highest total quantities generated are from wheat straw (283,112 tonnes), followed by maize stems and husks (91,878 tonnes) and sorghum stems and leaves (52,356 tonnes).

The highest total quantities at Markaz level are generated in Qena (104,660 tonnes), followed by Abu Tesht (67,178 tonnes) Dishna (54,720 tonnes) and Isna (52,257 tonnes). Moderate quantities are found in Nag-Hammady, Qeft, Qus and Naqada. These trends are generally because of the total area cultivated in each Markaz rather than different productivity levels or low yields in different Markaz.

The farmer uses about 60% of the residues directly as animal feed, animal bedding, and a fuel source, in brick manufacture or as mulch in the fields.

The remaining fractions are disposed of and stored in any available space and often accumulate in villages causing a serious fire risk. Residues not otherwise utilised are burned in the fields leading to significant localised air quality problems.

Table ٨.5 Field Crop Residues Generated in Qena Governorate (2000) [1]

Markaz	Wheat	Faba Beans	Barley	Maize	Sesame	Sorghum	Total (Tonnes)
Qena	57,891	135	125	33,849	1,000	11,660	**104,660**
Naga Hammady	18,640	461	4	6,390	448	793	**26,736**
Qus	19,448	214	125	5,665	563	3,939	**29,954**
Abu Tesht	36,315	197	2,794	15,000	322	12,550	**67,178**
Isna	39,036	500	4,723	5,368	1,200	1,430	**52,257**
Dishna	37,193	248	15	6,696	625	9,943	**54,720**
Armant	12,714	513	150	2,028	400	-	**15,805**
Farshut	5,231	188	-	1,069	80	-	**6,568**
Naqada	27,352	166	63	4,688	813	4,425	**37,507**
Qeft	16,292	201	93	4,725	200	7,505	**29,016**
El Wakf	13,000	32	-	6,400	500	111	**20,043**
Total	**283,112**	**2,855**	**8,092**	**91,878**	**6,151**	**52,356**	**444,444**

Sugarcane Residues

The residues of sugarcane consist of "green tops" (20% of the total harvest), dry leaves (5% of the total harvest), and Bagasse (33% of the processed cane), which are produced at the sugar factory. The quantities of sugar cane waste generated at Markaz level are shown in *Table 8.5*.

The green tops amount to 1,799,981 tonnes and are used as animal feed, with a price of L.E.40-50/tonnes. The dry leaves and stems left in the field after harvest have to be left over the cane stubbles to protect them from potential winter frost during December, January, February and early March. In late March and April the leaves are burned off. The burning has several functions including

[1] Agricultural Directorate – Qena Governorate

Table ٨.6 *Sugar Cane Residues Generated in Qena Governorate (During the 2000 Crushing Season)* [1]

Markaz	Farm Residues		Factory Residues	Total
	Green Tops	Dry Leaves	Bagasse	
Qena	24,696	6,174	40,748	**71,618**
Naga Hammady	279,848	69,961	461,174	**810,983**
Qus	211,884	52,971	349,611	**614,466**
Abu Tesht	217,285	54,321	358,521	**630,127**
Isna	224,420	56,105	370,293	**650,818**
Dishna	185,580	46,462	306,652	**538,694**
Armant	146,563	36,640	241,829	**425,032**
Farshut	97,436	24,349	160,769	**282,554**
Naqada	320,263	85,065	561,434	**966,762**
Qeft	33,408	8,352	55,123	**96,883**
El Wakf	58,598	14,649	96,683	**169,930**
Total	**1,799,981**	**455,049**	**3,002,837**	**5,257,867**

- Enhancing and encouraging the germination of the new sugar cane buds;
- Eliminates weed population;
- Kills all the different life cycle stages of pest insect species;
- Destroys harmful bacteria and other potential plant diseases; and
- Returnss nutrients to the soil, including calcium and potassium.

The practice of burning is therefore seen as greatly beneficial to sugar cane cultivation and on the sustainability of sugarcane monoculture. However, the burning has major impacts on air quality at a local level, particularly in the burning season in late March and April.

Table 8.6 also shows the quantities of bagasse produced at the sugar factories, with the total amount of bagasse generated exceeding 3 million tonnes per year. Bagasse is used as fuel at some of the sugar cane factories and this can generate significant amounts of smoke and carbon particles leading to poor air quality.

The four sugarcane factories in Qena governorate are located at: Armant, Dishna, Naga Hammady and Qus. Two of the factories have allied industries located adjacent to them and utilise the waste bagasse as a raw material. In Naga Hammady a company manufactures Fibreboard and in Qus a newsprint/paper has recently commenced operation. These industries will use about 40% of the Bagasse generated at the respective factories.

[1] Agricultural Directorate – Qena Governorate

8.4 RECYCLING OF AGRICULTURAL RESIDUES

The vast quantities of agricultural residues are generated in the Governorate, almost 6 million tonnes in total in the year 2000. More of this waste needs to be recycled into compost, animal fodder, and silage. In order for any recycling to be effective assistance will be required from companies or cooperatives supported by the governorate.

8.5 FISHERIES AND AQUACULTURE

The fisheries sector in Qena Governorate is under the supervision of the General Authority for Fisheries Research and Development (GAFRD). There are four fisheries cooperatives in Qena: Isna (649 fishermen), Qena (390 fishermen), Dishna (323 fishermen), and Naga Hammady (425 fishermen).

The total fish catch during the year 2000 was 1,531 tons of fish, dominated by Tilapia species. *Table 8.7* shows the monthly catch and annual distribution of fish catch across the four cooperatives. Naga Hammady Co-operative had the highest annual catch with 782 tonnes in the year 2000. It is estimated that the average price is L.E. 5/kg. This equates to an annual revenue of between LE. 7,655,000 and L.E. 30,620,000 derived from artisanal fisheries in Qena Governorate.

Table ٨.7 Total Fish Catch by Co-Operative in Qena Governorate (2000)[1]

Month	Isna Co-Op.	Qena Co-Op.	Dishna Co-Op.	Naga Hammady Co-Op.	Total
January	9	23	5	28	**65**
February	8	27	2	27	**64**
March	19	35	7	38	**99**
April	44	39	4	101	**188**
May	58	30	5	110	**203**
June	35	23	7	84	**149**
July	39	19	6	84	**148**
August	39	29	6	74	**148**
September	46	35	6	84	**171**
October	35	24	5	54	**118**
November	22	21	6	39	**88**
December	12	14	5	39	**90**
Total	**366**	**319**	**64**	**782**	**153**

[1] Directorate of Fisheries Wealth Authority – Qena Governorate

The total annual fish catch of these cooperatives during the period 1982-2000 is shown in *Table 8.7*. The table shows that although catches appear quite variable, with careful management fish catches could be increased quite significantly and possibly to in excess of 6,000 tonnes of fish per annum. The GAFRD has started a programme of re-stocking the Nile with fingerlings and has released about 1.25 million hatches during the year 2000. The GAFRD intends to restock the Nile with more than 55 million fingerlings to maximise the benefits of the fishery and also to compensate for a perceived decline, which may have been caused by one or more of the following factors:

- The lack of seasonal flooding resulting in a disappearance of the shallow pools that used to characterise the river;
- The lackof seasonal flooding which is also associated with the disappearance of seasonal changes in suspended organic material;
- Canalisation of much of the reaches of the Nile resulting in loss of habitat; and
- Water pollution resulting from increased urbanisation, industrial development and more intensive agricultural practices.

Table ^.8 Total Fish Catch (Tonnes) in Qena Governorate (1982-2000)[1]

Year	Qena	Dishna	Naga Hammady	Isna	Total
1982	306	56	752	--	1,114
1983	466	77	807	--	1,345
1984	435	71	804	--	1,310
1985	509	99	1009	--	1,617
1986	640	215	996	--	1,851
1987	530	86	1181	--	1,797
1988	497	98	1019	--	1,614
1989	435	65	1328	--	1,828
1990	464	100	1327	--	1,891
1991	430	226	949	--	1,605
1992	391	227	1135	--	1,753
1993	469	158	1070	--	1,697
1994	536	168	886	--	1,590
1995	517	331	736	680	2,264
1996	438	336	718	872	2,364
1997	301	391	669	587	1,948
1998	261	336	694	733	2,024
1999	363	106	580	391	1,440
2000	320	64	782	366	1,542

[1] Directorate of Fisheries Wealth Authority – Qena Governorate

In addition there are areas in the Governorate with the potential for development as aquaculture ponds. The Fisheries Wealth Authority (FWA) controls the aquaculture in Qena Governorate; at present there are no licensed fish farms or fishponds in the governorate. However, some individuals have established some unlicensed aquaculture around the Nile islands along the course of the Nile although their number and capacity are not known.

9 *MINING AND MINERAL EXTRACTION*

9.1 *AN INTRODUCTION TO MINERAL DEPOSITS IN THE GOVERNORATE OF QENA*

The Governorate of Qena is rich in minerals, especially building materials and ornamental stones. The mineral reserves of the Governorate are illustrated on *Map 17* and *Map 18*. No resources of oil or gas have yet been discovered in the Governorate.

Known mineral occurrences in the basement rocks include gold (Fawakhir and Atalla) and talc (Wadi Um Sulaymat). Granites and other igneous and metamorphic rocks as well as Hamamat sediments are widely distributed in the area and valued as ornamental stones.

The sedimentary succession of deposits to the east of the Nile includes a belt of phosphate deposits extending from Idfu to the north of Qena. Occurrences of Nubian sandstones, shale, sand and gravel along Qena–Safaga road are also commercially important. The sedimentary succession of the region includes limestone (Gebel Abu An-Nur), clay (Al-Gharirah) and sandstone (Naj'ash-Shimakhiyyah).

The sedimentary succession west of the Nile includes known occurrences of phosphate deposits (Gebel Al-Jir), shales (Gebel At-Tarif) and limestone (Al-Isawiyyah).

9.2 *PHOSPHATE ORE DEPOSITS*

Phosphate is exploited in El Mohamed and El Sibaiyyah south of Isna for domestic purposes. The Geological Survey of Egypt has studied the phosphate ore in the Nile Valley and determined its occurrence and the reserves in each area. The percentage of phosphate as P_2O_5 was also determined. Phosphate ores in the Nile Valley lie very close to the surface and may be cost-effectively exploited by the open cast mining. Phosphate is an important ore with several commercial uses including for use in the manufacture of fertilizers (super phosphate) and phosphoric acid.

Table ٩.1 Reserves of Phosphate in Qena Governorate[1]

Region	Total reserve (million ton)	P_2O_5 (%)	Reserve for open mining	Average P_2O_5 (%)
Gebel Abu Had	317.6	20.27	33.1	20.32
Wadi Hamamat	18.0	23.57	18.0	23.57
Gebel El Sarai	50.3	20.28	50.3	20.28
Gebel Al-Jir	44.0	20.83	44.0	20.83
Wadi El Mashash	359.0	22.67	134.3	22.41
Wadi El Shaghab	496.0	21.29	349.0	29.16
Wadi El Bator	279.0	21.32	199.5	21.40
Total reserve	1554.6	21.39	828.1	21.42

[1] Mining Department – Qena Governorate

Map 17 Metallogenic Map of Building Materials and Ornamental Stones in Qena Governorate

Map 18 Metallogenic Map of Metallic Ores and Non-Metallic Deposits in Qena Governorate

9.3 LIMESTONE

Limestone is another commercially important deposit and can be exploited for use in several industries including cement, iron and aluminium industries, and also for use in fertilizer and glass manufacture and sugar distillation. In addition limestone may also be used as a construction materials.

In Qena Governorate there are three main types of limestone with different physical and chemical characteristics. The main types are described below:

9.3.1 *Upper Cretaceous Limestone*

Composition of this marly limestone is suitable for the cement industry and a large cement factory is under development to the east of the Qeft Industrial area.

