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**Integrating Environmental Considerations in Five Priority Sectors in
Egypt**

**Water, Energy, Agriculture, Biodiversity, Human Settlements, and
Solid Waste**

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Integrating Environmental Considerations in Five Priority Sectors in Egypt¹

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Introduction

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Acronyms

AFD	Agence Francaise de Développement
CCRMO	Climate Change Risk Management Programme
DEAT	Department of Environmental Affairs and Tourism
EEAA	Egyptian Environmental Affairs Agency
ESI	Environmental Sustainability Index
EU	European Union
FfD	Financing for Development
GDP	Gross Domestic Product
GEF	Global Environment Facility
HCSD	High Council for Sustainable Development
HFCs	Hydrofluorocarbons
IA	Integrated Assessment
JPOI	Johannesburg Plan of Implementation
LA21	Local Agenda 21
MDGs	Millennium Development Goals
MEE	Ministry of Environment and Energy
MIDEPLAN	Ministry of Planning and Economic Policy
NALRA	National Association of Local and Regional Authorities
NCSD	National Council for Sustainable Development
NDP	National Development Plan
NEAPs	National Environmental Action Plans
NFSD	National Framework for Sustainable Development
NSDS	National Sustainable Development Strategies
NSSD	National Strategy for Sustainable Development Strategy
OECD	Organization for Economic Cooperation and Development
PES	Payment for Ecosystem Services
PCSD	Presidential Commission on Sustainable Development
SA	Sustainability Assessment
SD	Sustainable Development
SDS	Sustainable Development Strategy
SEA	Strategic Environmental Assessment
SNA	System of national account
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention for Climate Change
UNIDO	Industrial Development Organization

Introduction

It has become increasingly recognized that environmental strategies and action plans prepared in isolation from mainstream macroeconomic and sectoral policies have not yielded the expected results. The outcome has been giving economic considerations and priorities precedence over economic and social considerations. Moreover, in many instances policies, plans and programmes have resulted in negative impacts on the environment and society.

Conventional policymaking processes has therefore not yielded the desired outcome of achieving sustainable development and human welfare. Developing policies, plans and programmes that do not consider environmental considerations at its core has proved their deficiencies. Considering environmental aspects as an isolated exercise or after a policy, plan, programme, or project has been developed has proven to be ineffective. Environmental as well as social considerations should be considered alongside economic considerations in the planning and decision making process of macroeconomic and sectoral policies. The recognition of this imperative, particularly in the last decade has resulted in the emergence of new approaches and tools designed to achieve this objective. These included strategic environmental assessment (SEA), sustainability assessment (SA), and integrated assessment (IA). Though the advocates of these tools may lay emphasis on certain aspects over the other, they all aim more or less in achieving the same main objective, which is mainly to ensure that proposed policies, plans and programmes do not result in environmental and ecosystem damage.

In order to ensure the integration of the three sustainability dimensions in the policy and decision-making process, the benefits on the economic, social and environmental fronts and the inter linkages between the three dimensions should be clearly identified and brought to the attention of policy and decision makers and practitioners.

In order to achieve this end a number of measures need to be introduced. There is a need to institutionalize integrated policymaking as an

approach to be adopted in the design and formulation of policies, plans and programmes in Egypt. Relevant stakeholders should participate in the process and throughout the policy cycle in order to ensure that concerns and priorities of different stakeholders and segments of the population are taken into account. Public participation reduces any potential resentment to the proposed policy, plan, or programme, and increases the likelihood of their successful implementation. Raising awareness of the importance of integrating sustainability considerations in the decision making process is also an important component of an effective integrated policymaking process. It is therefore essential to establish modalities for continuously communicating the outcome of the different stages involved in the policy formulation process.

Monitoring the implementation of proposed policy, plan, and programme should also be an integral part of the process. This should be followed by an assessment of the outcome of implementation of the selected policy, plan, or programme, and the drawing of lessons gained through the policy formulation and implementation process to be taken into account in subsequent planning processes.

Objectives of the document

This document is intended to provide a framework for integrating environmental considerations in five key sectors: Water, Agriculture, Energy, Human Settlements, and Solid Waste.

The main criteria for the selection of the sectors identified for this study (Water, Agriculture, Energy, Municipal Solid Waste, and Human Settlements) are the importance of these sectors for Egypt and the priority given by the Government to them. Water, energy and food security are of primary concern. Egypt is now considered to be a water scarce country, with about 80% of its water supply directed towards the agriculture sector. Energy security is another challenge due to shortages in fuel supply needed to generate electricity required to support municipal and economic activities. Food supply is another challenge given increased demand due to the rate

of population growth and increased food prices. Solid waste has been and continues to be of concern to the Government, and is yet to be addressed effectively. Housing and new communities is another challenging sector in Egypt. This is represented in the need to satisfy increasing demand for housing units, particularly for low-income and poor families and the pressure this creates on available resources, financial and natural resources, primarily water and energy.

Though industry and tourism are also important sectors in Egypt, solid waste and human settlements were selected due to a number of reasons. Solid waste represents one of the main environmental problems facing Egypt, due to the environmental and health hazard associated with it. Moreover, the mismanagement of solid waste is not only negatively impacting health and the environment, but is also negatively impacting economic activities such as tourism, fisheries, agriculture, and urban development. The second stakeholder consultation meeting held in August recommended that the framework strategy document should cover all types of waste and not only municipal solid waste.

Due to the rate of population increase in Egypt and the need to provide housing, particularly for low income and poor families, the Government is investing heavily in large housing projects and new urban developments. The lack of an integrated and holistic approach in providing housing and in the development of new communities that are efficient and sustainable are lacking in Egypt. Given the large investments involved and that water and energy, already scarce resources in Egypt, are indispensable to support the development of new urban developments, adopting an integrated sustainable approach for new communities was identified as another priority area in Egypt. Moreover, informal settlements and the encroachment of urban development on agricultural land are another challenge facing Egypt that is requiring immediate attention. This will be addressed in the chapter dealing with Human Settlements.

Annex I provides an account of strategies developed for the five priority sectors subject of this study.

Main key considerations to be taken into account in the design of overall policies, sectoral and regional policies as well as plans and programmes is how integrating environmental considerations can complement and support economic and social objectives. The selection of the policy objective and the policy package necessary to achieve this end will be done on the basis of the extent to which the selected policy, plan, and programme achieves sustainable development.

The main objective of this document is not simply to produce an environmental strategy or an environmental chapter to be included in sectoral strategies, but to develop sustainable development sectoral strategies. The final document will emphasize the environmental dimension and the significance of integrating the environment in sectoral policies and as a means to achieve economic and social objectives, while at the same time conserving the environment.

In most cases, it is not clear in the mind of practitioners and policy makers the linkages between investing in the environment and the positive economic and social implications that result. This work is intended to demonstrate these linkages. It should be considered as an eye opener for practitioners and policy makers to chart a new sustainable path for development, taking fully into account the environmental dimension. The outcome document should be used to assist sectoral ministries in formulating plans, programmes and projects that are more sustainable, taking fully into account the environment, as well as the social dimension and the inter linkages between them and sustainable economic development.

An all inclusive consultative process involving relevant stakeholders was adopted in the preparation of the different versions of the document. Two stakeholder consultation meetings for each sector were convened in order to ensure

full participation of relevant stakeholders and that the final product reflects their concerns and views.

The first set of stakeholder consultation meetings were convened in June and July. The second round of consultation meetings were convened during the month of August in conjunction with the SWITCH Med meetings for the overlapping sectors (Agriculture, Energy, and Water), and independently for Solid Waste, and Human Settlements. The third and final workshop was held in October with the participation of relevant stakeholders participating the consultation process for the five sectors.

International Agenda

At the Millennium Summit held in 2000 world leaders called for a new global partnership for poverty reduction. As a consequence, the Millennium Development Goals (MDGs) were proposed following an extensive consultation process. The United Nations Secretary-General presented the proposed MDGs to the UN General Assembly in 2001, where member states recommended that they be used to guide the implementation of the Millennium Declaration by 2015.

During the last couple of years, Governments were negotiating what is referred to as the “Post 2015 development agenda”. The agenda includes: an introductory declaration, SDGs, targets, means of implementation, and new Global Partnership, and a framework for follow up, review and implementation.

The implementation of the SDGs and the outcome of the Third International Conference on Financing for Development (FfD) is an opportunity to begin to treat internationally driven environmental, social, and economic matters with the same degree of urgency and importance as a security crisis. It is also an opportunity to fashion a new structural alignment at the UN system appropriate to scale of contemporary globalization and its crisis.

After an extensive negotiating process, the following SDGs were adopted by Governments at the UN Summit on the Post-2015 Development

Agenda held in New York in September 2015:

- 1) End poverty in all its forms everywhere
- 2) End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- 3) Ensure healthy lives and promote wellbeing for all at all ages.
- 4) Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- 5) Achieve gender equality and empower all women and girls.
- 6) Ensure availability and sustainable management of water and sanitation for all.
- 7) Ensure access to affordable, reliable, sustainable and modern energy for all.
- 8) Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all.
- 9) Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- 10) Reduce inequality within and among countries.
- 11) Make cities and human settlements inclusive, safe, resilient and sustainable.
- 12) Ensure sustainable consumption and production patterns.
- 13) Take urgent action to combat climate change and its impacts (taking note of agreements made by the United Nations Framework Convention for Climate Change (UNFCCC) forum).
- 14) Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- 15) Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss.
- 16) Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
- 17) Strengthen the means of implementation and revitalize the global partnership for sustainable development.

It is becoming evidently clear that in order to realize the objectives of the SDGs, countries would need to formulate and implement sustainable development policies. The following section provides a brief review of the emergence of the concept of sustainable development and the experience of a number of selected countries

around the world in initiating and implementing sustainable development policies.

The EU Sustainable Development Strategy (SDS)

The concept of sustainable development (SD) goes back to Agenda 21, agreed upon at the 1992 Earth Summit (UNCED) held in Rio de Janeiro, Brazil. Agenda 21 called upon countries to transition to sustainability in the 21st century. Agenda 21 was not only the first comprehensive statement of principles for the Sustainable Management of the environment, but also the first document that called on all-countries to “ensure socially responsible economic development, while protecting the resource base and the environment for the benefit of future generations”¹

Agenda 21 being a non-binding voluntarily action plan, only a few European Union (EU) countries moved on from their conventional environmental policy strategies launched during the 70s and 80s into what the UN had called for, namely “a coordinated, participatory, iterative and cyclical process of thoughts and actions to achieve economic, environmental and social objectives in a balanced and integrated manner”². Thus, the 1997 Rio +5 summit called for the completion of the SD strategies by the year 2002 and to begin implementation by 2005³. Moreover, the 1997 Treaty of Amsterdam included sustainable development as an overarching objective of EU policies. Not only, the call was reiterated in June 2001 at the Gothenburg European Council, but also EU leaders launched the first EU sustainable development strategy (SDS) based on a proposal from the European Commission. By the of 2002 and prior to the Johannesburg World Summit for SD, the SDS of most of the EU Member States were already formulated and in-effect.

In June 2006, the European Council reviewed the EU SDS with the purpose of ensuring that it lives up to their ambitions. This resulted on a renewed strategy, which set out a single coherent strategy on how the EU will more effectively live up to its long-standing commitment to meet the challenges of sustainable development.⁴

It provided guidelines that, according to the Resource Book

for SD strategies was intended to guide the development of “an underlying vision through a consensual, effective and iterative process.”⁵ Thus, the development and implementation of SDSs moved on from being a one off fixed plan into a process that can continuously be developed and improved.

In general, SDSs are considered to be a transition from inflexible planning schemes to flexible strategy processes. They were also a transition from being the domain of “clear-cut sectoral authorities to cross-cutting competencies, from pure hierarchies to an amalgamation of hierarchies and networks, from top-down control to process and policy assessments, and from knowing to learning.”⁶

In July 2009, the Commission of the European Communities conducted a review of the EU SDSs. The review commended actions taken to combat climate change and to promote a low carbon economy, yet found that despite the exerted efforts towards incorporating sustainable development in the EU policies and practices, unsustainable trends still persisted. The review proposed that efforts need to be intensified to promote sustainable development policies and practices.

In 2010, the EU Commission published the Europe 2020 Strategy. The strategy was adopted by the European Council in the same year. The Strategy has five targets, namely; employment, research and innovation, climate change and energy, education, and combating poverty. It stressed the importance of coordination between the EU leaders, the involvement of relevant stakeholder and the integration of the three dimensions of SD in EU policies. It defines timeline and key performance indicators. It is referred to as a strategy for “smart, sustainable and inclusive growth.”⁷

In response to the 2009 review and the Europe

2020 Strategy, the period from 2010 to 2012 marked the adoption of the revised national SDSs in many European countries. The main purpose of the revision was to update the current national SDSs and promote collaborative efforts between actors involved at the regional level.⁸

In 2012, the Rio+20 Conference, took place in Rio de Janeiro, Brazil. The conference produced a document entitled “The future We Want.” The outcome document provides a firm foundation for social, economic and environmental well-being as well as a package of commitments for action and agreement by leaders of the world attending the Conference on the path for a sustainable future⁹

Experience of selected OECD Countries in SDSs

Germany¹⁰

In 2000, the State Secretaries' Committee on Sustainable Development was established in Germany. It was not before 2002 though that the Government adopted its first National Sustainable Development Strategy (NSDS). In its formulation, the German Government consulted a wide range of national and regional stakeholders. The Strategy consisted of 21 targets and indicators with the purpose of making sustainability quantifiable. The first comprehensive progress report was issued by the German Government in 2004 followed by a short report in 2005. In 2007, subsequent to the 2006 EU SDS, which was proposed by the European Commission, Germany published a report on the implementation of the EU SDS. In order to strengthen the EU linkage, the progress reports of 2008 and 2012 stressed the importance of the EU SDS as an important point of reference for the NSDS by using national sustainability-indicators in line with those identified by the EU SDS. Since 2008 and to-date, the current strategy includes 38 indicators for sustainable development in 21 areas. Key topics covered in the 2008 report were: climate change, energy efficiency, natural resources, social inclusion and international food crisis. The 2012 report focused on four key topics: sustainable economic activities, climate change, energy efficiency and sustainable water policy.

The German NSDS integrates all three dimensions of SD. This forms the framework for the main goals of the strategy and the identified indicators. The importance of covering the three dimensions of SD was clearly stated in the 2008 progress report, then again was reiterated in the 2012 progress report. The Government made as a basis of its NSDS an approach to sustainability which combines economic capacity with ecological responsibility and social justice. The strategy emphasizes sustainability as the basis for sound policy-making, with short-term thinking replaced by a comprehensive and holistic long-term policy design.¹¹

In order to ensure that the NSDS lives up to its expectations, the German Government implemented both horizontal and vertical integrations. Being the high-ranking coordinating and monitoring body for sustainability, the State Secretaries' Committee on Sustainable Development created for the purpose, consists of representatives from all ministries and chaired by the Head of the Federal Chancellery. This horizontal integration mechanism¹ is considered a key success factor for the NSDS. Because sustainability is a cross-cutting subject, this mechanism has prevented any kind of conflict between the respective ministries and ensured proper coordination, consistency and commitment. The vertical integration² mechanism is implemented to strengthen linkages between the main strategy and sub strategies, and between the NSDS and the EU SDS. The latter is achieved by making the renewed EU SDS an important benchmark for national activities.

Norway¹⁰

In 2002, the Government of Norway adopted its first NSDS, but it wasn't before 2004 that the strategy was implemented. The 2002 NSDS was known as the Local Agenda 21 (LA 21) since its

¹ Horizontal Integration: There is only one main strategy implemented by all

² Vertical Integration: an indirect link between the sub strategies and the main strategy

goals were based on the Agenda 21. LA 21 is distinguished from the earlier local environmental protection plan by its broadness. LA 21 emphasized the links between environmental impacts and socio-economic pressures and between local and global problems. Moreover, it stressed the importance of building sustainable development policies and strategies following a cross-sectoral approach.¹² LA 21 initiatives were later on replaced by the Vital Municipalities agreement and the Green Energy Municipalities cooperation agreement. The Former agreement was signed in 2006 between the National Association of Local and Regional Authorities (NALRA) and the Ministry of the Environment agreeing that municipalities direct attention to topics central to any of the three dimensions of SD. The second agreement was signed in 2007 between the local authorities and the Government agreeing to make municipalities support work on energy efficiency and renewable energy.

A new Strategy was presented in 2008 followed by an update in 2011. The 2011 NSDS focuses on 7 policy areas that cover the three dimensions of SD, namely; the economic, the environmental and the social. Progress is monitored by 17 indicators. The consulted multi stakeholders, include but not limited to representatives from all ministries, NGOs, industry and the public, participated by reviewing the document and by providing feedback and recommendations.

The Norwegian Ministry of Finance has a secretariat that coordinates and monitors progress in the implementation of the NSDS locally. It also guides how Norway can contribute to sustainable development globally.

Denmark¹⁰

In 2002, the Government of Denmark announced its first NSD Strategy, titled “A Shared Future – Balanced Development”. The Strategy covers the three dimensions of SD from national and international perspectives. The Strategy consists of 21 objectives and a total number of 200 priorities. In 2007, in response to the 2006 EU SDS, the Government of Denmark published its first

national report on the endorsement and the implementation of the EU SDS using the mechanism of vertical integration coupled with proposed amendments to the NSDS. Around 230 participants representing different stakeholders participated in the debate over the proposed amendments. This resulted in the 2009 revised NSDS. Denmark is currently participating in the development of a new Nordic Sustainable development strategy inclusive of indicators.

At the national level, each Danish municipality has its own SD strategy, which is being renewed every 4 years. The Ministry of Environment has been assigned the responsibility for the coordination and monitoring all activities and initiatives related to sustainable development in the country. Accordingly, municipalities as well as all involved ministries report periodically to the coordination body established for the purpose.

Experience of selected Non-OECD Countries in SDSs

South Africa

In 1995, The South African Department of Environmental Affairs and Tourism (DEAT) started developing a policy paper on environmental management, but it was not before 1997 the policy was adopted. The policy was in response to the Agenda 21, the product of the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil. The policy defined 7 strategic goals for achieving a sustainable environmental management system in the country. During the Johannesburg Summit, South Africa pushed for an action oriented outcome with a set of targets for sustainable development. The Johannesburg Plan of Implementation (JPOI), which is a detailed course of action for the implementation of Agenda 21 was thus adopted. In 2003, South Africa prepared a response strategy to the JPOI. For South Africa to successfully implement the JPOI, it was necessary to adopt integrated sustainable development principles. In 2004, the Government of South Africa announced the development of the first

draft of its National Strategy for Sustainable Development Strategy (NSSD) under the environmental pillar.¹³

In 2008, the Government of South Africa launched the National Framework for Sustainable Development (NFSD) – also known as NSSD 1 (2011–2014). It is a strategy that covers the three dimensions of sustainable development. NSSD is therefore a strategy that combines environmental protection, social equity and economic efficiency. “The 2012 Rio+20 identified two important themes to support the country’s efforts. These are the green economy, in the context of sustainable development poverty eradication and institutional framework for sustainable development.”¹⁴ The strategy identified 5 strategic objectives which are: “enhancing systems for integrated planning and implementation; sustaining our ecosystems and using natural resources efficiently; towards a Green Economy; building sustainable communities and responding effectively to climate change.”¹⁵ All role players were engaged in the development of the strategy. The evaluation of the progress of the NSSD 1 guided the formulation of the NSSD 2 (2015–2020).

Costa Rica

In 1994, Costa Rica adopted a sustainable development policy. There had been no unified national sustainable strategy but rather a set of decentralized activities. However, steps were continuously taken towards integrating the country’s sustainable development endeavours and related activities. In 1998, the Government established the National Council for Sustainable Development (NCSD) with the mandate of promoting dialogue between the relevant sectors and stakeholders involved in the field of environmental management and sustainable development. With the council failing to achieve its set objectives, the Government assigned the task to the Ministry of Environment and Energy (MEE) in 1999. The MEE focused its work on the implementation of the Agenda 21 strategies at the local level.¹⁰

In 2006, the Government launched its National Development Plan (NDP) covering the period between 2006 – 2010. The NDP addresses cross-sectoral issues, with each sector allowed a maximum of 10 strategic actions with budget estimates. The Ministry of Planning and Economic Policy (MIDEPLAN) is assigned the task of coordination of the implementation of the NDP at the national level. The MIDEPLAN is also in-charge of the development of the specific objectives and goals and the prioritization of programmes and initiatives.¹³

South Korea

The Korean National Strategy for Sustainable Development (NSSD) can be traced to the 1992 Agenda 21. The first national action plan to implement Agenda2 focused primarily on environmental issues. In 2000, the Korean Government announced the establishment of the Presidential Commission on Sustainable Development (PCSD). Immediately after its establishment, the PCSD started to develop a cross-sectoral NSSD. At the 2005 world environment day, Korea announced that its national vision for sustainable development is “to continue Korea’s growth as an advanced country while maintaining balance between the economy, society and the environment.”¹⁶ The strategy covers the three pillars of SD, yet focuses on five themes, two of which are the integration of economic growth and environmental conservation, and the establishment of an environmentally friendly economic structure. The PCSD was assigned the task of coordination and monitoring. Together with 22 ministries and Governmental offices and based on multi stakeholder consultations, including civil society organizations and business, the PCSD developed Korea’s NSSD. In 2005, Korea recognized the need to move on from a mere environmental policy to a broad sustainable development strategy. In addition to its poor environmental performance (ranked 122nd out of 146 nations according to the 2005 Environmental Sustainability Index (ESI) of the

World Economy Forum), Korea's level of social integration was falling. The rapid economic growth of Korea in the 60s (ranked 10th out of 30 Organization for Economic Cooperation and Development (OECD) countries in gross domestic product (GDP) increase), was coupled with "weak socio-economic structure in terms of pollution prevention comprising industrial structure, production and consumption patterns and people's attitudes."¹⁷

In 2006, the PCSD officially requested all Government departments to start implementing the agreed upon strategy. The strategy covered the period of five years (2006-2010), and is subject to review and update every five years. Based on the outcome of the evaluation of the previous strategy, lessons learnt and the current Korean situation, the next five-year NSSD is to be developed.

Environmental Challenges facing Egypt

Recognizing the importance of the environment for human health and right of future generations for access to natural resources, the Government has created in 1982 the Egyptian Environmental Affairs Agency (EEAA). Main responsibility of EEAA is to coordinate national environmental projects and activities. Furthermore, in 1997 the Government has created the State Ministry of Environment, which has been elevated to the status of a full Ministry in 2015. In order to regulate environmental activities in Egypt, the Government has issued Environmental Law Number 4 for the year of 1994 and its Executive Note amended by Law number 9 for the year 2009. Moreover, Item 46 of the new Egyptian Constitution has stated that every person is entitled for a safe environment and that its protection is a national obligation, with the Government responsible for all necessary measures for its protection, and for the rational use of natural resources that ensures their sustainable use and the rights of future generation access to these resources.

The following section will review the state of the environment in Egypt and will cover air pollution, and ozone depleting substances, noise pollution,

water, coastal areas, biological diversity, forest cover, green belts and green areas, Energy, solid and hazardous waste.

Regarding air pollution, in 1998 the Ministry of Environment has initiated the creation of a network of air pollution monitoring stations in 1998, which has now reached 87 stations distributed in the different parts of Egypt. These cover industrial areas (19), urban areas (36), traffic-congested areas (10), multiple use areas (21), and one reference area. Based on air pollution monitoring data for 2013 sulphur dioxide resulting from the burning of fossil fuel revealed that average annual emissions at the national level in urban areas did not exceed the permissible level of 50 micro grams/m³. In industrial areas, emissions were 60 micro grams/m³, which is the maximum permissible level of emissions. Regarding Nitrogen dioxide (NO₂), emissions were also within the permissible limits in urban areas, while for the industrial areas it was 80 micro gm/c³ carbon monoxide which is still within acceptable limits. Ozone emissions were also within acceptable limits. As for solid particles of less than micro meter PM10 in urban areas, in Cairo and the Delta it was 172 micrograms/c³ which exceeded the permissible level of 70 micrograms/c³ by 150% resulting from emissions from cars and open air burning of solid waste (agriculture and municipal) due to the limited control over these practices. As for industrial areas, it was 206 microgram/c³, which exceeded the annual acceptable levels of 70 microgram/c³ by 195%. For solid particles of less than micro meter PM2.5, which results from the burning of car fuel, energy generation facilities and factories emissions in Greater Cairo area figures were 104 micro gram/c³ exceeding the permissible level of 50 by 108%. As for led, monitoring stations in 2013 have recorded .24 micrograms/c³ in urban areas and .5 in Shobra El Kheima industrial area, which are within the permissible levels of .5 microgram c³ per annum and 1 microgram per annum, respectively.

Air quality assessment revealed a general reduction in solid particles in the air in 2013 as compared to the years 2008 up to 2013. This is mainly attributed to the current economic situation in the country and the shortages in fuel which resulted in the disruption of operations in factories.

Regarding agricultural waste, particularly rice husks, an assessment was undertaken to assess pollution emanating from the burning for rice husks for 2008-2009. The results which were analysed in newly established labs in Egypt indicate that the burning of rice husks revealed the burning of rice husks resulted in the suspended particles amounting to 10 kg/ tonne, Sulphur Dioxide 0,0685 of a kg/tonne, and Nitrogen Oxide 0,409 kg/tonne

It should be noted that while the amount of recycled rice husk in 2012 was 312,000 tonnes, the amount dropped down to 200,000 in 2013 or by 35%, with the resultant negative impacts on air quality due increased emissions of SO², T.S.P, an NO². This was mainly due to the prevailing political situation in the country at that time, and the reduced control and monitoring over the area cultivated rice. The black cloud phenomenon has started in Egypt since 1998 during the autumn season and was found to be linked to the burning of risk husks.

Increased population growth, economic activities, and increased number of vehicles in Egypt have all contributed to increased levels of air pollution in the country. Increase in the number of vehicles is one the main sources of CO² emissions in Egypt, where registered cars have reached 7 million cars across the country with 3.2 alone in the Greater Cairo region. In recognition of the significance of the transport sector to pollution in Egypt, the Government have started in 2009 a project on sustainable transportation in the country. The main objective of the project is to provide an efficient and affordable mass transit system, which connects the new cities such as the 6 October and El Sheikh Zayed cities. The project also includes the provision of space for pedestrians and cyclers

in the Governorates of El Fayoum and El Menoufia improving the efficiency of petrol consumption for transportation trucks, construction of parking lots. This project is being complemented by another one for an urban transport system for the city of Cairo with the support of the Agence Francaise de Développement (AFD). The other project was replacing 41,165 old taxis with new ones run by natural gas. This project should be extended to cover all taxis with more than 20 years old across Egypt. It would also be necessary to establish a factory for the recycling of old vehicles. Other efforts include the inspection of vehicles, trucks, including public buses for emissions.

Egypt's efforts to address climate change include the preparation of the National Communication Report for the UNFCCC. The project aims at creating a system for monitoring GHG emissions from different sources in Egypt. The project also includes the creation of a National Inventory System (NIS) for a national dbase on GHG emissions. Other related projects include the Low Emission Capacity Building project being implemented within the framework of an international project including 25 countries including China, Brazil, Malaysia, Mexico, the Philippines and Indonesia for capacity building in developing strategies fir clean development and reduction of GHGs. 7 clean development mechanism projects were launched in 2013 in the field of renewable energy, waste recycling, energy efficiency to reach a total of 24 projects resulting in 4.1 million tonnes of CO². Moreover, a portfolio of 39 clean development mechanism was prepared with an estimated reduction of 5.3 million tonnes of CO² reduction. Due to the importance of identifying the negative impacts resulting from climate change and measures needed to adapt to it, Egypt launched a nation strategy to adapt to climate change and reduce the potential damage that is likely to happen as a result.

Potential negative impacts resulting from climate change include:

- Inundation of the Delta, where most of the agricultural and industrial and marine transportation activities are located.
- Damage of the coastal sand strip, which is important for the protection of shallow and low lakes and reclaimed land.
- The erosion of the beach and damage of the coastal sand strip may result in the encroachment of the sea on the lakes as is expected for lake El Manzala.
- Change in water quality, which will impact on most of the fresh water fish.
- Damage to the buildings constructed on low lands in Alexandria, Port Said with negative impacts on tourism.

Other potential impacts of climate change include negative impacts on agriculture represented in increased water consumption and the spread of plant related diseases and infections due to increased temperatures. Ministry of agriculture together with the National Centre for agricultural research is introducing measures to adapt to the negative impacts of climate change.

Tourism is another sector that is likely to be affected due to coastal erosion and increased temperatures. Other sectors include housing and roads.

Climate change is expected to have negative health impacts due to increased incidence of disease associated with a hotter climate.

In order to address climate change concerns, EEAA has created the National Committee for Integrated coastal zone management to develop an integrated plan for potentially impacted areas. Other projects include the World Food Programme project “Building Resilient Food Security Systems to Benefit the Southern Egypt Region”, the “Clima South” project supported by the European Union, the “Climate Change Risk Management Programme (CCRMO)” project supported by the Spanish Development Fund, Assessment and Strategy Development to respond to the impacts of sea-level rise on human mobility in Egypt

supported by the International Immigration Organization. The General Department for Climate Change and Technology and Research is exerting efforts for enhancing local capacity to provide clean and sustainable energy and providing non-conventional solutions for environmental problems. Global Environment Facility (GEF) projects implemented by the United Nations Industrial Development Organization (UNIDO) in Egypt seeks to increase energy efficiency in industrial sector.

Regarding ozone depleting substance, the Government developed a National Strategy to phase out hydrofluorocarbons (HFCs) used in industry, including foam, thermal isolation, refrigerators, and cooling and the use of methyl bromide. Plans include gradually getting rid completely of HFCs in all sectors and restricting its importation starting 2013.

Regarding sound pollution, monitoring data in 2013 has indicated in most locations (industrial, commercial and administrative locations in the Greater Cairo area and Giza) an increase in noise above the set standards in the Executive Order of Environment Law number 9 for 2009 of 70 decibels.¹⁸

Three Scenarios for Climate Change

According to the Intergovernmental Panel on Climate Change, (IPCC) 2014 (Synthesis Report), there are three possible scenarios for climate change:

- i. The best case scenario with CO² emissions not resulting in an increase in global temperature beyond 2C°.
- ii. A 3C° above pre-industrial level, which is the most case scenario, and
- iii. The worst case scenario of 4.5 C°.

In case global emissions will result in an increase in global temperatures above 3C°, impacts include coral bleaching, the dying of most coral reefs (Frieler et al 2012, Kiessling et al. 2012), food production is expected to decline, and sea level may rise by 1 meter by 2100, with up to 30%

of global species being at the risk of extinction. With a 3-4 C° warming, between 40-70% of global species will be at risk of extinction accompanied by widespread coral mortality, coastal flooding, severe water shortages, destabilization of the Greenland and West Antarctic ice sheets.

Strategic directions

Integrated policymaking should be designed in a way to set the economy on a sustainable green economic growth path. In preparing this strategy document, the author has departed from the conventional approach of developing national environmental action plans (NEAPs) to developing environmental policies as an integral part of sectoral policies. Since the ultimate end is to achieve sustainable development the three pillars of sustainability has to be taken into account in developing the strategy.

In designing the strategy emphasis has been laid on investing in environmental infrastructure as a means of sustaining the ecosystem and the services it provides, and consequently provide the enabling for supporting sound economic development and social justice and equality. In doing so it should contribute to diversifying the economy by creating new sectors, activities, and business opportunities, thus reducing the heavy dependence on oil as the main source of income; efficient allocation and use of resources; enhanced competitiveness and market access of local products in international markets and the creation of new job opportunities. This should also encourage the waste avoidance and reduction, reduced pollution, and ecosystem degradation, and consequently improved environment, human health and welfare for the Egyptian population.

Integrated policymaking can be an effective tool for designing policies, plans, and programmes that can achieve environmental and sustainable development objectives. Several criteria may be used to evaluate the effectiveness of integrated policymaking. Apart from the economic viability of the proposed policy, plan, and programme, other criteria include rigor of the techniques used to assess the costs and benefits of the different

sustainability objectives, extent and effectiveness of stakeholder participation, enhanced inter ministerial coordination and cooperation, enhanced public awareness, integration in the decision making process, and the practicality of implementing the proposed policy options.

The current transition period the Egyptian economy is going through is placing tremendous pressure on the economy. It however, provides an opportunity to introduce national policies and strategies conducive to sustainable development and green economy. Greening policies and access to financial resources to achieve this end have the potential of addressing Egypt's current economic challenges. These include an increase in foreign debt, growing macroeconomic instability, scarcity of foreign exchange and depreciating value of the Egyptian pound, faltering growth rates, food security concerns, increasing energy demand, increased rates of poverty, and high unemployment rates.

Egypt is also facing serious environmental challenges and heightened climate change threats that are likely to have adverse economic and social impacts. Transitioning to green economy has the potential of putting Egypt on a sustainable path of development. It promotes an integrated and all-inclusive economic growth that enhances the competitiveness of the nation, diversifies and revitalizes the economy, creates new jobs, achieves equity and social justice, while at the same time preserving the environment and the ecosystem is badly needed.

Green Economy is an economy characterized by sustainable economic growth, employment generation, and making the market work for the poor, while preserving natural resources and the ecosystem. As defined by the United Nations Environment Programme (UNEP) a green economy is one that results in *"improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities"*.¹⁹ The concept has been gaining worldwide recognition since its launch in October

2008, in the wake of the financial and economic crisis. Mounting global concerns over food, energy, and water shortages is further exacerbated the problem Egypt has to face.

More than ever before, the world has come to realize that climate change concerns and degrading ecosystems and natural resources are seriously affecting sustainable economic growth. Egypt's transition to a green economy could therefore be considered as an imperative if the country is to address current and future economic, social, and environmental challenges that meet the priorities of present and future generations. Following this path of development is also expected to attract international financial support and investment.

Green Economy

It is becoming increasingly recognized that investing in environmental infrastructure is a necessary pre-requisite for sustainable development. In response to the financial and economic crisis that broke in 2008, UNEP has launched the Green Economy Initiative referred to earlier. The initiative advocates investing in environmental infrastructure as a means to revitalize and diversify economies, promote resource efficiency, reduce waste, hence increasing competitiveness, create jobs, and protects the environment, improves health and human welfare.