9.3.2 *Palaeocene Limestone.*

Palaeocene limestone or Chalk is widely distributed east of the Nile in the area between Idfu and Qena. In El Sharawna, about 11 km east of Isna Palaeocene limestone reaches about 15 m in thickness over an area of about 1.5 km^2 and the total reserves are estimated at approximately 35 million tonnes. Palaeocene limestone may be exploited by open cast mining and used in cement and fertilizer industries or as building stone. Commercially viable reserves exist in Gebel Abu Had and Gebel Um Aors (north of the Qena-Safaga road).

9.3.3 *Eocene Limestone*

Eocene limestone in Qena is composed of crystalline limestone with chert and some marl and chalk (Thebes Formation). It may reach a thickness of up to about 200m.

Limestone with relatively high levels of SiO_2, MgO, SO_3 and chert cannot be utilised for the fertilizer or cement industries, however, may be used for lime production and as building stone.

9.4 SHALE AND CLAY

Shale and clay deposits are important primary deposits used for several purposes including cement, brick, and ceramics industries. Shales and clays occur in marine Cretaceous and continental Quaternary deposits and often intercalate with sandstone and limestone. Isna and Dakhla shales are very important and widely distributed in Qena. Quaternary shales are distributed at the entrance of Wadi Qena and south of Qena-Safaga road. A large brick factory at El Maharousa, about 20 km south of Qena City exploits large quantities of Isna shale.

9.5 AGGREGATES (SANDS AND GRAVELS)

Sands and gravels are widely distributed in Qena and heavily exploited for use in the construction industry. Aggregates extracted in Qena are commonly exported to the Red Sea Governorate for use in the construction industry, particularly relating to the rapidly expanding tourism sector.

The demand for aggregates, especially gravel, has caused significant environmental problems relating to extraction and may also lead to local changes in hydrogeology, which may impact water supplies.

Sand and gravel quarries are widely distributed in the Qena area and occupy part of the old alluvial plain of the Nile Valley. A total of 59 quarries are officially registered in Qena Governorate and are regulated controlled by the Law 86/1956. The Governorate department of quarries and mining controls permitting.

Table ٩.2 Distribution of Sand and Gravel Quarries in Qena Governorate [1]

Markaz	Gravel	Sand	Shale	Limestone	Sandstone
Qena	6	6	3	-	-
Naga Hammady	5	2	-	-	-
Qus	4	3	-	-	-
Abu Tesht	4	1	-	-	-
Isna	5	2	-	-	-
Dishna	5	3	-	-	-
Armant	5	3	-	-	-
Farshut	1	-	-	-	-
Naqada	-	1	-	-	-
Qeft	2	1	1	1	1
El Waqf	-	-	-	-	-

9.6 SANDSTONES

Nubian sandstones are widely distributed east of the Nile Valley. A significant reserve of coloured sandstone occupies a very large area west of the basement rocks and extends more than 50 km along Qeft – Quseir road where it is quarried and about 30 km along Qena - Safaga road. Sandstones

[1] Mining Department – Qena Governorate

are mainly used as building stone and blocks of about 1.5m x 1.5m x 2.0m may be obtained using the main fracture direction of sandstone beds.

9.7 BRECCIA OR HAMAMAT SEDIMENT

These rocks occur within the basement rocks in the Eastern Desert along Qeft-Quseir road, about 75 km east of Qeft and are composed of red and green conglomerate. They are characterized by their hardness and attractive colours, and often used as ornamental stones.

9.8 GRANITE

Granites are widely distributed in the Eastern Desert along Qeft - Quseir road, about 90 km east of Qeft and along Qena – Safaga road, about 80 km east of Qena. Both grey and pink granites may be found and are often used as ornamental stones.

9.9 SERPENTINE

Serpentines (sometimes referred to as green Qena) are widely distributed in the Eastern Desert along Qeft - Quseir road, about 80 km east of Qeft at Wadi Atala. Serpentines are soft rocks and are exploited as ornamental and building (crushed rock aggregate) stones. Serpentine minerals are derived mainly from disintegration of ferromagnesian silicate minerals including pyroxene and olivine. Serpentine is generally accompanied by talc, carbonate rocks with a white cream colour consisting of chlorite, tremolite, talc, anthophyllite and related minerals.

10 INDUSTRY

10.1 AN INTRODUCTION TO THE INDUSTRIAL SECTOR IN QENA GOVERNORATE

The majority of Qena's population is employed in the agricultural sector. Only 6.4% of the workforce of 500,000 is employed in the industrial sector. Of this 6.4% approximately one third are employed at a single facility – the aluminium complex in Naga Hammady. Another 25% are employed in the sugar sector in the four major sugar factories located in the Governorate.

Almost all the rest of the industrial work force are engaged in more than 5,000 micro, small and medium enterprises (MSME's) with less than 100 employees with the micro sector making up more than 98% of the sector.

In the last ten years industrial development in Qena has been influenced by two main factors:

- Rapid development in the Red Sea Governorate;
- Establishment and development of industrial zones in Qena Governorate.

10.2 RAPID DEVELOPMENT IN THE RED SEA GOVERNORATE

The rapid development of the Red Sea Governorate, primarily related to the development of infrastructure for tourism such as hotels has influenced development in Qena. Not only has there been a high demand for labour in the construction industry, but also for staff for hotels. The ability of Qena to respond to this demand has been influenced by the improvement of communications and specifically, the road connections from Qena to the Red Sea (Qena – Safaga and Qus – El Quseir roads). In addition the concerted action from the Government to upgrade educational facilities in Upper Egypt has led to the development of a more educated workforce.

These developments have enabled Qena to capitalise on some of its advantages including:

- Presence of a relatively abundant work force with modest wage requirements;
- Presence of good mineral resources, such as marble and clay, suitable for use in the construction industry;
- After the construction of the Aswan High Dam, the abundance of cheap electricity encouraged the establishment of a number of electricity-intensive industries, most notably the aluminium smelter in Naga

Hammady. This comparative advantage has since been largely displaced; and
- High agricultural productivity all year round as distinct from the more seasonal nature of the Delta.

10.2.1 Qena New City

The National Strategy for Physical Planning (2000), produced by the General Organisation for Physical Planning, has identified Qena for the development of a New City. The reasons for locating one of Egypt's new cities in Qena Governorate are related to the perceived benefits of Qena's strategic location as identified above. The new city is planned to accommodate housing and industry and will include provision for both MSMEs and larger industry including industry from the chemical manufacturing sector. The boundaries of the New City have been defined are shown on *Map 19*, however the detailed planning, including a formal Environmental Impact Assessment, as required under Law 4 has yet to be finalised.

10.2.2 The Establishment of Industrial Zones

In order to stimulate industrial development in Qena, the Governorate administration established a number of industrial zones. To encourage industries to invest in these zones, serviced land is allocated to investors at no charge. In addition, permitting for industrial development in urban areas is strictly constrained.

Two industrial zones currently exist in Qena. The first zone, at Qeft, is already constructed and occupies an area of about 600 feddans. Infrastructure, with the exception of a public sewerage system, is already in place, however, only 4 significant industrial concerns are under establishment. Most of the current development is composed of MSME's.

The second industrial zone is located near the village of Hew in Naga Hammady is still under construction. The planned area for the zone is 636 feddans. When completed, the zone should be able to accommodate all the industrial development needs in the Markaz of Naga Hammady, Farshut and Abu Tesht.

Two additional sites have been allocated for two further industrial zones in Armant and Isna. However, the development of these sites has not yet started.

10.2.3 *Major Industrial Facilities in Qena Governorate*

There are a total of 26 significant industrial facilities located in Qena Governorate. Of the facilities identified, only 15 of those are actually operational. *Map 20* shows the locations of some of the major industrial facilities in the Governorate. These include:

- 4 sugar factories;
- 9 flour mills;
- A clay brick kiln; and
- The Naga Hammady Aluminium smelter.

In addition, there is a spinning factory, which is currently non-operational, three factories about to begin production and four additional facilities under construction. Various other industrial establishments are still in the early planning stages including the Egyptalia Marble and Granite Production Company planned for the Qeft industrial zone and two facilities planned adjacent to the zone: the South El-Wady Petroleum Refinery and a Pepsi Cola factory.

There are two factories that have recently commenced production and both are related to the sugar industry and actually located adjacent to existing sugar factories:

- A newsprint paper factory in Qus; and
- A fibreboard factory in Dishna.

The two factories have been constructed within the boundaries of the two existing sugar factories in Qus and Dishna, and are an investment of their national parent company, a national company known as the Sugar and Integrated Industrial Company. The Newsprint factory received international financing from Germany. The raw material used in both of the two factories is Bagasse or the solid fibrous residue from the sugar cane after the sap and juice have been extracted for sugar production.

Map 19 The Proposed Location and Extent of Qena New City

Map 20 The Location of Major Industrial Facilities in Qena Governorate

10.3 MICRO, SMALL AND MEDIUM ENTERPRISES IN QENA GOVERNORATE

Industrial establishments in the MSME sector are distributed widely across the Governorate in a variety of sectors. There are 19 sectors represented in the Governorate, which may be divided into 38 sub-sectors and covering nearly all-manufacturing sectors. However, micro enterprises are the major size class.

There are a total of 5,263 industrial MSMEs in Qena governorate, employing 13,166 employees in 1996. MSMEs in Qena are mainly from low technology labour intensive sectors, dependent on low cost labour. The manufacturing of clothes, furniture, simple fabricated metal products, milling, preparation of other food products, non-metallic mineral products, and wooden & cork products are the most common sectors in Qena (with over 100 establishments for each). Based on the CAPMAS data (1996) a list of all sectors and sub sectors present in Qena is shown in *Table 10.1*.

10.4 INDUSTRIAL POLLUTION

10.4.1 Major Pollution Discharges

Industrial pollution in Qena Governorate is limited in nature due to the fact that industrial development is limited. Larger industries including the sugar factories and their associated industries and the aluminium smelter have the most significant industrial discharges and emissions. However, cumulatively the MSME sector is important and although the majority of emissions and discharges are minor in nature, cumulatively they have a significant impact.

Table ١٠.1 MSMEs in Qena Governorate [1]

CAPMAS Code	Industrial Sector	No of Establishments	% Of MSME Sector
181	Manufacture of clothes (excluding fur products)	1474	28.01%
361	Manufacture of furniture	897	17.04%
153	Milling (crops, starch and animal fodder)	799	15.18%
289	Manufacture of miscellaneous metallic products	509	9.67%
154	Manufacture of food products (non-specific)	461	8.76%
202	Manufacture of wood, cork and straw products	281	5.34%
269	Manufacture of non-metallic mineral products	266	5.05%
201	Wood milling	115	2.19%
152	Dairy industry	78	1.48%
222	Printing and allied services	63	1.20%
172	Textile industry (non-specific)	52	0.99%
292	Manufacture of specialist machinery	46	0.87%
281	Manufacture of structural products, tanks and steam generators	43	0.82%
192	Manufacture of shoes	32	0.61%
171	Textiles (spinning, weaving and finishing)	22	0.42%
241	Manufacture of basic chemicals	16	0.30%
331	Manufacture of medical instruments	12	0.23%
151	Production, preparation and preservation of meat and fish	11	0.21%
252	Manufacture of plastic products	11	0.21%
311	Manufacture of engines, generators and transformers	10	0.19%
191	Tanning and dressing of leather (luggage, handbags and harnesses)	9	0.17%
381	Manufacture of general products (non-specific)	8	0.15%
173	Textiles (knitting)	7	0.13%
261	Manufacture of glass and glass products	7	0.13%
359	Manufacture of general equipment (non-specific)	6	0.11%
155	Beverages industry	4	0.08%
210	Manufacture of pulp, paper and paper products	4	0.08%
271	Iron and steel industry	4	0.08%
242	Manufacture of general chemicals (non-specific)	3	0.06%
351	Building and maintenance of ships	3	0.06%
291	Manufacture of multipurpose machines	2	0.04%
293	Manufacture of general household equipment (non-specific)		
252	Manufacture of rubber and plastic products	1	0.02%
223	Reproduction of recorded media	1	0.02%
232	Petroleum refining	1	0.02%
272	Manufacture of precious metals & non-ferrous products	1	0.02%
273	Metals smelting	1	0.02%
352	Manufacture of trains and trams	1	0.02%

[1] Assessment of MSME's in Qena Governorate (SEAM Documents, 2000)

10.4.2 *Atmospheric Emissions*

Significant atmospheric emissions are limited to the sugar factories, and their associated factories, flourmills, and the aluminium smelter. The burning of bagasse and mazut (crudely refined heavy fuel oil) is the major source of air emissions in the sugar sector.