Enabling conditions

In order to facilitate the transition of the Egyptian economy to a green and sustainable path and the achievement of SDGs, a package of policy measures need to be introduced. The following are proposed enabling conditions identified and prioritized based on expert consultations, and stakeholder meetings. Main criteria used in the identification of the proposed measures were their political acceptability and relative ease of introduction and implementation.

A strong governance system

A strong governance system that promotes transparency, accountability, and stakeholder participation is essential in making a transition to a

green economy. Moreover, fighting corruption is also a necessary prerequisite for a strong and efficient governance structure. This is particularly important in Egypt as it has been one of the reasons behind the January 2011 Revolution.

Officials, civil servants and decision makers should be provided with information, managerial capacity training, and the ability to analyse challenges, assess opportunities and ensure coordination to avoid redundant and inefficient policies.

Robust measures should also be introduced to promote the accountability of decision makers and their endorsed public policies.

Overall managerial restructuring and reform of certain public bodies and the establishment of new ones with specialized mandates related to green policies could significantly facilitate and put in place necessary policy tools and measures to green the economy. Decision makers should introduce a tight system of checks and balances while designing, planning, implementing and evaluating green policies. Strategic environmental assessments, project level impact assessment, devising sustainable development indicators, life cycle analysis integrated environmental and economic accounting, and public environmental expenditure reviews are tools that could be used. These are all tools that could be used to facilitate the transition to a green economy, influence consumption and production patterns towards a more sustainable one and hence achieve sustainable development.

Inter-ministerial coordination

A mechanism should be in place in order to ensure proper coordination, supportiveness, and policy harmonization between different sectoral strategies, policies, plans, and programmes. It is therefore proposed that a High Council for Sustainable Development (HCSD) should be created. It is proposed that HCSD is attached to the Prime Minister's Office with representation from all ministries. Another council to include relevant stakeholders is also proposed to be created to

ensure continuous interaction and cooperation between the Government and civil society, the private sector and academia.

Integrated policymaking

Integrating environmental and social considerations with economic sectoral and macroeconomic policies are essential in making a transition to a green economy successful. This integration should be achieved in designing overall Government strategy and in formulating, plans, programmes, and projects. Designed policies should ensure sustainability from the environmental, social and economic standpoint that results in human welfare for current and future generations.

Policies should ensure efficiency in the allocation and use of resources, including waste prevention, minimization, reuse, recovery, and recycling. Moreover, it should be emphasized that a key component for long-term sustainability and economic resilience is maintaining environmental and ecosystems integrity.

A strong and good governance system will facilitate the realization of this integration. It will also facilitate the implementation of the proposed strategy, plans, programmes, and projects. Integrated policy making for green transformation should be conducted in a manner that contributes to achieving a number of key objectives, which include sustainability and equity among others.

Social cohesion and equity considerations are necessary components for the transition to a green economy. Special consideration should be given to under privileged and marginalized communities. Equity considerations should be fully taken into account, including equal access to social services and natural capital.

Integrated policies should aim at achieving inter-generational equity ensuring that future generations do not bear the costs and negative implications of proposed policies. Policies should also ensure inclusiveness and equal distribution of wealth and opportunities for the different segments of the population in terms of employment and services.

Integrated policies and greening of the economy should contribute to generating new economic sectors, diversification of the economy, creating new jobs, particularly for the poorer segments of the population. It should also result in attracting and opening up new businesses and investment opportunities.

Assessment measures should be introduced to continuously monitor and assess the adequacy of policies related to potential social costs and the extent of inclusiveness that green policies are bringing about while being implemented.

Moreover, coupling a green transition with investments in physical infrastructure such as roads, schools, public facilities, and sewerage and electricity networks is important to achieve equity, and put in place a minimum social protection system. Investments in much needed social infrastructural services especially in rural areas in the form of health, sanitation, and education can raise the standard of living of the rural population, their productivity, and sense of belonging.

Information and outputs provided through the planning process should be readily usable in decision-making and implementation. Policies should also be flexible and can easily be implemented with changing environments and circumstances.

Regulatory framework

Regulations can provide a strong and effective means of supporting Government policies. Regulations can safeguard the competitiveness of green goods emerging markets and provide customers with trustworthiness and confidence in locally produced green products. Certification for Sustainable Production, green buildings, eco labelling, environmental compliance certifications and fair trade are possible interventions that can be introduced through regulations. However, the introduction of green standards, certifications and codes should take into consideration the need to reconcile and harmonize global and regional standards with ones developed at the local level to avoid inefficiency, redundancy and conflict of

interest. The introduction of new regulations would require accompanying information dissemination campaigns, stakeholder dialogue, training and capacity building. Lack of a long-term vision and strategy, weak compliance and monitoring mechanisms constrain the effectiveness of this tool. Costs involved in designing and managing a national regulatory framework is another impediment. A necessary prerequisite for an effective regulatory framework is a strong and good governance system in order to ensure proper monitoring and compliance.

Market based incentives

Economic incentives should be designed to support command and control mechanisms. They should be carefully selected to influence behaviours towards more sustainable patterns of production and consumption and achieve environmental and sustainable development objectives. An incentive system should also be designed to encourage private sector engagement and investment in green infrastructure projects. A principle such as the *polluter pays principle* among other market incentive tools and mechanisms should be introduced to influence consumption and production towards more sustainable patterns.

There is a need to reform the entire fiscal and tax system to achieve this goal. It is essential for example to shift the tax system from taxing jobs and incomes to taxing environmentally damaging and unsustainable practices. It should be designed to operationalize the *polluter-pays principle*, attempt to reflect full cost pricing of natural resources, and internalize environmental and social externalities. Economic instruments include taxes, pollution charges, credits and rebates, R&D grants, and subsidy reform and green subsidies. Other tools include feed in tariffs to promote the business competitiveness of renewable energy sources and encourage the building of its related infrastructure, and payments for providing natural capital or ecosystem service schemes (PES) to promote ecosystem and biodiversity preservation.

More specifically the Government should reform the subsidies system to encourage the efficient allocation and use of resources and discourage environmentally harmful activities. Such a reform will reduce pressure on Government budget and release financial resources to provide the much needed social services, fund environmental activities, and investments in human resources and R&D. Subsidized water, electricity, fuel, food prices, waste collection fees are all examples of the extent of current local market failure and the Government's inability to reflect the true cost of natural capital input used for this range of services and products. Subsidy removal, polluter pays, peak pricing, tiered pricing, resource user fees are all examples of tools that can be used to limit environmental degradation. This is particularly important to support and add a competitive edge to green investments and discourage current trends of brown investments that are harmful to the environment and human wellbeing.

Human resource development

Investing in human resource development is key in making a qualitative shift towards green and sustainable development. This is a necessary prerequisite to provide the needed calibres at all levels, whether managerial, technical, or skilled labour. In order to achieve this end, the education system at all levels should be reviewed to ensure the integration of social, environmental and sustainability considerations in the different disciplines and at all levels. We need to cease from teaching the environment as a separate discipline. Moreover, social and equity considerations should also be properly integrated in the different disciplines, and the linkages between environmental, social, economic and sectoral objectives clearly identified.

Trade Policy

Trade policies should be designed to promote sustainable development. This can be achieved by integrating environmental, as well as social and equity considerations in the design of trade policies. Investing and trading in environmental

technologies and environmentally produced and manufactured products creates new market niches and opportunities. In fact, greening contributes to resource efficiency, waste reduction and minimization, thus rendering produced products more competitive in international markets. Trade policies can be instrumental in supporting a green transition by providing trade incentives and encouraging private sector access to markets through direct incentive measures, cutting down on red tape and long bureaucratic procedures to encourage export. It can also contribute to greening the economy by removing or reducing tariffs on environmental technologies and products.

Research and development

Innovative technologies and practices are essential in supporting green and sustainable development. There is a need to develop a long-term strategic vision to achieve a green transition in Egypt. It is important to shift emphasis from mainly relying on outside technologies and know-how to developing national capacities to develop local technologies that can eventually be exported and generate foreign exchange earnings. Egypt currently allocates 0.02% of GDP to R&D. It is proposed that this percentage share should be increased to between 2-4% of GDP. The Republic of South Korea currently allocates about 7% of GDP to R&D, while Israel allocates more than 4%. The private sector should be encouraged to invest in R&D. This can be achieved through tax cuts and rebates and other incentive measures. Research and development in the five targeted priority areas subject of this scoping study should, include research in water desalination and wastewater treatment technologies, water saving irrigation equipment, and water-saving building and construction equipment and appliances. In the energy sector, research in renewable sources of energy, solar, wind, and wave to produce cheap and more appropriate technologies suiting the Egyptian climate needs to be undertaken. For solid waste, research need to focus on waste to energy, waste to compost, as well as the recycling, reuse of waste residues as an input in the manufacturing of products and most importantly waste prevention.

Access to finance and facilitating Investments

Regarding finance, the starting point should be gradually redirecting existing financial resources towards green investments. Innovative financial mechanisms include the introduction of soft loan programmes, credit schemes, hedge funds, social venture capital conditional grants, carbon credits, and micro finance. It is also important to emphasize that access to finance tools designed and endorsed by the Government should target small and medium size enterprises as they represent a vast majority of companies in Egypt.

Financial tools should be used to stimulate local market demand by supporting consumer-based schemes to purchase locally produced green goods such as renewable energy, organic products environment-friendly consumer goods and vehicles.

Adopting a green and sustainable development strategy has a high potential to attract technical and financial support from international and bilateral development institutions and donor countries.

Green public procurement

Government spending can be an effective tool in stimulating the economy. However, Government spending should be directed towards green products and investments. Apart from setting the example for the general public and the private sector, green public procurement will also create markets and demand for green products. Taking into consideration Egypt's current fiscal troubles and limited expenditure opportunities, the Government should focus on investing in natural resource infrastructure, and related public services to create a business environment for potential green private sector investments. This is to limit depletion of natural resource and encourage resource efficiency. It can also influence the market for cleaner production and efficient consumption by creating sustainable public procurement programmes to purchase locally made green goods. These programmes stimulate market demand and encourage private sector involvement, a major investor in green

infrastructure projects. This is especially so in green technologies, innovation and manufacturing.

Public awareness and information dissemination

Public awareness and information dissemination are tools that support the Government in defining, informing and conveying the benefits and significance of a green economy. Credibility, accessibility and transparency are important signals for citizens to build trust, facilitate the transition, eliminate resistance to change and alter consumerist excessive overuse behaviour. These tools can take the form of internet, social media, advertising and printed campaigns. They can also be in the form of educational materials, reports, flyers, brochures that can be distributed in Government as well as educational and public facilities. Seminars, expert consultations and lectures are also possible venues for outreach and awareness. It should be emphasized though that these communication packages should be designed to address different target groups in simple language and in a manner that caters for their specific interests, priorities and concerns.²⁰

Sustainable development indicators

The current system of national accounts (SNA) does not represent a genuine indicator for sustainable development as it does not reflect the depletion and degradation of resources. Moreover, it does not provide a correct indicator for human welfare. It even provides a distorted picture regarding the performance of the economy, where for example it calculates as income damage cost, and cost of selling natural assets such as oil and natural gas. Integrated environmental and economic accounting should be promoted and used as a more realistic indicator for sustainable development and genuine welfare. This is in addition to the use of sustainability indicators.

Monitoring and evaluation

This should be part and parcel of the planning, decision making, and implementation processes. It is intended to ensure that the proposed policies have or are achieving their set objectives through the introduction of necessary corrective measures and actions, if needs be to achieve the desired outcomes.

**Key sectoral and cross-sectoral strategies and policy documents dealing with
environmental sustainability in Egypt**

Sector	Sectoral/Cross Sectoral Strategy	Status	Current governance and implementation arrangements	Analyse their main achievements	Critical impediment
National	Sustainable Development Strategy for 2030	Initiated by the Ministry of Planning, Monitoring and Administrative Reform (MPAR) in 2014 following a consultative process engaging all ministries, relevant stakeholders from civil society, academia and private sector.	The strategy is in its final stages and should be released after approval by the Cabinet before end of 2015.	N/A	Main challenges facing the development of the strategy are adopting an integrated approach and establishing clear understanding of the inter linkages and feedback loops between different sectors. Working across sectors and integrating environmental and social considerations in mainstream economic policy.
Water	National Water Resources Policy (NWRP) developed in 2005	NWRP covers the period till year. The NWRP is currently undergoing a review process as part of the country updating cycle plan. The new NWRP provides an update to earlier guidelines, policies and plans making them dynamic in nature to allow for changing conditions, risks, and unforeseen measures.	All relevant stakeholders are being involved in the development of the new plan with the purpose of ensuring that the strategy document reflect the concerns and views of different stakeholders and that it has their support and commitment.	Increase in water treatment plants 10 times between 1985-2005. Late decision by Government to use treated wastewater for agriculture, and increased recognition to the need to	Lack of application of integrated water management programmes, including regulatory and incentive measures to promote water efficiency and the use of renewable sources of water.

				invest in water desalination	
Agriculture	Three strategies developed in 1980s, 1990s, and in 2006 extending to 2017	Under implementation with successful outcomes in a number of fronts as well as shortcomings represented mainly in lack of adopting an integrated approach and including inadequate considerations for social and environmental aspects.	Ministry of Agriculture and Land Reclamation is the main Government entity responsible for the implementation of agricultural related policies. Based on the assessment of the outcome of agricultural strategies adopting an integrated approach involving rural and community development was identified as a necessary requirement for the effective development of the sector, thus requiring the engagement of other sectoral ministries.	Increase in crop productivity & in total cultivated area.	Lack of adequate research, technical and financial support to farmers, small land ownership and the inequitable land distribution system and insecurity of land tenure, and lack of an integrated approach and necessary physical infrastructure.
Energy	The Government is currently in the process of finalizing a strategy for the energy sector.	The strategy has been finalized and should be endorsed by the Supreme Council of Energy in the next few months.	Ministry of Electricity and Renewable Energy is the main Government entity responsible for implementation. Since energy is a necessary requirement needed to support economic activities, different ministries need to be involved in the design and implementation of a sustainable energy strategy.	Increase in investments in renewable energy, upgrading of existing power stations, and introduction of energy efficiency measures.	Energy and fuel subsidies, lack of innovative technologies and energy efficient practices, & unsustainable consumption patterns are the main impediments for achieving an efficient and sustainable energy sector.
Sustainable Communities	The Physical Planning Law of 1981 established the necessary planning framework for	Master plans for cities prepared by GOPP were not fully implemented as they far exceeded available resources and gap between design and realities on the ground.	None	-	Lack of an institutional setup and a regulatory framework that promotes integrated community and city development.

	physical development.				
Municipal Solid Waste	National Strategy for Integrated Municipal Solid Waste Management (2000) National Strategic Directive for Waste Management in Egypt	The main objective of the strategy is to improve the existing solid waste management system in order to reach acceptable levels of public health, environmental protection, and resource conservation. Initiated in 2013 through the establishment of a national Think Tank and was completed and launched in November 2014. One of the recommendations of the Strategic directive document was to establish a central regulatory entity for SWM and to develop strategies for special the different streams of waste.	EEAA entrusted with the implementation of this strategy in coordination with relevant ministries. Government recently decided to develop a strategy for solid waste management taking into account recommendations contained in the November 2014 Strategic document and using the outcome of the GEF study as an input in the SWM Strategy.	Has not been implemented	Main impediments are the lack of clear division of labour between different ministries and Government bodies involved in SWM and the centralization of the decision making process and finances with the central Government.

Framework for Integrating Environmental Considerations in the Water Sector

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Acronyms

COMESA	Common Market Eastern and Southern Africa
EAC	East African Community
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GEMS	Global Environment Monitoring System
GERD	The construction of the Grand Ethiopian Renaissance Dam
GHG	Green House Gas
KPIs	Key Performance Indicators (KPIs)
IDDSSD	Information, Documentation and Decision Support System Department
IEA	The International Energy Agency
IGADD	Intergovernmental Authority on Development
IPCC	International Panel on Climate Change
IWRM	Integrated Water Resources Management
MALR	Ministry of Agriculture and Land Reclamation
MHUUD	Ministry of Housing, Utilities and Urban Development
MPMAR	Ministry of Planning, Monitoring, and Administrative Reform
MWRI	Ministry of Water Resources and Irrigation
MoE	Ministry of Environment
MWPS	Minimum Water Performance Standards
NWRP	National Water Resources Policy
PPP	Public-Private-Partnership
RO	Reverse Osmosis
SADC	Southern African Development Community
SDS	Sustainable Development Strategy SDS
UN	United Nations
UNEP	United Nations Environment Programme
WWTP	Wastewater Treatment Project Phase
WHO	World Health Organization

Introduction

The availability of water and its distribution, quantity, and quality determine the extent and level of all forms of human and economic activities such as agriculture, industry, tourism physical development both rural, and urban.

In order to face the critical need for water worldwide, and as requested by various Governments, the United Nations Environment Programme (UNEP) has developed a water policy document that provides guidelines for how to develop water policies. Water policies should aim at achieving adequate and sustainable use of water. It should also address climatic and human-related activities that contribute to drought. Moreover, recognizing the need for the efficient and sustainable management of water resources, the Global Environment Monitoring System (GEMS) has included as one of its priority areas, a Water Programme.

Overview

“There is a water crisis today. But the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people – and the environment – suffer badly.” (World Water Vision Report, 2000).

There is an increasing awareness that freshwater resources are limited and need protection. Water needs to be protected not only in terms of quantity but also in terms of quality. With urbanization and changes in lifestyle, water consumption is bound to increase. Hence, changes towards more sustainable consumption and production patterns, at all levels, are required.²²

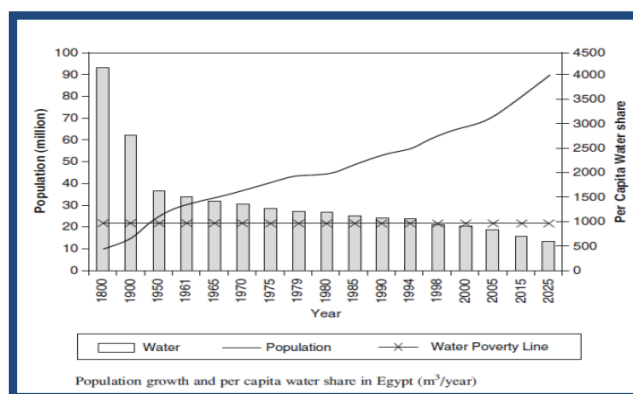
Water per capita

Egypt: <http://www.arabwatercouncil.org/administrator/Modules/CMS/Egypt-Country-Report.pdf>

The ocean holds 97% of the Earth's water; the remaining 3% is freshwater which is found in glaciers and ice, below the ground, or in rivers and lakes. The salty and fresh water on earth is part of the hydrologic cycle. Water resources must be used wisely and properly managed, otherwise, humanity is to face the risk of a global water crisis that it cannot afford.²¹

Although water is a renewable resource, it is not always available when needed. Moreover, most of the time, it is not of suitable quality for the

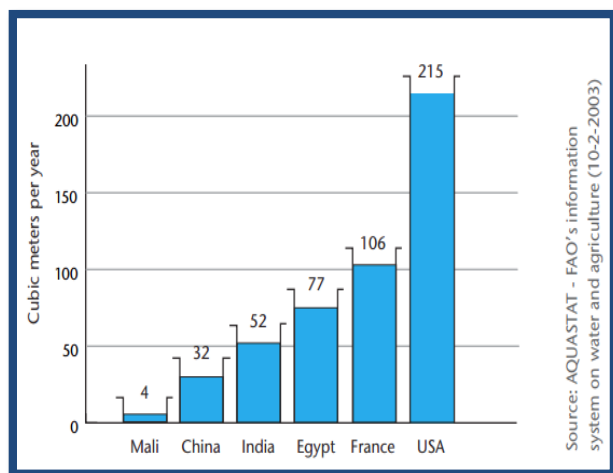
intended use, be it for drinking, growing crops, recreation, industry, mining or electricity generation.



Water and Energy²³

Energy accounts for a significant share of any country's water withdrawals. The International Energy Agency (IEA) estimates global water use for energy production in 2010 at 583 billion m³. This amount represents about 15% of the world's total water use and about 75% of all industrial water use. By 2035, the IEA estimates that water withdrawal would increase by 20%, whereas consumption would increase by 85%.

IEA also estimated that 90% of global power generation is water intensive. Environmental



considerations aside, this result in an increasing risk of conflict between power generating entities and the other water users.

About 15–18 billion m³ of freshwater resources are polluted annually by fossil fuel production. This has significant implications on ecosystems across the world. Climate change resulting from human induced activities in the form of excessive use of

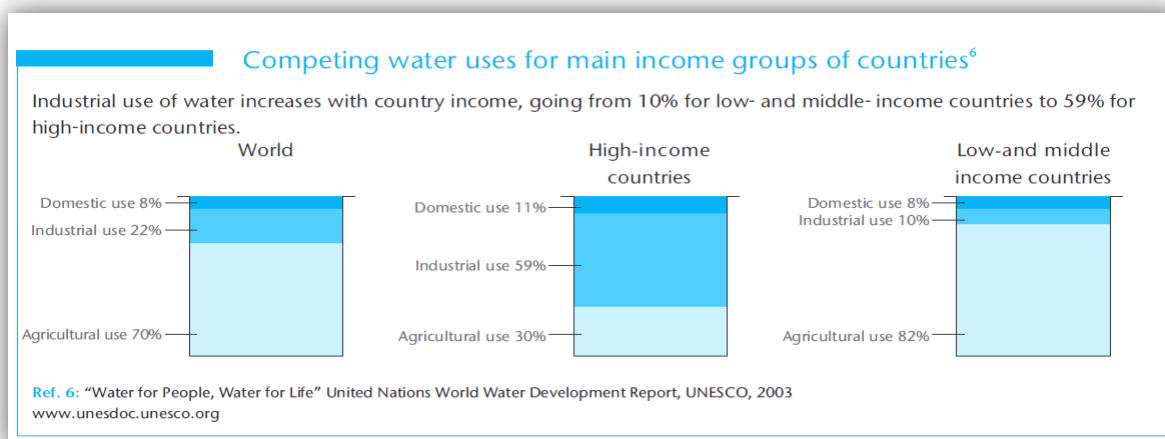
fossil fuels will have major long-term impacts on water availability and quality worldwide (Allen et al., 2012).

The thermal power sector is a large user of water, being responsible for about 80% of the global electricity production. In Europe, its share is 43% of the total freshwater withdrawals (Rübbelke and Voge, 2011) and more than 50% of the national water withdrawals in several other countries.²⁴

Africa

Water resource challenges have long existed in sub-Saharan Africa. However, their impact has increased due to recent trends in consumption and the expansion of economic activities. This includes the increase in population and urbanization, economic growth and trade. Despite Africa's diversified natural water resources being located in the rainy equatorial zone, large lakes, long rivers, and vast shores, water is unevenly distributed across the region. About 75% of sub-Saharan Africa's water resources are concentrated in eight major river basins.

The impact of climate change on water availability is another major challenge facing Africa. Repeated drought cycles threaten the lives of thousands of people in the continent; and floods also occur regularly with severe impacts on peoples' livelihoods. The reported scenarios by the International Panel on Climate Change (IPCC) indicate that climate change will likely increase aridity in Africa with significant negative impacts on food production. The potential increase in conflicts over shared water resources in the region



have serious social, economic and environmental threats.

The potential negative impact of climate change on the Nile riparian countries is also of particular concern as this may pose a threat for countries relying mainly on the Nile river for water, such as Egypt and Sudan.

Over the past 20 years, the change in the climatic and environmental conditions has considerably reduced the quantity of fresh water in Africa. As a result, most of the countries in the region are suffering from a severe water stress. According to the World Health Organization (WHO), more than 40% of all the African population are without access to safe drinking water, with some 300,000 people deprived of clean water.²⁵

Water in the region is not only scarce but also of poor quality. This is due to the continent's high pollution as well as the unreliable supply and sanitation infrastructure. A small percentage of the available water, can be safely used for human consumption. The result is that approximately half of all Africans suffer from water-borne diseases, with cholera and infant diarrhea being the most frequently sicknesses.

According to a survey conducted in 40 African countries by UNEP, shortage of funding is not the main obstacle in improving the quality of water (*quoted only by 18 countries*); lack of human capital (*quoted by 25 countries*), poor infrastructure, and inadequate legislation seem to be the greater obstacles.

The problem of inadequate sanitation is increasing in the region and is estimated to reach a critical level with the higher population densities. Currently about 1 billion people live in urban areas in sub-Saharan Africa, according to the United Nations Human Settlements Programme (UN-Habitat). That figure is expected to rise by 50% by 2030. With such a fast rate of expansion of cities in Africa, it is estimated that water consumption will grow twice as fast as the levels of population growth.

According to the WHO “for each dollar invested in safe drinking water in Africa, three to four dollars are generated, depending on the region and technology available.” Many countries in sub-Saharan Africa need to invest in water. This could be crucial in order to achieve the strived for ‘middle income’ status by 2020. According to the Food and Agriculture Organization (FAO) nearly 85% of the fresh water resources in sub-Saharan Africa are utilized for agricultural purposes. Over the next 10 years, according to the same source, unpredictability of water resources, as well as due to climate change, productivity in several countries in the region may decline by more than 50%.

The energy sector is also expected to be directly affected by water shortages in sub-Saharan Africa. Hydropower, as well as thermal-based power with nuclear, coal-and gas-fired power stations, being water-intensive, will be negatively affected by a decline in water supply.

The Arab Region

In the Arab region, water availability is a critical issue. The region is characterized by being mainly arid and semi arid, with poor rain water, and depleting groundwater resources. This is in addition to increasing population levels. Though the Arab region accounts for 5% of the world's population yet it has access to only 1% of the world's total water resources. According to the United Nations (UN), around 12 Arab countries suffer from severe water shortages. In order to address water shortage in the Arab region, the strategy for Water Security for the region (2010-2030), includes several projects that support efficient management and use of water resources. Agriculture in the Arab region as in the African continent continue to be a major water user. In the Middle East, it accounts for 85% of the total fresh water consumption, while its share in the total gross domestic product (GDP) is about 8%.²⁶

Increased population, economic growth, fast growing cities, industrialization and the expansion in agriculture have all contributed to an increase in water consumption.

Climate change, which is expected to result in droughts leading to the overuse of groundwater and major aquifers, is contributing to reduced the availability of both renewable and non-renewable water resources. Studies predict that most of the Arab countries will face the challenge of a severe water scarcity in the near future. The current status of the water supply shows that water quantity in the Arab region is continuing to decline. It is estimated that by 2025, per capita water availability in the region will be about 500 m³/cap/yr compared to 3,300 m³/cap/yr in 1960. Almost 15% of what it used to be.²⁷

The total population of all Arab countries in 2011 was estimated to be about 360 million. This figure will most likely increase to 634 million by 2050, of which 75% is comprised of urban population, a major increase from 57% in 2011. This fast expansion in terms of population and urbanization will intensify water scarcity and put more pressure on water resources and infrastructure. Additionally, the rise in the standards of living in the region and the change of the demographic structure with a younger population will necessitate economic growth, hence increased water demand. In 2009, the gap between water supply and demand, was more than 43 m³, and it is expected to reach 127 m³ by 2020–2030.²⁸

Overuse, unsustainable consumption and production patterns, as well as increased population levels are all factors threatening the availability of renewable and non-renewable water resources in the region. Furthermore, the change in climatic conditions is resulting in unpredictable weather conditions such as severe cases of both droughts and floods. Studies show that five of the top ten countries that are extremely vulnerable to climate change are in the Arab region with many of the remaining Arab nations also being considered as highly vulnerable. This will aggravate the problem of water scarcity by causing a reduction in renewable sources of water by another 20% by 2030.⁷

The Water Sector in Egypt²⁹

A number of strategies have been developed for the management of water resources in Egypt. This includes the integrated water management for 2050. Moreover, the Ministry of Water Resources and Irrigation (MWRI) has recently initiated the preparation of a strategy for 2037 on water to be completed by 2017. The framework for the sustainable management of water resources in Egypt proposed by this project, will benefit from the outcome of previous strategies. It will also ensure consistency with the strategy that is currently being developed by the MWRI in collaboration with the Ministry of Agriculture and Land Reclamation (MALR) and other related strategies. The focus of this document is to ensure the integration of environmental and sustainability consideration in the water sector in Egypt. Emphasis will be laid on ensuring that the expansion of cultivated area does not result in reduced allocation of water in already existing agricultural land, which may result in reduced land productivity and seawater intrusion.

The Nile River Basin countries receive an annual rainfall of 1,660 billion m³. This amount would be sufficient for the 370 million people living in the region, if resources were properly managed. Egypt receives 55.5 billion m³ from the Nile. This share of the represents more than 95% of Egypt's water resources. The availability of other sources of freshwater currently represents only 3% of demand, with limited development potential.³⁰

Agriculture consumes about 85% of that water and roughly contributes about 13.7% to the GDP and employs about 40% of the total workforce. Egypt's water requirements are nearly 78.5 billion m³ annually. To meet these requirements, water is reused more than three times, with serious environmental and health impacts.

The present drinking water treatment system in Egypt uses surface water as the main source of supply. Surface water roughly contributes about 82.1% to the needs of the housing and industrial sectors, followed by groundwater and desalinated

seawater, contributing 17.1% and 0.8% respectively. The housing, industry and trade sectors consume approximately 68% of the produced water, while the remaining 32% is lost due to leakage and poor infrastructure.³¹ This does not include urban unaccounted for water through informal connections.

Population has been rapidly increasing Egypt, from 59.3 million in 1996 to around 84 million in 2013 in addition to 8 million living abroad. Population is likely to increase to reach between 120-150 million by 2050, with increased pressure on water resources in the country. In 2013, municipal water demand was estimated to be 10 billion m³. By the year 2020, municipal water demand is expected to increase by 20%. Moreover, if the targeted 3.6% growth rate in the industrial sector is achieved by 2017, its demand for water is projected to rise to 5.7 billion m³, a 30% increase from 2010³²

Other sources of water in Egypt include rainfall, with is estimated at about 1.3 billion m³/year. Underground water represents a very small percentage of the water supply in Egypt (the safe yield is about 4 BCM/year).³³ Abstraction of underground water was estimated at 2.4 billion m³/year in 2010 and is expected to reach 4.9 billion m³ by 2017. Most to the underground water in Egypt is non-renewable,³⁴ thus need to use this source of water in the most prudent manner giving priority to human consumption, as opposed to supporting mega agricultural projects or human settlements.

Shallow groundwater is estimated at about 8.4 billion m³/year. Though, it is considered as a reservoir, the use of underground water is based on the amount of water recharged from the drainage of the irrigation system.³⁵ In 2010, abstraction from aquifers was estimated at 6.37 billion m³ and is expected to reach 7.5 billion m³/annually.

Another potential source of water in Egypt is desalinated seawater, which has been given low priority as a water resource due to the high cost of treatment. In 2010, it was estimated at 150 million m³.

Treated domestic sewage reused for irrigation was estimated at about 166 million m³ in 2010, out of the 3.42 billion m³ treated from the total of 7 billion m³ generated. Agricultural drainage water and treated sewage water was estimated at 15.7 billion m³ in 2010. This is mainly used after its discharge in canals resulting in increasing irrigation efficiency but affecting water quality.³⁶ Only 6.4 billion m³ of which was treated and reused.³⁷

Egypt's share of the Nile River is now at risk. The Nile river upstream riparian countries that share the Nile River Basin have demanded the revision of the 1959 agreement and other related agreements that assign the share of the river's water to Egypt and Sudan and allow Cairo to veto upstream projects. The construction by Ethiopia of the Grand Ethiopian Renaissance Dam (GERD) is of particular concern in Egypt due to the potential negative impacts the dam may have on the volume of water that will be made available to the country.

This will necessitate building of a number of scenarios, including a worst-case scenario in case the volume of water provided will be reduced. This scenario would also need to take into account potential negative impacts of climate change on water resources in Egypt in general.

Climate change scenarios have shown possible future droughts in the Nile basin, which would require drought management strategies. Many of these scenarios have projected that climate change will continue to pose major geopolitical, technological and ecosystem challenges.³⁸ This brings back the memory of the 1979-1987 drought, which forced Egypt to reduce its water use despite the large water reservoir in Lake Nasser behind the High Aswan Dam. This clearly shows that Egypt is vulnerable to changes in climate that affects its main water resource. A climate change prediction model identified water resources, coastal zones and agricultural resources as the three most vulnerable sectors to climate change in Egypt.

Moreover, natural flow of water at Aswan is sensitive to temperature changes in the Equatorial

Lakes sub basin and the to the precipitation in the Ethiopian Highlands.³⁹ Several studies indicate

that the Nile River is very sensitive to temperature and climate change mainly because of its low runoff/rainfall ratio (4%).

Based on the above and given the rate of population growth, expected increase in the level of economic activities across sectors and rate of urbanization, there is an urgent need for not only to adopt water efficiency measures and policies, but also to devise innovative means of securing additional water resources to meet future demands. This includes exploring potential collaboration with the riparian countries).⁴⁰

Serious consideration should be given to the issue of virtual water within the context of international trade and food security. As much as Egypt is concerned about food security and the need to satisfy increased demand, achieving water security is also a challenging task. A decision at the strategic level should be taken regarding whether Egypt will continue to grow water intensive crops such as rice and wheat or opt for importing them in order to increase water availability in the country.

"In summary, the actual resources currently available for use in Egypt are 55.5 billion m³/year, and 1.3 5 billion m³/year effective rainfall on the northern strip of the Delta, non-renewable groundwater in the western desert and Sinai, while water requirements for different sectors are in the order of 79.5 billion m³/yr."

Water Policies⁴¹

The history of water management in Egypt is dated back to the construction of the old Aswan Dam in 1902 and the barrages in the early 20th century. This dam was to be mainly used to store the Nile water for the growing of multiple crops per year. The barrages were to raise the water level of the

Nile so that water could be diverted into irrigation channels running off the river.

After building the High Aswan Dam in 1970, many water resource policies have been developed to improve the management of the available water resources to match the water supply and demand for all sectors (A number of water policies have been formulated since 1975.[‡]) Most of these policies were not flexible enough, and thus could not cope with uncertainties and immerging priorities.

There are many challenges facing the Egyptian water sector. In 1998, the MWRI developed a National Water Resources Plan with the objective to describe how to use water resources in a sustainable way from a combined socio-economic and environmental perspective. The plan covered the period till 2005.

The National Water Resources Policy (NWRP) was developed in 2005, with the main objective of describing how Egypt can safeguard its water resources in the future. The plan aims at increasing water use efficiency, protect water quality and control water pollution. The plan covers the period till 2017.

The NWRP is currently undergoing a review process as part of the country updating cycle plan. The new NWRP provides an update to earlier guidelines, policies and plans making them dynamic in nature to allow for changing conditions, risks, and unforeseen measures. The updated version suggests a set of initiatives as well as wastewater treatment and sanitation projects. It also promotes the construction of desalination plants for the supply of municipal water for coastal cities. The plan is based on an integrated water resources management approach. It provides guidance to both the public and private sector with the objective of ensuring optimum development and management of water resources. It comprises

[‡] Water Policy for the year 1975, Water Policy for the year 1980, the Egyptian Water Master Plan, year, 1982, Water Policy for the year 1986, Water Policy for the year 1990, Water Security Project, 1993, Water Policy for the year 1999, and the National Water Resources Policy (NWRP) 2005.

of a plan that covers a period of 20 years together with an investment plan. The plan covers the period till 2037 and aims to achieve the following main objectives:

Development of new water resources

Increasing water use efficiency

Water quality protection

All relevant stakeholders are being involved in the development of the new plan with the purpose of ensuring that the strategy document reflect the concerns and views of different stakeholders and that it has their support and commitment.

The amended version of the NWRP includes a wastewater treatment strategy. It suggests a set of initiatives as well as wastewater treatment and sanitation projects. It also promotes the construction of desalination plants for the supply of municipal water for coastal cities. The Ministry of Environment (MoE) has also proposed amendments to the environmental law No. 9/2009 to allow for the discharge of brine water into the sea. Additionally, a Public-Private-Partnership (PPP) law was issued in 2010 to encourage the involvement of the private sector in the water sector. Lastly, a recent strategy for wastewater reuse in Egypt 2030 has been prepared.⁴²

Generated wastewater is estimated to increase from 7.5 billion m³ to reach 11.6m³ annually by 2030. The existing Egyptian code for wastewater reuse (501/2005) does not allow any agricultural food production activities using wastewater. The code mainly supports wastewater reuse for growing trees, flowers, etc. Other Ministerial decrees also ban the use of recycled water for agricultural purposes. All these policy aspects need to be taken into consideration in order to ensure consistency of the policy framework policy within the 2030.⁴³ However, the Government has recently passed a legislation allowing the use of treated wastewater in the irrigation of agricultural crops.

There are different cost implications for primary, secondary and tertiary water treatment. These compete with the cost of treating brackish water using desalination techniques. The cost of desalination is estimated to be less and 50 cents (US\$ 0.5) equivalent to EGP 3.5, which is less than the cost of water treatment of EGP 5. As such there is competition between desalination of brackish water and primary, secondary or tertiary treatment of wastewater. Integrated Water Resources Management (IWRM) is therefore very important to ensure coordination between the different uses of different water resources⁴⁴

Water Legislations

A number of water legislations have been issued since 1948, those include the following:

- Law 4/1948 and law 9/2009.
- Law 12 for the year 1984 regarding irrigation and drainage.
- Law 213/1994 regarding stakeholder participation in water management.
- Law 48 for the year 1982 regarding the Protection of the Nile River and Waterways from Pollution.
- Resolution no. 8 of the Minister of Irrigation for the year 1983 concerning the executive regulations of Law 48 for the year 1982 regarding the Protection of the Nile and Waterways from Pollution.
- Resolution no. 14717 for the year 1987 concerning the executive regulations of Law 12 for the year 1984.

Although the number of treatment plants has increased 10 times between 1985 and 2005, only 35% out of the 3.8 billion m³ of water released into the Nile annually was properly treated as of 2004 (Ministry of Water Resources and Irrigation). In 2012, Egypt had 372 municipal wastewater treatment plants. The capacity of the wastewater treatment plants was more than 11 million m³ per day. The treatment plants were estimated to serve more than 18 million people.

The largest wastewater treatment plant in Egypt is located in Gabal el Asfar to the Northeast of Cairo. The African Development Banks has financed the expansions of the plant. The project entails construction of the next phase, which will provide an additional wastewater treatment capacity of 500.000 m³/d. The wastewater will undergo full



Source: Euro-Mediterranean Information system (EMWIS) on know-how in the Water sector

treatment, including preliminary, primary and secondary treatment.⁴⁵ Another large wastewater treatment plant is located at Abu Rawash in the western part of Giza governorate. It initially treated 0.4 million m³ only at primary level. In 2005-2008 the capacity was increased to 1.2 million m³ per day and is planned to increase to 1.6 million m³ per day in 2015 with a possible funding through public-private partnership.⁴⁶

Furthermore, a baseline assessment study was undertaken for the design and construction of the Egyptian wastewater treatment and reuse pilot

activity at Al Gozayyera Village, West Kantara City, Ismailia governorate. The purpose of the project is to conduct a pilot activity in a rural area of Egypt to demonstrate the potential application of decentralized wastewater management.⁴⁷

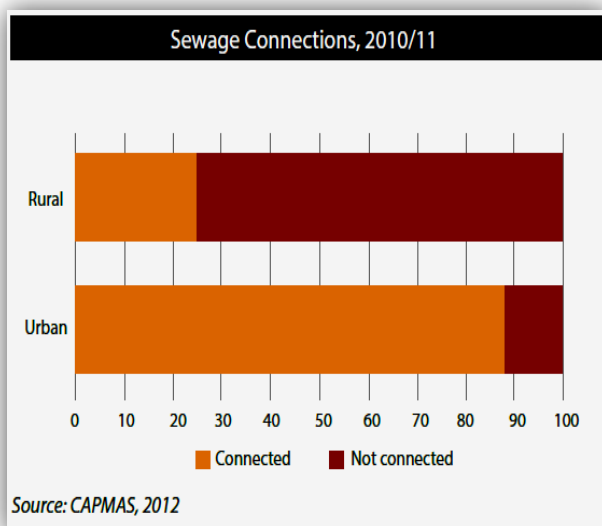
Impact of current water practices on the environment

As populations continue to grow alongside the changes in standards of living, and increased level of activity, demand on water will continue to increase. Apart from the impacts of the Aswan Dam on the Nile Delta, increased abstraction from the Nile for irrigation also results in negative impacts on the Nile Delta in the form of erosion and salt water wedge moving further up the Nile.

Moreover, climate change coupled with unsustainable consumption and production patterns for water will negatively impact availability of water to support human and economic activities in Egypt.

The Nile River and the seas receive enormous amounts of biological and chemical pollutants. Water pollution does not only affect the environment and human health, which in turn have negative implications on the economy.

Several studies revealed that untreated industrial wastes of most of the factories are discharged into either the Nile or the Mediterranean Sea. This includes toxic and hazardous chemicals with severe consequences on the environment and human health. Additionally, the Nile and its waterways suffer from the discharge of polluted agricultural wastewater as referred to in the Agriculture Chapter. The discharge of oil and grease originates from marine transportation and untreated municipal wastewater. The threats imposed by chemical discharges include pollution of drinking water supplies, waterways with negative health impacts on agriculture and fisheries.



Most of the rural population do not have access to sewer systems or wastewater treatment facilities.

The “septic tank” is the common disposal facility. The soil surrounding the tank subject shallow groundwater to pollution. The treatment of urban sewage is also insufficient. The unused drainage water fed into the lakes and the sea transfers its pollution burden to the coastal and marine ecosystems. Typhoid, paratyphoid, infectious hepatitis, and infant diarrhea are some endemic diseases caused by polluted water quality in Egypt. However, the Government has included in the recent update of the national water strategy, a rural sanitation strategy to improve the quality of treated wastewater in the country.

Agricultural, industrial and human needs essentially depend on the availability of freshwater. Yet the present situation allows mixing up of all types of wastes produced from different sectors. This results in negative health impacts on the rural population and consequently on the national economy.

The major groundwater aquifers in Egypt stretch in the western desert and Sinai, and under west of the Delta, Salheyia and Upper Egypt. The renewable aquifer is the Nile aquifer around the Nile valley and the Delta as it originates from the leakage of Nile and drainage waters. Seawater intrusion along the northern sector of the Delta aquifer renders it nearly saline, with a top layer of freshwater.

The quality of groundwater is assessed on an irregular basis, predicting signs of pollution within a 30-meter depth. There are also some geological formations within the Egyptian desert that carry groundwater, such as the Nubian sandstone in the western desert, the Dakhla, Kharga and Siwa Oases. Water availability is found in depths ranging from 60–100 meters to 400- 600 meters below surface. These ground waters are of non-renewable fossil origin.⁴⁸

Institutional Impacts

As water is becoming scarce, tensions among users may intensify. On the international level, the absence of strong institutions and agreements, changes within the same basin can lead to trans boundary tensions. Also, if major projects are implemented without adequate coordination and collaboration, they can cause conflicts and regional instability.

The MWRI, is one of the oldest and the most deep-rooted ministries in Egypt. The Ministry undertakes many responsibilities including:

- Monitoring of all the water resources.
- Rationalization of the use of current water resources.
- Planning and implementation of water resources development projects and development of irrigation in Egypt. Main responsibilities of the Information, Documentation and Decision Support System Department (IDDSSD) in the MWRI, include:
- Improving the quality of communications between the Ministry and its districts.
- Security and confidentiality of data exchange
- Making full use of the available resources by upgrading the Ministry’s information network.
- Supporting decision making for water management at the country level.

Socioeconomic Impacts

Access to water for domestic uses and for economic activities (agriculture, industry, other

economic activities), has a direct impact on poverty, unemployment, health and food security. Access to sufficient and reliable sources of water is a necessary prerequisite to support economic activities.

There are wide disparities in access and water consumption in Egypt. Moreover, rural areas and informal settlements suffer from a poor and deteriorating sewage networks. It is estimated that only 24.7% of the rural population are connected to the sewage system in 2010/2011, compared to 88% in urban areas.⁴⁹ Significant disparities also exist between governorates. According to the last census conducted in 2006, 96% of Greater Cairo was connected, in comparison to 15% connections in cities of Upper Egypt.⁵⁰

In July 2012, laboratory tests showed that the percentage of ammonia in the Nile water is 180 times more than the accepted rate. Also, the lack of access to sanitation has a direct impact on water quality, increasing the risk to people's health. Diarrhea and Schistosomiasis, the diseases that are most commonly linked to water, sanitation and hygiene problems, are very common in Egypt.⁵¹ Moreover, 13% of child deaths under five years of age are caused by diarrhea.⁵²

Challenges facing the water sector

The growing population of Egypt and increased level of economic activities have increased the demand for water beyond available supply. Moreover, current practices have resulted in severe pollution levels of the Nile River, threatening public health and the environment. Since water is essential for sustenance of all living organisms and for supporting economic activities, wisely managing it is a shared responsibility of all users, be it, business, industry, farms, factories, individuals or communities.

Challenges

A number of challenges face the water sector in Egypt. These include, growing population, increased rate of urbanization, impacts of climate

change, the construction of the Ethiopian dam, and the potential negative implications of the separation of South Sudan.

Other challenges facing the water sector in Egypt can be summarized as follows:

Institutional Challenges

MWRI has drafted a water vision for 2050 and is currently preparing in consultation with all relevant stakeholders the next strategic national water plan for the period 2017-2037.

A number of measures need to be introduced to address institutional challenges facing the water sector in Egypt. These include the following:

- A regulatory framework that encourages the use of renewable water resources, including rainfall, groundwater, and desalinated brackish and seawater. A number of regulations and codes governing the optimum use of desalinated water, including the Egyptian code for water desalination are currently under preparation.
- Water is integrated into the wider economic policies related to agriculture, trade, energy, real estate, finance, and social protection, and that are likely to have significant impacts on water management. Understanding the centrality of water in policies across sectors and the need for close coordination between sectoral ministries and MWRI is essential.⁵³
- Introduction of an implementation, monitoring and evaluation mechanism to ensure the effective implementation of proposed policies, strategies, and plans and their adherence to set objectives.
- Water subsidy reform that encourages the efficient allocation and use of water, based on a cross subsidization system.
- Provide an incentives package for public and private investment in the water sector.
- Adoption by the Government of sustainable production and consumption practices with respect to water.

- Invest in human resources with the objective of providing the necessary expertise and skills in the sustainable management of water resources, including for operation and maintenance of facilities.
- Promote active participation of relevant stakeholders and the contribution of the private sector in water related projects.
- Continuously maintain and upgrade the water network system in order to reduce and ultimately avoid water leakages in the system.
- Water scarcity means greater risks for the long-term viability of economic activities and competitiveness of the country. It also means that a community's ability to grow and create jobs is at risk.
- The increasing gap between supply and demand and reduced Government budget to be directed to investments in the water sector.
- The growing economy is leading to increasing water use as well as other associated demand.

Economic challenges

Economy depends on water resources to exist and prosper. Thus, maintaining the sustainability of water supply and use will greatly influence the sustainability of economic growth.

The Government has recently launched a set of projects and initiatives, which have implications on water demand. These include the converting of a 1 million feddans of desert land into agricultural land, the construction of a new Administrative City, and the provision of one million units of housing. These projects will further intensify demands on water.

This is compounded by the following other challenges:

- The required expansion in land reclamation and agricultural activities in order to achieve food security and self-dependency vis-à-vis the need to reduce water consumption per unit of cultivated area.
- Allocating sufficient budgetary allocations for investment in human resources and R&D and innovative water-saving technologies, practices and measures.
- The dependency of the industrial sector on water and the projected increase in demand for water to achieve the targeted increase in the sector's growth rate.
- Proper sanitation infrastructure and integrated solid waste management.

Environmental Challenges

Without smarter water resources management systems, a growing world with more people and more activities will demand more water and create more pollution.

The following are the main environmental challenges facing the water sector in Egypt:

- The need to enhance awareness about the linkages between water consumption, wastewater, CH₄ and CO₂ emissions and negative impacts on health, increasing water pollution and deteriorating water quality, and increased morbidity and mortality.
- Limited renewable water resources.
- Large amount of water losses as a result of the current irrigation system (flood irrigation) and the existing open irrigation network system.
- The potential impacts of climate change on the River Nile, lakes, coastal areas and the ecosystem as a whole.
- The impact of urban expansion on the quality and quantity of water in terms of pollution and scarcity.

Social Challenges

- Unsustainable patterns of production and consumption of water is one of the main social challenges impacting negatively on water resources, and increased rates of wastage in water consumption.
- Inequity in water use and allocation is directly linked with social imbalances and is also likely to

- jeopardize human well-being. This is further being aggravated by increased levels of urbanization, continuous increase in informal settlement and the difficulty the Government faces in meeting increased demand in water in these areas.
- Ensuring equity in the provision of clean water to the different segments of the population, particularly in rural and poor areas is another challenge facing the Government.
- Enhancing awareness of the importance of reducing water consumption and then need to resort to new and renewable sources of water, including the reuse of treated wastewater, particularly for irrigation.
- Health problems associated with water pollution and inadequate sanitation, and for which a great deal of effort is being undertaken to ensure the provision of clean and safe water to different segments of the population.

Opportunities

The Egyptian Government has realized the importance of a proper water management system and the need to introduce necessary reforms in the sector. Measures and initiatives taken by the Government include the following:

- Implementation of an efficient drainage system and the expansion in the use of drip irrigation in old and newly reclaimed land as referred to in the Agriculture Chapter.
- Utilization of renewable energy sources, including solar and wind for irrigation in order to minimize pumping costs.
- Utilizing brackish groundwater for aquaculture.⁵⁴
- Application of new irrigation technologies in desert areas.
- Serious consideration for the use of desalination of seawater. This is of particular importance as it is evident that seawater desalination provides a real solution for meeting Egypt's future water demands. This is becoming an attractive solution in light of reduced cost of between 30-40% of desalination costs and the potential of using solar energy to operate desalination plants.

- Water harvesting projects from rainfall and flash floods.
- Modernizing water control systems, and upgrading municipal infrastructures. Application of drip irrigation is being introduced in the new land where water is pumped from shallow aquifers and does not require screening to remove debris. This cannot be applied in old land where surface water contains a lot of debris and organic matters. Moreover, "Center Pivot Irrigation" using fossil groundwater in the desert can also be used.
- Solar energy can be considered for pump irrigation in the desert fringe areas but wind is not reliable in Egypt except in coastal areas such as Kafr El Sheikh governorate. Desalination of seawater could be only considered for drinking water due to its high production cost.
- Considering unreliable and limited rainfalls in Egypt, water harvesting is only possible in Sinai Peninsula.
- Additionally, the Government has launched a set of initiatives for private sector participation in water projects. The Government's focus on PPP had been mainly directed toward water infrastructure. The country's first PPP was launched in May 2009 for the New Cairo Wastewater Treatment plant. Followed by two similar projects in Abu Rawash and the 6th October City. Numerous other PPPs projects are in the pipeline for 2014.⁵⁵

Vision

Water sector capable of satisfying the needs of the different segments of current and future generations, support economic activities, and enhance the sector's contribution to the national income, create jobs, improve health through sustaining environmental and ecological systems through the provision of clean and safe water, reduction of CO₂ emissions through the adoption of sustainable production and consumption patterns, enhanced efficiency and increased use of recycled water.

Proposed 2030 Targets

- Achieve equitable access to safe and affordable drinking water for at least two-thirds of the Egyptian citizens.
- Save lives and advance development through improvements in water supply, sanitation, and hygiene.
- Increase water-use efficiency across all sectors by 30% and increase the share of recycled water sources by 60%.
- Reduce the number of citizens suffering from water scarcity and improve water quality by reducing pollution and increasing recycling.

Implement integrated water resource management.

Increase the share of recycled wastewater use.

Protect and restore water-related ecosystems, including the River Nile, underground aquifers, and lakes.

Approach

In order to ensure Egypt's water quality and security, there is a need to adopt a long-term water policy in Egypt that promotes water efficiency, minimize water losses, and diversifies water sources, including from recycled water.

It was not until 2014 that Egypt announced that it was in the process of developing a long-term vision and a sustainable development strategy (SDS) for 2030 in which water management comes as a cross cutting theme. It involves the improvement of water management systems, heavy investment in water resource development from aquifers and the drafting of legislative proposals to take concrete actions regarding the rationalization of water use. Policies and plans designed for the water sector are therefore expected to affect the functioning of activities in other areas. For instance, sustainable urban development entails adopting an integrated dynamic urban plan that maximizes the utility of water. Increasing water productivity is one of the Key Performance Indicators (KPIs) to assess improvement of the quality of life for present and future generations.⁵⁶

Integrated water management systems included in the SDS are a step forward towards realizing the Government's objectives of maximizing the use of domestic water resources (traditional and renewable), developing the capacity of its water sector to effectively satisfy and meet demands, as well as taking measures to address climate change concerns.¹⁶

Strategic Objectives

Three main strategic objectives are identified to reach the vision.

Strategic objective 1

Promote the development and implementation of practices, measures and solutions that improve the efficiency of water use, to reduce losses.

Strategic objective 2

Enhance the contribution of the water sector to sustainable economic development, social integration and cohesion, and environmental integrity

Strategic Objective 3

Promote the efficient functioning and management of the water sector

As part of this strategy framework, the Government should develop a package of water initiatives. The package should include initiatives with immediate effect, initiatives setting the long-term direction, and those that encourage technological development. The proposed initiatives need to be aligned with the overall strategic direction of the Government to achieve sustainable development, and consists of the following package of measures. It is proposed that the Government's strategic direction follows three tracks. The strategy starts up with immediate initiatives in all three tracks, but the types of initiative vary.

Track 1: The transition track

A takeoff phase in which thresholds are reached and the system begins to shift to a more sustainable path. It also contributes to realizing

short and medium-term objectives. This includes making major water consuming sectors more water-efficient, increase the use of water from renewable resources, optimize treated water usage, reduce water losses and leakages, and promote the improvement of water quality in drains and the reuse of water.

Track 2: The planning and preparation track

An acceleration phase, where visible structural changes take place rapidly through an accumulation of socio-cultural, economic, ecological and institutional changes that reinforce each other. This includes a structural change in the way the societal system operates. It is important to decentralize the water management system in order to maximize the efficiency of water use.

Track 3: The technology development track

A stabilization phase where the speed of social change decreases, and new development dynamics is reached. This includes optimizing the use and application of appropriate technologies, and development of technological processes at various levels. It deals with areas in which the primary need is for more knowledge, analysis, research, and development to support sustainable and integrated water management systems.

Strategic objective 1

Promote the development and implementation of practices, measures and solutions that improve the efficiency of water use and reduce losses

- Since Egypt has a limited quota of the Nile water, new sources of water has to be found. This includes device methods to capture rain water, and through condensation from the air, reuse of wastewater, and desalination of brackish and seawater. It should be mentioned in this context that the Egyptian Cabinet has recently approved the water code related to the reuse of treated wastewater for the irrigation of cash crops.
- Since the agriculture sector is the most consuming water sector, efficiencies in the use of water can be achieved through the selection of crops to be cultivated in Egypt. Crop selection is however affected by the price the farmer can get for those crops than by the cost of irrigation services.

Thus a much broader lens is required in designing long-term water policy in Egypt, which should include setting a national policy for moving towards less water intensive crops. This policy can be implemented through setting cropping choices according to the following: minimum consumption of water, maximum output per unit of water consumed in agronomic terms, and duration of planting. This is to be set in collaboration with farmers, and offering incentives for farmers to plant these crops, by buying their production with considerable margin of profit.⁵⁷

- Integrating the concept of virtual water in the agriculture and trade policies.
- The reuse of agricultural drainage water several times contributes to the efficiency of water use in Egypt. Transitioning to a green and more efficient water management system in the different sectors, specially the agricultural sector being the major water-consuming sector will go a long way in promoting water efficiency in the country.
- The introduction of quotas for water consumption by different income groups, particularly high income families using excessive water, who should be appropriately charged if quota limits are exceeded.⁵⁸
- Drive the transition process through a political buy-in for a proactive approach to implementing sustainable practices in the water services sector through legislation, incentive measures, and funding mechanisms.
- Since water pricing is a politically charged issue, and in order to influence irrigation practices towards more sustainable patterns, imposing penalties in the form of fines on farmers excessively using water may be considered.⁵⁹
- Introduction of prepaid electrical cards to avoid delinquent payments and improve water supply; improvement of control gates of branch canals through a metered system; and introduction of rotational operation schedules of pumps, valves, and hydrants to harmonize farmer needs and efficient use of water, labour, and energy.⁶⁰

- Set standards and targets as well as incentives for different water users, including farmers and agricultural landowners, companies and industries to encourage efficiency in water use and consumption through regulatory and incentive measures.
- Promote wastewater reuse in agriculture as a substitute for conventional water as one of the strategic objectives of the Egyptian water strategy.
- Develop water framework directives for efficiency to be adaptive and action-based, accompanied by the introduction of water-tariff, cost recovery, cost sharing policies with incentives for efficient use at all levels and sectors.
- Support R&D in water efficient and water saving equipment and technologies.
- Revitalize Water User Associations and their role in promoting water efficiency measures and the use of renewable sources of water.
- Extensive improvements in water consumption practices and infrastructure in order to enhance water efficiency of existing and future housing and building. Green building codes that sets clear water efficiency standards for buildings among other standards related to the use of energy, building material and equipment should be introduced.
- Develop Minimum Water Performance Standards (MWPS) to be adopted by different economic sectors, public and private sector, as well as by households.
- Market-promotion initiatives for water-efficient equipment and technologies.
- Encourage and support investment in water efficient equipment and technologies, such as water efficient taps, toilets, monitoring equipment and industrial equipment
- Enhance public awareness on water saving efforts, the reuse of treated wastewater in agriculture, and environmental issues.
- Implement an integrated water management system to include a monitoring system for network

operations to detect leakages and operational problems, hydraulic modeling, pressure management, metering, asset management and smart operations.

- Increase use of media and internet and mobile phones as a means of raising awareness about the importance of more sustainable production and consumption patterns in the use of water.
- Build the capability of the public sector in the sustainable management of water across sectors. This includes training water operators and managers in innovative water efficient techniques, technologies and equipment.

Strategic objective 2

Enhance the contribution of the water sector to sustainable economic development, social integration and cohesion, and environmental integrity

Economic dimension

- Increase the contribution of the water sector to the national income by ensuring the supply of water requirements needed to meet existing and future needs of the different economic sectors.
- Promote investment in water projects, particularly in renewable water resources and technologies by the public as well as the private sector, and through PPP, by introducing the appropriate regulatory and incentive measures.
- Design and initiate the construction of the necessary infrastructure needed for renewable water.
- Adopting an integrated water resources management approach to support sustainable economic development across sectors.
- Develop a plan for subsidy reform in the water sector aimed at phasing out water subsidies taking fully into account that it does not affect low-income and poor families. Savings to be directed to water projects targeting mainly communities lacking water connections. Cross subsidization should also be encouraged as it reduces pressure

on Government budgets and makes funding available to support subsidized water services for low and poor income families.

- Introduce a volumetric system for setting water tariffs for irrigation that is based on water use and rather than land area. This should be combined with a minimum water right system in order to deny farmers from access to water.⁶¹

Social dimension

- Priority should be given by the Government to provide safe drinking water to areas with no clean and safe water connections.
- Ensure that equity considerations are fully taken into account in the design and implementation of water related policies.
- Apply gender equality and female empowerment policies by supporting gender sensitive approaches to empower women and promote their engagement in the development and implementation of water related programmes and activities.
- Investment in water management projects should result in job creation, with due consideration given to the geographic locations of the projects and the category of workers employed, giving priority for marginalized communities and those most in need for jobs.
- Due to the contamination of fresh waterways in many locations in Egypt, to add active carbon adsorption as needed technology to remove the dissolved organics ahead of final water chlorination to prevent the formation of chlorinated organics leading to the noticeable and recorded increase in cancer, kidney failure, hepatic failure as well as variable immunity decline in many communities.⁶²
- Invest in human resource development and training to create a cadre of skilled labour and professionals in water efficient technologies and equipment.
- Raise the level of awareness of the general public of the negative impacts resulting from the inefficient use of water resources and the

- unsustainable water practices and mismanagement of water resources.

Environmental dimension

- Promote the greening and sustainable water management practices of the different economic and service sectors, including agriculture, industry, tourism, housing and construction through a package of regulatory and incentive measures.
- The most important environmental dimension related to water use, if Egypt plans to effectively adopt an integrated water use management system, is to determine the quantity of water that should be left in the natural system in order to maintain ecological and biodiversity values. This minimum residual flow or lake or estuary recharge level must also be included in the water allocation strategy.
- Monitoring and enforcement of health standards that ensure compliance with WHO standards with respect to water quality.
- Strict monitoring and enforcement of regulations related to the disposal of waste in the Nile River by industry, agriculture, tourism, and municipalities.
- Increase investments in water management and conservation projects, including construction of water storage and catchment areas in rainy areas, replenishment of underground water, water treatment and wastewater treatment facilities.
- Conservation and sound management of watershed areas by promoting the sustainable and equitable use of water resources, as well as protecting ecosystems that function as water catchment areas and the recharging of the underground water reservoir.
- Review water tariffs to gradually capture the cost of production with due consideration given to low-income and poor families. While high-income families should pay the full cost in water production, other segments of the population should be subsidized. This will contribute to increased efficiency in the use of water, and reduce energy costs and CO₂ emissions.

- Avoid negative health impacts resulting from the contamination of underground water and waterways resulting from the discharge of untreated wastewater.
 - Egypt will have to invest in the desalination of seawater in order to meet future water demand. Using reverse osmosis (RO) technology in the desalination process results in the generation of brine water, which has negative environmental impacts if discharged to the sea or recharged into the underground aquifer without treatment. Solar ponds with the reclamation of salts as a base for several salt based industries is a viable solution from the environment as well as the economic standpoint.⁶³
 - The construction of the GERD and the expected decrease in Egypt's share of the Nile River as indicated earlier poses a particular threat to water security for Egypt. The negotiating process currently under way should not only ensure that the construction of the dam does not result in the reduction of the water share provided to Egypt, but should not also in any negative environmental impacts on the ecosystem of the entire Nile valley and its implications on its biodiversity, fauna and flora.
- Strategic Objective 3***
Promote the efficient functioning and management of the water sector
- Promote capacity building and good governance through policy and institutional reform, enabling environment, and innovative financing.
 - Strengthen the institutional capacity of Government entities responsible for the management of the water sector, including ensuring the adoption of a participatory process in the decision making process, transparency and accountability.
 - Provide a stable and predictable macroeconomic environment in order to raise confidence and attract investment in the water sector.
 - Promote private sector participation and investment in water related projects, including through PPP.
 - Launch an in-depth review of legislations and regulations in order to ensure that incentives and rules support the transition to the efficient and sustainable use of water resources, including renewable sources of water.
 - Support renewable solutions projects for households, buildings and agriculture.
 - Carry out a technology assessment in order to ensure the right framework for new technologies to support the targets for reducing CO₂ and CH₄ emissions.
 - Lay emphasis on sanitation programmes and encourage multiple water use systems for agriculture.
 - Ensure an efficient follow up, monitoring and evaluation system of the water sector.
 - Decentralize water related projects at municipalities and governorates level to allow flexibility in the design and implementation of integrated water management systems that reflects the needs and existing conditions of different localities.
 - Introduce regulatory and incentive measures that encourage the efficient use of water through water tariff and quota systems, introduction of water saving equipment and measures for irrigation, household consumption, hotels, and industrial operations. This should also contribute to encouraging the use of recycled water for irrigating green public spaces, fodder crops and forest areas for wood production, and agricultural crops.
 - Reform water tariffs and revisit tariffs paid by Egypt for each foreign partner's share of water.
 - Develop a long-term R&D strategy for the sound and sustainable management of water resources to include efficient and innovative and water saving and efficient irrigation techniques and equipment.
 - Identify and improve coordination and interaction between relevant authorities and stakeholders.
 - Participate actively in international forums aiming at achieving a global transition to sustainable development and aiming at addressing climate

change concerns, the promotion of a green growth agenda, the phasing-out of subsidies, and efforts leading to water efficiency.

*Emission Reduction*⁶⁴

Water is a necessary prerequisite for any human and economic activity and its scarcity poses a serious challenge for achieving sustainable development. It plays a key enabling role in strengthening the resilience of social, economic and environmental systems in the light of rapid, unpredictable and changing environment. Water is critical for socio-economic development, healthy ecosystems and for human survival itself. It is vital for reducing disease and improving health, welfare and productivity. It also serves as the crucial link between the climate system, human society and the environment.

Substantial emissions of CH₄ and N₂O can occur during wastewater transport in closed sewers and in conjunction with anaerobic or aerobic treatment. In many developing countries, in addition to GHG emissions, open sewers and uncontrolled solid waste disposal sites result in serious public health problems resulting from pathogenic microorganisms, toxic odors and disease vectors.

In spite of the fact that current GHG emissions from wastewater are lower than those from waste, it is important to implement clean and optimized wastewater treatment facilities to ensure overall reduction in emissions.

Economic Growth

Improving availability and access to water, while increasing efficiency and reducing waste can contribute substantially to sustainable economic growth.

There is a positive correlation between increased national income and the proportion of population having access to improved water supply. Globally a 0.3% increase in investment in household access to safe water is associated with a 1% increase in GDP.⁶⁵

Job Creation

Water sector can be a direct and indirect driver for

job creation. Encouraging public and private sector investment in water efficient technologies and in renewable water resources, including green buildings and construction could be a direct driver for job creation.

Investment in sustainable water projects is likely to have positive impacts on all critical sectors, which are heavily dependent on it. Availability of water and improved water supply affect the performance of production industries and sectors, as well as service industries and sectors. Subsequently, it indirectly affects the sustenance of jobs these industries and sectors provide. It also determines the increase in the number of new job opportunities these sectors provide.

Food Security

The water sector and the agriculture and food sector are heavily interdependent. The agriculture and food sector's dependencies on water go well beyond irrigation. Throughout the production process, and distribution of food supply, water use and recovery is essential. The agriculture and food sector refers to this cycle as the "farm-to-table continuum"⁶⁶ and includes the supply chains for animals, and animal products, crop production, seeds, fertilizers, and other necessary related materials. It also includes the post-harvesting of the food supply chain, including processing, production, and packaging through storage and distribution, retail sales, and restaurant and home consumption.

Improved Human Health

Lack of access to safe water, basic sanitation and good hygiene practices is one of the most significant risk factors for poor health in developing countries with high mortality rates. Poor people in Africa spend at least a third of their income on the treatment of water-related diseases. The cost of productive time lost due to diseases, as well as, widespread human suffering must also be added to this.¹⁸

Evidence shows that improved water supply and sanitation facilities and better hygiene behavior

will radically reduce illness, mortality and morbidity.

Potential gains

The transition into a sustainable and greener water sector should result in an increase in (i) Crop production per drop of water (ii) Number of jobs created per drop of water (iii) Multi-stakeholder participation (iv) Care for the environment and human health.

- Investing in household water saving devices for domestic use including residential building is estimated to result in water savings between 10-20%. In Egypt this could translate to 1.4 billion m³ of water savings annually.
- Investing in water saving equipment and practices in the agricultural sector can result in water savings of between 20% 40%.
- Other benefits of water efficiency approaches include increased land productivity and yields estimated at between 20-30%. This can translate to an estimated corn production of about 1.4 million tonnes annually or about LE 2 billion.
- Efficiency in the use and allocation of water resulting from good governance and regulatory framework is expected to result in savings in water consumption estimated.
- Increasing the percentage of water supply from agricultural reused drainage water by 2017 could reach 4.5 billion m³ in water savings.

Indicators

- Create an additional 5,000 new jobs annually in the water sector.
- Increase the share of the budget allocated to the water sector by 20%.
- Budgetary allocations spent on water related R&D representing 10% of total allocations to R&D.
- Reduce the incidence of disease attributed to the water related contamination of the food chain by an annual 15%.
- 15% annual increase in the share of renewable water resources.

- Increase in the efficiency of the functioning and operation measured by the reduction of the gap between supply and demand by 10% annually.
- Number of laws and regulations related to the greening of the sector developed, instituted in law and implemented.
- Reduction of identified and reported incidence of non compliance to laws and regulations by a 20% annual rate.
- An annual increase of 30% of the percentage share of educated and trained personnel in sustainable water practices and techniques.
- Increase in the budgetary allocation to the water sector by 20% by the public sector and 30% by the private sector.
- Increased awareness by different stakeholders to the importance of adopting a more sustainable path in the water sector.