Emissions from the flourmills are generated in the first stages of cleaning the wheat. The higher impurities in local wheat, as compared to imported wheat, make the problem sensitive to the mix of wheat used by each mill. When the mills use 25% or less of local wheat, the existing cyclones control pollution to acceptable levels. When a higher percentage of local wheat is used, dust emissions are much higher and the existing control systems are not sufficient.

Emissions from the aluminium smelter at Naga Hammady result from process related- fumes containing hydrogen fluoride, sulphur oxides, carbon monoxide, carbon dioxide, nitrogen oxides, hydrogen sulphides, sulphur hexaflouride, metal oxides, and dust. The pollution abatement equipment at the complex is currently being upgraded with assistance of loans from the World Bank and the European Investment Bank and a new dry flue gas purification system is being installed. *Table 10.2* shows the concentrations of pollutants from the aluminium smelting process before and after treatment by the existing "wet " process and after installation of the new "dry" process.

Table ١٠.2 ***Concentrations of Pollutants (mg/m^3) in Flue Gases from Naga Hammady Aluminium Smelter Before and After Treatment*** [1]

Pollutant	**Before Treatment**		**After Treatment**	
	Wet Treatment	Dry Treatment	Wet Treatment	Dry Treatment
Hydrogen Flouride	250	177	25	3.5
Sulphur Dioxide	400	30	40	0.6
Dust	2,130	65	210	1.3

10.4.3 *Wastewater and Industrial Effluent Discharges*

The major sources of industrial wastewater in the Governorate are the sugar factories. Historically the untreated wastewaters were a major source of pollution and contamination of the River Nile. All of the four factories have installed cooling towers and wastewater treatment plants which, when properly operated, are sufficient controls for their effluent discharges. It should, however, be noted that the current operation of the sugar factories effluent treatment facilities is a point of disagreement between the

[1] Nagga Hammady Aluminium Factory

representatives of the industries and the Qena Governorate Environmental Management Unit or EMU.

The Qeft Industrial Zone is due to have a full sewerage system and industrial wastewater treatment plant; however the plant has still to be constructed and commissioned. Although this has not caused a significant problem to date, due to the fact that only a few industries are currently operating, the delayed implementation may hamper the start up of new industrial facilities in the zone.

10.4.4 Solid and Hazardous Wastes

Solid and hazardous wastes generated by industry in Qena Governorate include the iron cyanide complexes formed in the carbon lining of the production cells of the aluminium smelter, potentially plastic and glass chemical containers formerly containing solvents, acids, alkalis, and disinfectants from the Hebi pharmaceutical factory, and waste paints and waste oils from the shipyard in Armant. Most industrial facilities from micro-enterprises to the larger factories generate solid wastes and generally they are poorly managed and disposed of in an uncontrolled way. Many of the problems relate to the lack of adequate solid waste collection and disposal systems in the Governorate described in *Section 13*.

Table ١٠.3 Main Sources of Industrial Emissions in Qena Governorate [1]

Markaz	Large Industries	Small Industries
Qena	-	Pottery Kilns
Naga Hammady	- Sugar Factory - Aluminium Complex	Molasses
Qus	- Sugar Factory - Paper Factory	-
Abu Tesht	-	Molasses
Isna	-	Clay-Brick Kilns
Dishna	- Sugar Factory - Fibre Board Factory	-
Armant	- Sugar Factory	-
Farshut	-	Molasses
Naqada	-	-
Qeft	-	-
El Wakf	-	-

[1] Large Industry Studies in Qena Governorate (SEAM Documents, 2000,2001)

11 TOURISM

Tourism in Qena Governorate is restricted because of issues rating to security and movement of foreigners through the Governorate by road is restricted. Nile cruises do pass through the south of the Governorate on their way between Luxor and Aswan and Isna Temple is often a scheduled stop off point. In addition day excursions by boat from Luxor are available to Dendara temple in the north. Dendara Temple may also be visited by coach or bus from Luxor. Coaches and buses so pass through the Governorate on the way between Luxor and the Red Sea and use the Qena-Safaga road. Coaches and buses travelling this route rarely stop and often travel in convoys. Revenues from entrance tickets at tourist sites go into the central exchequer of the Supreme Council of Antiquities in Cairo and do not necessarily benefit the local economy. Limited economic benefits are derived in the immediate vicinity of the temples from soft drinks stalls and souvenir stalls.

11.1 DENDARA TEMPLE

Dendara Temple is a major tourist site in Upper Egypt and is visited by tourists both from cruise ships on the Nile and via road in coach convoys directly from Luxor. In 2000, the temple generated LE 1,220,193 in entrance fees and was visited by 124,647 visitors.

11.2 ISNA TEMPLE

Isna Temple is so a major tourist site in Upper Egypt and is visited by tourists both from cruise ships on the Nile and via road in coach convoys directly from Luxor. In the four-month period from October 2000 to January 2001, the temple generated LE 523,829 in entrance fees and was visited by 67,949 visitors.

PART IV

PROVISION OF ENVIRONMENTAL SERVICES AND INFRASTRUCTURE

12 WATER SUPPLY AND SANITATION

12.1 AN INTRODUCTION TO POTABLE WATER SUPPLY SERVICES

Water resources in Qena Governorate include both surface water and groundwater sources. Surface water sources account for about 61% of the total water production (estimated at 38,6762 m3/day). The average per capita daily water consumption for Governorate is 159 litres.

There are no standard water supply systems or technologies used in Egypt in general or specifically in the Governorate of Qena. Existing operating facilities seem to dictate the system choice. In Qena, both compact units and groundwater supplies continue to be used to serve different communities. Potable water treatment systems in use in Qena Governorate include:

- Traditional (large) surface water treatment plants (44.4% of total water production);
- Compact Units (16.6% of total water production); and
- Groundwater systems of various types (39% of total water production).

Water consumption figures vary widely from 58.3 litres per capita per day in Abu Tesht and 88.6 l/c/d in Naqada to 235.88 l/c/d in Qena and 254.29 l/c/d in Qus. These figures are difficult to interpret as allowances for leakage and amounts of groundwater used for irrigation purposes can skew the numbers upwards dramatically, and use of un-metered sources such as hand-pumps and wells can make the figures look unrealistically low.

Water quality of potable water supplied in the different Markazes varies according to the treatment system. Water produced by traditional surface water treatment plants is of relatively good quality, and compact units that are functioning well generally produce water of fair quality. However, many groundwater supplies have either no or very basic treatment, and various different problems rated to water quality are often reported e.g. high levels of manganese, significant levels of manganese and iron, or heavy bacterial contamination. In addition, pollution of potable water in the distribution network is evident in many rural areas.

In general, potable water services in the Governorate suffer from operation problems rated to inadequate pressure, frequent interruptions in supply and very high leakage rates. *Maps 21* illustrates the main sources of potable water supply in the Governorate.

Map 21 Water Supply Locations in Qena Governorate

12.2 RAW WATER ABSTRACTION

12.2.1 Sources of Water Abstraction

The traditional large water treatment plants and the compact units abstract water directly from the River Nile, with the exception of the Bakhanes compact unit in Abu Tesht, which abstracts water directly from the Naga Hammady canal. The location of most of the abstraction points for the major water treatment works and Compact units is shown on *Map 21*.

Groundwater abstractions take water from aquifers in a variety of locations in the Governorate with depths varying from 30m to 85m, with the average being approximately 45m in depth.

Volumes of Water Treated

Production figures for the different types of treatment are summarized in *Table 12.1*.

Table ١٢.1 Water Production in Qena Governorate [1]

Markaz	Groundwater Wells (m^3d^{-1})	Compact Units (m^3d^{-1})	Traditional Large Treatment Plants (m^3d^{-1})	Total Water Produced (m^3d^{-1})
Qena	16,460	14,758	78,100	109,308
Naga Hammady	22,568	17,336	20,900	60,804
Qus	55,961	5,720	13,937	75,618
Abu Tesht	14,810	1,980	0	16,790
Isna	3,926	20,793	13,200	37,919
Dishna	0	0	41,818	41,818
Armant	10,770	2,970	0	16,790
Farshut	12,362	0	0	12,362
Naqada	5,852	4,950	0	10,802
Qeft	4,420	0	20,909	25,329
El Waqf	3,660	2,200	0	16,790
Total	150,789	70,707	188,862	410,359

Production figures for the large treatment plants were obtained directly from the plant operator, based on actual measurements. For compact units the operation hours are not constant on a daily basis, so the nominal discharge of the unit (50 l/s, 100h/s, etc.) does not represent the actual daily production, as there are no flow-measuring devices working in any of the units. The value of the daily production was obtained from discussions with the person responsible for water and wastewater in each Markaz. Losses through the

[1] Water Department – Qena Governorate

water treatment process have been estimated as 10% of the total water production. For groundwater operations, information regarding pumps and their production rates were obtained and estimates calculated for water production.

Table 12.1 lists Markaz in order of population size. The water production figures do not correspond to population size. As previously stated, these figures are difficult to interpret as allowances for leakage and amounts of groundwater used for irrigation purposes can skew the numbers upwards dramatically, and use of un-metered sources such as hand-pumps and wells with no meters can make the figures look unrealistically low.

12.3 WATER TREATMENT AND DISTRIBUTION

Groundwater abstracted for potable supply is rarely treated, except in the following villages:

- *Chlorination*: Shaaniah, Awlad Nigm Bahgurah in Naga Hammady;
- *Iron & Manganese Removal via aeration*: El Araky and El Dahsa in Farshut.
- *Flocculation & Sedimentation:* Dandara in Qena;

The standard compact unit treatment procedure involves the following steps: initial disinfection, rapid mixing, flocculation, settlement, filtration through a sand filter and final disinfection. Often the water does not receive all these stages of treatment, it depends on the condition of the unit, the operation and maintenance regime and the availability of water treatment chemicals such as flocculants and chlorine.

Data regarding water quality, water treatment, and volumes of water produced are extremely scarce and only a few hand written records exist. Operating hours ranged from 2 hours a day to 20 hours a day. Some of the groundwater treatment and pumping facilities date back to the 1950s and 1960s and only remain operational with virtually continuous maintenance. The majority of compact units date from the 1980s and 1990s and although more recent, require regular maintenance in order to meet their original operational specification. The majority of the large traditional treatment plants are less than 20 years old with the exception of Isna, which was constructed in 1948. Isna water treatment works is now being rehabilitated and expanded with new plant under construction.

Operation and maintenance of treatment plant is the responsibility of either the local administrative unit or the Housing Department and in some instances the responsibility is shared.

Water supply networks or distribution systems are constructed from asbestos cement and serve typically serve between 40% and 90% of the population. Access to potable water varies from a connection to each household, a single connection to each building, standpipes in the street, hand pumps direct from groundwater wells, or water transported by tanker. Access to potable water was discussed in more detail in *Section 2.3.4*.

12.4 WATER QUALITY MONITORING

The water analysis laboratory in the new water treatment plant in Qena is responsible for monitoring, sampling and analyses of water in the Governorate. There is no discrete monitoring programme for Compact Units or groundwater supplies. The monitoring programme constitutes taking a sample of treated water from each groundwater well or compact unit every six months. In addition, samples are taken in the event of any complaint or emergency. Each of the seven larger traditional water treatment works has a dedicated laboratory and sampling programme.