Roadmap to achieve the strategic vision (2016-2017)

Actions/ Measures	Activity	Responsibility	Months	2016	2017
<i>Vision and Strategy</i>	<ul style="list-style-type: none"> • Agree on the vision, strategy and a detailed implementation plan for the water sector in Egypt for the year 2037. • Process to take into account the Framework for Integrating Environmental Consideration in the Water Sector” in order to ensure the sustainable management and use of water resources in Egypt. 	MWRI in collaboration with Moe and other relevant sectoral ministries	4-6	✓	
<i>Integrated Policymaking</i>	<ul style="list-style-type: none"> • Develop and endorse a holistic and integrated approach that ensures the integration of social, environmental, and economic dimensions in water resource management. • Undertake an assessment of existing regulatory & incentive measures & assess their impacts on the environment & resource efficiency with the objective of identifying measures & policies, including means of implementation that promote SCP & resource efficiency. • Develop an Action Plan for the implementation of the proposed strategy that takes into account environmental, social and economic considerations. • Develop innovative water efficient practices in water resource management. • Provide an institutional set up that ensures public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector, including through Public-Private-Partnership (PPP) - exchange of information on best available technologies and good environmental practices on integrated water management. • Promote the use of a number of tools, measures, and concepts that facilitate the design and implementation of integrated water management systems, these include: life cycle assessment, risk assessment, producers’ responsibility, eco labelling schemes, and environmental management systems. Introducing the concept of producers’ responsibility entails the application of the polluter pays principle, thus encouraging producers to design products that uses water more efficiently and avoids waste. • Create and continuously update a database on the existing stock of water resources in order to support the planning and decision making process. • Introduce innovative techniques and practices that can help adapt to changing climatic conditions with due consideration to preserving the ecosystem and biodiversity. • Since most of the water needs for Egypt currently comes from outside it borders, 	<p>MWRI in close collaboration with MoE, Ministry of Planning, MALR</p> <p>Action to start immediately by developing an action plan by the different governorates to be coordinated by the MWRI</p>	Throughout	✓	✓

	<p>there is a pressing need to develop a long-term strategic cooperation with countries of the riparian countries of the Nile valley. This should include joint infrastructure and social development projects in the different spheres of life.</p> <ul style="list-style-type: none"> • Ensure policy coherence and consistency between different policy measures, and between policies and action plans developed and implemented by different economic sectors. • Ensure the equitable distribution and provision of water services and equal opportunities for the different segments of population, and for current as well as the future generations. 				
Good governance and institutions	<ul style="list-style-type: none"> • Identify action needed to reform/restructure or create a mechanism that will facilitate the coordination of planning, implementation, operation of in an efficient, transparent and accountable water management system. A system that ensures public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on good water management practices and technologies across sectors. • Create within the MoE a Unit that will be entrusted with the responsibility of providing guidance and technical support related to efficient and sustainable water systems in the different sectors. • Initiate action to decentralize the decision making process with more powers given to governorates and local authorities in the design, planning, and management of water resources. 	MWRI in collaboration with the MoE, and other relevant sectoral ministries	1-2	✓	
Regulatory framework	<ul style="list-style-type: none"> • Develop a package of regulatory and policies that support the efficient and sustainable management of water resources throughout the entire life cycle of production processes. • Develop a regulatory and incentive package that promotes eco-design and the construction of sustainable and green and water efficient housing. • Introduce in law a requirement for all public buildings to be constructed following green and environmental friendly codes and standards, including energy efficient systems, use of renewable sources of energy, water efficient system, and recycling and reuse of treated wastewater, conversion of sewage water into biogas, source separation of municipal waste, recycling, reuse, and recover, and the production of compost from organic waste. • Institute in law the requirement for economic activities, including industry and agriculture related activities to encourage sustainable and water efficient practices. • Institute in law the requirement for major water consuming activities to recycle wastewater for reuse. • Introduce laws that prohibit the use of freshwater in irrigating green areas (public 	MWRI in collaboration with the Ministry of Environment, Ministry and other relevant sectoral ministries	6	✓	

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	<p>and private).</p> <ul style="list-style-type: none"> • Institute in law a requirement for coastal communities to use desalinated water as the main source of water supply for municipal and economic activities. • Assess the environmental impacts resulting from the implementation of the code related to the use of treated recycled wastewater in the production of agricultural crops. 				
Economic instruments	<ul style="list-style-type: none"> • Design market incentives to encourage investments in efficient and renewable sources of water, including water recycling and desalination. • Introduce incentives that encourage the use of organic fertilizers that enhances the water retaining capacity of soil. • Provide incentives to encourage the use of efficient irrigation systems, such as drip and pivotal irrigation systems. • Provide a package of incentives, including tax rebates and exemptions in order to encourage investment by the private sector in water projects • Reform the water subsidy system through cross subsidization. • Encourage through incentives and awareness raising and training the reuse of the treated sewage water in irrigation of organic waste and the use of renewable water resources. 	MWRI in collaboration with the MoE, Ministry of Finance, and other relevant sectoral ministries	3-4	✓	
Economic analysis	<ul style="list-style-type: none"> • Undertake an economic analysis to assess the financial viability of the proposed plan to include social and environmental costs and benefits. Social and environmental benefits resulting from the proposed plan should include number of new jobs created, positive health and environmental impacts It should also identify budgetary requirements needed to finance the programme, and sources of funding. 	MWRI in collaboration with the MoE, Ministry of Finance, and other relevant sectoral ministries	3-4	✓	
Government Procurement	<ul style="list-style-type: none"> • Government to take the lead in promoting green and sustainable agricultural communities, green infrastructure and buildings by directing public spending towards water and energy efficient building designs, equipment and construction, agricultural and industrial activities, and tourism. • Upgrade and continuously maintain the water network to reduce water losses. • Retrofit public buildings and offices with water saving equipment. • Direct public investment towards the wastewater treatment and recycling, and water desalination, and the production of water saving equipment. • Provide farmers with innovative environmentally sound technologies, techniques and practices that decrease water losses, promote efficient irrigation systems and increase the use of renewable sources. 	MWRI in collaboration with MoE and relevant ministries	Throughout	✓	✓
Trade	<ul style="list-style-type: none"> • Design trade policies to support a sustainable and green water system through a tariff system that encourages the import of water efficient technologies and equipment. 	Ministry of Trade and Industry in collaboration with Ministry of Planning, Monitoring, and Administrative Reform	2	✓	

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		(MPMAR), Ministry of Finance, and MWRI, Ministry of Housing, Utilities and Urban Development (MHUUD)			
Funding	<ul style="list-style-type: none"> Provide a stable and predictable budgetary allocations needed to implement the proposed Framework for the IWRM. Financial institutions to support financing investments in green and resource efficient water systems, giving priority for supporting SMEs. 	Ministry of Planning, Monitoring, and Administrative Reform, Ministry of Finance, and MWRI	Throughout	✓	✓
Private sector	<ul style="list-style-type: none"> Develop a package of incentives and measures to encourage and promote the engagement of the private sector in green and sustainable water systems directly and through Public-Private-Partnership. Package may include tax exemptions, concessionary loans, and making land available for the different water related projects. 	MWRI in collaboration with the MoE and Ministry of Finance	4-6	✓	
Public Awareness	<ul style="list-style-type: none"> Develop and implement a public awareness campaign targeting different target groups, including policy & decision makers, the general public, academia, civil society, private sector and business, builders & contractors, & clients, highlighting the economic, social, health and environmental benefits of providing safe water. 	MWRI in collaboration with the MoE, Ministry of Ministry of Education	4	✓	✓
Education	<ul style="list-style-type: none"> Review the education curricula with a view to ensuring the integration of environmental and sustainable water management practices and techniques of water in all disciplines. Develop and implement a curriculum for IWM to be offered at the Egyptian Universities. This can be at the undergraduate and the post graduate level. Increase public investment in the education system particularly for the rural poor, including training programmes for teachers and training the trainers programmes, special programmes for women and elderly 	Ministry of Education in close collaboration with MWRI, public and private universities (Cairo and Ain shams University, the October 6 th University, and the British University etc.	6	✓	✓
Capacity Development	<ul style="list-style-type: none"> Undertake a needs assessment to identify short and long term training and capacity building requirements in the water sector. Emphasis should be laid on making available necessary skills and professional human power to support water efficiency management and the use of non-conventional sources of water resources. Develop a capacity building, educational, and a research programme that supports the efficient use of water resources, promotes the use of renewable sources of water, including recycling, and seawater desalination Develop a programme aimed at promoting the use of tools and concepts that support the transition to a green and sustainable water sector to include tools such as integrated assessment, life cycle assessment, green economy, and circular 	MWRI in collaboration with the MoE, (MHUUD, Ministry of Education, and Ministry of Labour	4-6	✓	✓

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	<p>economy/closed loop economy.</p> <ul style="list-style-type: none"> Develop a training programme for farmers and extension works on the new irrigation technologies and systems. 				
Monitoring and assessment	<ul style="list-style-type: none"> Develop, for adaptation at the national level of an efficient monitoring, enforcement & assessment system for water related activities that ensures compliance & adherence to sustainability principles in the allocation and use of water resources. The system should also include the a coordination mechanism to coordinate initiatives, programmes, & funding related to IWM. Upgrade and enhance the performance of water quality monitoring stations. 	MWRI in collaboration with the MoE, Ministry of Housing, Ministry of Education, Ministry of Labour	Throughout	✓	✓
Research & development	<ul style="list-style-type: none"> Design a long-term R&D programme in efficient water systems and the introduction of new strains of crops that consume less water and that are draught resistant. develop a long-term R&D programme to support the development of innovative water saving and efficient equipment, increase the efficiency in water use and the development of draught resistant and low water consuming plant varieties. 	Academy of Scientific Research in close consultation and collaboration with MWRI, MALR, and MoE	4-6	✓	✓
Indicators	<ul style="list-style-type: none"> Develop a set of indicators to monitor the achievement of the set objectives and targets. 	MWRI in collaboration with the MoE, MALR, and other relevant ministries	3-4	✓	
Regional & International Cooperation	<ul style="list-style-type: none"> Promote regional and international cooperation in the field of efficient and sustainable water management, including FAO, East African Community (EAC), Regional Development Banks, the World Bank, Intergovernmental Authority on Development (IGADD), Southern African Development Community (SADC), Economic Community of West African States (ECOWAS), and Common Market Eastern and Southern Africa (COMESA). 	MWRI in collaboration with the MoE, and Ministry of Foreign Affairs	Throughout	✓	✓

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Acronyms

BSCF	Billion Standard Cubic Feet
CEO	Chief Executive Officer
EEAA	Egyptian Environmental Affairs Agency
EEHC	Egyptian Electricity Holding Company
EIA	environmental impact assessment
EBRD	European Bank for Reconstruction and Development
EU	European Union
FiT	Feed-in Tariff
LED	light-emitting diode
HFO	Heavy fuel oil
LFO	Light fuel oil
MCM	Million Cubic Meters
MoE	Ministry of Environment
NREA	New and Renewable Energy Authority
OPEC	Oil Producing Exporting Countries
PPA	Power Purchase Agreements
RDF	Refuse-Derived Fuel
RECREE	Regional Center Renewable Energy and Energy Efficiency
IRENA	Renewable Energy Agency
TARES	Technical Assistance for the Reform of the Energy Sector
TDF	Tire-Derived Fuel
TPA	Third Party Access
TSO	Transmission System Operator
WEC	World Energy Council

Introduction

Energy is a critical strategic sector shaping national as well as global agendas. Being a centrepiece to development of every country, it has now established itself as a top priority for leaders worldwide. Thus, its sustainable management is crucial to guarantee national energy security and economic development. Key components of this management strategy is keeping electricity supplies at a secure level ensuring that demand is met nationwide at competitive prices and in line with current environmental safeguards, regulations and social expectations. Thermal energy can provide low-carbon base-load power, heat and cooling from high temperature hydrothermal resources, deep aquifer systems with low and medium temperatures, and hot rock resources. The current energy situation worldwide requires adaptive measures to meet the rate of population increase, level of economic activities, changes in living standards and consumption patterns, and climate change concerns. The highly competitive electricity and gas markets pose a challenge for ensuring security in the provision of energy supply both in the short-term and long-term. It is estimated that 1.3 billion people around the world lack access to electricity.⁶⁷ Adequate policies need to be put in place to ensure the provision of secure and stable supply of energy sufficient to support economic activities, while at the same time taking into account environmental and social considerations. Moreover, providing an enabling macroeconomic environment is necessary in order attract investments in the energy sector.⁶⁸

Overview

The basic analysis derived from the World Energy Council (WEC) Commission report "Energy for tomorrow's world" with its horizon year of 2020 shows that by that year the global population will reach 8.0 billion. Global economic development will likely grow to between 1.6% and 2.4% annual growth. All the traditional major variables required

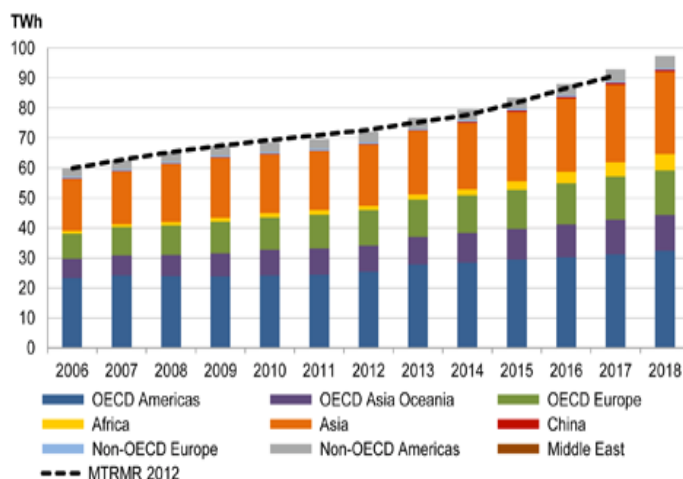
to examine future energy perspectives have been built into the commission's scenarios. The scenarios produce around 50% increased energy demand from 1990 to 2020 of around 50%. This large increase in energy demand has the following potential implications:

- More than 90 million barrels of oil a day will be consumed, an increase of some 27 million B/d, or the equivalent of the entire Organization for Oil Producing Exporting Countries (OPEC's) daily production.[§]
- Coal production will double to about 7 billion tonnes per annum, with the negative environmental implications this involves. However, the general trend is a decline in the use of coal worldwide. In the U.S. for example the use of coal dropped 21% between 2007-2014, with more than one third of the plants having been closed or having announced their closure in the last 5 years.⁶⁹
- However, since coal still constitutes the largest highest share for energy generation worldwide, there is growing recognition that technology development is necessary to address the negative health and environmental impacts resulting from the burning of coal.⁷⁰
- Nuclear power generation peaked in 2006 and dropped by nearly 14% by 2014 globally. In the U.S., the country with the most reactors, nuclear generation peaked in 2010 and is now on the decline.⁷¹
- Thermal energy power capacity was estimated at 11.4 GW in 2012 and generated about 72 TWh of electricity. Geothermal electricity provides a significant share of total electricity demand in Iceland (25%), El Salvador (22%), Kenya and the Philippines (17% each), and Costa Rica (13%).⁷²

The figure below shows geothermal generation and projections by region from 2006 up to 2018 indicating an increase from 60 TWh in 2006 to close to 100 TWh by 2018.

[§] According the Global Tracking Framework (GTF) the 450 Scenario, which limits long term temperature increase to 2°C predicts an oil demand peak of 93m barrels per day with a decline to 83 m b/d in 2030. The decline is due to stricter fuel standards.

Geothermal Generation and Projections by Region

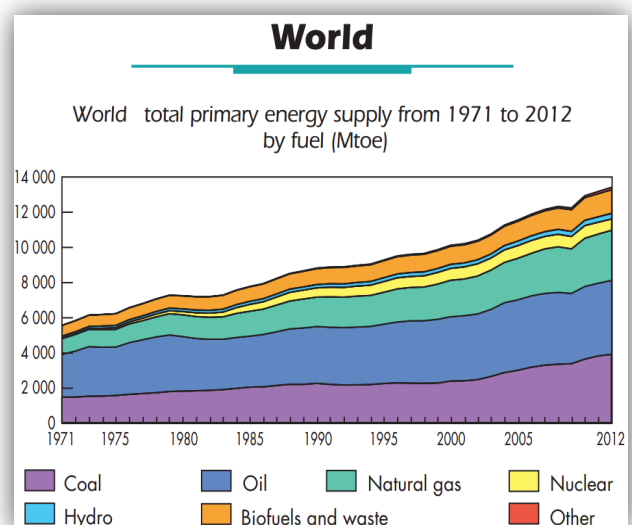


Source: IEA, (2013), **Medium-Term Renewable Energy Market Report 2013**, OECD/IEA, Paris

- Annual gas demand will reach some 4 trillion cubic meters.
- More electricity generating capacity will be built over the next years than in the previous century.
- 90% of the energy growth could take place in developing countries, provided these markets are able to develop satisfactorily with the necessary support and incentive measures in place.
- Investment in renewable power and fuels has increased by 17% in 2014 globally. This represents an investment of US\$ 270.2 billion. China and Japan alone represent \$74.9 billion of the total.⁷³
- Global installed capacity in wind and solar amounted to 95 GW in 2015. An increase from the previous years, where 74 GW were installed in 2013 and 79 GW in 2012.⁷⁴
- Total clean energy investment has reached US 300 billion in 2014, with 90% of these investments taking place in China, the US, the European Union, Japan, India, and Brazil.⁷⁵
- It is expected that more than 5,570 GW of electricity capacity may be added through 2030 with 54% or 3,000 GW from renewable sources of energy, while less than 30% is expected to be provided from fossil.
- Main countries attracting clean energy investments from 2009-2023 include: Thailand (US\$ 5.6 billion, Bulgaria (US\$ 4.6 billion), Ukraine (US\$ 3.3 billion, Kenya (US\$ 2.6 billion, and Peru (US\$

2.2 billion) with solar attracting most of the investments in emerging market. It should be pointed out that in the top leading new emerging markets for clean energy conventional fossil fuel energy grew by 10% from 2009-2013, while clean energy capacity grew by 91%.⁷⁶

- By the end of 2014, global wind generating capacity grew more than 20% annually. Global wind generating capacity totalled 369,000 MW⁷⁷
- Global fossil fuel subsidy amounted to US\$ 548 billion in 2013, which is five times the subsidy for renewable energy.⁷⁸
- Developing countries, which today consume approximately 30% of the world's total energy will consume 50% and probably 70% by 2020.
- Developing countries will emit CO₂ from fossil fuel burning equivalent to the total CO₂ worldwide emissions from the industrial countries in 1990.
- In 2014 developing countries nearly overtook the developed world in renewable energy investments. Developing countries increased investment in renewable energy by 36% from the previous year to a total of \$131.3 billion compared to \$138.9 billion, which was mainly through investments by the developed world. Countries that have each invested at least \$1billion are Indonesia, Chile, Mexico, Kenya, South Africa and Turkey.⁷⁹



Source: IEA. **Key World Energy Statistics 2014**

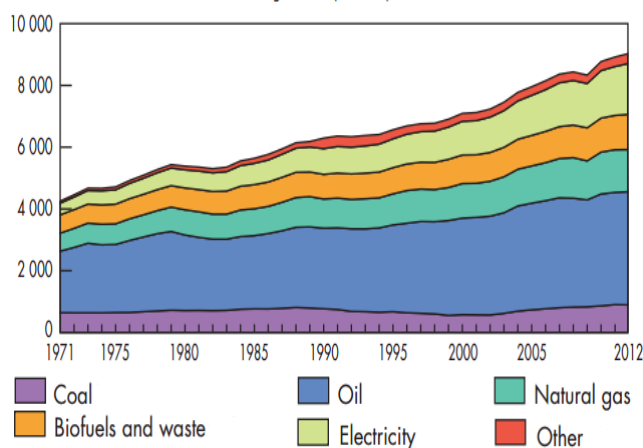
<http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

According to BP's Energy Outlook for 2035, there is an expected increase in energy demand by up to 37%. Furthermore, energy trends seem to be hovering away from the use of coal and more towards natural gas. Demand for natural gas is increasing by 1.9% per year while coal has been showing a growth of around 0.8% per year.⁸⁰

TOTAL FINAL CONSUMPTION

World

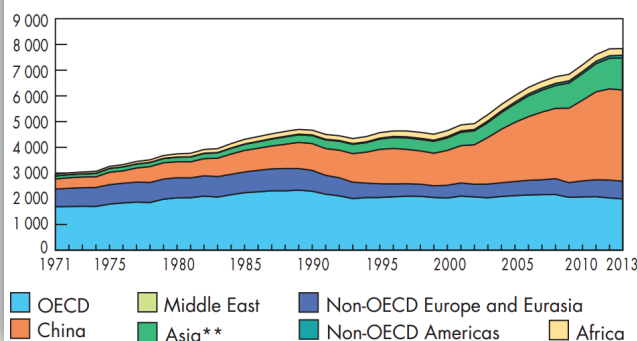
World total final consumption from 1971 to 2012
by fuel (Mtoe)



Source: IEA. Key World Energy Statistics 2014
<http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

Coal Production

Coal* production from 1971 to 2013
by region (Mt)

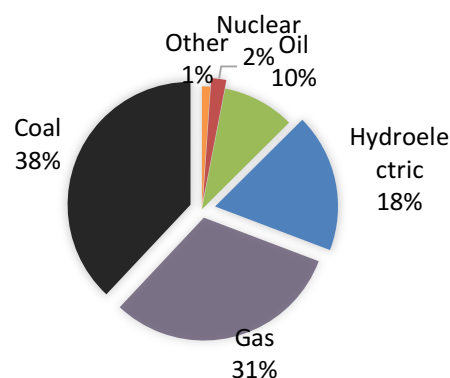


Source: IEA. Key World Energy Statistics 2014
<http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

In Africa, energy is produced mainly from biomass (47%), oil (24.8%), coal (16.5%), gas (10.4%), and other renewable sources, such as large and small hydro dams, solar, and geothermal sources (1.3%).⁸¹ Biomass actually constitutes the main energy resource for the large majority of African households for cooking, drying and heating.

While electricity access data varies widely depending on the source of data, according to IEA data, reports average rates ranging from 70% to over 94% in Northern Africa and 23% in sub-Saharan Africa, with large disparities between countries.⁸²

Electricity Generation for Africa in 2012

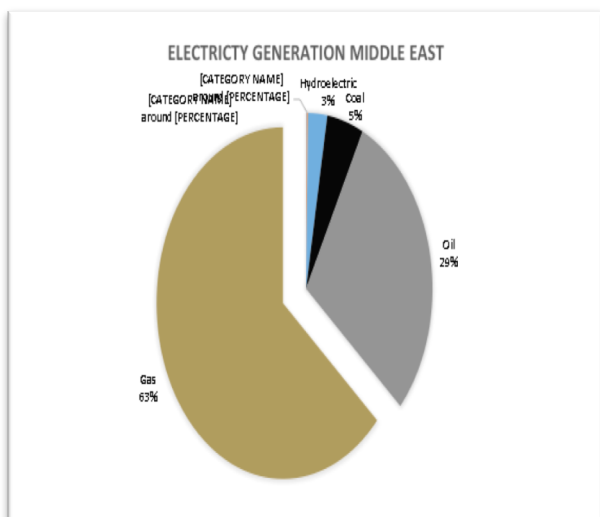


Source: World Bank
<http://data.worldbank.org/indicator/EG.ELC.PROD.KH>

For most of the past four decades, the Arab world has primarily been seen as an energy producing and exporting region. However, the region's fast economic growth, coupled by rapidly rising populations and living standards, has gradually turned the region into an evolving consumer market for energy. Total consumption of primary energy in the Arab world rose four-fold between 1980 and 2009, at a rate of 4.5% annually.⁸³

Fast growth in domestic demand for oil and natural gas has already turned several Arab economies into major consumers of their own production. Arab economies rely heavily on oil and gas to

meet more than 97% of the domestic energy demand, with renewable energy contributing the remaining 3%. The Arab world's continued reliance on hydrocarbons to meet its own domestic energy needs also raises challenges of a different kind: surging domestic demand for energy implies an increasing drain on the region's oil production, diverting growing shares to domestic markets away from export.⁸⁴



Source: World Bank

<http://data.worldbank.org/indicator/EG.ELC.PROD.KH>

World primary energy demand by fuel and energy
related CO₂ emissions 1990 - 2035⁸⁵

(Mtoe)	2000	2012	2020	2025	2030	2035	2012 - 2035
Oil	3663	4158	4469	4545	4600	4666	0.5%
Gas	2072	2869	3234	3537	3824	4127	1.6%
Coal	2357	3796	4137	4238	4309	4398	0.6%
Nuclear	676	642	869	969	1051	1118	2.4%
Hydro	225	313	391	430	466	501	2.1%
Bioenergy	1016	1318	1488	1598	1718	1848	1.5%
Other Renewables	60	142	311	432	566	717	7.3%
CO ₂ emissions (Gt)	23.7	31.5	34.3	35.4	36.2	37.2	0.7%

Source: IEA. Key World Energy Statistics 2014

<http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

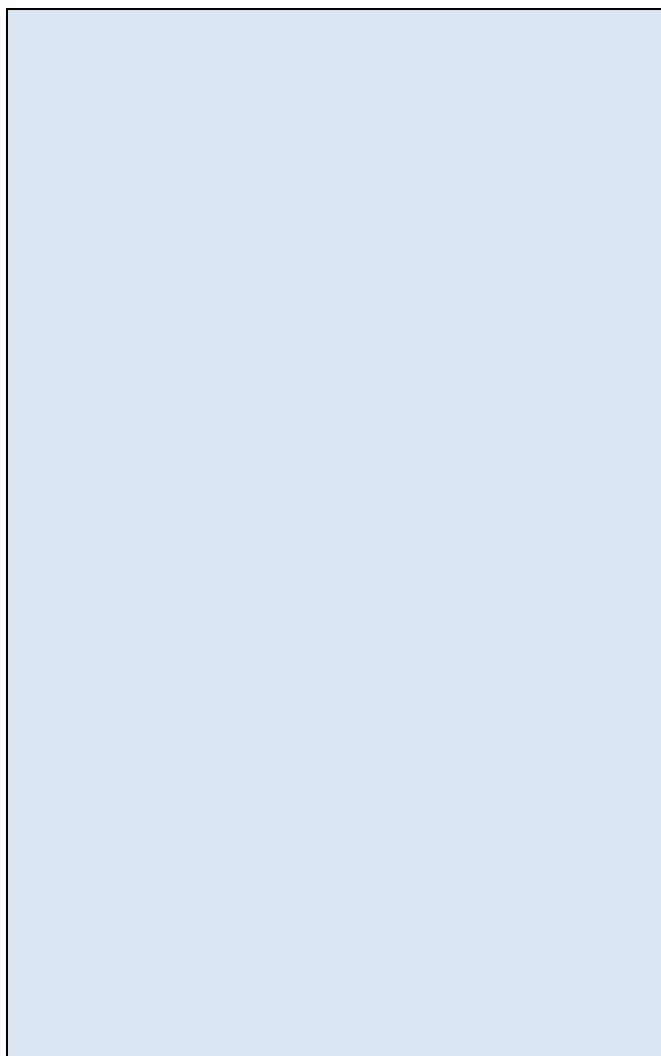
Source: Global Trends in Renewable Energy
Investment, UNEP 2014

The Energy Sector in Egypt

Egypt is currently facing a serious energy challenge with demand far exceeding current supply. In the last several years, the country has experienced frequent shortages in the supply of electricity, triggered by shortages in natural gas and oil supply. Moreover, the sector is characterized by an aging infrastructure, and inadequate generation and transmission capacity. Increased population growth, level of economic activity, industrialization and changing consumption patterns are further exacerbating the situation.

Recognizing the need for a long-term sustainable energy strategy for the energy sector the Government is currently in the process of finalizing such a strategy, which should be endorsed by the Supreme Council of Energy in the next few months. The strategy has been developed through a Technical Assistance for the Reform of the Energy Sector (TARES), which is an EU supported project. The project is supervised by a steering committee including: Egypt ERA, EEU, MERE, EGPC, EGAS, NREA and EC in Cairo. The strategy should provide the country with an energy mix that ensures energy security for the country in the short, medium and long-term adopting a coherent and well-coordinated approach in dealing with energy in Egypt, including the role of the private sector. The proposed integrated sustainable energy strategy for 2035 include (a) challenges, goals and rational, (b) different energy scenarios developed using the adopted simulation tool (TIMES-Egypt), including the least cost option for the country, and (c) main recommendations. The strategy document also provides a “White Book” comprising of a policy, as well as, an action plan based on the main strategy. In addition, sector specific strategies/policies/action plans are introduced for oil and gas, conventional, renewable energy, and energy efficiency sectors.⁸⁶

All scenarios examined by the strategy document show that Egypt will become a net energy importer of energy not later than the second half of the 21st century. Accordingly, the efficient management of resources and the diversification of sources of energy are necessary to ensure security of supply and reduce system vulnerability. Reforms are necessary in many areas in order to liberalize the market, restructure the existing providers, attract investment, develop renewable energy and tariff reform. Other areas of interest include; improving fuel to power efficiency, adopting smart meter programme, demand side management and energy efficiency programmes, as well as enhancing system security.



The energy sector in Egypt, which employs about 226,200 workers,⁸⁷ satisfies energy demand through a mix of sources that include fossil fuel and natural gas representing about 45.7 % and 50% of total energy supply respectively, while renewable, excluding hydro, contributed about 2.4% in 2014.⁸⁸

The household and commercial sectors are the third most consuming sectors after industry and transport, reaching 26% of the total energy consumption in Egypt 2013-2014. The energy sector itself consumes 41% of total energy consumption to support its energy production operations.⁸⁹

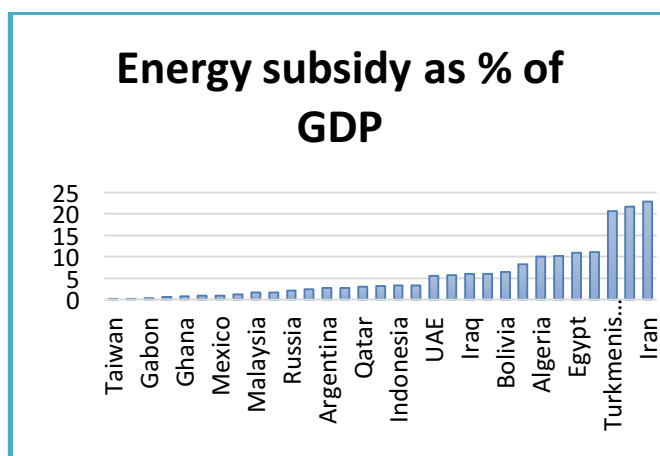
In order to face the shortage of energy supply in Egypt, the Government has decided to import coal as a solution to fill the current supply gap. The initial purpose was to provide a source of energy supply for the cement industry. Coal is now intended to be also used to power new electricity power plants, coke production facilities, aluminium, and steel production under strict environmental regulatory safeguard and measures.

Annex No 12 of the Prime Minister's Decree No 964/2015 includes standards and preconditions regarding the use of coal and petrol. A necessary requirement is the preparation of an environmental impact assessment (EIA) by the entity intending to use coal. No entity therefore can use coal, unless special approval is provided by the Egyptian Environmental Affairs Agency (EEAA). Annual reports are to be submitted by the entity using coal providing an EIA and the impacts of coal on the environment and human health based on principles and procedures provided by the Chief Executive Officer (CEO) of EEAA.

In 2012, the Government increased the cost of fuel to generate electricity by 33% for heavy industries in order to reflect the true costs of final products.⁹⁰ Heavy energy consuming industries in Egypt include the steel, cement, and aluminium industries reaching 12.5% of the total energy consumption in 2009-2010.⁹¹ Furthermore, in July

2014, the Government introduced a five-year plan ending in 2018 aimed at phasing out energy subsidies. This is to be done with annual tariff increases as endorsed by the cabinet in accordance with the Prime Ministers Decision No. 1257. The commercial sector will see an increase in electricity tariffs of around 7% annually until 2018. Also, the more electricity intense sectors in industry could experience an increase in tariff of more than 20% per year.⁹²

Subsidies and its impacts on GDP and climate change is of particular importance for Egypt. Radek Stefanski, at the University of St. Andrew according to a new model-based method for assessing fossil fuel subsidies found that without subsidies global GDP would have been 1.7% higher and overall emissions between 1980-2010 would have been 36% lower. He underscored the potential of fossil fuel subsidy reform for climate change mitigation, noting that fossil fuel amounted to 3.8% of global GDP in 2010, which is almost twice as much the IPCC estimates for the cost of climate change in 50 years.⁹³



Source: Global Trends in Renewable Energy Investment, UNEP 2014

Energy subsidies, which cost the Government US\$ 18 billion in 2013-2014, have contributed to rising energy demand and a high budget deficit. Subsidies for electricity in 2011-2012 amounted to US\$ 3.5 billion, which represented an increase of 42.9% over 2013-2014.⁹⁴ It is therefore essential

that Egypt continues to introduce energy subsidy reform due to the potential positive impacts this would have on GDP and climate change mitigation.

One of Egypt's main challenges is to satisfy increasing oil demand amid falling production. Over the past 10 years, total oil consumption grew by an average of 3% annually, with an average of about 770,000 bbl/d in 2013. Despite this, Egypt's oil consumption has outpaced production since 2010.

Egypt is considered to be the largest oil and natural gas consumer in Africa, accounting for more than 20% of total oil consumption and more than 40% of total dry natural gas consumption in 2013.

Egypt has the largest oil refinery capacity in Africa, although it operates well below capacity. The country's refinery output declined by 28% from 2009 to 2013, despite growing domestic oil consumption. As a result, Egypt must import petroleum products to make up for the shortfall. The built up for a large oil refinery capacity in Egypt was in anticipation of an increased oil levels of discoveries which have yet to reach estimated levels.

Egypt has reached a peak in oil production in the nineties, with 900,000 daily oil production⁹⁵. However, in 2011 oil production dropped to 560,000 barrel/day. This is despite the 30% increase in oil consumption during the first decade of 2000 from 500,000 barrel/day to 815,000 in 2011. Oil reserves have declined from 4.3 billion barrels and is expected to reach 1.5 billion by 2030.⁹⁶

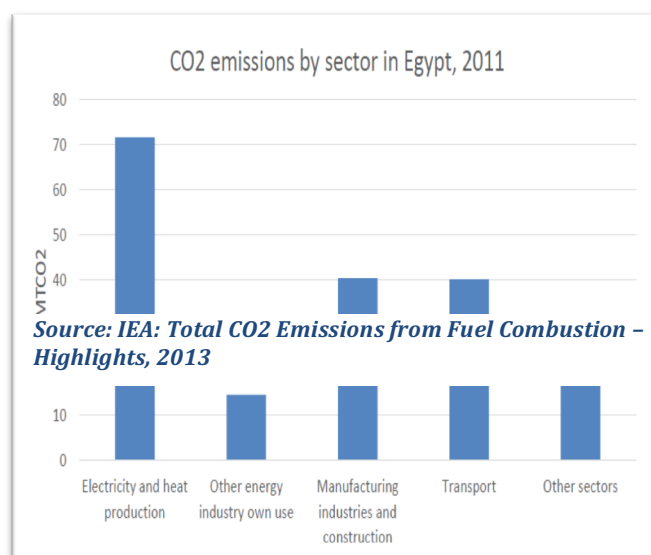
The energy production and consumption mix in Egypt relies mainly on conventional resources. More than 90% of total energy needs come from fossil fuel and natural gas, while the contribution of renewable energy is relatively minor.

The country has submitted targets to the Arab Renewable Energy Framework to achieve an increase the percentage of renewable energy

production in the energy mix to 20%, of which 12% will come from wind, 2% from solar, 6% from hydro by 2020.⁹⁷

Egypt continues to export natural gas, but had to divert large amounts of its natural gas for local consumption thus losing foreign exchange earnings. Due to long-term contractual agreements with other countries, Egypt sells natural gas at US\$ 7 a barrel/a million BTU, while imports the same at US\$ 10-14 for each million BTU. Egypt's reserves from natural gas is expected to be completely used up by 2030.

Egypt relies heavily on natural gas to power its power stations; in 2013 natural gas and oil accounted for 94% of the country's total energy consumption.⁹⁸ Egypt needs to reduce its dependency on fossil fuels and enhance its energy efficiency in order to reduce CO₂ emissions and to



address its negative implications on the environment and human health. Measures should therefore be introduced to diversify Egypt's energy mix. The Government has already recognized the importance of diversifying its energy mix and is taking necessary actions to achieve this end.

Egypt's dry natural gas production has declined by an annual average of 3% from 2009 to 2013.⁹⁹

Substantial gas discoveries in the deep offshore Mediterranean Sea and in other areas in Egypt remain undeveloped as investments in these locations, given current gas and oil prices are not economically viable.

Peak demand is expected to reach 61,820 MW in 2029/2030. Generating capacity must be planned in advance in order to ensure that utilities will be able to meet future demand. Applying a typical utility planning margin of 20% results in a need for some 74,000 MW of generating capacity in 2029/2030. New wind power plants can contribute to the total generating capacity requirements at a level of 30 to 40% of its installed capacity. Also solar power could contribute to meeting peak demand.¹⁰⁰

Energy Policies

Energy policies in Egypt have led to unsustainable patterns of energy production and consumption, and consequently on the economy, the environment, and human welfare. Heavy reliance on fossil fuels, as the main source of energy, has surrendered the economy to the vulnerability of world energy prices. Given current trends, the deficit in the energy supply is expected to reach 30-50 mtoe during the period between 2022-2050. This represents about 24%-35% of total energy demand.¹⁰¹

In order to meet increasing energy demand, the Egyptian Electricity Holding Company (EEHC) and its affiliates have launched a number initiatives and projects, which have culminated in the following outcomes:

- Total investment capacity for 2013/2014 reached LE. 11.3 billion with an expected total investment of LE 105.6 billion during the investment plan period 2012-2017.
- An additional 1250 MW of new generating capacity were provided bringing the total installed capacity to 32015 MW.
- Share of natural gas has reached 77.8% and 75.2% from total fuel consumed. Heavy fuel oil (HFO) and light fuel oil (LFO) as a source of energy provided the balance of energy needs.

- Power availability reached 86.8% in compliance with international standards.

The year 2013/2014 was however characterized by the following:

- Percentage of losses in the network reached 11.71% against 11.2 in 2012/2013 attributed mainly to illegal access to power supply, including connections to informal settlements.
- A decrease in the peak load from 27000 MW in 2012/2013 to 26140 in 2013/2014.
- Conversions of gas units to combined cycle units resulting in increased generation of power without the need for additional fuel.
- The launch of the Feed-in Tariff (FiT) system for electricity generated from both wind energy and solar photovoltaic projects in Egypt targeting the implementation of 4300 MW within the next two years.
- Encourage the installation of PV panels on administrative buildings.
- Installing 50,000 digital meters in the 6th of October city as a pilot project.¹⁰²

It should be pointed out that improving energy efficiency became one of the main priorities for the Egyptian Government. The following are main measures taken to achieve this end:

- The use of efficient lighting systems in Government offices and buildings.
- Set specification for various models of light-emitting diode (LED) lamps and the dissemination of the LED technology. Ten million LED lamps are set to be distributed to residential homes.
- Set standard specifications for household for energy efficient household appliances to include electric fans and dish washers, compressors and electric motors used in refrigerators and air conditioners.
- Conduct awareness campaigns for the public on the need and importance of using energy in an efficient manner.

- Capacity development to enhance the skills and performance of the workforce within the EEHC and its affiliated companies.

It has also been estimated that demand for primary sources of fuel is expected to reach 135 m.t.t by 2021-2022.¹⁰³

Since 2007, a gap between energy supply and demand has emerged, and is expected to continue to increase if major shifts in Government policies are not made. Increased demand over supply accompanied by policies that encourage the inefficient allocation and use of energy is resulting in frequent load shedding in peak times raising serious concerns about the sustainability of electricity supply in Egypt.

As referred to earlier, in 2012, the Government increased fuel prices for electricity generation by 33% for heavy industries in an effort to capture the true cost of energy production. For decades, tariffs for electricity have remained fixed, but lately the Government has increased electricity tariffs by phasing out subsidies by between 10-17% for different income groups in a step that has not been taken for decades. The Government plans to completely phase out subsidies in the next four years.

Furthermore, the decree issued on 5th of July 2014 by the cabinet with the passage of Prime Minister Decision No. 1257 approves the implementation of price increases of fuel, diesel and natural gas for transportation. These are as follows:

- An increase in price from EGP 1.85 to EGP 2.6 (40% increase) in Gasoline 92 Octane.
- An increase from EGP 0.90 to EGP 1.6 (78%) for Gasoline 80 Octane.
- An increase from EGP 1.1 to EGP 1.8 (64%) for Diesel.
- An increase in natural gas for cars from EGP 0.4 to EGP 1.10 (175%)¹⁰⁴.

The Supreme Council of Energy, in Feb 2008, approved an ambitious plan to meet 20% of electricity generated by renewable sources of energy by 2020, including: 12% from wind energy (about 7200 MW grid-connected wind farms) 6% from hydropower, 2% from solar energy (concentrated Solar Power and photovoltaic).

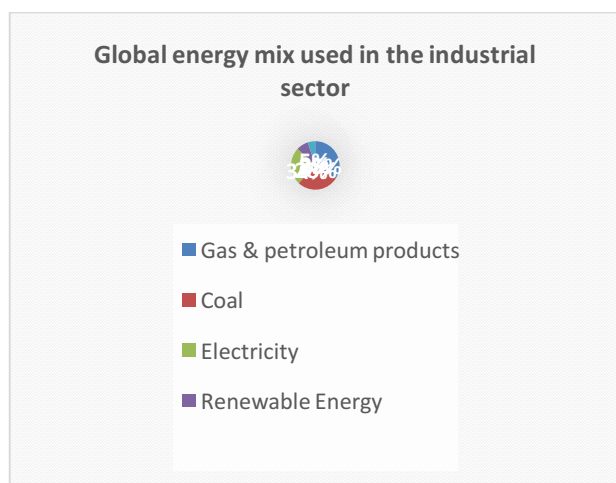
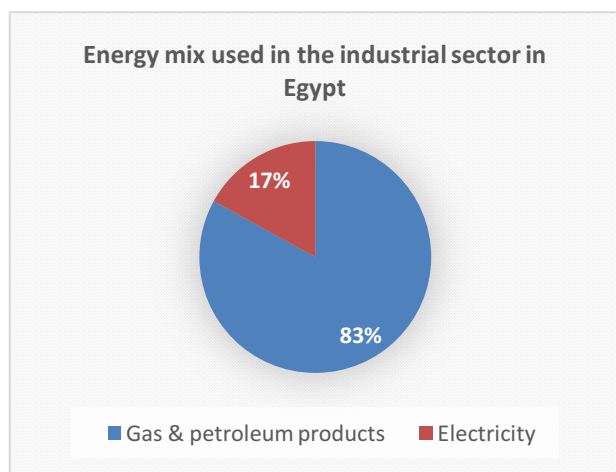
In September 2014, the Government announced the new feed-in-tariffs for renewable energy projects to encourage private developers to install 4,300 MW of renewable electricity generation capacity. The target of FiT mechanism includes 2000 MW from wind energy and the same capacity from PV. The maximum capacity per project is 50 MW. In addition, another 300 MW from rooftop PV systems are targeted. Producers will enjoy long-term leases of land charged at 2% of the value of energy produced, and a customs tariff of 2% will apply to imported equipment and materials.¹⁰⁵

Through the implementation of Power Purchase Agreements (PPA), the Government, through distribution companies, is committed to purchasing the electricity generated by investors for 25 years for PV projects and 20 years for wind.

The tariff for renewable electricity is divided into five categories, each tailored to different usages. The prices range from EGP 0.84 for 200 kW of usage to EGP 1.02 per kilowatt-hour for 200-500 kW. The new tariff system also reduces customs on new and renewable energy production supplies by 2%.¹⁰⁶

As indicated earlier, it is estimated that the industry sector contributed 16 % of CO₂ in 2005. Extrapolating the rate of expansion of the sector and emissions for 2015 one would expect a larger share of the sector in the total CO₂ emissions in Egypt. However, due to the closure of a number of factories during the last several years and the relatively slow down of the economy, the percentage share may not have dramatically increased from previous levels.

The two figures below show the energy mix used in the industrial sector in Egypt as compared to the world.



EGAS 2015

As for the transport sector, there is a great potential in reducing emissions from that sector by introducing a number of measures:

- Reduce reliance on private car ownership by providing a reliable and affordable public transport system. There are about 1.5 million vehicles in Greater Cairo alone and about 5.9 million cars in Egypt in 2010. Total CO₂ emissions was estimated at 27.27 Mt CO₂/annually, with a share of 25.83% in total GHG emissions.¹⁰⁷

- Replace old vehicles (those more than 15 years old representing 68% of vehicles) with energy efficient natural gas operated vehicles.¹⁰⁸ The Government has launched in 2009 a scrapping and Recycling programme that replaced vehicles (taxis) older than 20 years with more new vehicles. Under this programme 41,000 vehicles have been replaced. It has been estimated that average fuel efficiency achieved through the programme reached 9.39 litres/100 Km of CO₂ with an average of 60,000 tonnes of CO₂ reduced annually (equivalent to taking 10,000 vehicles off the road annually).¹⁰⁹
- Introduction of hybrid electric vehicles and vehicles using fuel cells, with improvements in technologies rendering them economically viable.
- Promote Nile transport for passengers and cargo with the gradual introduction of solar powered engines.
- Promote a network of rail transport for passengers and cargo that relies primarily on electricity rather than diesel.
- Replacement of two-stroke motorcycles by Hybrid electric motorcycles.

Moreover, a presidential decree No. 203 issued on 21 December 2014 aims at accelerating sustainable public and private investments in renewable energy. The new law sets different mechanisms to promote production of electricity from renewable sources. These include public and private projects decided upon through competitive bidding and feed-in tariffs as well as grid connections and land allocation rules. Budget allocations to subsidize electricity for FY 2014/2015 have been reduced to EGP 27bn. The Government hopes for new and renewable energy to account for 20% Egypt's total energy mix by 2020. These are in line with the least cost energy strategy for 2035, which envisages high renewable and a wind capacity of 20.5 GW by that year (Draft Energy Strategy for 2035).

Moreover, as part of the efforts to encourage the use of renewable energy the Government has decided to provide a 1% subsidy on total exported

products for industries introducing energy efficiency measures, recycling of waste, and those introducing advanced and environmentally sound technologies to produce the end product. These directives are expected to be implemented the beginning of July 2015.

Furthermore, EU supported project referred to as TARES (Technical Assistance to Reform the Energy Sector), aims at restructuring the energy sector. Some of these reforms include:

- Tariff reforms
- Reforming the energy supply mix
- Introducing new electricity laws and reforming market
- Introducing new electricity law's and reforming market laws
- Reforming the energy supply mix

These however have their own set of challenges that need to be dealt with. These include inefficient use of sources of energy, steam power plants are fuel intensive alternatives, volatility in availability of fuel renders electricity generation vulnerable, lack of use of renewable energy.

Moreover, the Government has recently introduced a five-year plan to increase energy efficiency saving approximately US\$ 6-8 billion annually.

These include the following measures:

- Introduce 40 million energy efficient light bulbs to phase out incandescent bulbs.
- Install energy saving equipment for air conditions.
- Introduce smart meters to reach all customers within a five-years period.
- Implement financial incentive schemes to promoter energy efficiency in industries.
- Launch a major energy efficiency awareness and communication campaign.¹¹⁰

A new electricity law was issued in July 2015. The law is designed to reflect the planned market reform as well as to strengthen the regulatory agency. The main features of the new law include:

- Establishment of competitive electricity market, which is based on bilateral contracts and the ability of the customer to purchase electricity form the supplier of his choice (the concept of eligible customers).
- Third Party Access (TPA).
- Establishment of Transmission System Operator (TSO) and providing assurances for its independence and full unbundling from other sector actors.
- Tariffs are ratified by the regulatory agency.
- Support cogeneration and power generated from secondary resources.
- Supporting energy efficiency and demand side management.

Impacts of current energy policies

Socioeconomic Impacts

Energy is a critical resource essential to support economic activities and development. The sector's share of GDP was 15% in 2009 - 2011. However, being heavily subsidized, the sector represents a heavy financial burden on the Government's budget.

Low energy prices due to subsidies have led to the inefficient use and allocation of energy. Moreover, applied energy tariffs are considered low and do not reflect the true cost of production, operation and maintenance of supplied energy. Egypt's relatively low electricity rates have been one of the main reasons that have rendered renewable energy as uncompetitive and hence discouraging investments in this source of energy.

Public expenditure on energy subsidies has diverted Government spending from priority social services such as, education, health, and the environment, as well as public services and infrastructure.

Environmental Impacts

The energy sector is the primary contributor of GHG emissions in Egypt, where CO₂ has the largest share of total emissions, followed by CH₄ and N₂O due to dominant role of fossil fuels in

both primary energy supply and electricity generation. Fuel combustion makes the most of energy sector GHG and CO₂ emissions.

Globally, Egypt's share in CO₂ emissions in 2010 represented 0.61%, as compared to countries such as China 24.65%, USA 16.16%, and India 8.95%. It should be noted though that per capita CO₂ emissions for Egypt was 2.62 and India was 2.66 for the same year.

Egypt is experiencing serious negative impacts, which is mainly attributed to the heavy reliance on fossil fuels and gas. In 2011, total CO₂ emissions from fuel combustion in Egypt's energy sector amounted to 188.4 MtCO₂, where the largest share of CO₂ emissions came from electricity production (71.6 MtCO₂), followed by manufacturing industries and construction (40.3 MtCO₂), and transport (40 MtCO₂). CO₂ emissions from other sectors were much lower (22.1 MtCO₂) where the residential sector was the largest CO₂ emitter (15.1 MtCO₂).¹¹¹

The Government has estimated that the environmental cost of CO₂ emissions was about US\$ 14.2 million in 2009-2010.¹¹² In 2010 about 10 pollution incidences caused by oil leakages were registered around the country. Increased air pollution has direct negative impacts on health. It is estimated that 7.8% of children less than five years old suffer from severe respiratory diseases.¹¹³ CO₂ emissions also have a direct impact on climate change and consequently on potential sea level rise and the implications this is expected to have on the inundation of the Delta, and coastal areas in Egypt. According to Egypt's Competitiveness Report 2011, the country is currently using resources and ecological services more than its ecosystems can sustain.¹¹⁴

An assessment of greenhouse gas (GHG) emissions for Egypt for 2000 revealed an increase of 5.1% annually since 1990. The energy sector, including transport, is the primary contributor to GHG emissions in the country. The energy sector contributed about 61.6 Mt CO₂ in 2005 and about

46% of total GHGs emissions in 2010. Under a business as usual (BAU) scenario, emissions are expected to grow to ~210 Mt CO₂ by 2030. Increased levels of emissions are further expected due to increased level of demand for electricity (from ~85 Tw in 2005 to ~350 TWh in 2030).¹¹⁵

Moreover, the introduction of coal as a source of energy, negative environmental impacts include particulate matter, 10 microns diameter, acid rain/fallout, and fly ash disposal. However, the Egyptian Government has introduced stringent air quality control standards for coal to keep under control the emission of the different polluting elements resulting from the burning of coal.

Egypt's contribution to GHGs is estimated at 0.4% in 1990, 0.58% in 2000, and 0.6% in 2005 according to the first, second and third national communication reports, respectively. Total CO₂ emissions in 1990 was estimated at 116.6 Mt, 193.3 Mt in 2005, and 247.97 Mt in 2015.¹¹⁶

The Government will contribute to the total 18% energy saving potential (approx. 20mtoe) identified in the Energy Strategy to 2035 by working with other Ministries who have responsibility for energy efficiency activities, and other key stakeholders¹¹⁷.

The energy sector is the largest source of GHG emissions globally and hence it has a crucial role in tackling climate change. On the other hand, climate change will increasingly affect the energy sector in many ways.

In line with sustainable development goal (SDG) number 13: "Take urgent action to combat climate change and its impacts", the Government is committed to reducing emissions from the energy sector, including the reduction of the national carbon footprint as well as decrease in the emissions of other pollutants. Moreover, other relevant SDGs are Goal 7: "Ensure access to affordable, reliable, sustainable and modern energy for all" and Goal 12: "Ensure sustainable consumption and production patterns".

Challenges facing the energy sector

Egypt is facing serious challenges in the energy sector. Its Government's sustainable development strategy is aiming at a 7% growth rate in GDP in the next decade. This promises economic benefits and huge improvements in people's standards of living, but also involves increased use of energy. Unsustainable pressure on natural resources and on the environment is inevitable if energy demand is not de-coupled from economic growth and from fossil fuel consumption. Adopting sustainable energy policies that promote energy efficiency and an increase in the use of renewable energy is therefore essential to ensure the provision of the necessary sources of energy to support increased energy demand by households and economic sectors.¹¹⁸

Heavy reliance on fossil fuels as the main source of energy supply contributes to increased CO₂ emissions and the resulting negative impacts on climate change, sea level rise, health, the environment, and the economy. The Government therefore cannot afford to overlook climate change concerns and their potential negative environmental, social, and economic impacts. This includes impacts on the ecosystem, biodiversity and marine life due to increased fossil fuel consumption.

Institutional Challenges

Main institutional challenges facing the energy sector in Egypt are as follows:

- Absence of a long-term vision, strategy and action plan for sustainable energy. The Government is however, currently working on such a strategy for the year 2030.
- The need for efficient governance structure that functions in a transparent and accountable manner and capable of implementation, monitoring and assessment.
- Late introduction of adequate regulatory framework that encourages the use of renewable energy, including solar, wind, and bio fuel.
- Lack of adequate inter-ministerial coordination.

- Limited budgetary allocations for investment in human resources, R&D in renewable energy and innovative energy-saving technologies, practices and measures.
- Lack of adequate policies and incentives for public and private investment represents a missed opportunity for Egypt to gain a market share in energy efficient and renewable energy products.
- Laxity in ensuring abidance with laws, particularly those related to illegal use of electricity and energy efficiency in buildings.
- Unsustainable production and consumption patterns by the public and private sector, and the general public with respect to resource consumption, including energy.
- Lack of local expertise and skills for the sustainable management of the energy sector.
- Lack of knowledge and awareness about energy efficient technologies and practices, and the increasing worldwide trend to increase the share of renewable energy in the total energy mix.

Economic Challenges

- The increasing gap between supply and demand and reduced Government budget to be directed to investments in the energy sector.
- The current energy subsidy system is marked by unsustainable fiscal spending, thus resulting in market distortions, the inefficient allocation and use of energy, and discourages investment in renewable sources of energy.
- Increase Government spending thus diverting investment from the energy sector.
- Political economy concerns and obstruction of vested interests from diverting investments in non-conventional sources of energy.
- Lack of active participation and contribution of the private sector in the energy sector.
- Reduced competitiveness of Egyptian products due to the inefficient use of energy.
- Lack of sufficient market incentives and finance for energy efficient and renewable sources of energy.

- The increased pressure on public Government spending and the diversion of Government financial outlays from priority areas such as, education, health, the environment, and other public services and infrastructure to imports and subsidies for fossil fuel.
- Lack of local capacity to manufacture energy efficient and renewable energy products and equipment.
- Negative impacts on tourism as a result of increased emissions and air pollution thus impacting negatively on the contribution of the tourism sector to GDP.

Social Challenges

- Unsustainable patterns of production and consumption of energy and increased rates of wastage in energy consumption.
- Share of the population that are not provided with electricity (0.4% according to World Bank data).
- Lack of awareness of the importance of reducing energy consumption on health and human welfare.
- Lack of appreciation for the use of renewable sources of energy.
- Lack of awareness on the linkages between fossil fuel consumption, CO₂ emissions and negative impacts on health, increased morbidity and mortality.

Environmental Challenges

- Heavy reliance on fossil fuels is resulting in increased CO₂ emissions and the consequence this has on climate change and sea level rise, health, environment, and the economy. The burning of fuel oil used when gas is in short supply also results in air pollution.
- The co processing of alternative fuels (Refuse-Derived Fuel (RDF), Tire-Derived Fuel (TDF) and hazardous waste in cement kilns in order to reduce the use of fossil fuel.
- Lack of capacity to deal with the potential negative implications resulting from climate change.

Opportunities

Energy efficiency measures in the different sectors represent the least cost measure to providing additional energy capacity.

Based on actual field projects in Egypt, energy efficiency projects have resulted in energy savings of about 10% for households, 10-25% in the industry and transport sectors. Studies at the national level revealed savings of about 8.3% by the year 2020¹¹⁹. The industrial sector is the most inefficient sector in the use of energy. Average wastage in the use of energy by this sector is reported to be between 20%-25%. Energy efficiency measures are estimated to achieve savings in energy consumption up to 18% in the housing sector, 12% in the industrial sector, and 8% in the transport sector.¹²⁰

Economic Sector	Ktoe	Percentage (%) Reductions
Industry	6,752	18%
Residential	7,091	18%
Commercial	1,529	9%
Transport	4,614	23%
Total	19,986	18%

Source: TIMES-Egypt Energy Model

Measures to promote the introduction of efficiency and energy saving measures in the industrial sector in the form of incentive and regulatory measures, including the phasing out of subsidies and the introduction of carbon pricing is expected to result in a shift into more efficient industrial process and technologies. Application of the polluter pays principle, life cycle assessment, and producers responsibility should induce industry to shift into more energy efficient industrial processes. Energy efficiency measures are estimated to achieve savings of about 12% in the industrial sector¹²¹.

The housing sector is another heavy energy consuming sector. The promotion of green and energy efficient buildings through the use of energy saving bulbs (LED) is estimated to achieve

savings in energy consumption in the housing sector by 18%. Saving by household through the use of more efficient household appliances such as air conditions, refrigerators, washing machines, etc. is estimated to result in savings in energy consumption by 10%.¹²²

Another major energy consuming sector is the transport sector. Greening the transport sector by promoting a clean public and commercial transport system and sustainable communities should also result in major energy savings. Though gasoline does not include lead in Egypt, diesel still contains sulphur. New communities should provide easy access to economic, commercial and cultural services and job opportunities thus reducing commuting distance. They should also be designed to provide affordable public transport system, space for cyclers and pedestrians. Savings in the transport system is estimated to result in savings of about 8% from current levels¹²³.

Energy subsidy reform accompanied by the promotion of the concept of green and sustainable communities in Egypt will induce a change in transportation habits, including the use of bikes through incentives and the provision of space for cyclers. Bike-sharing programmes have spread worldwide in recent years. More than 800 cities in 56 countries now have fully operational bike-share programmes, with over 1 million bikes. In the U.S., by the end of 2012 some 21 cities had 8,500 bikes in bike-share racks. By the end of 2016, this is expected to climb to over 70 cities with close to 40,000 bikes. The share of households without cars in the U.S. urban areas increased (84 out of 100 households). It is expected that this share will increase with urbanization.¹²⁴

Moreover, Egypt is endowed with a diversity of renewable energy resources unevenly located across the country. These include:¹²⁵

Hydroelectricity

Hydropower is Egypt's third-largest energy source after natural gas and oil. In 2013, Egypt generated 13,121 GWh of hydroelectricity, almost all of which came from the Aswan High Dam and the

Aswan Reservoir Dams across the Nile River.

The installed capacity of the dams is 2100 MW for the Aswan High Dam and about 700 for the others with Aswan dam I and II accumulating about 550 MW.¹²⁶ Also, some small and mini hydro stations are either operational or under implementation.

However, much of the Nile River's hydropower potential has already been exploited, and as a result, Egypt's New and Renewable Energy Authority (NREA) is actively pursuing other types of renewable projects, primarily solar and wind power, to diversify the country's energy mix. Nevertheless, in 2014 the Hydro Power Plants Execution Authority (HPPEA) announced plans for 2000MW of hydro pumped storage plant to help address the peak load challenge and the variable nature of solar and wind electricity.

Solar

Located in the "Sunbelt region", Egypt has one of the highest levels of solar irradiance in the World. Average sunshine in Egypt is between 2900- 3200 hours annually, with an energy density of around 1970 – 3200 kWh/m²/year.¹²⁷ Egypt's first solar-thermal power plant, located in Kuraymat just south of Cairo, has the capacity to generate 140 MW of solar-thermal energy. The plant was connected to the national grid in June 2011. The plant uses concentrated solar power (CSP) with back-up natural gas-fired generators.¹²⁸ In addition to a number of investment projects in solar energy in Egypt, the European Bank for Reconstruction and Development (EBRD) has recently announced the allocation of US\$ 500 million to support solar energy production, aiming at generating 2000 MW.

Also, it should be pointed out that the price of solar photovoltaic (PV) systems has declined substantially over the last four decades¹²⁹ making most investments in PV solar power viable. It is worth noting that each 1 kW of solar energy needs around 10 meters, and for large scale project each square kilometer can host around 30 to 50 MW depending on different technology and site characteristics. However, a great deal of solar

energy can be installed on rooftops thus saving a lot of space. Current cost for producing 1 kW is about 50 to 80 piasters, which is competitive with the actual cost of producing energy using fossil fuel.

In Egypt, PV power would tend to be more economical than in developed countries, partly because of the higher solar radiation intensities and fewer clouds, but also because Egypt's cheap labor lowers installation and maintenance costs. Pumping water is one of the country's biggest consumers of off-grid power. The payback period for switching from diesel water pumping to PV pumping is about five years if all costs of diesel are accounted. These include maintenance, depreciation, the unreliability of supply and the quality of the diesel itself in some cases. The Government has recently received a grant from the African Development Bank for the use of renewable energy in irrigation, including the use of solar run water pumps.¹³⁰

Another application where solar is beginning to have an advantage is heating water. Solar thermal water heaters are not ubiquitous in Egypt, where the existing subsidises of diesel, gas, electricity and other fossil fuels, are making them cheaper than solar. However, the ongoing subsidy reforms such as the increase of diesel prices in July 2013 helped solar thermal water heating to become more economical, especially for large-scale users like hotels that generally use diesel boilers. Recent increases in electricity tariffs are expected to generate a similar effect.

Wind

According to NREA, Egypt has abundant wind power resources, especially in the Gulf of Suez and Nile Valley. The western part of the Gulf of Suez has an annual average wind speed of around 7 m/s.¹³¹

The location between Ras Ghareb to the north to Gulf of EL Zeit has a wind speed, which exceeds in some locations 10 m/s¹³²

Egypt is leading the Arab region with 750 MW of installed capacity at the Zafarana and

Gabal El-Zayt and Hurghada located on the western coast of the Gulf of Suez areas. Zafarana wind farm's total installed capacity is 545 MW, making it one of the largest onshore wind farms in the world and Egypt's largest non-hydro renewable project. The wind farm houses a number of wind projects that were developed in several stages.¹³³

Zafarana hosts around 700 different turbines. It is estimated that El Zafarana wind farm saves about 360,000 tonnes of CO₂ annually.

The new feed-in tariff system adopted in 2014 aims to contract around 2000 MW of wind energy in the periods 2015-2017.¹³⁴

The Egyptian Ministry of Electricity and Renewable Energy has recently inaugurated the largest wind farm in the middle East and Africa in Gabal El Zeit along the Red Sea with a capacity of 200 MW. The farm has been built with the support of the European Investment Bank and the German Government with a total cost of Euros 270 million.

Geothermal Energy

Geothermal energy is another source of energy often disregarded. Egypt has two main areas that could be used for gathering geothermal energy, namely the Gulf of Suez and the Western Desert. There are no installed geothermal plants in Egypt. However, there are some direct applications across the nation. These include hot springs that were used for domestic use since ancient Egyptian times.

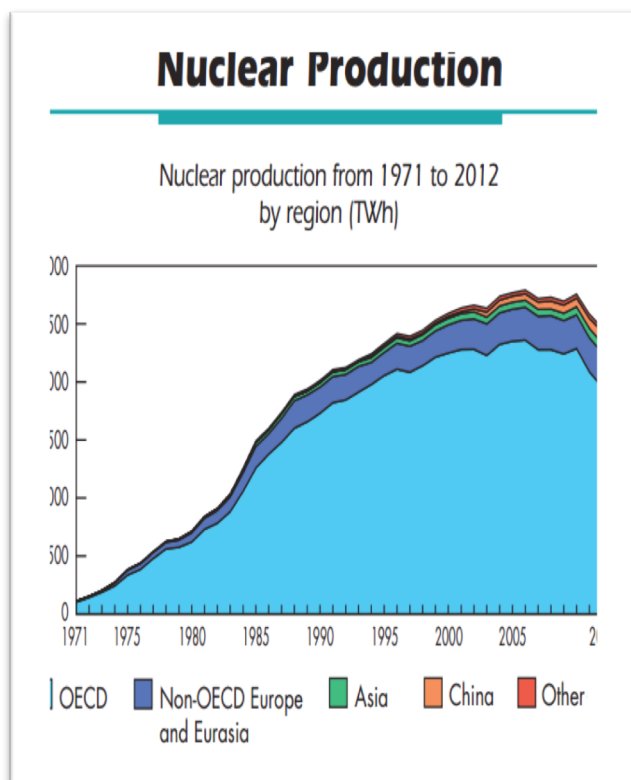
Research still needs to be done to properly assess the potential geothermal energy has, but one recent study indicated that the Hammam Farun hot spring had a geothermal power potential of 12.4 MWt – 19.8 MWt.¹³⁵

Nuclear Power

Egypt's civil nuclear power programme is in the research and development phase. The country operates two small research reactors, which are much less powerful than a commercial nuclear power reactor. Egypt does not operate any

commercial nuclear reactors but has proposed plans in the past to build a nuclear power plant at El Dabaa on the Mediterranean Coast.

However, project timelines have repeatedly been delayed, and Egypt's nuclear power plans are uncertain. It should be pointed out though that due to the high cost, as well as operational and environmental risks associated with nuclear power stations, it is being debated if it would provide the best possible solution for Egypt.



Source: IEA. Key World Energy Statistics 2014
<http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

Vision

Energy security is necessary to satisfy the needs of the different segments of current and future generations, support economic activities, and enhance the sector's contribution to the national income, create jobs, without compromising human health and the environment. The adoption of energy efficiency measures, sustainable production and consumption patterns, increased reliance on renewable sources of energy, and reducing reliance

on imported fossil fuel are among the main contributors to achieving such security.

Proposed 2030 Targets

In setting targets for the energy sector as in any other sector due consideration should be given to existing potentials and capabilities in the country to satisfy the expected increase in demand.

Accordingly, the following targets are being proposed for the energy sector using 2014 as the base year:

- Energy efficiency measures to result in 18%-25% savings in energy consumption.
- Increase power generation capacity by around 100 GW by 2030, in order to meet the peak power demand at a growth rate of 6.5 GW per year as indicated by the MERE, which constitutes an investment of about US \$ 8.5 billion annually.
- **Achieve a share of 20-25% of renewable energy in the total energy mix.
- Increased use of renewable energy by the different sectors, including housing and construction, transport, industry, agriculture, and tourism.
- Increase the number of job opportunities in the energy sector prompted by increased investment in renewable energy and energy efficiency.
- A 10-15% reduction in greenhouse gas emissions compared to 1990 levels.

Approach

In order to ensure Egypt's energy security, there is a need to adopt a long-term energy policy in Egypt that promotes energy efficiency, and diversifies energy sources.

It was not until 2014 that Egypt announced that it was in the process of developing a long-term vision and sustainable development strategy for 2030. The Energy Strategy for 2030 is a step forward towards realizing the Egyptian Government's aims at maximizing the use of domestic energy resources (traditional and renewable), developing the capacity of its energy sector to effectively contribute to competitiveness,

** According to the MoERE, peak demand in 2015 is estimated at around 30 GW. Taking into account the 6.5 GW increase annually, by 2030 peak demand would be around 97.5 GW. (Energizing Egypt. EEDC 2015.)

adjusting effectively to domestic and international developments in the field of energy and innovation; and becoming a pioneer in the field of renewable energy. Key Performance Indicators (KPIs) have been developed to measure achievements.

Strategic Objectives

Three main strategic objectives are identified to reach the vision.

Strategic objective 1

Promote the development and implementation of practices and solutions that enhance energy efficiency.