12.5 MANAGEMENT AND MAINTENANCE OF WATER TREATMENT AND SUPPLY INFRASTRUCTURE

There are many issues relating to the quality of service of water supply and distribution in the Governorate. Maintenance is a major issue as there is no strategic maintenance plan and resource constraints mean that the maintenance tends to be reactive in nature responding to equipment failures. This means that when maintenance is carried out there is inevitably a disruption to supplies. Often technical assistance is needed from Cairo to repair more sophisticated equipment, as locally skilled technicians are in short supply. Spare parts are often scarce, and even basic commodities such as water treatment chemicals and chlorine are not available in sufficient quantities. There is also a general lack of strategic planning for replacement and expansion of treatment and distribution facilities.

12.5.1 Water Supply Charges

Water tariffs in Qena Governorate average approximately 25 Piastres m^{3-1} for domestic use, and 40 - 49 Piastres m^{3-1} for commercial or industrial use. The real cost of water production was mentioned by the local units to be in the range of the tariff value to 150 Piastres/m^3 with an average value of 85 Piastres/m^3. The collection of water charges was made by the local units or the housing departments and based on meter readings or based on a flat-rate of 10-25 m3/month/connection (when meters are not working meters or readings not available). No billing system exists and the shortage of fee collection can be seen clearly in the Governorate. Every consumer should go to the city village council to know his charges and pay his dues.

12.5.2 *An Introduction to Sanitation*

With the exception of Qena city there is no sewerage infrastructure in any settlement in the Governorate of Qena. The network of gravity sewerage systems in Qena City covers about 200 km with approximately 1600 manholes, covering approximately 80% of the city's area, with approximately 10,000 connections.

The types of sanitation systems available include traditional gravity sewers, untraditional or pumped sewers or on-site sanitation systems. Traditional sewers account for 5% of sanitation coverage in the Governorate, untraditional sewers approximately 15% and on-site sanitation systems account respectively for approximately 45%. Accordingly, about 35% of the population is not provided with any sanitation services.

The only operational wastewater treatment plant is in the city of Qena. However, the National Organisation for Potable Water And Sanitary Drainage (NOPWASD) has a plan for construction of a wastewater plant in every major city in the Governorate. It is expected that this addition capacity will cover the majority of the needs of urban areas, however, the plan does not address the provision of sanitation services to rural areas.

The sanitation services in Qena are lagging way behind the water services. *Table 12.2* presents the basic distribution of sanitation in the rural areas of Qena as well as the sanitation services in the urban areas. The table illustrates that the sanitation services available in the Governorate are only available in urban areas, and only in the larger urban areas. Four cities lack any type of service provision. Rural areas have no central sewerage systems or wastewater treatment plants. As a whole, service provision in the Governorate is below the national average. The table does not illustrate the situation in urban slum areas where provision of sanitation and sewerage services is also virtually non existent.

The situation in urban and rural areas will be presented in details in the following parts of this report.

Table ١٢.2 Sanitation Services in Qena Governorate [1]

DISTRICT	URBAN		RURAL	
	M^3D^{-1}	%	M^3D^{-1}	%
Qena	25,000	14.7	None	0
Naga Hammady	35,000	20.6	None	0
Qus	30,000	17.6	None	0
Abu Tesht	15,000	8.8	None	0
Isna	15,000	8.8	None	0
Dishna	30,000	17.6	None	0
Armant	20,000	11.8	None	0
Farshut	None	0.0	None	0
Naqada	None	0.0	None	0
Qeft	None	0.0	None	0
El Wakf	None	0.0	None	0
TOTAL	170,000	100.0	None	0
AVERAGE	15,450	14.3	None	0

12.5.3 Sanitation Services in Rural Areas

The rural areas of Qena accommodate over 65 % of the total population, yet there are no formal wastewater services in these areas. Currently, the rural population has a major problem in disposing of wastewater. The difficulties in disposal of wastewater in turn leads to a reduction in the amount of potable water utilised which leads to adverse effects on health, particularly for women and children.

Wastewaters may be classified into two major components:

- Sullage: wastewater generated from cooking, cleaning, washing and other household uses. This component makes up about 80 % of the total wastewater generated.
- Sewage: human wastes from defecation and urination making up approximately 20% of the wastewater generated.

The latter component of the wastewater is the most significant since it has high BOD and is biologically contaminated. In addition water used for cleaning and disposal of this fraction of wastewater may increase its volume significantly.

Sullage is often disposed of into drainage canals, in the street or any open area inside the house or outside it. This often causes serious environmental contamination and pollution problems.

[1] Baseline Study on Water Supply and Sanitation Services in Qena Governorate 2001 (SEAM Document)

In Qena, communities often claim that this disposal route has been practised for many years without causing serious problems. Although this perception is common it is not an accurate reflection of the real situation and is due to a lack of awareness and education in matters relating to public health.

Sewage disposal is more complicated in nature. When people are asked how they dispose of this fraction of the wastewater that they generate a wide range of responses and the following list gives examples of typical responses received when people were asked where they go to the toilet:

- Open or 'free-range' defecation;
- In the animal quarters "Hazira or Zeriba";
- At a neighbour's house;
- In a corner in the house;
- In the fields;
- On the roof;
- In a can or any similar container; or
- At the mosque.

The answer differs markedly among men and women, which is to be expected as the degree of freedom and the daily routine of life is widely different between the different genders. Children probably suffer the most from the lack of adequate sanitation facilities. Almost one third of the Infant Mortality Rate has been attributed to diarrhoea and dysentery in Qena[1], although this data does not correspond with recent data provided by the Health Directorate in Qena. There have been many attempts at addressing the problems of sanitation in rural Egypt and probably the most significant programmes have been those implemented by the SHOROUK Programme and by UNICEF.

Box ١٢.1 The SHOROUK-UNICEF Pour Flush Latrine

The twin pit pour flush latrine design was implemented in Qena Governorate through a joint venture between the SHOROUK Programme and UNICEF. Over 10,000 units have been installed to date across six different Markazes. The project commenced in 1997 and is still supported by SHOROUK and Ministry of Local Development - over 25,000 units were requested in the year 2000 fiscal year alone.

The installation of the units was completed through a local NGO, the General Federation of Boy Scouts and Girl Guides, ensuring the sustainability of the installation, continuous monitoring of their performance and support to community members requiring assistance or guidance. The cost of each unit is less than 400 LE and each unit may serve about 10-15 people at an average of about 20-30 LE per person. The low cost made the units very affordable and attractive for beneficiaries to replicate on their own. In some communities, participation in installation of these units has reached levels of up to 50%.

[1] The Situation of Children in Egypt - UNICEF 1999.

Box ١٢.2 The UNICEF-Save The Children Communal Septic Tanks

UNICEF, in conjunction with Save the Children, developed a community sanitation service between 1994 and 1997. It was carried out in Higaza and its satellite villages. Over 100 septic tanks were installed varying from a tank serving a single household to communal tanks serving between two and six families. The cost of the tank varied between LE 2000 and LE 4000, depending on the capacity.

The system comprised a septic tank with solid base, which, via an extended trench leads to a tile drainage system that allows partially treated water to seep into the ground. The system proved to be very successful as it handled both sullage and sewage and therefore offered a service to communities that fully addressed the environmental requirements for wastewater disposal.

The system has the potential to be upgraded through a connection to a small-bore sewer network system and potentially to a full wastewater treatment system.

12.5.4 Sanitation Systems in Urban Areas

With the exception of Qena City, there are no sewage treatment systems in any of the urban settlements in the Governorate. The only wastewater treatment plant is in the city of Qena. NOPWASD has a strategic plan for the construction of wastewater plants in all the major urban areas of Qena Governorate.

12.5.5 Sewerage Infrastructure

Full sewerage infrastructure comprising gravity sewers, pumping stations, and sewage treatment plant, is present in Qena city, but in no other city in the Governorate. NOPWASD is implementing projects to provide full sewerage infrastructure and treatment in the following urban centres:

- Naga Hammady;
- Qus
- Abu Tesht;
- Isna;
- Dishna;
- Armant;
- Farshut; and
- Qeft.

The systems will utilise oxidation ponds and will serve the main urban centres and immediately adjacent village centres.

For those cities and villages where a centralised sewage collection and treatment system does not exist, localised systems are utilised. For the majority of houses the system consists of an underground tank with a porous bottom made of bricks or large stones, which acts as a soakaway. However, in many parts of the Governorate the presence of clay or high groundwater levels mean that the tanks fill more quickly than they empty via drainage through the porous bottom. They therefore require emptying by vacuum tankers, which are provided by the local administrative unit. The wastewater and sewage collected by vacuum tankers is normally disposed of at the nearest designated dumpsite, normally located in a desert area outside the main valley. In some areas such as El Waqf, the tankers empty their contents into nearby drainage canals, which obviously causes serious degradation of water quality in the canal and when as the canals discharge back to the Nile, in the Nile itself.

The tanks are emptied at intervals ranging between a few weeks and 6 months, depending on the size of the tank and the number of members of the household. The tanks are emptied by the local government unit at a charge to the household of between 10 and 20 LE. The volume of a typical tank ranges from about from 4m^3 to 15 m^3.

Box ١٢.3 Qena City Municipal Wastewater Treatment Plant and Sewerage System

The Qena City wastewater treatment plant is located at El Salihia, approximately 7km from the city center. The design flow of the plant 25,000 cubic metres/day, which will rise to 33,000 cubic metres/day after the construction of a new pumping station and extensions to the sewerage network. The first stage of the plant was commissioned in 1985 and the second stage in 1994. The treatment includes screening, grit removal, primary settlement, trickling biological filters and final settlement. The final effluent is used to irrigate a tree plantation and meets the following parameters:

BOD	30 mg/l
COD	40 mg/l
Suspended Solids	50 mg/l
Total Dissolved Solids	350-400 mg/l

The operation of Qena City sewerage system commenced in 1985 and consists of two main pumping stations and three sub-stations; a new pumping station is currently under construction. The daily flow of the system is approximately 33,000 m^3/day. The main pumping stations discharge flow directly to the treatment plant through two pressure mains of 1000 mm and 600 mm diameter and lengths of 5.0 km and 6.0 km respectively. The network is in good condition and blockages do not occur frequently.

13 SOLID WASTE MANAGEMENT

13.1 SUMMARY OF CURRENT WASTE MANAGEMENT PRACTICES IN QENA GOVERNORATE

Solid waste collection and disposal is a major problem across the Governorate. The problem has been identified by local officials and members of the public alike and is seen as a priority for action by HE The Governor.

The nature of the problem, however, differs with the nature of the area in question. In urban areas, low collection coverage, infrequent collections, unsuitable infrastructure and open tipping result in significant quantities of municipal waste accumulating on the streets. This is a common situation for most urban centres in the Governorate.

In rural areas there are problems with the accumulation of both agricultural and animal wastes on the street, which reflect the inadequacy or often complete absence of a collection system.

There is also a marked seasonal trend in terms of problems relating to agricultural residues. During the sugar cane harvesting season, December through to May, significant volumes of agricultural waste are evident throughout the Governorate, and the burning of these wastes leads to local deteriorations in air quality and often reduced visibility.

In summary, there is an insufficient solid waste management system in urban areas, whilst in the more rural parts of the Governorate, there is no solid waste management system in place at all (though there are occasional collections).

A summary of the nature of the waste management systems currently in operation in each of the Markazes is presented in *Table 13.1*, and the waste management problems identified through interviews with local officials are given in *Table 13.2*.

The causes of the problem are varied but most Markaz Heads believe that inadequate numbers of waste collection vehicles and staff to work on street sweeping and waste collection are the main problem. The problem tends to be exacerbated by the often, large areas of cities which have very narrow streets with poor access for waste collection vehicles, and the time spent by vehicles travelling to and from the dumpsites, rather than actually collecting waste.

The current disposal practices also result in public health hazards. Municipal wastes arising from domestic and commercial properties are being collected and mixed with animal waste and clinical waste, and taken as a single load to the dumpsite where the wastes are either left to be scavenged or are burned.