Strategic objective 2

Enhance the contribution of the energy sector to sustainable economic development, social integration and cohesion, and environmental integrity.

Strategic Objective 3

Promote the efficient functioning and management of the energy sector.

A strategy with three tracks

As part of this strategy, the Government should develop a package of energy initiatives. The package should include initiatives with immediate effect, initiatives setting the long-term frameworks, and those that encourage technological development.¹³⁶

The proposed initiatives need to be aligned with the overall strategic direction of the Government to achieve sustainable development, and consists of the following package of measures. The Government's strategy follows three tracks. The strategy starts up immediate initiatives in all three tracks, but the types of initiative vary.

Track 1: The transition track

Deals with the areas in which physical conversion can already start today because the technology is cost effective with long operational life.

In addition, because the areas involved also contribute to realizing short and medium-term objectives. This includes making buildings more

energy-efficient, expansion of wind and solar energy, increase the use of biomass as a source of energy and widespread waste to energy applications.

Track 2: The planning and preparation track

Deals with areas in which initially there is a need to ensure the development of the necessary infrastructure to enable the achievement of the framework 2030 objectives. This includes, but is not limited to, the necessary infrastructure for renewable energy, including biogas and district heating systems and pushing for increased sustainability and efficiency across all sectors.

Track 3: The technology development track

Deals with areas in which the primary need is for more knowledge, analysis, research, and development to support renewable sources of energy. This includes R&D in wind, hydro and solar power energy sources, the use of solar energy for seawater desalination and other industrial processes, agriculture, and transport systems.

Strategic objective 1

Promote the development and implementation of practices and solutions that enhance energy efficiency

A number of measures are proposed to achieve energy efficiency in Egypt. These include the following:

- Develop a framework directive on energy efficiency to be ambitious and action-based, to include the use of energy efficient LED bulbs, household equipment and appliances.
- Making buildings more efficient: Extensive improvements in the energy efficiency of existing buildings should be implemented in connection with renovation and replacement in order for them to be cost effective. Introduce and apply green and energy efficient codes.
- Develop a Minimum Energy Performance Standards (MEPS) to be adopted by the different economic sectors; public and private sector, as well as for households.

- Market-promotion for initiatives aimed at energy-efficient systems and solar heating, package solutions.
- Introduce instruments and policies at the local level and at the national level to encourage investment in energy efficient equipment and technologies. This will take place through more energy efficient appliances and products; and tightening of the requirements for efficiency and labelling of appliances and products.
- Introduce a package of regulatory and incentive measures to promote efficiency in the Industrial sector.
- Introduce benchmarks for each type of industry.
- Introduce standards for the incineration of hazardous waste in cement kilns using appropriate technologies.
- Promote the use of RDF and TDF locally generated and available as a source of energy.¹³⁷
- Develop and incorporate a 'low-energy rating' in the building regulations with a view to promoting the establishment of new buildings with very low energy consumption.
- Enhance public sector energy savings efforts in public buildings including public offices, schools, universities, hospitals, public clubs and recreational centres, and through public procurement.
- Conversion of the energy sector to renewable energy and greater energy efficiency of the transport sector and other relevant sectors. This involves developing reduction and adaptation strategies, including methods to calculate emissions.
- Transition to green and more efficient energy systems in the different sectors, including the transport sector. Transport currently accounts for about one quarter of global energy use and energy-related emissions. Bringing to the fore the system-wide implications of electrification of public transportation and biofuels.
- Undertake intensive research and development efforts to devise measures, techniques and technologies for energy efficiency in the different economic sectors including, housing and construction, and transport.
- Set standards and targets as well as incentives for companies and industries to encourage them to reduce energy consumption through regulatory and incentive measures. Realistic and achievable targets for businesses with regard to energy efficiency should be set.
- Promote efficiency in the management and operation of the public sector, including green public procurement.
- Engage the banking sector in financing projects supporting renewable energy and energy efficiency on different scales

Strategic objective 2

Enhance the contribution of the energy sector to sustainable economic development, social integration and cohesion, and environmental integrity

Economic dimension

- Increase the contribution of the energy sector to the national income by optimizing the use of the country's energy resources to ensure sustainable economic development.
- The energy sector exports used to be an important source of foreign exchange earnings for Egypt. Natural gas is the most important contributor to net export earnings from the energy sector. With diminishing gas reserves and increased demand on energy, priority is being given to meeting domestic demand.
- As per EGAS Annual Report 2014/2015 exports of natural gas through pipelines was 8.7 billion standard cubic feet (BSCF), liquefied natural gas (LNG) 3.7 BSCF equivalent, and commercial propane (Derivatives) 429 million tonnes. LNG imports and regasification process started in April 2015 and amounted to 1462 million cubic meters (MCM).

- The recent discovery of the largest natural gas in the Mediterranean Sea, estimated at 30 trillion m³ is expected to meet Egypt's demand for natural gas and reduce the amount of financial outlays to purchase fossil fuel products to meet local demand.
- With the potential of renewable energy in Egypt, this source of energy should see major investments in the coming years, with the objective of not only meeting domestic demand, but eventually for export in the not so distant future.
- Increase domestic production and an efficient demand side management of domestic use of energy in order to free up resources to support economic activities.
- Investment in renewable energy and renewable energy technologies has the potential of increasing local export capacity and consequently to increase foreign external earnings.
- Develop an economic model for use in the energy sector in order to ensure the optimum allocation of energy among the different sectors.
- Arrangements with the EU to provide in the long-run energy generated from renewable sources to nuclear power and coal run power locations in Europe.
- Converting thermal power stations with hybrid solar stations.
- Design and initiate the construction of the needed infrastructure to integrate renewable energy systems, including solar, wind, and biogas.
- Introduce more comprehensive sustainability requirements for first generation biofuels, and the option to prioritise second-generation biofuels.
- Review the existing subsidy and tax system with a view to designing it in a manner that encourages the transitioning of the sectors across the board to greener and more sustainable energy uses.
- Continue to deploy efforts for the expansion of investment in the development and provision of additional gas reserves, especially in the offshore areas.

- Introducing electric driven public transportation systems and gradually electric vehicles as opposed to fossil run ones.
- Encourage the use of bikes through incentives and the provision of space for cyclers. Bike-sharing programmes have spread worldwide in recent years.

Social dimension

- Ensure that equity considerations are fully taken into account in the design and implementation of Government policies.
- Due consideration should be taken into account when phasing out energy subsidies that it does not impact the middle and low income segments of the population.
- Investment in energy efficient projects and renewable energy should result in job creation, which should, with due consideration given to the geographic locations of the project and the category of workers employed, give priority for marginalized communities and those most in need for jobs.
- Provide sufficient budgetary allocations for energy production in order to meet social needs by making available electricity for schools and hospitals, and economic activities, including for the low and poor income families, thus contributing to poverty reduction.¹³⁸
- Invest in human resource development and training to create a cadre of skilled labour and professionals in energy efficient and renewable energy technologies.
- Raise the level of awareness of the general public of the negative health impacts resulting from the use of traditional practices to produce energy such as the burning of wood and dung.

Environmental dimension

- Increased use of biomass - Biomass can play a central role in combination with wind and solar. In the short term, conversion to more biomass for electricity and thermal energy generations could

- reduce the use of fossil fuels and thereby contribute to meeting the target of 20-25% renewable energy by 2030.
- Widespread waste-to-energy applications.
- Expansion of wind power - Wind power is increasingly becoming cost effective and robust against future developments in fuel and gas prices, and it will be able to replace part of the existing electricity capacity, which will have to be replaced over the next 10-20 years.
- Invest in solar power - Similarly, solar power is also becoming cost effective and robust, not only that, but the potential for generating energy through solar power far exceeds that of fossil fuels.
- Adopt a national programme for the use of biogas from animal and agricultural waste as well as municipal wastewater (sludge) for the production of energy.
- Invest in other renewable sources of energy such as geothermal energy and energy generated from waves, hot air and flow of water.
- Promote the greening of sectors, including but not limited to, housing and construction, transport, industry, agriculture and tourism through a package of regulatory and incentive measures.
- Introduce carbon taxes in order to encourage emitting industries introduce measures, production processes, and technologies that reduce carbon emissions.
- Promote and enforce the efficient and sustainable consumption and production patterns of energy, including increase the percentage share of renewable energy in the energy mix.
- Avoid negative health impacts resulting from the extensive use of fossil fuel, and apply stringent environmental standards for the use of heavy polluting sources of energy such as coal. The Ministry of Environment (MoE) has already developed a set of codes related to the use of coal, and which has been instituted in the legal system as referred to earlier.
- Aim for long-term reduction in the emission of greenhouse gases
- Increase the area planted forests in Egypt (currently estimated at 70,000 hectares or 0.1% of the total area of Egypt in 2012 according to World Bank).
- Improve conditions for using biomass to produce biogas and energy.
- Evaluate the pilot projects and potential to establish a possible permanent scheme for national joint implementation projects.
- Promote a sustainable common sectoral policy, for example in relation to climate, so that sectoral policy can be used to promote climate friendly production processes and practices.
- Analyse long-term opportunities to reduce emissions from the various sectors as part of cost effective climate efforts.
- Analyse long-term opportunities to reduce emissions from the various sectors as part of cost effective climate efforts.

Objective 3

Promote the efficient functioning and management of the energy sector

- Launch an in-depth review of legislations and regulations in order to ensure that incentives and rules support the transition to renewables and improve efficiency.
- Environmental efficiency requires modelling of placement of burners, and fluidized beds for combustion chambers, use of bag filters or electrostatic precipitators to control airborne particulates, and proper waste disposal of ash/fly ash.
- Support solar power projects for household and buildings solutions, in combination with other renewable solutions.
- Support investment in renewable energy technologies such as wind power, bio-gasification and solar photovoltaic.
- Carry out a technology assessment in order to ensure the right framework for new technologies to support the targets for reducing greenhouse gas emissions from the transport sector.

- Research focusing on incorporating wind and solar power: Egypt's wind and solar resources provide future opportunities to harvest large parts of energy consumption from the wind and sun. Increased incorporation of wind and solar requires, however, continued research and technological advances to reduce costs and optimize the interplay of wind power and solar power with the electricity grid and electricity consumption, including methods to store the energy for a period.
- A large number of technologies may require large-scale testing before subsequent preparation for market and full-scale implementation. For example, this applies to offshore wind, fuel cells for CHP production, smart grids, bio refineries, low-energy building and energy renovation.
- Improving tendering procedures for wind farms and solar photovoltaic systems to reduce the lead-time, the costs of expansion and prepare the basis for expansion decisions.
- Participate actively in international forums aiming at achieving a global transition to sustainable development and aiming at addressing climate change concerns, the promotion of a green growth agenda, the phasing-out of subsidies, and efforts leading to energy efficiency and transition to clean and renewable energy.
- Assist municipalities with off and on grid energy solutions such as solar PV, solar water heaters and waste to energy systems.
- Greater use of biomass and waste-to-energy through regulatory and incentive measures.
- Carry out an analysis of the use of biomass and waste-to-energy for energy-related purposes in Egypt. The analysis will focus on whether the right framework conditions for efficient and environmentally sustainable use of biomass resources are in place. The analysis will prepare a long-term strategy for the use of biomass resources for energy purposes and will draw on experience from other governorates.
- Promote private sector participation through regulatory and incentive measures and through Public-Private-Partnerships (PPP).
- Develop human resources capabilities and skills.
- Reform energy prices and continue the subsidy reform process initiated in 2014.
- Revisit the price paid by Egypt for each foreign partner's share of gas to ensure the continued development of Egypt's hydrocarbon resources.
- Provide a stable and predictable macroeconomic environment in order to raise confidence and attract investment.
- Promote green public procurement and services that encourages energy efficiency and savings equipment and lighting bulbs.
- The use of energy efficient hybrid-electric transportation for public officials.

- Prioritize research and development in the energy and climate change areas, particularly for renewable energy, smart grids and energy efficiency.
- Identify and improve coordination and interaction between relevant authorities and stakeholders.

Potential gains

Off-grid Energy Solution

Investing in renewable energy applications can effectively contribute towards meeting the increasing energy demand of industries and household located in remote areas where no connection to the electrical grid exists. They can also be used where the existing electricity grid structure is limited, or when it is costly to connect to the existing electricity grid.

They can be used in public facilities, schools, hotels and medical centres especially in remote and poor governorates. Off-grid solar systems are especially relevant; since land in Egypt is mostly desert and the increasing rate of population growth is constantly forcing the increased urbanization of desert land.¹³⁹

Carbon Emission Reduction

Investing in energy efficiency equipment and appliances such as the installation of efficient lighting equipment can lead to significant energy savings. This is particularly so as 34% of residential energy consumption is attributed to lighting. The use of CFL lamps saves 80% of the electricity consumption as compared to the incandescent one leading to an average energy savings per one lamp over its lifetime of about 750 kWh. This corresponds to fuel savings of 225 kg oil equivalent and 675 kg CO₂ reductions.¹⁴⁰

It is estimated that a reduction in fossil fuel consumption by 20% will cut down CO₂ emissions by about 18,000,000 tonnes of CO₂ emissions annually.

Social Justice

The phasing out of energy subsidies is expected to result in savings for the Government. These savings can be directed towards investments in health, education and energy efficient technologies

and renewable energy. It should be emphasized that the phasing out of subsidies should take into account equity consideration and should not result in additional burden for the middle and low-income segments of the population. In addition to investing in social services, direct payments to poor and middle-income families can be considered in order to compensate these income groups for any additional financial burden and ensure that subsidies reach those in need of financial support.

Job Creation

Investing in energy efficient technologies and in renewable sources of energy, including green buildings and construction opens up new economic opportunities. It could also be a driver for job creation, with an estimated 75,000 new job opportunities in solar and wind systems design, manufacturing, operational services, and sales.¹⁴¹

Moreover, it should be pointed out that investing in solar photovoltaic energy generates the highest employment rate of between 7–11 jobs per megawatt for a plant with average capacity. This is compared to coal-fired energy, which only generates between 0.27 – 0.95 and natural gas between 0.25 – 0.95 jobs per megawatt for a plant with average capacity.¹⁴²

The country has the potential to be a renewable energy producer as well as an exporter, which can attract national and foreign investments, boost economic activities, and GDP growth. The country's renewable energy export potential faces some challenges though due to deep sea waters and steep coast lines making it difficult to export via submarine cable. However, according to experts, solar photovoltaic power plants and wind power are locally competitive if costs/benefit analysis are calculated against the real cost of electricity generation from gas and heavy fuel oil.

Indicators

- Reduce energy consumption by 18-25% as a result of energy efficiency measures.
- Increase the contribution of the energy sector to the national income by 15%.

- 5% increase in employment in the energy sector as
- a result of increased investment in new energy projects, including renewable energy. Double the share of renewable energy used for power generation to 20% .
- Expand wind capacity to increase wind generation to 7.2 GW.
- Number of laws and regulations related to the greening of the sector developed, instituted in law and implemented.
- Reduction of identified and reported incidence of noncompliance to laws and regulations by a 20% annual rate.
- Increased awareness by different stakeholders to the importance of the transition to renewable and greening the sector.

Roadmap for achieving the vision 2016-2017

Actions/ Measures	Activity	Responsibility	Months	2016	2017
<i>Vision and Strategy</i>	<ul style="list-style-type: none"> Finalization and endorsement of the vision, strategy and a detailed implementation plan that meets the country's needs, priorities and socioeconomic circumstances. Develop an Action Plan for the implementation of the proposed energy strategy. Prepare a reduction and adaptation climate change strategy, including methods to calculate emissions, to be integrated within the energy strategy and across sectors. 	MERE in collaboration with relevant ministries	4-6	✓	
<i>Integrated Policymaking</i>	<ul style="list-style-type: none"> Develop endorse and implement a holistic and integrated approach that ensures the integration of social, environmental, and economic dimensions in the energy sector and within integrated sustainable communities. Ensure that sectoral policies integrate energy and climate change concerns to include the adoption of energy efficiency measures and climate friendly production technologies and practices. Oblige each economic sector to incorporate energy efficiency and renewable energy integration policy measures as key components of their annual plans and communicate these measures as part of a national action plan. Such sectoral policies/measures can be formulated through assigning a working group with different specializations divided into teams. The working group teams should then create a list of all potential opportunities and priority list based on detailed consumption statistics, if possible. Measures identified should include zero, low, medium and high cost measures. Promote the use of a number of tools and measures that facilitates the adoption and implementation of sustainable and green energy practices, these include: life cycle analysis, producer responsibility, eco labelling schemes, and environmental management systems. The main aim is to ensure the integration of environmental considerations in the design and manufacturing of products. Introducing the concept of producer responsibility entails the application of the polluter pays principle, thus encouraging industry to design products that avoids and reduces waste and promotes reuse and recycling. Ensure that the proposed energy mix for the country should not result in negative health impacts for the population and the environment. Introduce long-term reduction in the emission of greenhouse gases, through improve conditions for using biomass to produce biogas and energy and the adoption of more comprehensive sustainability requirements for first generation 	MERE in close consultation and collaboration with relevant ministries	Throughout	✓	✓

	<p>biofuels, and the option to prioritise second generation biofuels.</p> <ul style="list-style-type: none"> Facilitate a transition to efficient and sustainable energy efficient practices, policies related to energy, water, housing and urban development, land use, tourism, industry, which are under the jurisdiction of other sectoral ministries through proper inter ministerial coordination. 				
Good governance and institutions	<ul style="list-style-type: none"> Identify action needed to reform/restructure or create an institutional mechanism that will be entrusted with coordinating action related to planning, implementation of energy related activities in an efficient, transparent and accountable manner. A set-up that allows inter-ministerial coordination in order to ensure the integration of energy efficiency measures and those related to increasing the percentage of renewable energy in the energy mix of the different sectors. The institutional set up should also aim at avoiding redundancy, conflict of interest and overlap of responsibilities between different ministries. It is recommended by many specialists to create or mandate an entity with energy planning and efficiency. Such mandate would include developing and updating energy strategies for Egypt and follow up its effective implementation, estimating the future energy needs and options for Egypt, and supporting/coordinating the efficiency of energy use in all economic sectors. The institutional set up should ensure public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on best available technologies and best environmental practices on energy practices. Ensure public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on best available technologies and energy efficiency practices. Provide a stable and predictable macroeconomic environment in order to raise confidence and attract investment. Create a mechanism to be responsible for linking research centers with universities in order to support R&D in the field of energy efficiency and renewable energy. Closely link the development and implementation sectoral strategies by the including the Ministry of Environment, Ministry of Trade and Industry, and Ministry of Water Resources and Irrigation. Engage different EE stakeholders (manufactures, distributors, NGOs and law enforcement organizations in Egypt) to work together for developing, 	MERE in close consultation and collaboration with relevant ministries	4-6	✓	82

	<p>promoting and enforcing the EE programmes.</p> <ul style="list-style-type: none"> • Create within the Ministry of Environment a Unit to be entrusted with the responsibility of providing guidance and technical support related to renewable and sustainable energy across sectors. • Identify a Government body to be entrusted with data gathering, updating and analysis of energy related information. • Introduce an efficient monitoring and enforcement mechanism in order to ensure compliance with energy related regulations across sectors, including those related to illegal access and use of energy. • Strengthening and improving the institutional capacity of different stakeholders through sharing best practices and success stories, provision of standards, guidelines and tools for effective quantitative/qualitative assessment, planning, implementation and monitoring of sustainable energy policies and measures, as well as qualifying energy auditors and managers. 				
Regulatory framework	<ul style="list-style-type: none"> • Review legislation directly and indirectly related to the energy sector and assess their impacts on the environment and resource efficiency with a view to develop a regulatory framework supported by a package of incentive measures and policies that support energy efficiency and promote the use of renewable energy and sustainable practices in the different sectors. • Set standards and targets as well as incentives for companies and industries to encourage them to reduce energy consumption through regulatory and incentive measures. Realistic and achievable target for business with regard to energy efficiency and emissions should be set. • Introduce a package of regulatory and incentive measures to promote efficiency in the Industrial sector and introduce benchmarks for each type of industry. • Introduce standards for the incineration of hazardous waste in cement kilns using appropriate technologies. • Develop and apply guidelines for green new cities, including the allocation of land and rooftop areas to solar energy projects for electricity and heat supplies. • Develop an ambitious and action-based framework directive on energy efficiency to include the use of energy efficient LED bulbs, household equipment and appliances. For a start, five appliances, namely refrigerators, air conditioners, washing machine, televisions and lights, to be included in the MEPS. Through the implementation of MEPS, the country will ensure that these electrical appliances meet certain energy efficiency standards before being sold in the country. This should be accompanied by testing and certification procedures. • Regulatory framework to be designed to encourage waste-to-energy and use of 	MERE in close consultation and collaboration with relevant ministries	4-6	✓	

	<p>biomass and waste-to-energy through regulatory and incentive measures.</p> <ul style="list-style-type: none"> • Introduce green building regulations in line with the Egyptian Green Building code for the retrofitting of existing housing stock and their application on new housing, construction and building. • Amending existing laws and regulations to prevent producing/ importing low efficiency appliances as well as intensive energy equipment and machines, and to stimulate the market of efficient electrical appliances through, for example; energy labelling for energy consuming products. • Promote the vehicle fuel efficiency, replacing old vehicles (Vehicle scrapping scheme). Also, setting strict conditions for renewing the licenses for old vehicles and polluting industries. • Institute in law a requirement for the tourism sector to retrofit existing hotels and related tourist offices and use efficient and renewable sources of energy in new hotels and structures. • Enforcement of building codes, especially for Governments buildings. Institute in law a requirement for Government to use renewable energy for all newly built Government offices and buildings, lighting for roads, and implement a retrofitting programme for existing buildings. • Strictly enforce the compliance with environmental standards for the use of coal by different sectors, • Promote the greening of sectors, including housing and construction, transport, industry, agriculture and tourism through a package of regulatory and incentive measures. • Introduce regulatory framework encouraging the use of renewable energy solar and wind power as a cost effective and viable solution as well thermal energy and energy generated from waves, hot air and flow of water. • Introduce laws that directs investments into the production of biogas from animal and agricultural waste as well as municipal wastewater (sludge) for the production of energy. • Improve tendering procedures for wind farms and solar photovoltaics, wind to reduce the cost of production and time. • Develop and incorporate a 'low-energy rating' in the building regulations with a view to promoting the establishment of new buildings with very low energy consumption. • Efficient use of biomass (including biogas) for parts of the transport sector and Examine the feasibility of introducing electric public transport system and the gradual introduction of private electric cars and the support system of electric 				
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	<p>recharging.</p> <ul style="list-style-type: none"> • Include in law and implement a requirement for farmers to use efficient irrigation techniques, including the use of renewable sources of energy to pump underground water and irrigate crops • Develop and launch a labelling and certification scheme for products that have been produced through energy efficiency measures, including the use of renewable energy. • The EIA studies of all energy generation and transmission projects should focus on their health impacts and ways to reduce these impacts, especially those caused by transmission lines when going through urban areas, to eliminate the electromagnetic waves of hanging high voltage lines (brain cancer, blood leukemia, epilepsy, migraine, etc.) 				
Economic instruments	<ul style="list-style-type: none"> • Develop a package of incentive measures to be designed to support regulations market incentives to influence behavior toward more sustainable energy production and consumption patterns and encourage investments in energy efficient technologies and renewable. Measures may include subsidies and tax rebates and exemptions for industries and activities using energy saving equipment and measures. • Introduce market-promotion options for initiatives aimed at energy-efficient systems and district heating systems. • Provide incentives to encourage the use of RDF and TDF locally generated and available as a source of energy. • Introduce tax reform that ties taxes levied on the extent to which producers adopt sustainability consideration in the entire life cycle of products. • Introduce instruments and policies at local and national level to encourage investment in energy efficient equipment and technologies through the use of more energy efficient appliances and products; and tightening of the requirements for efficiency and labelling of appliances and products. • Reform energy prices and continue the subsidy reform process initiated last year with in a manner that encourages the transitioning of the sectors across the board to transition to greener and more sustainable energy uses. Due consideration should be given middle and low income segments of the population so that the subsidy reform does not represent an extra burden on them. This may include direct payment to poor and middle income families can be considered in order to compensate these income groups for any additional financial burden and ensure that subsidies reach those in need for financial support. • Set prices for carbon emissions in order to cut down on emissions. • Provide incentives that encourages investment in energy efficient projects and 	MERE in close consultation and collaboration with Ministry of Finance, and Ministry Planning, and MoE relevant ministries	4-6	✓	

	<p>renewable energy that results in providing affordable and clean sources of energy, particularly to the middle and lower income groups, and create jobs.</p> <ul style="list-style-type: none"> • Provide incentives for the private sector in the form of tax cuts and rebates and other incentives to invest in energy efficient and renewable sources of energy, and R&D. • Revisiting the price paid by Egypt to foreign partners involved in oil explorations as well as in the purchase of natural gas. • Introduce strict penalties for heavy polluting industries and activities. • Provide incentives to introduce covered and efficient irrigation systems, including the use of solar panels, use energy efficient irrigation machines, Introduce solar powered systems, including solar-run underground water pumps. 				
Economic analysis	<ul style="list-style-type: none"> • Undertake an economic analysis to assess the financial viability of the proposed plan to include costs and benefits. The latter should include the expected social and environmental benefits resulting from the proposed plan, including number of new jobs created. It should also identify budgetary requirements needed to finance the programme and sources of funding. • Develop an economic model for use in the energy sector in order to ensure the optimum allocation of energy among the different sectors. • Assess the trade impacts of investment in renewable energy and renewable energy technologies has the potential of increasing local export capacity and consequently increase foreign external earnings. • Carry out regular evaluation of the effect of instruments deployed in order to ensure adequate progress towards the goals and to ensure cost-effectiveness in overall efforts, including developing analytical tools which can help in ensuring energy security. • Analyse long-term opportunities to reduce emissions from the various sectors as part of cost effective climate efforts. • Evaluate the potential to establish a possible permanent scheme for national joint implementation projects. • Carry out an analysis of the use of biomass and waste-to-energy for energy-related purposes in Egypt. The analysis will focus on whether the right framework conditions for efficient and environmentally sustainable use of biomass, which will result in a long-term strategy for the use of biomass resources for energy purposes and will draw on experience from other governorates. 	MERE in close consultation and collaboration with Ministry of Finance, and Ministry Planning, and MoE relevant ministries	4-6	✓	
Government Procurement	<ul style="list-style-type: none"> • Government to take the lead in promoting green and sustainable energy investments and practices through direct public investment in energy efficiency and renewable energy. 		Throughout	✓	✓ 86

	<ul style="list-style-type: none"> Enhance public sector energy savings efforts in public buildings including public offices, schools, universities, hospitals and public clubs and recreational centres, and through public procurement. Invest in green and sustainable energy infrastructure, particularly solar, wind and biogas, to support the introduction of renewable sources of energy across sector, including the development of rural areas and enhancing their economic potential. Public, entities including ministries, public schools, hospitals, hotels to use energy efficient lighting systems, equipment and products. Designate land for wind farms and solar photovoltaic by the Government for local and foreign investors on a long-term lease basis or at concessionary rates. Subject Government contracts to a life cycle assessment to ensure the energy efficiency and the use of high percentage of renewable sources of energy in the purchase products and the provided services. Government to use energy efficient and or public transport systems for its employees and for the mass transit system. 				
Trade	<ul style="list-style-type: none"> Design trade policies to support sustainable and green energy sector through a tariff system that encourages the import of environmentally friendly and energy efficient technologies and encouraging the export of locally produced ones. 	Ministry of Trade	4	✓	
Funding	<ul style="list-style-type: none"> Secure a stable and predictable source of funding for the implementation of a sustainable green and renewable energy programme. Provide innovative mechanisms to shorten payback periods through rebates and “on bill” financing.^{††} Financial institutions should be requested to support funding investments in green and renewable energy, including providing loans to MSEs on concessionary terms. Provide sufficient budgetary allocations for research and development and to support the transitioning of the sector to a green and sustainable path. Provide financial assistance to entrepreneurs, particularly SMEs with innovative environmentally sound technologies. 	MERE Finance,MPMAR,	Throughout	✓	✓
Private sector	<ul style="list-style-type: none"> Develop a package of transparent regulatory/ legal frameworks and incentives measures in order to encourage the private sector direct engagement and through Public-Private-Partnership in investing in sustainable and green energy efficient and renewable energy projects, such as the use of renewable sources of energy in the recycling and desalination of seawater, while guaranteeing a 	MERE in collaboration with MoE	4	✓	87

^{††} On-bill financing refers to a loan made to a utility customer, such as a homeowner or a commercial building owner, the proceeds of which would pay for energy efficiency improvements. Regular monthly loan payments are collected by the utility on the utility bill until the loan is repaid.

	<p>suitable return on investment.</p> <ul style="list-style-type: none"> Encourage industrial firms to have an environmental register where energy conservation interventions are recorded. Such a system would require installing monitoring instruments and tools to measure the improved efficiency achieved by integrating EE actions. 				
Public Awareness	<ul style="list-style-type: none"> Transparency of the Government efforts is needed to achieve a sustainable energy supply/demand balance in Egypt. The effective means to promote public awareness could include direct communications/messages to different target groups, press, radio and television campaigns, web-based outreach activities, as well as organizing events, conferences, workshops, show rooms and training activities. Pilot demonstration of key technologies and clean energy applications. Develop and implement public awareness campaigns targeting different target groups highlighting the economic, social, health and environmental benefits of using clean sources of energy. Promote the role of media in promoting green and sustainable energy consumption and production patterns and in highlighting the benefits to individuals, the economy, and the environment. Designate a TV channel for promoting public awareness and education on the sustainable consumption of energy and educate consumers to change their energy consumption habits. Raise the level of awareness of the general public to the negative health impacts resulting from the use of traditional practices for energy generation such as burning of wood and dung. Use of mobile phones to disseminate knowledge and information on the energy savings measures and practices for different stakeholders. Reach out to appliance manufacturers, dealers and contractors to transform the way in which they develop and install new technologies and to architects and builders to improve construction practices towards sustainable energy systems. The EIA public hearings for energy and industrial projects is a vital tool to involve local communities and get their feedback on challenges facing the sector. Both Governmental and non-Governmental bodies should aim at increasing the renewable energy share in the energy mix. Community participation in EIA public hearings will put the necessary pressure on developers to ensure proper sustainable energy interventions in their projects. 	MERE in collaboration with MoE	4	✓	✓
Education	<ul style="list-style-type: none"> Invest in human resources in order to raise the level of education and awareness of the population and provide the necessary calibres to support a green and sustainable energy sector. Develop and implement an educational curriculum for the efficient and 	MERE in collaboration with MoE and Ministry of Education	Throughout	✓	✓

	sustainable energy uses across sectors.				
Capacity Development	<ul style="list-style-type: none"> Develop and implement a capacity building programme that supports green and sustainable energy, as well as tools and concepts that support this transition such as integrated assessment, life cycle assessment, green economy, and circular economy/closed loop economy. Develop and conduct training programmes for practitioner and trainers, and special programmes for technician, women, and youth. 	MERE in collaboration with MoE, Ministry of Education, and Ministry of Labour	Throughout	✓	✓
Monitoring and assessment	<ul style="list-style-type: none"> Develop, for adaptation at the local level of a framework for the efficient monitoring, enforcement, assessment and implementation of a system that ensures compliance & adherence to sustainability principles in green & sustainable energy regulations, codes of practice & standards. The framework would also include the creation of a coordination mechanism to coordinate initiatives, programmes, & funding related to green & sustainable energy. Provide air quality monitoring stations to monitor air pollution and main pollutants on a continuous basis, including gaseous pollutants, and those resulting heavy polluting industries. 	MERE in collaboraion with MoE	Throughout	✓	✓
Research & development	<ul style="list-style-type: none"> Design and implement a long-term R&D programme in environmentally sound energy saving equipment and infrastructure. The programme to be developed by the Academy of Scientific Research in close consultation and collaboration with the Ministry of Environment, and other relevant ministries and research bodies and think tanks. Carry out a technology assessment to ensure the right framework for new technologies to support the targets for reducing greenhouse gas emissions from the transport sector. Research focusing on incorporating wind and solar power: Egypt's wind and solar resources provide future opportunities to harvest large amounts of energy from them. Increased incorporation of wind and solar requires, however, continued research and technological advances to reduce the energy costs and optimize the use of wind and solar power and its feeding into the electricity grid and electricity consumption, including energy storage methods. Undertake intensive research and development efforts to devise measures, techniques and technologies for energy efficiency and the use of renewable sources of energy in the different economic sectors including, the water and agriculture sector, housing and construction, and transport. Prioritize research and development in the energy and climate change related areas, particularly for renewable energy, smart grids and energy efficiency. 	MERE in collaboration with Ministry of Environment and Ministry of Scientific Research	Throughout	✓	✓
Indicators	<ul style="list-style-type: none"> Monitor and assess the achievement of the objectives and targets and implementation of the road map based on the identified set of indicators. 	MERE in collaboration with MoE and Minisrty of	Throughout	✓	✓

*Integrating Environmental Consideration in Five
Priority Sectors in Egypt*

	<ul style="list-style-type: none"> Review indicators and adjust as appropriate in order to ensure achieve the sustainability objectives identified for the sector. 	Planning			
<i>Regional & International Cooperation</i>	<ul style="list-style-type: none"> Participate actively in international forums aiming at achieving a global transition to sustainable development and aiming at addressing climate change concerns, the promotion of a green growth agenda, the phasing-out of subsidies, and efforts leading to energy efficiency and transition to clean and renewable energy Promote regional and international cooperation in the field of sustainable and green agriculture sector by being an active member/partner in organizations such as International Renewable Energy Agency (IRENA), Regional Center Renewable Energy and Energy Efficiency (RECREE), etc.,..... 	ERE in collaboration with MoE and Minisrty of Planning	Throughout	✓	✓
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Acronyms

ARDC	Agricultural Research and Development Council
CAPMAS	Central Agency for Public Mobilization and Statistics
COMESA	Common Market for Eastern and Southern Africa
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GISs	Geographic Information System
MALR	Ministry of Agriculture and Land Reclamation
MALR	Ministry of Agriculture and Land Reclamation
MWRI	Ministry of Water Resources and Irrigation
MHUUD	Ministry of Housing, Utilities and Urban Development
MERE	Ministry of Electricity and Renewable Energy
R&D	Research and Development
SAP	Structural Adjustment Programmes

Introduction

Agriculture activities account for the largest share of land use and over two-thirds of water use. In 1999, it is estimated that pasture land and cultivation takes up 37% of the Earth's land area.¹⁴³

Crop and livestock production have a significant impact on the environment. In addition to being the main source of water pollution, they contribute on a massive scale to air pollution and are also a major source of greenhouse gas emissions (GHG). Unsustainable agricultural practices, forestry and fishing are the main causes of biodiversity loss worldwide.