13.2 ORGANISATIONAL STRUCTURE OF WASTE MANAGEMENT IN THE GOVERNORATE

There is no single department within the Governorate Administration responsible for solid waste management Each Markaz has a series of cleansing departments who take control of all operational (and service) issues relating to street cleansing, waste collection and waste disposal.

Solid waste management throughout the Governorate is managed under a standardised organisational structure however, there is a clear lack of technical expertise at senior management levels, and little or no training of staff.

Each Markaz has the following officers and staff responsible for waste management in the main city within their administration:

- Cleansing Director;
- Sector supervisors (responsible for planning and enforcement in different areas within the city)
- Cleansing supervisors (responsible for operational concerns such as street sweeping/vehicles/collection equipment)
- A 'fleet' of workers and equipment drivers (and vehicles).

13.3 WASTE GENERATION

A waste generation survey was commissioned by SEAM Programme in order to assess actual waste arisings in Qena City. The average waste generation rate in Qena City was calculated to be approximately 0.78Kg/person/day. Unfortunately, at the time of the survey (2000) there was no comprehensive collection system operating in Qena and so bags were handed to a selection of households in which to collect their daily waste arisings. This approach may often lead to overestimates of the amount of waste generated as households purposely clean-out their dwellings more than usual. In the rural parts of the Governorate the figure is predicted to be about 0.3 Kg/person/day.

These figures do, however, compare with the data derived from national sources on waste generation [(1)] . The figure quoted for urban and rural areas

[1] National Strategy for Integrated Municipal Solid Waste Management - A Framework for Action, Egyptian Environmental Affairs Agency, 2002.

of Qena, respectively, is 0.6 Kg/person/day and 0.25 Kg/person/day. The nationally derived figures may therefore be considered to be representative of the actual situation within the Governorate. Extrapolating these figures for the entire Governorate (see *Table 13.3*), an aggregate tonnage of in excess of 385,000 tonnes of waste require collection, management and ultimate disposal;

- *The 710,000 urban residents would produce 426,000 kgs of waste daily (426 tonnes), or 155,490 tonnes annually.*
- *Additionally the 1,901,500 rural population will produce 631,000 kg daily, which is equivalent to 230,315 tonnes annually.*

Table 13.3 consists of data relating to waste arisings in each Markaz, linking this to current waste collected in the cities. Some Markazes perform better in terms of the proportion of predicted waste arisings (based on national waste generation data) that they collect and dispose of, than others.

Table ١٣.1 Summary of the Current Waste Management Systems Utilised in Each Markaz [1]

Existing Situation	Qena	Naga Hammady	Qus	Abu Tesht	Isna	Dishna	Armant	Farshut	Naqada	Qeft	El Waqf
Accumulations of waste visible on streets	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Waste Bins Present on streets	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No
Numbers of Collection Vehicles	Too Few	Limited	Too Few	Limited	Some	2 Streets Only	Limited	Some	Some	Too Few	Limited
Staff Numbers	Limited	Adequate	Too Few	Limited	Limited	Limited	Too Old	Limited	Limited	Limited	Limited
Extent of Street Sweeping	480 Staff sweeping 2 x Daily	Main Streets 3 x Daily	Main Streets 2 x Daily	Main Streets Daily	Main Streets Daily	Main Streets Daily	Main Streets Daily	Main Streets Daily	Main Streets Daily	Main Streets 2 x Daily	Main Streets
Accessibility of Streets	Good	Adequate	Adequate	Poor	Limited	Adequate	Limited	Poor	Poor	Adequate	Adequate
Intention to Expand Service [2] (Coverage and frequency)	Yes	Yes	Yes	Unknown	Unknown	Yes	Unknown	Unknown	Yes	Yes	Yes
Clinical Waste Mixed with Municipal Waste	Yes	Yes	Yes	Yes	Unknown	No	Yes	Yes	Yes	Unknown	Yes
Separate collection of Animal Wastes	Yes	Yes	No	Yes	Unknown	Yes	Unknown	No	No	Unknown	No

[1] Determined from interviews with Heads of Markaz/Cleansing Managers (June 2001) with further feedback (November 2001)

[2] Expressed a desire to expand service coverage and frequency should sufficient funds become available and have started to plan improved service

Table ١٣.2 Summary of Waste Management Problems in Qena Governorate [1]

Waste Management Problems [2]	**Qena**	**Naga Hammady**	**Qus**	**Abu Tesht**	**Isna**	**Dishna**	**Armant**	**Farshut**	**Naqada**	**Qeft**	**El Waqf**	**Average**	
Lack of Equipment/Poor Maintenance	4	1	2		1	1	1	1	2	1	1	1.5	1st
Limited Availability of Staff/Labour	2=	2				2	2	2	1	3	7	2.6	2nd
Location of Suitable Dumpsite				4					4	6	10	6.0	10th
Waste Elimination	1	4	1			6				4	2	3.0	3rd
Collection Coverage Limited		3	3	1		3	4		5	2	8	3.7	4th
Suitability of Dumpsite	2=	5				10					4	4.8	6th
Distance to Dumpsite	3	6					3		3	5	9	4.8	5th
Clinical Wastes		7		3	3	9					6	5.6	7th
Uncontrolled Dumping in Streets and Canals		9			2	7			6			5.8	9th
Agricultural Wastes		8		5		8	5				3	5.8	8th
Lack of Enforcement	5	10				5					11	7.8	12th
Lack of Public Interest	6	11		2		4					12	7.0	11th

[1] Determined from interviews with Heads of Markaz/Cleansing Managers (June 2001) with further feedback (November 2001)

[2] List of waste problems derived from comments made by Deputy Secretary General in May 2001

Table ١٣.3 Current Waste Generation and Waste Collection in Qena Governorate [1]

Markaz	Population [2]	Urban Population [3]	Urban Waste Generated [4] (Tonnes/year)	Urban Waste Collected (Tonnes/year)	% Urban Waste Collected (Tonnes/year)	Estimated Rural Waste Generation [5] (Tonnes/year)	Total Estimated Waste Arisings (Tonnes/year)
Qena	462,663	169,249	37,066	34,580	93	26,774	63,840
Naga Hammady	398,234	55,000	12,045	7,280	60	31,320	43,365
Qus	310,015	84,000	18,396	8,736	47	20,624	39,020
Abu Tesht	302,656	12,201	2,672	1,820	68	26,504	29,176
Isna	298,713	73,883	16,180	8,736	54	20,516	36,696
Dishna	268,000	55,000	12,045	6,570	55	19,436	31,481
Armant	146,588	105,000	22,995	6,552	28	3,795	26,790
Farshut	129,234	50,750	11,114	6,916	62	7,162	18,276
Naqada	127,329	16,135	3,534	2,190	62	10,146	13,680
Qeft	107,258	48,788	10,685	3,276	31	5,335	16,020
El Waqf	60,770	40,000	8,760	1,092	12	1,895	10,655
Total	2,611,460	710,006	155,491	87,748	56	173,508	328,999

[1] Figures reported by the Markaz Administration (June 2001) and from a dumping survey at city dump sites (May 2001)

[2] Based on 1999 Census Data

[3] Based on City Visits (May-June 2002) and local records

[4] Based on 0.6 kgs/person/day

[5] Total urban waste generated plus rural waste generated (rural population multiplied by 0.25kg/person/day)

Table ١٣.4 Summary Data for Waste Generation and Collection in Urban and Rural Parts of the Governorate [1]

	Population	Predicted Daily Waste Generation (tonnes)	Predicted Annual Waste Generation (tonnes)	% Waste Collection
Urban areas	710,006	425	155,189	56%
Rural areas	1,901,454	475	173,508	Near zero

Although most attention is being focused on provision of services to urban areas, there is still a need to focus on the rural parts of the Governorate where the majority of the population live. *Table 13.4* clearly illustrates that although rural communities produce less waste per person it is predicted that the rural parts of Qena Governorate will produce more waste in total (475 tonnes/day) than the urban areas (425 tonnes/day).

At present, little waste is collected in rural areas, with communities and villages reliant upon infrequent visits by tractors and trailers, tipping in canals or on agricultural land, and burning of wastes in the home.

In addition waste management data (particularly data relating to generation and collection) is poor in quality and availability, with wide variances between Markaz, which in turn makes the implementation of effective solid waste management even more problematic.

13.4 WASTE COMPOSITION

According to a study by a local team of consultants (and substantiated during subsequent visits by SEAM Programme Specialists) the waste composition in Qena City is as follows:

- 65% animal wastes and organic wastes;
- 10% dust and other materials;
- 7% plastic bags and street sweepings/dusts;
- 6% recyclable materials (paper/plastic/textiles/glass/tins etc.);
- 5% straw;
- 5% other; and
- 2% clinical wastes.

The figures for Qena City do bear some similarities with the composition of solid waste for urban areas as predicted by EEAA [(2)]:

[1] SEAM Programme Solid Waste Study – Qena Governorate

[2] National Strategy for Integrated Municipal Solid Waste Management - A Framework for Action, Egyptian Environmental Affairs Agency, 2002.

- 50-60% organic material;
- 10-20% paper;
- 1-5% glass;
- 3-7% plastics;
- 2-7% metals; and
- variable amounts of "other" material.

The make-up of the waste stream is important for determining what can be realistically done with the wastes in terms of management and treatment. The waste stream may also have value, particularly in rural and peri-urban areas as a manure or as a fuel, and is often separated and re-used prior to it becoming part of the waste stream. In urban areas the composition has less

13.5 WASTE COLLECTION

There is neither reliable data on waste generation, nor on waste collection, at present. Estimates have been made based on capacities of current collection vehicles tipping at the dumpsites (approximately 90,000 tons per annum) and the use of averages derived from national studies for waste generation in urban and rural areas. Estimates of capital needed have utilised a projection of what equipment should amply cover once city's population, Naga Hammady, for the next ten years.

13.5.1 *Collection Systems*

There are no formal system of waste collection for the majority of villages and rural settlements throughout the Governorate. The informal systems that do exist often involve donkey cart collections or the occasional loan of a tractor to clear accumulations of solid waste once every few months. In the absence of a formal system, rural inhabitants do develop disposal strategy's, such as burning the waste, distributing animal waste on the fields when the amounts are worthwhile or transporting the waste to the desert.

In the main cities of the Governorate, more formalised systems are in existence, although the quality of the services on offer does vary markedly from one Markaz to another. The standard systems in operation utilise old barrels/bins on main streets, the disposal of wastes in vacant areas of the city or depositing waste in the street for subsequent collection. The 'makeshift' containers are subsequently emptied, or the waste is gathered-up by labourers, using a local collection system (either handcart, donkey and cart, small trailer, or specific refuse collection vehicles). However, the bins may be used by residents for other purposes and actually removed or, when left on the street, are in poor condition with piles of waste dumped in adjacent areas.

Furthermore, the frequency of collection is irregular, or non-existent in some areas, resulting in the further piling of waste in public areas.

Where building to building collection exists, the households will usually leave their wastes on the street for the sweepers to collect on a daily basis (although the frequency may be less in secondary and peripheral streets) in the larger cities. Only Qena City has a recognised doorstep collection service for refuse with an allotted time and day of collection. Other large cities collect waste from residential streets every two or three days. This approach, although appropriate to the levels of equipment and funding provided, leads to waste accumulations in the streets and associated public health concerns. In addition, the unstructured nature of this system results in low willingness to pay for the service, low public awareness levels concerning waste related issues, and a general lack of concern and commitment to the local environment.

13.5.2 Collection Equipment

There is a general lack of cleansing equipment available in the Governorate, from brooms and carts to full scale refuse collection vehicles. Not only is the level of equipment poor, but the standard of equipment in use totally inadequate, often in a state beyond repair. Where working equipment is present in urban areas, it is often poorly designed, resulting in inefficient waste collection and often refuse collection trucks are often not small enough to be able to manoeuvre down narrow streets.