Negative impacts of agricultural activities on the environment can be avoided or reduced if sustainable production practices are adopted. Food, water, and a healthy environment are essential for human wellbeing. If properly managed they can be the basis for sustainable and equitable development. They are however, being threatened throughout the world especially in developing countries due to unsustainable production and consumption patterns across sectors. The key to providing these essentials is to increase agricultural productivity, and food and water security, while ensuring environmental sustainability. This can only be achieved through, sound environmental management practices and policies, as well as, research and extension work that would lead to a long-term sustainable economic development that is equitably shared.

Agriculture requires large quantities of water for irrigation and for various production processes. In order to achieve the targeted global food security, commitments and investments are needed to produce more nutritious food with less water. Innovative technologies and methods are required to ensure a greener and more sustainable food production practices.

These include the implementation of efficient irrigation strategies, the reuse of wastewater and drainage water and use of water, and increasing the share of renewable sources of water in the total water supply. It also includes reducing post-harvest losses,

and creating more sustainable livestock and marine fisheries production.

Overview

Technological advancements in the past century have significantly contributed to increased food production worldwide. This has been mainly achieved through the extensive use of land, fertilizers and pesticides, water and expansion over fragile ecosystems and forests. Unfortunately gains from increased crop production and productivity have also resulted in many instances in environmental degradation and loss of biodiversity. They have also led to the misuse and depletion of water resources, loss of land fertility, and generally the degradation of sensitive ecosystems and environments.

It was estimated that by 2008, 24% of the global land area had been degraded, and 40% of the world's agricultural land was undergoing serious degradation and loss of biodiversity. Pesticide toxicity is estimated to contribute to the poisoning up to five million agricultural workers annually, and there is emerging evidence linking it to child stunting.

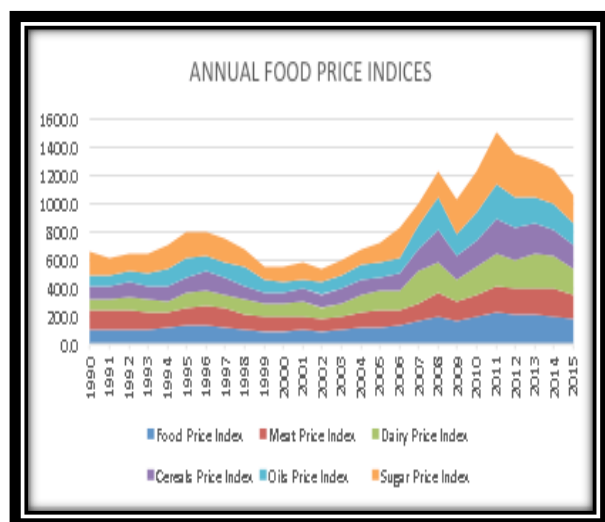
Oceans and seas, while they contribute to food security through fishing and marine aquaculture, are also threatened as a result of overfishing and pollution. Similarly, deforestation, which is in most instances driven a result of agricultural expansion, cause about 17.4% of the global GHG emissions.¹⁴⁴

The African continent faces a number of challenges. The impacts of the changing climate change on African countries, particularly North African countries, including Egypt, represents among others one of the challenges facing the region. The livelihoods of many farmers and livestock keepers are likely to be negatively affected by climate change. The changes in crop and livestock production that are likely to result from the changing climatic conditions will diminish the options available to most small scale farm owners. Existing crop and livestock varieties are likely to be affected. Current agricultural practices have proven to be inadequate and inefficient, and food security has thus been of great concern.

This has led to increases in the prices of agricultural products accompanied by a widening gap between supply and demand. It is estimated that climate change will result in a decline in production by 5–20% for all crops in Sub-Saharan Africa alone.¹⁴⁵

Arab countries are also among those countries unable to reach food self-sufficiency. Continuous growing demand accompanied by inefficiencies management of resources, as well as natural disasters all play a factor in this.¹⁴⁶ Lack of appropriate agricultural policies and practices led to reduced capacity of natural resources to regenerate their services, thus threatening agricultural sustainability and making food security an even more serious problem for the future.

The food crisis experienced during the last several years accompanied by the unprecedented rise in food prices and restrictions imposed by some food-exporting countries have renewed calls for ensuring reliable sources of food for countries that mainly rely on imports to meet the gap in food shortages.



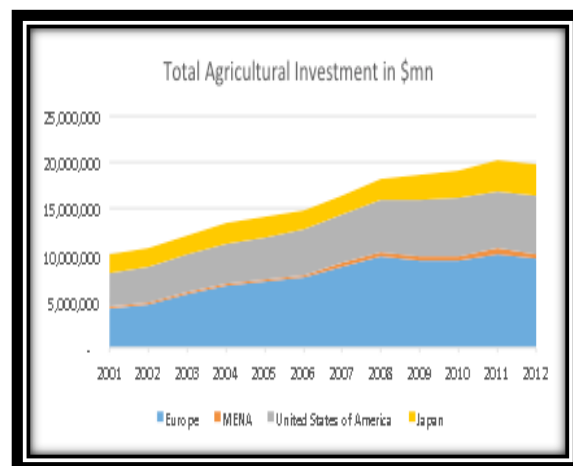
FAO Statistics <http://faostat3.fao.org/download/I/IG/E>

The Agriculture Sector in Egypt

Agriculture is an important sector for socio-economic development in Egypt and plays a significant role in Egypt's national economy. It contributes 14.7% of the national GDP¹⁴⁷, and provides for the overall food needs for the country. According to the World Bank, Rural population was estimated at 56% in 2014 with about 50% of the Egyptian population relying on agriculture for income generation and employment.

According to estimates by the Food and Agriculture Organization (FAO) women represent a substantial share of the total agricultural labor force, as individual food producers or as agricultural workers,

with around 43% of the Egyptian female labor force being engaged in the agricultural sector.



FAO Statistics <http://faostat3.fao.org/download/I/IG/E>

Agriculture in Egypt is not only considered as an important driver for economic development, but also as an essential component for socio-economic development. Farm incomes account for about 25-40% of the total income of rural households, while agricultural related off farm incomes account for an additional 20-35%, and non-farm revenues and wages account for about 40% of rural household incomes in Egypt.¹⁴⁸ Any attempts to boost the Egyptian economy must seriously consider revitalizing the agriculture sector.

Total cultivated area in Egypt was estimated at 8.5 million feddans (8.159 million acres) in 2007 (approximately 3.5% of the country's area). Nowadays, vertical cultivation has brought the crop area up to 14.6 million feddans (14.065 million acres). A long-term plan is being implemented to increase the area of reclaimed land to reach 3.4 million feddans (3.274 million acres) by 2017. This will be through adding around 150,0700 feddans (144,508 acres) to Egypt's cultivated area annually.¹⁴⁹

Water scarcity in Egypt accompanied by high rate

of population growth, urbanization, and increased levels of economic activities represent one of the main challenges facing the country. This is expected to result in increased demand on already scarce water resources.

In addition to the water efficiency measures that need to be introduced to optimize the use of water resources in Egypt, with agriculture consuming more than two thirds of existing water supply in the country, other sources of water outside the Egyptian borders should be sought. This includes joint cooperation agreements with the Nile riparian countries and the revival of the Egyptian-Sudanese joint cooperation projects in the field of agriculture and food security. This should also be accompanied by the creation of sustainable agricultural communities to assist in filling the gap in food shortage and reduce pressure on existing agriculture land.

Moreover, encroachment on cultivated land caused by increased rate of urbanization, is also another challenge facing Egypt. As earlier indicated the rate of encroachment on cultivated land has reached unprecedented levels in the last several years.¹⁵⁰

Crop cultivation in Egypt takes place during three cropping seasons. Wheat is the most popular crop grown in winter. Popular summer crops include rice, cotton, and maize. Cotton has been the country's largest agricultural export product for many years. The higher cultivation costs have resulted in a reduction of the share of land cultivated cotton. Accordingly, cotton exports have dropped from 121,500 metric tons in 1993/1994 to 45,000 metric tonnes in 1996/1997. The Government tried to reverse this trend by importing lower-grade cotton in 1996 to meet the local demand and allow for the export of the better-quality cotton. The Government also moved to a full liberalization of the cotton trade in 1998/1999.¹⁵¹ According to CAPMAS Egyptian cotton exports from March to May 2013 totaled 351,700 tonnes compared to 231,800 during the previous season.¹⁵²

Wheat and rice production have increased since the early 1990s, particularly since 1994 when all

subsidies for fertilizers, seeds, and pesticides were

lifted. However, due to population growth, about 95% of the production consumed locally. In 1996/1997, imports of wheat rose by 8% accounting for more than a quarter of total imports.

Recent statistics show that Egypt's annual wheat consumption is between 15m and 20m tones of which Egypt imports annually more than 10m tonnes. This makes the country the world's largest importer of the grain on international markets. These imports impose a significant drain on Egypt's currency reserves. The \$4.6bn Egypt spends annually on food imports goes mainly towards buying grain.¹⁵³

Strategies for the agricultural sector and the dynamics of the market have affected the cropping pattern significantly. Examination of key crops in Egypt shows that during the 1960s, 1970s and 1980s price control measures imposed by the Government has led to the shifting away from major field crops with controlled prices towards untaxed, higher value products. The area cultivated cotton and grains, whose prices were highly controlled, declined relative to other high-value, less regulated crops, such as clover, rice, vegetables and fruits.¹⁵⁴

The liberalization of the agricultural sector in the early 1980s brought about major changes in cropping patterns in Egypt. Thus, the relative importance of rice, sugar cane clover, and horticultural crops has increased noticeably. Moreover, agricultural output increased significantly because cultivation of most crops became more profitable for farmers. However, according to Shousha and Pautsch (1997), the response to the liberalization strategy was very slow. Moderate success of the agricultural liberalization strategy, is evidenced in the rate of progress of the cropping pattern during the 1990s and later years, where relative importance where given to wheat, clover, rice and maize over some other economically important crops.¹⁵⁵

Egypt has limited opportunity to improve the production of some strategic crops such as wheat. This is due to shortages of arable land and water. Thus, changing cropping patterns is another option that could be considered for greening the sector.

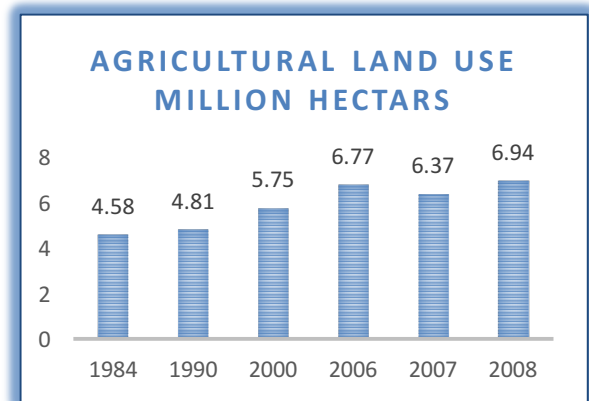
To date, the cropping patterns that were encouraged by the Government during the 50s, 60s and 70s still exist. These are cropping patterns that favor high value added crops, which use large quantities of irrigated water. Thus, small farmers still favor the cultivation of rice and sugarcane because of their high financial returns despite the high water consumption involved in their cultivation.

Sustainable Agricultural Development in Egypt should not only be concerned with increasing crop production to achieve food security and increasing self-sufficiency, but also with greening the sector by improving agricultural productivity, increasing plant yields and shifting to low water intensity crops. Greater attention should be paid to the cultivation of varieties suitable for the use of agricultural drainage water, as well as early maturing crops. This will lead to savings in water consumption accompanied by higher crop productivity rates.

The Government has since sometime recognized the need to increase the efficiency in water use in the agricultural sector, and has thus introduced water saving and efficient techniques in newly reclaimed land, as well as in several cultivated locations. The new water efficient systems are now being applied in 1,400 feddans in El Wadi El Gadid, 5,000 feddan along El Nasr water tributary in Alexandria and in El Beheira governorate.¹⁵⁶

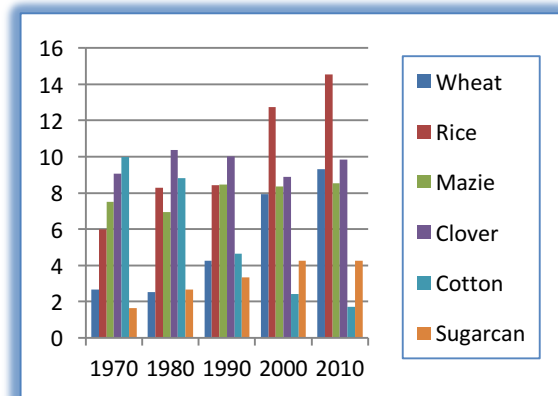
There are three main productive sectors in Egypt: services, industry, and agriculture. In 2014, the World Fact book estimated the share of each of the three sectors as follows¹⁵⁷:

- Agriculture: 14.6%
- Industry: 38.9%
- Services: 46.5%



Source: Economic Affairs Department, Agricultural Statistics Bulletin (2009), Ministry of Agriculture, Cairo, Egypt

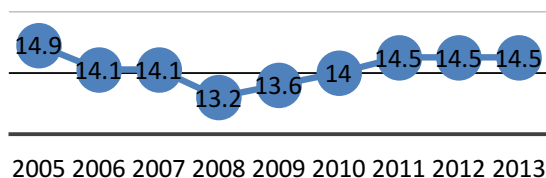
Crop Consumption of Water (Million m3)



Source: Annual Bulletin of Indicators of Agricultural statistics, MALR (various issues)

The Egyptian economy has traditionally relied heavily on the agriculture sector as the main sector that drives the economy. This dominance declined during the 1980s and 1990s, with the share of agricultural to GDP falling from 29.3% in 1970 to 18.2% in 1980 and 16.6% in 2000. However, agriculture still accounts for a significant share of growth, exports and employment. Moreover, it should be pointed out that during the seventies and eighties agriculture used to be the lead sector in Egypt, where thereafter other important sectors emerged such as the tourism and the industrial sectors. So while the share of agriculture has declined, contribution of the sector in total exports has increased in absolute value.

Agriculture, value added (%of GDP)



<http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS/countries>

Moreover, the growth of the agriculture sector has averaged between 2.7% and 3.9% during the last three decades. Food production however, continue to fall short of demand with the four strategic crops cultivated, namely; wheat, maize, rice, and potatoes, satisfy only 50% of the population's needs.

According to the World Bank, it is estimated that 95% of the total local food production is consumed locally. This is despite increasing emphasis on cash crops for export, particularly horticultural produce. Nevertheless, the continuous growth in population makes Egypt one of the world's largest food importers.

Development research across many countries suggests that rapid agricultural growth results in the highest employment generation sector. Thus, agricultural growth is the best entry point for ensuring that economic growth is inclusive and hence equitable. In Egypt, the difference between rapid agricultural growth (estimated to be 4.8%) and slow agricultural growth (estimated to be 2.8%) represents 300,000 more jobs per year. About 60% of those additional jobs are in the rural non-farm consumer goods and services sector, 15% of which are in agricultural production and the remaining 25% are in agribusiness input and output marketing activities.¹⁵⁸

The share of agriculture in total functional expenditures in Egypt is estimated to be 5.27%.¹⁵⁹

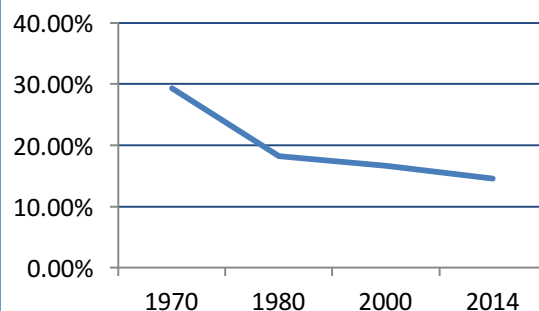
Between 1965 and 2004, the share of agricultural commodities in total exports dropped from 71% to 9%. While in 2014, agriculture commodity exports contributed 20% to Egypt's total exports, which makes it a major revenue-generator.¹⁶⁰

Egyptian agriculture is entirely dependent on irrigated land mainly from the river Nile. The agriculture sector consumes about 88% of the water in Egypt.¹⁶¹ The Government provides irrigation water free of charge, except for cost recovery of on-farm investment projects. The Egyptian Government subsidizes irrigation by around US\$5.0 billion annually¹⁶².

Only 3% of the total land area of Egypt is arable. About 1/3 of which is serviced by main and secondary drains. The rest are mostly in dire need of

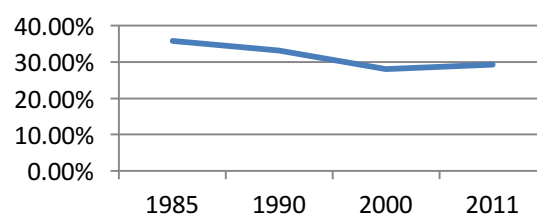
maintenance and upgrading. In addition, only 2% of the 8 million feddans of cultivated land are irrigated by modern methods.

% of GDP



The share of agricultural employment in Egypt has declined from 35.8% in 1985 to 33.2% in 1990 and 28.1% in 2000.¹⁶³ Employment in the agriculture sector as a percentage of the total employment was estimated at 29.20% in 2011, according to the World Bank.

% of Employment



Egypt's population has been growing rapidly estimated at 2.5% per year (CAPMAS, 2014). Given the existing pattern of development, as population grows, the amount of land needed for housing and businesses rises, at the expense of the amount of land available for agriculture. This means, that Egypt may be producing less of its own food in the future if current trends continue. It has been estimated that in 2010, Egypt imported 40% of its basic foodstuff, including 60% of its wheat needs.¹⁶⁴

In 2013/2014, Egypt's food import bill was US\$ 4.5bn. On the other hand, the Government is expecting a decrease in the consumption of subsidized bread by 25% to 20% after the introduction of the smart-card system. This will consequently decrease the consumption of wheat by 2m tonnes annually.¹⁶⁵

Agricultural Policies in Egypt

Traditional agricultural practices continue to dominate the agricultural sector in Egypt. These include extensive farming practices and flood irrigation. Inappropriate agricultural practices and land use have had harmful impacts on natural resources, biodiversity and water resources.

Over the years, the control of the Egyptian Government over the agricultural sector has been weakened. This is attributed to the progressive elimination of subsidies, and the relaxing of policies related to land and price control, as well as procurement control. This is in addition to the increased level of private sector involvement in agricultural relate projects.

Three strategies were developed for the agriculture sector in Egypt. First agriculture strategy was developed in the 1980s and the second strategy was developed to cover the 1990s. By the early 2006 due to changing socioeconomic conditions, the Government decided to develop the Agriculture Development Strategy extending until 2017.

The three strategies had different focuses and priorities that reflected the the varying economic and political circumstances dominating the international and local scene at that time. While in the eighties the focus was on the liberalization of the agricultural sector and the pricing system, and

achieve an annual growth rate of 3.4%. It also aimed at providing incentives for farmers and reconciling between private and public sector targets, including decentralizing the decision making process in the the agricultural sector. In the eighties, the focus was on completing the economic reform of the sector and increasing exports to reach EGY 5 billion annually and achieve a 3% annual growth rate in the sector. It also aimed at completely liberalizing the production and marketing of cotton, and supporting research and development (R&D).

The 2006-2017 strategy aimed at self-sufficiency in grain production and achieve a 4.1% annual growth rate, while continuing the land reclamation programme of 150,000 feddans annually. It also included the decentralization with respect to the use and allocation of water, initiate a process of partial recovery of cost of irrigation and maintenance, address the land encroachment problem, and cultivation of more strategic crops.

Though the three strategies succeeded in achieving a number of strategic objectives, they fell of achieving other. This has led to the development of a new strategy for 2030. This has been called for due to a number of compelling reasons, which included the following:

- Scientific and technological developments in the agriculture field, including the use of Geographic Information System (GISs), genetic engineering, and Nano technology.
- The need to introduce water efficiency techniques and practices, with the doubling of area cultivated rice in spite of the reduction of per capita water share below the water poverty line.
- Amendments of the law governing the relationship between land owners and tenants, which allowed land owners to fix rents.
- The bird flue crisis.
- Though the reform in exchange rates has contributed to increasing the competitiveness of agricultural products, poor managerial and marketing capacity.

- Instability of world food markets due to fluctuations in food supply and demand that has resulted in the global food crisis, which has further worsened due to the 2008 financial crisis.
- Global trends toward the cultivation of grains for the production of biofuel.
- Climate change and green house effects and the negative impacts this has on agricultural production and on the Delta and the northern lakes.
- New trends in for investment in agriculture production outside national borders as is the case for the BRICS countries.
- Implementation of the EU Partnership agreement and other agreements such as the Common Market for Eastern and Southern Africa (COMESA), which required new directions in the development of the agricultural sector.

Main findings that have emerged from the implementation of these strategies from the sustainability point of view was the need to address the following:

- Institutional reform that still needs to be further developed to support a more efficient agricultural sector.
- Coordination between relevant different Government bodies.
- Promote the efficient use of water resources in spite of its scarcity.
- Climate change on total cultivated area, composition of crops, water availability and cultivation practices.
- Encroachment on agricultural land.
- Adequate land use planning and the promotion of integrated communities.
- Human resource development resulting in shortage of skilled labour.
- Equitable distribution of wealth and returns from development gains.
- An effective monitoring, implementation and follow up system.

This has all resulted in aiming to incorporate the sustainability dimension in the 2030 agriculture strategy.

Main components of 2030 agriculture strategy:

- Sustainable use of natural resources.
- Increase agricultural productivity per unit of water and land.
- Achieve food security for strategic crops.
- Enhance the competitiveness of agricultural products locally and internationally.
- Promote investments in the agricultural sector.
- Improve the standard of living of the rural population and reduce poverty.¹⁶⁶

One of the negative implications for agriculture policies that has been in effect since the 1950s has been the policy dealing with land ownership. Allotting 80% of the total cultivated area in plot sizes of less than 5 feddans to small landowners has resulted in a reduction in productive capacity. It also led to inefficiency in the use of resources as well as reduced capacity of market access and competitiveness. This is coupled with a lack of capacity and finance to invest in research and development to improve and shift to a more sustainable agricultural techniques and processes.

The period between 1965 and 1986 witnessed extensive involvement of the Egyptian Government in the agricultural sector. This included, fixing crop areas, prices, and the compulsory purchase of crops. This was followed by a period where the Government was engaged in an ambitious set of macroeconomic policies and market reform programmes through the Structural Adjustment Programmes (SAP). The agricultural reform programme began earlier compared to other sectors of the Egyptian economy.

As for subsidies and their impact on the agricultural sector, it should be emphasized that subsidies negatively affect various sectors of the Egyptian economy not only the agricultural sector. However, their influence on agriculture, which deploys a considerable share of the nation's resources, is particularly strong.¹⁶⁷ In 1987, the Ministry of Agriculture began its reform through removing taxes and subsidies on agricultural related activities. The major SAP policy changes

were introduced in the period between 1987 to 1994. It made cultivated crop areas and rotations to be freely decided upon by farmers. The only exception was the maximum area set for rice at 1.2 million feddans, which was retained.¹⁶⁸

The situation has not improved much in the last decade. This is due to reduced investments in the agricultural sector, and the low priority given to rural areas in general. This has been coupled with the deterioration in infrastructure needed to support the sector and social and health services for the rural population.

With regard to fertilizers, their use in Egypt is estimated to be the highest among developing countries estimated at 465 kilograms per feddan annually. This excessive use has resulted in increased demand and consequently in about 20% shortfall in Egypt's fertilizer needs. Moreover, excessive regulations in the production of fertilizers has become a deterrent to investments by local and foreign investments. This has also made privatization of the country's public fertilizer companies almost impossible.¹⁶⁹ It is estimated that fertilizers subsidies cost the Government LE. 1.3 billion in 2008.¹⁷⁰

The negative impacts of the use of insecticides has been estimated to cost the Egyptian economy L.E. 1.979 billion during the period between 2011-2013.¹⁷¹

However, in 2014 the Government decided to raise the prices of subsidized fertilizer products by 33%. In June of the same year the MWRI increased cost of fertilizers from LE 1,400 to LE 1,900 per tonne for nitrate-based fertilizers and from LE 1,500 to LE 2,000 per tonne for urea-based fertilizers.¹⁷²

Subsidies to consumer goods, including fuels and food, account for almost one third of Egypt's public spending, or 13% of the country's gross domestic product (GDP) in 2013.¹⁷³

In 2014, The Egyptian Government has finally decided to lower its food subsidies. This has been called for following the economic and financial that have befallen the Egyptian economy during the last several years. Attempts have been made to

remove or lower subsidies sufficiently in order to lower the public budget deficit. Analysis suggest that in previous decades, subsidies on goods were among the most important challenges facing fiscal policy reform in Egypt.

As per capita food consumption rose, importation of foods such as wheat, corn and rice amounted to 50 kilograms per capita per year in the 1960s. It decreased to 20 kilograms in the 1970s only to skyrocket to 150 kilograms in the 1980s.¹⁷⁴

Adopting sustainable agricultural practices in Egypt will contribute to overall rural development, which in turn will help achieve food security, poverty reduction and sustained economic development in the country. As earlier indicated, the contribution of the agriculture sector in Egypt is estimated at 14.7% GDP¹⁷⁵ and employs over 30% of the Egyptian workforce. The agricultural sector provides about 20% of the country's exports.

Poverty is on the rise in Egypt, particularly in rural areas. In recent years, poverty increased at a much higher rate, 4.6% in the rural areas as compared to 1% in urban areas.

As such, enhancing sustainable agricultural and rural development as a means to reduce poverty and food insecurity is a prerequisite for sustainable social and economic development, and hence should be considered as a social and political priority for the country.

Impacts of current agricultural policies

Socioeconomic impacts

An assessment of the SAP in Egypt on the agriculture sector reveals some negative impacts. This is in terms of income distribution within farming sub-sector as well as price and income stability.¹⁷⁶

Data reveals that 40% of total income in rural areas is derived from agricultural activities. Statistics also show, as earlier indicated that 29% of the total labor force in Egypt are employed in the agricultural sector and 43% of the poor live in rural areas.¹⁷⁷ This figure is likely to be higher if industrial agricultural related labour is included.

If climate change continues unabated, its threats on the agricultural sector in Egypt, crop productivity and fisheries production will have broader societal implications in terms of loss of its contribution to GDP, and increases in unemployment and poverty rates.

Environmental impacts

Unsustainable agricultural practices present the greatest direct threat to biodiversity and ecosystems in Egypt. Farmlands provide important habitats for a variety of plants and animals. When farming activities are sustainably managed, they can help preserve natural resources, restore critical habitats, protect watersheds, and improve soil health.

Negative environmental impacts resulting from unsustainable farming practices include:

- Land conversion & habitat loss
- Wasteful water consumption
- Soil and genetic erosion and degradation
- Pollution
- Negative climate change impacts

Additionally, agricultural waste, which amounts to about 32 million tonnes annually, can cause environmental problems. For example, the burning of rice straw, causes negative environmental and health effects. There are a number of solutions to this problem, as well as to other types of agricultural waste. Apart from the potential of composting of agricultural waste, it can be used as upgraded nutritious animal feed, which could help in closing the feed gap for livestock. A large percentage of organic waste is used as fodder for animals. Most of the waste from poultry and cattle are also used as fertilizers.

The burning of agricultural waste and the accumulation of undisposed agricultural waste and animal residues result in CO₂ and methane emissions that pose risks to health and the environment. This is in addition to the negative impacts on the climate, which is expected to pose a serious threat for Egypt's agricultural land aggravating the food security situation in the country. Negative impacts include the reduction of

major crop production by an estimated 20% within the range of 40 years.

This is because of the expected rise in temperatures and the increasing need for water. It is also expected that the potential sea level rise will reduce up to between 12-15% of the existing agricultural land in the Nile Delta. The potential impacts of climate change may place Egypt in the not so distant future as one of the critically water scarce countries in the world.¹⁷⁸ This is in addition to the pollution impacts resulting from increased agricultural activity represented in industrial related agricultural activities, excessive use of fertilizers and herbicides/pesticides.

Challenges facing the agricultural sector

Rate of population increase, water scarcity, and increased world food prices are considered among the main challenges facing Egypt.

The following section attempt to identify more specifically, institutional, economic, social and environmental challenges facing the agricultural sector in Egypt.

*Institutional Challenges*¹⁷⁹

The institutional set up in the agricultural sector is characterized by being complex with duplication of responsibilities, conflict in some aspects and absence of institutional framework and appropriate instruments for implementation.

Main institutional challenges facing the agricultural sector in Egypt include the following:

- Institutional and organizational capacity and skills.
- Encroachment on cultivated land which reached 37,000 feddans annually, with an estimated 50,000 feddans lost to construction activities in 2014.¹⁸⁰
- Monitoring, law enforcement and compliance capacity.
- Farming systems that could cope with drought and water shortages.
- Adequate technical and financial support for small farmers.
- Support services to provide farm input, including seeds, fertilizers and credit.

- Subsidies provided to fertilizers and pesticides resulting in their excessive use with damaging effects to the environment and human health.
- Level of public spending on research and development to introduce low water consuming and drought resistant crops, as well as water efficient technologies and practices.
- Level of public sector investment in physical and social infrastructure in rural areas.
- Ineffective current tax and subsidy schemes.
- Small land ownership and the inequitable land distribution system and insecurity of land tenure.

Economic and technical challenges

Main economic challenges facing the agricultural sector in Egypt include the following:

- Relatively low share of contribution of the agriculture sector to GDP.
- Food imports amounting to more than 50% of local needs.
- Large subsidies (food and energy) representing about 13% of GDP.
- Post harvest losses amounting to between 25-25% for some products.
- Activities that are needed to increase the value added of agricultural products, including agricultural related industrial activities.
- Competitiveness of agricultural products.
- Adequate farming technologies needed to adjust the cropping systems/patterns to various zones.
- Scarcity and high cost of skilled and qualified agricultural labour.
- Necessary rural infrastructure and road/transport system needed to support agricultural activities.
- Due to lack of intensification and diversification of the agriculture sector, farm (agribusiness) and non-farm entrepreneurship are limited and are becoming scarcer day-by-day.
- Marketing policies and low market prices for some strategic crop.
- Information about market access requirements for international market.

Social Challenges

Main economic challenges facing the agricultural sector in Egypt include the following:

- Decreasing rates of employment opportunities in rural areas due to low rates of public and private sector investment in the agricultural activities, infrastructure and service sectors.
- Increased health problems resulting in high rates of morbidity and mortality among the rural poor due to the absence or insufficient levels of health services, adequate water and sanitation facilities.
- Poor health and sanitation, malnutrition and high family growth rates in rural areas, thus less productive agricultural labor force.
- High poverty rate in rural areas.
- High illiteracy rate in rural areas, especially among women who represent a large proportion of the agricultural labour. FAO estimates show that women represent a substantial share of the total agricultural labor force, as individual food producers or as agricultural workers, and that around 43% of the Egyptian female labor force is engaged in agricultural work.
- Increased migration from rural to urban areas resulting in increased pressure on urban areas, physical and social infrastructure and services, employment and housing resulting in the development of informal settlements and the negative social consequences associated with that, including the increased incidence of crime and use of drugs.
- Low private sector participation in agricultural and agricultural related activities, including industries that increases the value of agricultural products.
- Lack of awareness about sustainable agriculture practices and the opportunities it offers.

Environmental Challenge

Unsustainable agricultural practices in Egypt has contributed to the loss of agricultural biodiversity, increased desertification, land erosion, and increased loss of soil fertility.

The following are the main environmental problems and challenges associated with unsustainable agricultural practices in Egypt:

- Inadequate irrigation system, drought, inefficient use of water, and limited access of fresh (blue) water to inland and desert areas.
- It is estimated that almost 35% of Egyptian soil currently suffer from high salinity.¹¹
- The practices of the industrial farms disregard the need to work in harmony with environment (i.e., Land is used continuously and is not allowed sufficient time to rest and regain its productive capacity.
- Crops are not rotated in a way that allows soil replenishment.
- Very little use of recycled wastewater for growing fodder crops and forest areas.
- Over excessive use of organic and chemical fertilizers result in negative environmental impacts.
- Agricultural waste and associated agricultural related industries. The creation and disposal of such enormous quantities of waste with negative effects on the air water and soil.
- Factory farms emit harmful gases and particles such as methane and hydrogen sulfide, which can contribute to global warming and harm the health.
- Loss of land productivity due to the loss of natural nutrients in the soil.
- Excessive uses of chemical fertilizers and pesticides have turned agriculture into a leading source of water pollution and have caused pollution to the food chain.
- Air pollution resulting from the overuse of machinery, the mismanagement of manure, and the irresponsible feeding practices that characterize industrial farming.
- Lack of capacity to adapt and mitigate potential impacts of climate change.

Impact climate change on the agricultural sector

Egypt is one of the countries that is expected to be heavily impacted on as a result of climate change. The agriculture sector is the main sector to be affected. This is represented in the potential inundation of the Delta as a result of sea level rise, increase salinity of land and underground water, increased incidence of draught, desertification and frost. This is accompanied by the emergence of endemic diseases, with detrimental impacts on fauna and flora in Egypt. It is therefore essential that Egypt takes the necessary measures to in order to adapt as well as mitigate climate change. This includes policies that reduce CO2 emissions resulting from the burning of fossil fuel across sectors.