In parallel, there is limited provision of maintenance workshops and clear lack of technical expertise in maintenance and repair. Naga Hammady is the exception with a well-stocked and efficient running workshop close to the heart of the city, but in all other cases the workshops are poorly staffed, with limited materials and space. Procurement and subsequent storage of spare parts is limited and very slow. This affects the performance of the operational equipment, and consequently results in deterioration in the cleansing service with lengthy ‘off-road’ periods for the vehicles.

The number of containers allocated for waste collection is inadequate, and often only found in the main roads in each city. The containers are also often badly designed, usually recycled barrels or oil drums, and are also in a poor state of repair.

13.5.3 Labour

Labour for waste collection is extremely limited in most Markazes as the work is unpopular and seen as having very low social prestige. In addition salaries are generally low and the working conditions and wages do not encourage new recruits to the service or ensure that the labourers do their jobs properly.

The shortfall in permanent labour could potentially be made up by employing temporary labour, however, the often ready availability of agricultural labouring work, particularly during harvest makes availability of workers highly seasonal.

The current systems result in unpleasant and unhealthy working practices for the labourers. Waste has to be picked-up directly by hand and loaded over high-sided vehicles. Clinical waste is also often mixed with the municipal waste stream.

The lack of adequate labour is often cited as a high priority, however, other factors influence the issue of labour availability. Maintaining labour would be far easier with sustainable financing of collection systems and better equipment and systems, would allow each labourer to become more productive, lessening the need for more staff.

13.6 TRANSFER

Several cities in the Governorate have developed locations on the urban margins for collection vehicles to dump waste temporarily, prior to larger vehicles transferring it to the main dumpsite. The transfer is facilitated with mechanical loaders or manually, with shovels.

Present transfer sites are not formally designate sites and have few controls in place leading to unsightly, and unhealthy accumulations of waste which are often burning. The proximity of sites to residential areas makes these hazards more significant.

13.7 DISPOSAL

Map 22 shows the location of existing dump sites in the Governorate and the location of sites that have already been approved for use by the Governorate. EEAA have been involved with some of the site selection activities of the newly approved location of dump sites. Under Law 4 an EIA is required for a waste disposal site, however, to date no EIA's have been produced and submitted for approval for the new sites.

The disposal of waste is both unregulated and opportunistic. Random dumping of waste in the streets is a common phenomenon. There is also an increasing trend for waste to be tipped in canals and drainage channels.

Map 22 Approximate Locaton of Existing and Approved Dumpsite in Qena Governorate

The location of some of the existing dumpsites used in the Governorate are not ideal due to their proximity to residential areas or agricultural land. However, in many of the less suitable locations, plans are already being put in place to move the dumpsites to more suitable positions.

Transfer of waste to the dump sites is often hampered by the fact that the roads are often unpaved and poorly maintained. This often results in trucks tipping their 'loads' at the roadside, or the entrance to the dump site, resulting in a sprawling mass of waste by the road that is both unsightly and unhealthy.

The dumpsites are uncontrolled with no site management or municipal presence, which simply encourages the free tipping of waste, and allows widespread scavenging by local inhabitants and animals. None of the sites in the Governorate cover the waste with sand as would be good practice, and exposed waste becomes a significant problem on both health and environmental grounds. Often dumpsites are burning, and at least some of the fires are started by lorry drivers when they tip their waste to reduce the apparent volume.

At many dump sites it is not only municipal solid waste that is dispose of. Often the sites receive sewage and sewage sludge from vacuum tankers that empty septic tanks and soakaways.

Each Markaz prefers the use of local dumpsites, rather than shared or regional dumpsites, with short transportation times.

13.7.1 Financial resources

There are several sources of finance available for solid waste management in the Governorate. Some of the sources are under direct control of the Markaz/City administration and some are granted from Central Government to the Governorate administration.

Under city control the following revenue streams exist:

- 2% of the leasing value of the property (Cleansing Fund);
- 1% and 2% of the electricity and water bills respectively;
- Service Improvement Fund – additional local taxes levied from taxis etc., septic tank emptying fees, and fines for illegal dumping, littering etc. and
- Donations from residents.

Funds allocated by Central Government and distribute via the central Governorate administration include:

- BAB 1 – cleansing funds distributed specifically for labour associated with solid waste management;
- BAB 1 – general funds for permanent workers within the Governorate, many of whom may be involved ion the solid waste management sector;
- BAB 2 – funds allocated for operation and maintenance of equipment; and
- BAB 3 – funds for capital investment.

At present, the level of financial resources is totally inadequate to fund an effective and regular waste collection and disposal service for the majority of the population of the Governorate of Qena. Additional funding could help in purchasing new equipment, in raising salaries and in improving general infrastructure.

13.7.2 Clinical waste

The average generation rate for wastes in hospitals is 0.86 kg per day, of which approximately 25% is clinical (or hazardous). This was based on fieldwork carried out in Qena City Hospital [1] , and relates well to known data from other hospitals across Egypt. This suggests an annual tonnage of clinical waste in Qena City requiring specialised management of approximately 42 tonnes. The estimates for the amounts of clinical waste generated in Qena City are given in *Table 13.5*.

Table ١٣.5 Clinical Waste Generation in Hospitals in Qena City [2]

Name of hospital	Number of beds	Total Waste generated (T/yr.)	Clinical Waste generated (T/yr.)
Fever hospital	49	15	3.8
Ophthalmology hospital	31	10	2.5
Chest hospital	174	55	13.8
Child medical health care	8	3	0.8
General hospital	266	83	20.8
Sidi Abd El Reheem clinic	8	3	0.8
Total	536	168	42

If the analysis is extended (and the same assumptions made) to all the hospitals in the Governorate, the amount of clinical waste requiring management is approximately 200 tonnes per annum (*see Table 13.6*).

[1] Data derived from a project carried out by a local consultant in Qena City Hospital - June 2001

[2] IBID

Table ١٣.6 Clinical Waste Generation in Hospitals in Qena Governorate [1]

Markaz	Total number of beds	Total Waste generated (T/yr.)	Clinical Waste generated (T/yr.)
Qena	536	168	42.0
Naga Hammady	553	174	43.5
Qus	209	66	16.5
Abu Tesht	177	56	14.0
Isna	419	132	33.0
Dishna	115	36	9.0
Armant	196	62	15.5
Farshut	96	30	7.5
Naqada	75	24	6.0
Qeft	112	35	8.8
EL Waqf	99	31	7.8
Total	2,587	812	203.0

Generally, clinical waste is collected by refuse trucks (or whatever alternative collection method is in use by each Markaz), and amalgamated with the household waste generated by the public. This leads to a great deal of syringes, needles, blood bags at the dumpsites, which, because the waste is not covered represent a major health hazard for the resident scavengers.

The current lack of awareness concerning the importance of segregating clinical waste from the normal municipal refuse amongst both the general public, the cleansing staff and especially the hospital staff, is a major concern. If people throughout the waste management chain are not 'managing' the clinical element of the waste correctly, then there is little chance of preventing clinical waste from arriving at the open dump sites.

Labourers collecting the clinical waste in the hospitals do not take appropriate precautions against the specific risks, which this type of waste presents, and little segregation is evident.

There is also no monitoring of (and data for) the clinical wastes that are generated from private clinics, the number of which is unknown. This could prove to be a significant source of additional clinical waste, thus far unaccounted for.

Some hospitals have on-site incinerators for their clinical wastes, but they often burn all of their wastes (including more domestic type wastes) at the site because they do not have a regular 'waste collection' service. These

[1] Data derived from a project carried out by a local consultant in Qena city Hospital (June 2001)

incinerators are generally in a poor state of repair and are thus working at a much-reduced capacity and below optimum efficiencies. Only the hospital in Farshut claims to be incinerating the bulk of their clinical waste, whilst the Heads of Markaz in Qena, Naqada, Armant and Isna all acknowledge that the current hospital incinerator capacity is sub-standard in their Markaz.

At Qena Central Hospital incineration is being used to eliminate both hazardous and non hazardous wastes. The plant has a maximum operating capacity of 150 kg/hour, and according to calculations the hospital produces 220 kg per day of waste of which 55 kg (approx.) is clinical. The hospital is utilising this spare capacity of almost 100 kg/hour to burn additional clinical wastes from the Fever Hospital and the Red Crescent Hospital, with some small additional input from local private clinics (amount unknown) at a cost of 20 LE per month per hospital. The clinical input from these other sources would not exceed 85 tonnes.

13.7.3 *Slaughterhouses and Poultry Slaughter Shop Waste*

The public slaughterhouse waste throughout the Governorate is collected and transferred to the same dumpsites (in the same collection vehicles) as used for all other wastes.

The owners of private slaughterhouses generally sell the majority of their wastes (leather, hooves, bones) for re-use and application in the agricultural sector.

The owners of poultry slaughter shops often dump their waste in any available space on the street, and the feathers and intestines are evident on many streets in the cities of Qena.

Box ١٣.1 The Current Waste Collection System in Qena City

The current waste collection system in Qena City is indicative of what can be achieved when resources are made available, funding is directed to priority issues and adequate planning is directed at the problem.

Qena City, under the direction of HE The Governor and under direct control and supervision of the Deputy Secretary General, has undergone a major programme of both improved solid waste management and beautification of the streets, including tree planting, street lighting, statues and flower beds.

The Governor has restructured the cleansing section inside Qena City enabling diet supervision from the Deputy Secretary General for the duration of the project implementation. In addition the City has hired additional staff with secondary school qualifications. This has been achieved through offering improved salaries and a distinctive green uniform to help raise public awareness. The staff supervise door to door collection of solid waste.

The labourers from the City Council are responsible for street sweeping and collecting rubbish from the non-residential streets and have distinctive orange uniforms and hand-carts. All sweepers have new brooms, carts and uniforms and in each street a three-shift sweeping rota is in operation. Approximately 700 sweepers are employed to keep the streets of the Governorate capital clean.

The City has purchased 10 Suzuki trucks to facilitate waste collection from the narrower streets. The existing dump truck fleet of 25 vehicles have been fully overhauled and maintained and four new dump trucks purchased.

Waste containers have been removed from the streets and people abused the system by filling them with waste water or by tipping the contents on the street I n order to scavenge. Now residents deposit waste daily by their doorstep in plastic bags and small wire baskets attached to lampposts are available for general litter.

The majority of the City is covered by a daily collection round and the streets are arguably some of the cleanest in Egypt. Those areas of the City outside the beautification scheme to still have accumulated wastes and this has been attributed to the difficulties collecting from areas with unpaved roads and the inability to adequately enforce fines for waste management offenders. There is no transfer system for the City, however this might allow the stem to be expanded to cover all the urban area.

The Qena system is equivalent to approximately 19 LE per person per year for collection. Qena hires 700 street sweepers and 200 waste collectors and the majority of the cost of the system is spent on keeping the streets exceptionally clean – an objective commensurate with its status as Governorate capital and regional commercial center.

13.8 QENA SOLID WASTE MANAGEMENT STRATEGY

As art of the GEAP process Qena Governorate is also developing an integrate solid waste management strategy. The strategy, when finalised will represent a sustainable and integrated strategy for solid waste collection and disposal across all urban and rural areas in the Governorate.

PART V

ENVIRONMENTAL ISSUES AND PRIORITIES

14 ENVIRONMENTAL QUALITY AND ENVIRONMENTAL DEGRADATION

14.1 ENVIRONMENTAL QUALITY MONITORING IN EGYPT

Although Egypt has national environmental monitoring programmes, which give a good baseline picture on a national basis, data on environmental quality on a regional basis are very sparse and therefore hard to interpret.

Data for water quality are available on a regional basis because water quality is monitored as part of the functions of Qena Water Authority discharging its duties for water supply and sewage treatment.

Data for air quality also exist but are very limited in nature as the monitoring stations are part of a national monitoring framework (there fore local stations are limited in number) and the determinands monitored are very limited in extent.

Information on land quality is restricted to data related to agricultural productivity rather than environmental quality *per se*, and is restricted to the data relating to the 1972 Soil Survey. The data are reported for sake of completeness and because it reflects on the agricultural productivity in the Governorate.

14.2 WATER QUALITY

14.2.1 Groundwater

As most groundwater is supplied directly to the consumer without treatment, the raw water quality is measured regularly in all wells in the Governorate. The main problem and concern with groundwater is the presence of iron and manganese, which give rise to taste, and odour problems though have limited public health implications. In addition ammonia levels have exceeded the maximum recommended limit of 0 mgl^{-1} in Abu Tesht, Qena and Qeft as well as having elevated levels of faecal coliforms. Groundwater quality data from the Health Directorate summarise in *Table 14.1* the exceedances of the maximum limits for ammonia and the occurrences of faecal coliforms.

Table ١٤.1 Groundwater Pollution in Qena Governorate (October 1999) [1]

Markaz	Village	Ammonia (mgl^{-1})	Faecal Coliforms (cfu/100 ml)
Qena	EL Tawabia	0.24	6
Qena	Awlad Amr	0.31	5
Abu Tesht	Abu Tesht City	1.00	23
Abu Tesht	El Amiria	1.66	9
Abu Tesht	El Behery Samhud	1.42	2
Abu Tesht	Kaser Bakhanes	1.78	-
Abu Tesht	Kaser Bakhanes	1.24	-
Abu Tesht	Beni Barza	1.31	-
Abu Tesht	Ezbet El Bosa	1.42	-
Qeft	El Sheikhia	0.19	2

14.2.2 *Surface Water*

The raw water abstracted from the River Nile for treatment in Compact Units is not analysed regularly. *Table 14.2* summarises some available data from the Irrigation Directorate from June 1999 for the chemical analyses of surface water samples at different location through the Governorate of Qena.

Table ١٤.2 Surface Water Quality in Qena Governorate (June 1999) [2]

Markaz	Conductivity (μscm^{-1})	PH	O_2 (mgl^{-1})	NH_4 (mgl^{-1})	NO_2 (mgl^{-1})	Fe (mgl^{-1})	Mn (mgl^{-1})	Hardness $CaCO_3$ (mgl^{-1})
El Waqf (Drain)	1060	8.0	6.5	0.02	0.04	0.08	0.009	249
Dishna (Drain)	1110	7.8	6.2	0.01	0.04	0.07	0.017	249
Dishna (Canal)	285	8.1	7.5	0	0	0.21	0.023	107
Dishna (Canal)	285	6.7	7.5	0	0	0.16	0.014	107
Qena (Nile)	340	8.0	6.9	0	0	(-ve)	(-ve)	160

14.3 LAND QUALITY

In terms of land and soil quality, most of the information available in Egypt rates land quality to agricultural production. There is little information on land contamination caused by other anthropogenic activities, though such contamination is likely to be limited in Qena Governorate and related to the

[1] Qena Water Authority
[2] Qena Water Authority

larger industry establishments, fuel storage areas and filling stations and mechanic and automotive workshops.

14.3.1 Soil Classification

A soil survey carried out in 1972 by the Soil and Water Resources Institute identified two main soil types in Egypt, the Nile alluvial Soils and the Sandy Desert Soils.

The Nile alluvial Soils may be further divided into three main types:

- Fine Textured Soils – these soils cover the floodplain areas of the valley and are characterised by the dominance of clay particles in most or l of the layers of the soil profile;
- Medium Textured Soils – these soils are located in areas near to the Nile or between other alluvial soils and are characterised by loess clay content and higher levels of silt and sand. These soils are less compacted and more permeable than the fine textured soils; and
- Coarse Textured Soils – these soils are located in scattered areas mostly near the banks of the River and on some of the islands. These soils are loose in structure with a high content of fine sand and are extremely permeable.

The Sandy Desert Soils cover the large areas to the east and west of the Nile Valley and are formed by the washing out of material down the wadis or dry river valleys and mixing with the soils of the old river terraces. The soils are loose soils with high permeability rates, typically high in coarse and find sand particles and low in clays and silts. Often the soils may contain gravels particularly on the fringes of areas where the alluvial valley soils occur.

The majority of the cultivated soils are recent alluvial soils with marked differences in texture depending on the prevent conditions at the time of sedimentation. The variables include floodwater velocity, distance from the main river channel, differences in topography and the influence of the eastern and western desert mountains. The soils near the mountain ranges are always very coarse in texture and often have a high calcium carbonate content. These soils are often saline in nature and approximately 20% of the soils on Qena are impacted by salinity problems, including areas of Naga Hammady and Abu Tesht.

14.3.2 Soil Productivity

The soil types in Egypt have been classified in to six classes based on soil properties and soil profile characteristics. A brief description of each of the classes and their prevalence in Qena Governorate is given below and a summary of the areas of each of the different classes is given in *Table 14.3.*

- Class 1 – these soils are highly productive and are characterised by clays and loams with moderate to rapid permeability, often occurring adjacent to the river or on islands.
- Class 2 – these soils are of above average productivity and often composed of clays. Generally they have little problems with salinity or alkalinity, with only isolated occurrences.
- Class 3 – these soils are of average productivity and often poorly drained with a water table at less than 150 cm below ground level. Salinity and alkalinity problems are more common and the soils are often sandy and calcareous in nature.
- Class 4 – these soils are of poor productivity and found in scattered areas near the mountains of the eastern and western desert.
- Class 5 – this class corresponds to unproductive desert areas; and
- Class 6 – refers to areas that have been developed for housing, roads or other utilities.

Although, as the data is from the origin soil survey work carried out in 1972 and the administrative structure of the Governorate has changed, it is clear that nearly 80% of soils classified in Qena Governorate at that time were classified in the most productive two Classes of 1 and 2.

Since 1972, land management practices have improved and a study in 1990 carried out by the Ministry of Agriculture and Land Resources indicated that up to 50% of oils had improved in quality in areas such as Abu Tesht, Farshut, Qena, Qus, Armant and Isna. The study so recognised that in some areas soil productivity had so declined and these areas so included Abu Tesht and Farshut.

Table ١٤.3 Soil Productivity Classification in Qena Governorate (1972) [1]

District	Class 1	Class 2	Class 3	Class 4	Total Cultivated Area	Class 5 + Class 6	Total Land Area
Abu Tesht	644	37,507	4,432	452	43,035	6,049	49,084
Naga Hammady	1,027	35,272	7,100	2,351	45,750	10,239	55,989
Dishna	918	37,740	3,060	37	41,755	11,654	53,409
Qena	4,386	32,473	8,915	552	46,326	9,383	55,709
Qus	1,226	44,625	6,170	2,495	54,516	10,083	64,599
Luxor	307	33,931	4,533	254	39,025	10,816	49,841
Armant	864	15,394	7,457	2,209	25,924	2,931	28,855
Isna	1,076	27,723	13,398	9,162	51,359	15,659	67,018
Total	10,448	264,665	55,065	17,512	347,690	76,814	424,504

One reason for the increase in soil quality was the expansion of areas covered by tile drainage, which reached a total of in excess of 157,000 feddans in 1990 compared to only small areas in 1972. In addition improvements in techniques such as on-farm water management, addition of gypsum to soils, sub-soiling and land levelling using laser technologies have l benefited soil productivity.

14.4 AIR QUALITY

Ambient Air Quality

Ambient air quality is affected by many industries with atmospheric emissions such as the sugar factories and the Naga Hammady aluminium smelter. However, this is not reflected in ambient air quality measurements, for the simple reason that there is only one monitoring station operated in the Governorate, in Naga Hammady. Another station is located in Luxor, which although not administratively a part of the Governorate, does give a reflection of the local air quality. These stations are part of the EEAA monitoring system supported by EIMP (Danida's Environmental Information and Monitoring Project). In addition there is a parallel system operated by the Ministry of Health's Centre for Environmental Monitoring, but this does not operate any monitoring stations in Qena governorate.

The parameters monitored in both Naga Hammady and Luxor include:

- SO_2,
- NO_X, and

[1] Department of Agriculture – Qena Governorate

- PM10.

Annual average monthly dust fall in Naga Hammady and Luxor in the year 2000 was 13 gm/m^3 and 12 gm/m^3 respectively. According to international WHO standards, an area is considered dusty when the dust fall average is above 10 gm/m^3. It should be noted that this is the case of all monitoring stations nation-wide except that for Ras Mohamed, South Sinai. However, dust concentrations in Egypt may be expected to be high as a large proportion of the country is arid desert.

The SO_2 annual and daily average standards, of 60 µg/m^3 and 150 µg/m^3 respectively, as well as the NO_x standards were not exceeded at either station.

14.5 COSTS OF ENVIRONMENTAL DEGRADATION

The costs of environmental degradation are currently being assessed.

14.6 ENVIRONMENTAL PRIORITIES AND ISSUES

Environmental priorities and issues are currently being defines by the GEAP working groups in different sectors including:

- Water supply and sanitation;
- Water resources, irrigation and drainage;
- Agriculture and fisheries;
- Solid waste management;
- Industry;
- Environmental regulation and enforcement; and
- Environment and Health.

The information collected during the baseline studies is being verified, supplemented and reviewed by each of the working groups.

14.6.1 *Summary of Environmental Problems in Qena Governorate*

Currently, the stakeholder analysis and environmental baseline are on-going and will be used as the basis for participatory identification of the priority environmental issues within the Governorate. The GEAP will then be developed to address the priority issues and actions will be identified for implementation over the next ten-year period.

Table ١٤.4 Summary of Environmental Issues in Qena Governorate

Environmental Issue	Description of the Problem
Solid Waste Disposal	Inadequate collection and transfer systems are in place in the majority of the Governorate and solid waste is often disposed of in an uncontrolled manner to irrigation canals, or dumped on streets. Often solid waste is disposed of by uncontrolled burning resulting in deteriorations in air quality. No engineered waste disposal facilities currently exist in the Governorate.
Sanitation	Only one established sewerage reticulation network and sewage treatment works exists in Qena Governorate (Qena City). All other towns and cities within the Governorate rely on septic tanks and soak-aways for sewage disposal. Sullage from septic tanks and soak-aways is often dumped at uncontrolled sites in the desert. The construction, installation and operation of septic tanks and soak-aways are extremely problematic in areas with high groundwater levels. Groundwater levels are particularly high upstream of the barrages at Isna and Naga Hammadi. The New Naga hammadi barrage will locally exacerbate the problem further. The quality of groundwater is adversely impacted by the disposal of sewage via soak-aways and presents a risk to potable supplies derived from groundwater sources in some areas.
Water Supply	Many villages have inadequate water supply networks with many houses without connections to the main water distribution system. Many houses still rely on water pumps. Much of the Governorate still relies on groundwater for the supply of drinking water. In some areas high levels of dissolved salts such as iron and manganese result in taste and odour problems and in other areas the high levels of salts are reported to result in health problems.
Disposal of Waste Agricultural Residues	Qena is largely an agricultural Governorate and large amounts of waste agricultural residues are produced. Much of these residues are reutilised or used as animal fodder, however, much are also burned in an uncontrolled manner causing deteriorations in air quality. The major agricultural crop in Qena is sugar cane. Once the sugar cane has been harvested, the fields are cleared by burning, also leading to significant seasonal deteriorations in air quality.
Industrial Pollution	Aqueous and atmospheric emissions from the larger industrial facilities in the Governorate lead to local reductions in air and water quality. Emissions from SME's in the Governorate, although individually not significant, lead to cumulative reductions in environmental quality.
Institutional Capacity	It appears as though significant capacity building in environmental planning, management and enforcement is required in some parts of the Governorate, although this has yet to be fully evaluated.

Environmental Issue	Description of the Problem
Environmental Awareness & Education	Environmental awareness in the general public is very low, particularly relating environment to health. This has yet to be fully evaluated although significant environmental education and awareness raising will be required in parallel to development of the GEAP.

15 POLICY, LEGISLATION AND ADMINISTRATION

15.1 INSTITUTIONAL AND ADMINISTRATIVE FRAMEWORK

15.1.1 The Governorate of Qena

The Governorate of Qena is responsible for the public administration of the Governorate and is controlled by His Excellency the Governor, assisted by the Secretary General and the Deputy Secretary General.

The Governor is directly responsible for the management of all affairs of the Governorate and has responsibility for the following departments:

- General Directorate of Governorate Affairs;
- Department of Planning and Monitoring;
- Department of Legal Affairs;
- Department of Observation;
- Public Relations Department;
- Complaints Department;
- Communications Department;
- Department of Production and Economic Affairs;
- Department of Investment;
- Department for Companies and Agencies; and
- Department of Economic Research.

The Governor delegates direct responsibility of the following departments to the Secretary General:

- Committees and Conferences Department;
- Financial and Commercial Affairs Department;
- Administrative Affairs Department;
- Personnel Department;
- Co-operation Department;
- Central Statistics Department;
- Organisational Development Department;
- Information and Decision Support Centre; and
- General Department of Engineering Affairs, including:
  - Physical Planning Department;
  - Roads Department;
  - Mining and Quarries Department; and
  - Inland Navigation Department.

The Deputy Secretary General assists the Governor and Secretary General across a wide range of activities and generally provides support to the management and administration of all Governorate Affairs.

At the local level, each City has a local City administration with a City Council and each Mother Village has a Local Administrative Unit which manages the administration of the village and all associated satellite villages.

15.2 ENVIRONMENTAL POLICY, PLANNING AND MANAGEMENT

Environmental policy, planning and management are managed centrally by the EEAA from its Head Office in Cairo and through a network of eight Regional Branch Offices. The EEAA is the central policy maker, however, local enforcement and management is delegated to the Governorate through the Governorate Environmental Management Unit or EMU. EEAA also has a co-ordinating role with the other Competent Administrative Authorities (CAAs).

The Governorate has a central Environmental Management Unit which is responsible for environmental management across the whole Governorate. Specific duties include environmental regulation and enforcement of Law 4, "The Environmental Law".

Each Markaz also has a local unit, the Environmental Unit and each mother Village has an officer known as an Environmental Liaison Officer. The village level officers report to the Markaz level Units who in turn report to the Governorate level EMU. In Qena Governorate the EMU reports to the Governor via the Secretary General.

15.2.1 Environmental Enforcement

Responsibilities for legislation not covered under Law 4 such as water pollution control rests with the relevant Ministry, which is normally represented at a local level. The "Line Ministries" that have environmentally related responsibilities include:

- Ministry of Water Resources and Irrigation;
- Ministry of Agriculture;
- Ministry of Health; and
- Ministry of Industry.

In addition to the regulation and enforcement responsibilities of Line Ministries, there is a branch of the national police force known as the Environment and Water Police whose duties include enforcement of environmental regulations such as Law 48 – "*The Protection of the River Nile and Waterways Against Pollution*" aspects of Law 4 relating to pollution control.

The institutional structure, relationships and responsibilities of the EMU with these other Ministries and with the surface water police are currently under review and a Decree, better defining the role of the EMU is under development.

The new decree is anticipated to elevate the status of the EMU to a General Office, which would give the EMU its own budget and greater legal powers of enforcement.

EEAA is responsible for auditing operator's environmental registers on an annual basis. In fulfilling this function, the Agency may take environmental samples, or samples from any emissions and carry out any appropriate tests. If any violations are discovered, the Agency will notify the relevant administrative authority, who will write to the operator demanding rectification of the violation. If the facility does not comply within 60 days, the Agency, in co-ordination with the relevant administrative authority may any of the following actions:

- Close down the facility;
- Suspend the polluting activity; or
- Take the operator to court, demanding suitable compensation to remedy any pollution or damage resulting from the incident.

The legislation does not specify any fines for violations of the legislation however, violations may lead to closure of the facility and costs or any remediation of damage or pollution caused.

15.3 THE ROLE OF THE ENVIRONMENTAL MANANGEMENT UNIT

15.3.1 Environmental Management Units

Environmental Management Units (EMUs) were established in 1982 with the objective to protect the environment from pollution within the Governorate boundary. The EMUs report administratively to the Governor and theoretically he is responsible for their technical role as well, however, in reality the guidance comes from EEAA policies and directives.

The EMUs have the responsibility to follow up the implementation of Law 4 and other environmental laws. The head of the EMU has legal powers for the enforcement of Law 4.

15.3.2 Environmental Units

Environmental Units (EUs) are established at a local or municipal level (city/markaz) and were established by a governor's decree to assist the EMUs in their activities. The EUs therefore undertake tasks delegated to them by the EMUs.

15.3.3 *Environmental Liaison Officers*

Environmental Liaison Officers are appointed at village level and their contribution varies from activities such as receiving EIAs to assisting in solid waste management planning to simply responding to complaints.

15.3.4 *Functions related to EIA*

Environmental impact assessment is managed and implement by the Head Office of EEAA in Cairo, the EEAA Regional Branch Offices (RBOs) and by the EMUs at the Governorate level. Specific responsibilities include:

- EEAA centrally is responsible for setting policy and procedures, managing the EIA system, reviewing Category B and C EIAs, reviewing Category A EIAs where the RBO is not operational, setting conditions for projects during construction and operation and providing technical support to the RBOs and EMUs.

- RBOs are responsible for inspection of large and medium facilities and providing technical and laboratory support to EMUs.

- EMUs are responsible for inspecting small facilities (which are large in number), however they actually carry out the majority of inspections on all sizes of facility.

15.3.5 *Functions Relating to Investigation of Complaints*

EEAA, the RBOs and the EMUs/EUs are responsible for investigating all complaints they receive and for informing the complainant of any results or finding of any investigation. Complaints received that do not fall under the legal responsibility of the EMU are required to be forwarded to the relevant line ministry.

15.3.6 *Functions Relating to Strategic Environmental Planning*

EEAA is centrally responsible for the production of the National Environmental Action Plan or NEAP which is the strategic plan at the national level.

At a local level the Secretary General or Deputy Secretary General is responsible to a Higher Committee for Environment (HCE) who with technical working groups assisted by the EMU is responsible for the production of GEAPs or Governorate Environmental Action Plans. GEAPs address issues at a local level although embrace policies defined in the NEAP. Issues defined in GEAPs, which collectively are of national significance are also embraced by the NEAP through updating and revision.

The Higher Committee for Environment is made up of key stakeholders from the Governorate, local line ministries and other CAAs. Typically the HCE will include the senior official from ministries such Ministry of Water Resources and Irrigation, Ministry of Industry, Ministry of Health, Ministry of Local Development etc.

15.4 CO-ORDINATION OF EMUS AND OTHER ACTORS

15.4.1 Co-ordination with the Governorate Licensing Officer

The EMUs co-ordinate with the Governorate licensing office for the issuing of construction licences and operating licences. Post construction field investigation are undertaken to ensure the implementation of mitigating measures referenced in the EIA. In some cases the EMU may be a member of the licensing committee.

The EMU must ensure that no project is granted a construction licence without preparing an EIA according to the regulations. They must provide the licensing office with the EIA approval with any conditions that are required and participate in any post construction investigations to ensure implementation of any requirements from the EIA.

15.4.2 Co-ordination with the Governorate Citizen's Complaints Office

In the Governorate there is an office responsible for managing complaints from citizens. Where applicable the EMU/EU must provide a complaint form and ensure that the form is completed by the complainant correctly. The EMU must then inform the Office of the nature of the complaint to ensure that the EMU is dealing with relevant complaints. Finally the EMU must provide the Office with the results of any investigations into the complaint.

15.4.3 Co-ordination with the Governorate Investment Office

The EMU interacts with the Governorate investment office in setting the investment plan in the Governorate and for new projects. Specifically the EMU must participate in the identification of any industrial areas, participate in the selection of new residential areas and co-ordinate with the investment office to investors who will need to prepare EIAs for new projects.

15.4.4 Co-ordination between EMUs and other CAAs

The EMU interacts with a number of other line ministries and CAAs including, but not limited to:

- Ministry of Water Resources and Irrigation;
- Ministry of Health;
- Ministry of Petroleum;

- Ministry of Agriculture;
- Ministry of Manpower;
- Ministry of Electricity;
- Ministry of Tourism;
- Ministry of Housing;
- Ministry of Transportation;
- Ministry of Interior;
- Ministry of Information; and
- Ministry of Youth.

The activities include planning activities such as the preparation of the GEAP, development plans or contingency or emergency plans, production and approval of EIAs, inspection and enforcement activities, management of hazardous wastes, training and awareness and preparation of state of the environment reports.

15.5 ENVIRONMENTAL LEGISLATION

The major environmental licensing requirement is for all industrial facilities to have completed the process of environmental impact assessment (EIA). Details of an approved EIA including technical specifications and any attached conditions must be recorded on an official register by the facility operator. This effectively then forms an operating permit. The register must be maintained by the operator on an on-going basis, including details of all emissions to the environment and results of any environmental monitoring. Such a register must be kept for a minimum of 10 years. The EEAA audits the register on an annual basis and can prosecute for any non-compliant activities or emissions.

Facilities that are likely to produce atmospheric emissions must be appropriately sited and require approval by the local authority prior to construction. Once the facility is operating, it must comply with various provisions specified for releases to air, in particular from machines, engines and vehicles, and from fuel-burning sources.

For discharges of wastewater, legislation provides for the protection of the River Nile and other surface water bodies by requiring a permit for the discharge of industrial wastewater. A permit is also required for the operation of any installation within 200 metres of the coast, in order to protect the marine environment. A permit is also required to discharge wastewater to sewer.

Controls over the handling of hazardous waste include the requirement for a permit to be held and for a register detailing the types and quantities of waste generated an disposed of. Import of hazardous waste into Egypt is not prohibited. Incineration of wastes must be in a designated incinerator and land filling of wastes may only be carried out at approved sites.

Noise levels regulated against ambient noise level standards which are set according to land use. Levels are set for day-time, evening an night time.

16 THE NEXT STEPS AND QENA'S FIRST GEAP

16.1 THE GEAP SURVEY

In order to ensure the GEAP reflects the issues of concern to the people of Qena, a comprehensive survey has been undertaken to assess where people see the environment on their list of priorities and which environmental issues are of the greatest significance to the general public and civil society.

The survey was carried out between November 2001 and March 2002 and covered every "Mother" village in every Markaz and approximately 50% of all "satellite" villages and represents a significant sample of the Governorate over all geographical areas.

16.2 THE GEAP WORKING GROUPS

As previously described environmental management responsibilities lie across not only the EMU in the Governorate, but also with other Governorate departments, other CAAs and the line ministries. In order to define the environmental priorities and issues that are facing the Governorate a series of GEAP Working Groups are running for the different sectors. The working groups have members taken from wide variety of line ministries, Governorate Departments and other stakeholders. The Working Groups cover a variety of sectors including:

- Water supply and sanitation;
- Water resources, irrigation and drainage;
- Agriculture and fisheries;
- Solid Waste Management; and
- Industry and environmental regulation and enforcement.

The information collected during the baseline studies is being verified, supplemented and reviewed by each of the Working Groups. The conclusions of each of the sector working groups will be the identification of environmental problems and issues.

Cross-sectoral working groups made up of stakeholders who have an interest in the particular issue will then evaluate these issues in more detail. These groups will be charged with formulating cost-effective management options which will address the issues identified over the lifetime if the GEAP. The cross-sector working groups will also prioritise the issues so that the most significant will be the first to be addressed and so that appropriate budgetary provisions may be made equitably across the issues identified.

16.3 PRODUCTION OF QENA'S FIRST GEAP

This report the Environmental Profile of Qena Governorate forms the first volume of the Qena's GEAP and contains the detailed information on the state of the environment in the Governorate.

The opinions and findings of working groups and the opinions and findings of the GEAP survey will be synthesised and analysed and compiled with the results of the working groups. The results will then be assessed with the management options identified and compiled to formulate the second volume of the plan which will detail the priority issues and the management options identified.

The two volumes combined, the Environmental Profile and the Action Plan will then form Qena's first ***Governorate Environmental Action Plan***.