The series of measures need also be introduced to adapt to climate change, including, new plant varieties that are resistant to draught and salinity, variable climatic conditions from high temperatures to extreme cold weather and frost. It is also proposed that an early warning system should be used to predict these climatic variations before hand as a precautionary measure to address climate change impacts.¹⁸¹

Opportunities

The adoption of good agricultural practices can assist in sustaining high value agricultural production. Good agricultural practices entail wise use of agro-chemicals, fertilizers, water and other agricultural inputs. It also entails the application of technologies that will keep productivity high, while improving the quality of product. If there is viable agriculture in the old lands, there will be a room for expansion into new agricultural areas. Those areas should be predominantly export-oriented. Sustainable agricultural practices can help, not only prevent environmental degradation and depletion of natural resources, but also improve them. The rural households that pursue sustainable livelihood strategies are less prone to land loss to urbanization.¹⁸²

The amount of wheat straw produced annually in Egypt is about 7.3 million tonnes. The growing rate from using the same amount of feed could be doubled if the treatment process of the straw with urea could be introduced and adopted by farmers. Similarly, converting corn and sorghum straws to silage at the right time would improve its nutritional value. The total amount of farm residues is estimated to be more than 30 million tonnes annually. In addition, feed from various forms of waste totals some 3 million tonnes and includes: animal by-products (poultry manure and offal, tannery waste) and plant by-products (potatoes, tomatoes, oranges, grapes, dates, brewers' waste, and kitchen waste).¹⁸³

The Government aims at creating a rapid development of its infrastructure through larger public investments. It aims at attracting private

investors and promoting public-private-partnerships (PPP). Among its main objectives are achieving food security, and alleviating poverty, particularly in rural areas.¹⁸⁴

The use of biochar as a soil enhancer provides another opportunity for Egypt, which needs to be explored. Biochar is obtained from the carbonization of biomass (heating agricultural waste in the absence of oxygen. When used as a soil enhancer it can retain carbon, increase soil biodiversity, improve soil functions and reduce emission from biomass that if left unused would degrade to GHGs.¹⁸⁵

Vision

A vibrant sustainable agricultural sector that aims at achieving food security for the Egyptian population, contributes to GDP growth through increased output, value addition and trade, creates new job opportunities for the rural poor while preserving the environment and agricultural biodiversity.

Proposed 2030 Targets

- Increase contribution to GDP from 14.7%¹⁸⁶ to 20%. Increase share of employment from 29%¹⁸⁷ to reach 35%.
- Increase efficiency in the use of water. To increase efficiency in water lost through irrigation network from 70% to 80% and of irrigation from 50% to 80% covering an area of 8 million feddans by 2030.¹⁸⁸
- Limit the area cultivated rice in order to save water that can reach 12.4 billion m³.¹⁸⁹
- Increase the cultivated area by 1.25 million feddan by 2017 and by 3.1 million by 2030, as a result of water savings.¹⁹⁰
- Increase in cultivated crop area to reach 23 million feddans due to increased crop productivity and water efficiency.¹⁹¹
- Recycle 70% of agricultural waste.
- Reduce use of chemical fertilizers and pesticides by 20%.
- Create 4 million additional jobs in the agricultural sector and associated activities by 2030.¹⁹²

Framework

The proposed framework lays emphasis on greening the sector by integrating environmental considerations in agricultural activities with the aim of revitalizing and diversifying the sector, enhancing the competitiveness and market access of the agricultural products, enhancing food security potential, creating new employment opportunities, alleviating poverty and improving health, the environment and human welfare.

Implementation of the proposed framework should encourage investment in the agriculture sector and consequently its contribution to GDP, create jobs, and promote social cohesion and integration of the rural community in the Egyptian economy. It should achieve this, while preserving agricultural biodiversity, the environment and the ecosystem that supports it.

A strategic objective to absorb population growth in Egypt is to promote integrated sustainable communities in desert areas that support agricultural activities complemented by industrial related agricultural activities. Promoting sustainable agriculture is a key component of this approach.

In 2011, the MWRI started implementing a new strategy, which was developed by the Agricultural Research and Development Council (ARDC). The vision, towards 2030 has been articulated as follows: “to achieve a comprehensive economic and social development based on a dynamic agricultural sector capable of sustained and rapid growth, while paying a special attention to helping the underprivileged social groups and reducing rural poverty.”¹⁹³

Strategic objective 1

Promote the development and implementation of practices and solutions that enhance agricultural efficiency

Strategic Objective 2

Enhance the contribution of the agriculture sector to sustainable economic development, social integration and cohesion, and environmental integrity

Strategic Objective 3

Promote the efficient functioning and management of the agriculture sector

A framework with three tracks

The Government should develop a package of policies and initiatives to revitalize the agricultural sector. The package should include initiatives that need to be implemented immediately, those that set the stage for long-term interventions, and those that encourage research and development and technological development. The proposed initiatives need to be aligned with the overall strategic direction of the Government to achieve sustainable development, and consists of the following package of measures. The Government’s strategy follows three tracks. The three track approach proposes a set of actions that are intended to be implemented simultaneously and not sequentially.

Track 1: The transition track

This track is intended to focus on activities that need to be taken to enable the realizing short and medium-term objectives, while at the same time paving the way for the long-term transition of the sector to a more sustainable path. This includes introducing measures that promote sustainable agricultural practices, including resource efficiency, increased productivity, and waste reduction, producing compost from agricultural waste, and taking measures that introduces supporting industrial related agricultural activities that increases the value added of agricultural crops.

Track 2: The planning and preparation track

Track 2 focusses on actions and measures that needs to be take to ensure the development of the necessary infrastructure to enable the realization of the objectives of the framework. This includes the necessary infrastructure for modern irrigation system, including drip irrigation, roads, and water and sanitation networks, and off grid renewable energy installations.

It also includes, the conceptualization and implementation of a sustainable agricultural programme within integrated sustainable communities.

Track 3: The technology development track

Research and development should be targeted to support sustainable and organic agriculture. This includes R&D in new strains of seeds that use less water and are drought resistant, and promote the use of solar power in drip irrigation systems and for pumping underground water, the application of an efficient crop rotation system, the use of organic fertilizers, micro organisms and pesticide products that increases land productivity.

Strategic objective 1

Promote the development and implementation of practices and solutions that enhance agricultural efficiency

- Enhance efficiency in the use of natural resources and factor inputs and the adoption of sustainable practices and techniques in cultivation, storage, processing, transportation, packaging and handling of crops.
- Enhance the efficiency in the use of water through the introduction of water efficient techniques, measures, and irrigation equipment.
- Optimize the use of water resources in the agriculture sector that will lead to increased value of output per drop of water.
- Introduce innovative water efficient techniques (drip irrigation) in newly reclaimed land and the improvement of the irrigation system in existing cultivated areas.
- Promote irrigation practices that reduce water evaporation such as irrigation early in morning and after sunset.
- Introduce covered water irrigation systems, including the use of solar panels.
- In spite of the scarcity of rain water in Egypt, measures should be introduced to maximize the use of rain water (150-100 mm along the northern coast).¹⁹⁴
- Introduce new strains of crops that consume less water as compared to current ones.
- Increase the use of organic fertilizers that enhances the water retaining capacity of soil and reduce negative impacts on soil, water, and health.
- Organic fertilizers produced with the aid of minute living organisms has the ability to fix organic azot and facilitate the absorption of potassium and phosphorous and results in 20%-30% savings in synthetic fertilizers. This is in addition to increasing crop productivity.¹⁹⁵
- Optimize the use of energy, with increased reliance on renewal energy that will lead to increased value of output per unit of energy.
- Reduce the use of energy and increase the percentage of the use of energy from renewable sources in the total energy use in the sector.
- Use energy efficient irrigation equipment.
- Introduce solar powered systems, including solar run underground water pumps.
- Reduce loss of final products by improving storage and pre- and post-harvest practices.
- Support farmers in providing adequate storage facilities and transport systems to reduce post harvest losses.
- Adopt sustainable agriculture methods and techniques that promote and maintain land fertility and productivity.
- Reduce wastage throughout the cultivation, harvesting, processing, storage, transport, and packaging.
- Introduce and enforce cultivation practise, including crop rotation systems that allow the revitalization and the regaining of productive capacity of soil.
- Since encroachment on cultivated land is one of the main problems facing agricultural land, particularly in the Delta and Wadi (20,000 feddans lost annually), strict measures should be introduced to monitor and enforce laws that prohibit such actions.¹⁹⁶
- Loss of land fertility is another major problem facing agricultural land in Egypt. This requires the continuous the undertaking of soil survey on a periodic basis and subjecting these areas to an upgrading and soil enhancer system and connecting these areas to with proper and adequate drainage systems.¹⁹⁷
- Identification of draught and soil salinity resistant crops and enhancing the productivity of selected crops through integrated agricultural practices.¹⁹⁸

- Promote the use of bio technology to increase crop productivity (Wheat 3.6 tonne, rice 5.2 tonnes, maize 5 tonnes, sugar cane 65.4 tonne, beetroot 35 tonne, tomatoes 30 tonnes, etc).¹⁹⁹

Strategic objective 2

Enhance the contribution of the agriculture sector to sustainable economic development, social integration and cohesion, and environmental integrity

Economic Dimension

- Achieve self sufficiency in strategic crops, thus contributing to food security in food supply of strategic crops such as wheat, maize and sugar.²⁰⁰
- Increase competitiveness and market access of Egyptian agriculture products in national and international markets through resource efficiency and improved quality of products, use of environmentally friendly technologies and processes, and reduction in post harvest losses.
- A stable and predictable macroeconomic environment that encourages public and private sector investment in the agriculture.
- Improve the investment climate for agricultural related activities through regulatory and incentive reform package.
- Increase value addition of agriculture products and their contribution to the national economy.
- An efficient infrastructure system to support the development and efficient functioning of the agriculture sector.
- Maintain and increase crop productivity for cash and strategic crops.
- Give priority to the agriculture sector in policymaking and provide the necessary budgetary allocations to revitalize the sector.
- Develop a long-term action plan for a long that supports trade promotion of agricultural crops that Egypt possesses a comparative advantage.
- Promote an extensive programme for extension services to farmers to promote the introduction of

modern water and energy saving practices, the use of organic and environmentally friendly, and minute living organisms as a soil enhancer (Posasium and Phosphorous,) and pesticides.²⁰¹

- Promote agricultural tourism in protected areas and by hotels and restaurants to contribute to meeting the food demand tourists.
- Promote urban agriculture in designated urban public areas, including on house roofs and residential compounds.²⁰²
- Promote the development of agricultural industries and processes that increases the value added of agricultural products.
- Prepare an action plan for the provision of a network of rural infrastructure across Egypt.
- Continue to undertake research to identify drought resistant and less water consuming crop varieties.
- Improve productivity in the agriculture sector through the use of sustainable and organic farming.
- Direct public investment towards the agriculture sector as a traditionally lead economic sector and due to its importance in providing food for and increasing population and amidst increasing international food prices.
- Provide incentives to the private sector to invest in the agriculture sector not only to satisfy local demand but also for export.
- Assist farmers with innovative environmentally sound technologies, cultivation techniques and practices that increase efficiency and reduce costs.
- Promote sustainable and organic agriculture as a means to create a market niche for Egyptian products.
- Invest in green and sustainable infrastructure to support the development of rural areas and enhance its economic potential.
- Plant newly developed drought resistance varieties.

Social Dimension

- Develop an integrated rural community programme to promote the physical and social integration of rural areas within the country.
- Provide the necessary physical and social services in rural areas and newly created communities in order to discourage rural to urban migration, attract inhabitants in new settlements.
- Promote investment in agriculture and agricultural related activities and supporting industries and physical and social infrastructure.
- Efforts should be made to alter feeding habits in Egypt to reduce reliance on rice and wheat products, high in carbohydrates, and replace them with other food such as potatoes, beans, fruits, and vegetables.²⁰³
- Revive the traditional feeding habits that promote a balanced diet of proteins, carbohydrates, bring back the traditional feeding habits of the Egyptian farmer.²⁰⁴
- Provide education for women and youth in order to enhance their role in the economic and social activities of the rural community.
- In addition to providing sufficient budgetary provisions for to invest in physical rural infrastructure, priority should also be given to investing in human resources in order to promote the integration of the rural poor in the national community and economy.
- Direct investments in agricultural related industrial activities to increase the value added of agriculture crops, revitalize and diversify rural areas, and create new jobs for the local community.
- Increase public investment in the education system for the rural poor, including training programmes for teachers and train-the-trainers programmes, special programmes for women and the elderly.

Environmental Dimension

- The rational management of pesticides and fertilizers and the increased share of organic products. This should include the complete

- banning of harmful pesticides and fertilizers such as Urea.
- Promote the use of small living organisms in the soil as a means of fertilizers to support other fertilizers, as has been introduced in the governorates of Ismailia and Fayoum.²⁰⁵
- Prepare biological map for the Egyptian soil that also include agricultural biodiversity in Egypt to be used in determining the kind of crops to be cultivated in the different geographical locations in Egypt in a manner that does not result in negative impacts on biological diversity in the country.²⁰⁶
- Improve the quality of food chain and consequently health of the population.
- Develop and implement an integrated organic waste management system for the sector, including providing subsidies for farmers to encourage the introduction of sustainable and organic agriculture.
- Ensure the cultivation of 2 million feddans on a crop rotational basis (1 million feddan per rotation) of rice in the northern part of Egypt to protect the delta from salination.²⁰⁷
- Consideration should be given to the cultivation of bananas and sugar cane in upper Egypt, being most suited for cultivation in upper Egypt, as being two crops requiring relatively high amount of water.
- Introduce strict measures and enforcing mechanisms to prevent the discharge of municipal and industrial pollution in the Nile and its tributaries.

Introduce measures that prevent the mixing of industrial and municipal waste with agricultural waste.

- Promote integrated agricultural management that considers all aspects related to sustainable agriculture, including water efficiency, irrigation methods that optimizes the use of fertilizers that provides all the necessary and adequate nutritional elements for the plant.²⁰⁸
- Introduce modern monitoring and surveillance systems to predict natural risks.²⁰⁹

- Promote the resilience of the agriculture sector and enhance its capability to deal with climate change and variability.
- Promote the conservation of agricultural biodiversity through adoption of sustainable agriculture practices and techniques.
- Reduction in the use of pesticides and fertilizers, and the gradual shift towards environmentally friendly and organic alternatives.
- Ensure through the introduction of strict measures and the standards restricting the use of harmful pesticides and fertilizers and the use of polluted water and wastewater.
- Develop an integrated waste management programme to deal agriculture waste.
- Reduction in waste generated through the entire life cycle of the cultivation process, recycling of waste and the production of compost, fodder, and energy.
- Promote sustainable production and consumption patterns.
- Introduce innovative techniques and practices, including new strains of crops that can adapt to changing climatic conditions with due consideration to preserving the ecosystem and biodiversity.
- Introduce strict regulatory measures and control mechanisms for the use of chemical fertilizers and pesticides.
- Train farmers and extension works on the disadvantages of the excessive use of pesticides and fertilizers, particularly inorganic ones.
- Encourage through incentives and awareness raising and training the recycling of organic waste and the production of compost and biogas as well as fodder for animal feed.
- Reduce and eventually avoid the burning of agricultural waste and promote the conversion rural waste into compost and energy.
- Undertake measures to control the burning of agricultural waste.

- Introduce strict penalties for the burning of organic waste, while at the same time facilitating through direct Government support and incentives of converting the risk of burning into an opportunity.

Strategic Objective 3

Promote the efficient functioning and management of the agriculture sector

An institutional mechanism should be set up to ensure close coordination between relevant ministries and institutions in Egypt, including Ministry of Agriculture and Land Reclamation (MALR), Ministry of Water Resources and Irrigation (MWRI), Ministry of Housing, Utilities and Urban Development (MHUUD), Ministry of Electricity and Renewable Energy (MERE), and Ministry of Local Development (MoLD).

It should also be pointed out in this connection that clear responsibilities and division of labour between the Ministry of Agriculture and the Ministry of Water Resources and Irrigation that ensures adequate supply of water resources to the agricultural land by the latter, with the former Ministry taking charge of the on farm water management²¹⁰

The following are a set of measures that are proposed to be introduced to promote the efficient functioning of the agricultural sector:

A regulatory framework that supports the introduction and implementation of sustainable development practices in the sector.

- An effective package of market incentive measures that encourages sustainable practices and investment in the agriculture sector.
- An efficient management, monitoring and enforcement system in place.
- Promote the role of Government for the quality control of agricultural products, consumer protection, assist in providing marketing service for farmers, use of modern technologies in communication and extension services, standard settings, and the upgrading of agricultural infrastructure.²¹¹
- Increased number of skilled agriculture workers

- and farmers in sustainable agricultural practices and techniques.
- A long-term research and development programme to support the sustainability of the agriculture sector and the introduction of innovative agriculture practices.
- Increased public awareness for policy and decision makers and the general public to the importance of adopting sustainable production patterns in the agriculture sector.
- Strengthen the institutional capacity of Government entities responsible for the management and operation of the agriculture sector, including ensuring the adoption of a participatory process in the decision making process, transparency and accountability
- Enhance the effectiveness of laws and regulations related to agriculture that would lead to enhancing its contribution to the economy, while following a sustainable path.
- Promote the use of market-based incentives in encouraging sustainable agriculture practices and encouraging investment in the sector.
- Strengthen monitoring and enforcement mechanism in order to ensure compliance with regulations and policies.
- Enhance national capacities in innovative environmentally sound and sustainable agriculture practices.
- Promote research and development and technology development in green and sustainable agriculture technologies and practices.
- Review and restructuring of existing institutions involved in the management of the agriculture sector as appropriate.
- Review the existing regulatory framework related to the agriculture sector that promotes the greening and transitioning of the sector onto a more sustainable path.
- Develop a long-term capacity building programme to provide needed skills in the agriculture sector.
- Invest in human resource development through the development of an agricultural curriculum that

promotes the transitioning to a green and sustainable sector as well as the construction of schools, training centres and public awareness centres.

- Making information more accessible to farmers through different means: extension workers, media, videos, and the use of mobile phones to disseminate information.
- Promote the role of cooperatives that assist farmers in introducing good agricultural practices, the selection of crops, and the undertaking activities that promote the value added of their produce.²¹²
- Provide sufficient budgetary allocations for research and development and develop a long term R&D strategy to support the transitioning of the sector to a green and sustainable path.
- Provide incentives for the private sector to invest in R&D and invest in green and sustainable agriculture.
- Develop public awareness packages for different stakeholders to include policy and decision maker, entrepreneurs, private sector, investor, farmers, and the general public.

Potential Gains

- Giving priority to the agricultural sector with emphasis on promoting green and sustainable agriculture if properly designed and implemented can effectively support Egypt's efforts towards achieving sustainable development.
- One of the most important benefits of giving priority to the agricultural sector in Egypt is revitalizing the sector in a manner that it does not only increase its contribution to the national economy, but that it also lifts and upgrades the socioeconomic fabric of rural areas and provides the local communities with basic social and health services, employment opportunities and consequently integrates the rural population into the economy. This will effectively contribute to the gradual reduction in rural to urban migration and the negative socioeconomic and environmental implications this has on both rural and urban areas.
- Sustainable agriculture has the potential of

achieving food security through savings in the use of water; energy and other factor input, increased productivity and reduced costs. This will also reduce Government expenditures on imported food and eventually the large subsidy bill paid to support basic foodstuff. It is estimated that drip irrigation saves up to 40% of water consumption. This would mean about 32 billion m³ annually for Egypt.

- Sustainable agricultural practices have the potential of reducing costs through the use of organic fertilizers instead of chemical ones, reduced cost of water and energy, and efficiency in post harvest operations and increased productivity of land. It is estimated that these savings can range between 25-35%.²¹³
- Reducing the heavy dependence on chemical fertilizers and replacing it with locally produced organic fertilizer apart from the resulting environmental benefits it will save large amounts of Government spending that may reach over LE. 9 billion annually. It is estimated that about LE. 1 billion can be saved annually simply by converting 20% of the agriculture land into lands which use sustainable agricultural practices.²¹⁴
- Converting 500,000 tonnes of rice husk into
- compost or other uses are estimated to reduce CO₂ emissions by 32,500 tonnes annually.
- It has the potential of increasing competitiveness of agricultural products and the creation of new marked niches for Egyptian products that are grown sustainably, hence increased contribution to GDP.
- Sustainable organic agriculture is more profitable than conventionally grown crops and can fetch between 10% to 50% higher prices.
- Applying efficient and water saving irrigation systems will save large amounts of scarce water resources that can be directed towards the reclamation of additional desert land thus increasing the cultivated area in Egypt.
- Investing in sustainable agriculture has the

potential of creating new jobs. It is estimated that investment in sustainable agriculture crates three times as much as investments in conventional agriculture.

Indictors

- Reduce water consumption in the agriculture sector in Egypt by 20%.
- Reduce energy consumption in the agriculture sector in Egypt by 20%.
- Increase the contribution of the agriculture sector in Egypt by 30%.
- Increase value of export of agricultural products by 20% over current levels.
- Increase share of organic agriculture to represent 10% of total agriculture exports.
- Increase crop productivity by 15%.
- Create an additional 500,000 new jobs annually in the agriculture sector.
- Increase the share of the budget allocated to the agriculture sector by 20%.
- Budgetary allocations spent on research and development related to this subject representing 10% of total allocations to R&D.
- 10% annual reduction in the use of chemical fertilizers per crop of cultivated land.
- Reduce the incidence of disease attributed to the contamination of the food chain by an annual 15%.
- Budgetary allocations spent on research and development related to this subject representing 10% of total allocations to R&D.
- 10% annual reduction in the use of chemical fertilizers per crop of cultivated land.
- Reduce the incidence of disease attributed to the contamination of the food chain.
- Increase in the efficiency of the functioning and operation measured by the reduction of complaints by farmers and investors by annual rate of 15% over the previous year.

- Number of laws and regulations related to the greening of the sector developed, instituted in law and implemented.
- 15% annual increase in the share of organic waste recycled.
- Burning of organic waste completely banned by 2030.
- Reduction of identified and reported incidence of non compliance to laws and regulations by a 20% annual rate.
- An annual increase of 30% of the percentage share of educated and trained personnel in sustainable agriculture practices and techniques.
- Increase in the budgetary allocation to the agriculture sector by 25% by the public sector and 40% by the private sector.
- Increased awareness by different stakeholders to the importance of adopting a more sustainable path in the agriculture sector to the economy, health and human welfare.

**Roadmap to achieve the strategic vision
of the Agriculture Sector
2016-2017**

Actions/ Measures	Activity	Responsibility	Months	2016	2017
<i>Vision and Strategy</i>	<ul style="list-style-type: none"> Review and endorse the vision, strategy and a detailed implementation plan that meets the country's needs, priorities and socioeconomic circumstances 	MALR Cabinet	4-6	✓	
<i>Integrated Policymaking</i>	<ul style="list-style-type: none"> Develop and endorse a holistic and integrated approach that ensures the integration of social, environmental, and economic dimensions in the agriculture sector and within integrated sustainable communities. Undertake an assessment of existing regulatory & incentive measures & assess their impacts on the environment & resource efficiency with the objective of identifying measures & policies, including means of implementation that promote SCP & consequently resource efficiency in the agriculture sector. Develop an Action Plan for the implementation of the proposed agriculture strategy. Develop laws and regulations that promote the use of water and energy saving agricultural methods and techniques, reduce the use of chemical fertilizers and pesticides and replace them by environmentally sound ones, including organic material. Regulations should also include restricting the burning of agricultural waste and encouraging recycling and composting. Moreover, regulations should restrict the establishment of agricultural communities that depend solely on non-renewable underground sources of water that is likely to be depleted in the short run resulting in a reverse migration with all the negative economic, social and environmental implications associated with it (Ayman Abou Haddid). Create an institutional set up that ensures public participation, involvement of 	MALR in close consultation and collaboration with relevant Ministries MALR in collaboration with MoE MALR in collaboration with relevant ministries MALR in collaboration with relevant ministries MALR in collaboration with relevant ministries	Throughout 4-6 months 4-6 4-6	✓ ✓ ✓ ✓	✓ 115

	<p>relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on best available technologies and best environmental practices on sustainable agricultural practices.</p> <ul style="list-style-type: none"> Promote the use of a number of tools and measures that facilitates the adoption and implementation of sustainable and green agricultural practices, these include: life cycle analysis, producer responsibility, eco labelling schemes, and environmental management systems. The main aim is to ensure the integration of environmental considerations in the design and manufacturing of products. Introducing the concept of producer responsibility entails the application of the polluter pays principle, thus encouraging industry to design products that avoids and reduces waste and promotes reuse and recycling. 	MoE to take the lead role in promoting these tools and providing technical support to practitioners in the relevant Government departments	Throughout	✓	✓
Good governance and institutions	<ul style="list-style-type: none"> Identify action needed to reform/restructure or create an institutional mechanism that will be entrusted with coordinating action related to planning, implementation of agriculture related activities in an efficient, transparent and accountable manner. A set-up that allows inter-ministerial coordination to avoid redundancy, conflict of interest and overlap of responsibilities between different ministries. Moreover, in order to facilitate a transition to sustainable agricultural practices, policies related to energy, water, and land uses, which are under the jurisdiction of other sectoral ministries should be taken into account, thus necessitating close coordination with relevant ministries. Institution should function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources. 	MALR in collaboration with Ministry of Planning and relevant Ministries	1-2	✓	116
	<ul style="list-style-type: none"> Clearly identify the responsibilities of the Ministry of Agriculture and the institutions affiliated with it in formulating policies, research, extension work, development of action plan, monitoring and follow up, data gathering, planning provision of necessary infrastructure for reclaimed land. 	MALR in collaboration with Ministry of Planning and relevant Ministries	4	✓	
	<ul style="list-style-type: none"> Clearly identify the responsibilities of relevant entities involved in agriculture and agriculture related activities, integrating entities with similar responsibilities. 	MALR in collaboration with Ministry of Planning and relevant Ministries	3	✓	
	<ul style="list-style-type: none"> Restructuring of the Extension Services Authority and enhance its role in technology transfer to small and medium size enterprises. 	MALR	3	✓	

	<ul style="list-style-type: none"> Create an institutional set up that responsible for linking research centers with universities (Summary, Sustainable Agricultural Development Strategy 2030, Ministry of Agriculture and Land Reclamation, January 2009). 	MALR in collaboration with Ministry of Planning and relevant Ministries	3	✓	
	<ul style="list-style-type: none"> Closely link the development of the different strategies by the different related ministries, particularly the Ministry of Agriculture, Water, and Environment should be closely linked and well coordinated (Ayman Abou Haddid). 	MALR in collaboration with the Ministry of Planning and relevant Ministries	Throughout	✓	✓
	<ul style="list-style-type: none"> Institutional reform of the Agricultural Cooperatives to meet changing socioeconomic conditions and in a way that they are supportive to sustainable agriculture. 	MALR	3	✓	
	<ul style="list-style-type: none"> Ensure public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on best available technologies and best environmental practices on sustainable agricultural sector. 	MALR	Throughout	✓	✓
	<ul style="list-style-type: none"> Create within the Ministry of Environment a Unit to be entrusted with the responsibility of providing guidance and technical support related to green and sustainable agriculture. 	Ministry of Environment	1	✓	
	<ul style="list-style-type: none"> Identify a Government body to be entrusted with data gathering, updating and analysis. 	MALR in cooperation with Ministry of Planning and relevant Ministries	1	✓	
	<ul style="list-style-type: none"> Emphasis should be laid on monitoring and enforcement of regulations including those related to land encroachment with severe penalties as instituted in the law implemented. 	MALR	Throughout	✓	✓
Regulatory framework	<ul style="list-style-type: none"> Review agriculture legislation with a view to developing a package of regulatory supported by incentive measures and policies, that support sustainable agricultural practice, including organic agriculture and the use of renewable energy, and sustainable practices, throughout the entire life cycle of agricultural products. 	MALR in collaboration with the Ministry of Environment	6	✓	
		MALR in collaboration with	2		117

	<ul style="list-style-type: none"> As referred to in the Water Chapter enact a law regarding the use of recycled wastewater for agriculture purposes provided it meets acceptable health and environment standards and prohibit the use of freshwater in irrigating green areas (public and private). Include in law and implement a requirement for farmers to introduce innovative water efficient techniques (drip irrigation) in newly reclaimed land and the improvement of the irrigation system in existing cultivated areas. Develop and launch a labelling and certification scheme for sustainable and organic products. Institute in law the requirement for the mandatory recycling and implementation of agricultural waste to be implemented with necessary Government technical and financial support. Introduce and implement strict regulatory measures and control mechanisms for the use of chemical fertilizers and pesticides. 	<p>the MoE, Ministry of Water Resources and Irrigation</p> <p>ALRM</p> <p>MALR in collaboration with MoE</p> <p>thMALR in collaboration with MoE and Ministry of Finance</p> <p>ALR in collaboration with MoE and Ministry of Finance</p>	<p>Throughout</p> <p>3</p> <p>Throughout</p> <p>Throughout</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>
Economic instruments	<ul style="list-style-type: none"> Design market incentives to encourage investments in sustainable and organic agriculture as a means to create a market niche for Egyptian products. Measures may include subsidies and tax rebates and exemptions for farmers using energy and water saving equipment and measures, the introduction of water resistant crops and climate resilient crops. Introduce tax reform that ties taxes levied on the extent to which farmers adopt sustainability consideration in the entire life cycle for the production of crops. Introduce strict penalties for the burning of organic waste, while at the same time facilitating through direct Government support and incentives of converting the risk of burning into an opportunity Provide incentives to introduce covered and efficient irrigation systems, including the use of solar panels, use of new strains of crops that consumes less water as compared to current ones, and the use of organic fertilizers that enhances the water retaining capacity of soil, use energy efficient irrigation machines, Introduce solar powered systems, including solar-run underground water pumps. Provide incentives for farmers in providing adequate storage facilities and transport systems to reduce post-harvest losses. 	MALR in collaboration with the MoE, Ministry of Finance	3-4	✓	

Economic analysis	<ul style="list-style-type: none"> Undertake an economic analysis to assess the financial viability of the proposed plan to include costs and benefits. The latter should include the expected social and environmental benefits resulting from the proposed plan, including number of new jobs created. It should also identify budgetary requirements needed to finance the programme and sources of funding. 	MALR in collaboration with, Ministry of Finance	3-4	✓	
Government Procurement	<ul style="list-style-type: none"> Government to take the lead in promoting green and sustainable agriculture through direct public investment in the agriculture sector as a traditionally lead economic sector and due to its importance in providing food for increasing population and amidst increasing international food prices. Land reclaimed directly by MALR should adopt sustainable cultivation methods and practices setting the example for local and international investors. Invest in green and sustainable infrastructure to support the development of rural areas and enhance their economic potential. Public entities including ministries, public schools, hospitals, hotels to purchase sustainably grown and organic food and products. 	MALR in collaboration with Ministries	Throughout	✓	✓
Trade	<ul style="list-style-type: none"> Design trade policies to support sustainable and green agriculture sector through a tariff system that encourages the import of environmentally friendly technologies and encouraging the export of locally produced technologies. 	MALR in collaboration with eMinistry of Trad & Industry	2	✓	
Funding	<ul style="list-style-type: none"> Secure a stable and predictable source of funding for sustainable and green agriculture in order to ensure the continuity of services provided and meeting the set objectives of the programme Financial institutions should be requested to support financing investments in green and sustainable agriculture. Provide sufficient budgetary allocations for research and development and develop a long term R&D strategy to support the transitioning of the sector to a green and sustainable path Direct investments to agricultural related industrial activities to increase the value added of agriculture crops, revitalize and diversify rural areas, and create new jobs for the local community. 	Ministry of Planning, Monitoring, and Administrative Reform in collaboration with MALR	Throughout	✓	✓
Private sector	<ul style="list-style-type: none"> Encourage the private sector to be engage directly or through Public-Private-Partnership in investments in sustainable and organic agriculture projects and generally in non-conventional agricultural practices, such as the use of renewable sources of energy in the recycling and desalination of water, and the promotion of 	MALR in collaboration with Ministry of Environment, Ministry of Housing. Utilities and Urban Development, and Ministry	4-6	✓	

	<p>urban agriculture and agricultural tourism (Ayman Abou Haddid).</p> <ul style="list-style-type: none"> Develop a package of incentives and measures to encourage and promote the engagement of the private sector in sustainable agriculture projects, including industrial related agricultural projects that increase value added of agricultural products. 	<p>of Trade and industry</p> <p>MALR in collaboration with MoE, and Ministry of Trade and Industry</p>	4	✓	
Public Awareness	<ul style="list-style-type: none"> Develop and implement public awareness campaigns targeting different target groups highlighting the economic, social, health and environmental benefits of sustainable agriculture. The role of media can be significant in promoting sustainable agricultural patterns of cultivation and the benefits individuals and the economy of healthier food products. Promote the role of media is significant in demonstrating the economic and financial benefits of sustainable agricultural practices to different stakeholders. Designate a TV channel for promoting public awareness and education on sustainable agriculture. 	<p>MALR in collaboration with the Ministry of Environment, and Ministry of Education</p>	4 Throughout	✓ ✓	✓
Education	<ul style="list-style-type: none"> Investing in human resources in order to promote the integration of the rural poor in the national economy and provide the necessary calibres to support a sustainable agricultural sector within integrated sustainable communities. Develop and implement a curriculum for green and sustainable communities and buildings to be offered at the Egyptian Universities. This can be at the undergraduate and the post graduate level. Increase public investment in the education system for the rural poor, including training programmes for teachers and training the trainers, special programmes for farmers, women, youth and the elderly. 	<p>MALR in collaboration with Ministry of Education in close collaboration with public and private universities (Cairo and Ain shams University, the October 6th University, and the British University etc.</p>	Throughout	✓	✓
Capacity Development	<ul style="list-style-type: none"> Develop and implement a capacity building, educational, and a research and technology development programme that supports sustainable agriculture as well as tools and concepts that support this transition such as integrated assessment, life cycle assessment, green economy, and circular economy/closed loop economy. Promote the role of extension programmes to train farmers and raise their awareness to water and energy efficient agricultural practices and innovative environmentally friendly cultivation techniques and practices. Promote irrigation practices that reduces water evaporation such as irrigation after sunset, increases the use of organic fertilizers that enhances the water retaining capacity of soil, Introduce and enforce cultivation practise, including crop rotation systems that allow the revitalization and the regaining of productive capacity of soil. 	<p>MALR in collaboration with the Ministry of Environment, Ministry of Education, Ministry of Labour</p>	Throughout	✓	✓

	<ul style="list-style-type: none"> Assist farmers with innovative environmentally sound technologies, cultivation techniques and practices that increases efficiency and reduces costs. Train farmers and extension workers on sustainable agricultural practices and on the disadvantages of the excessive use of pesticides and fertilizers, particularly inorganic ones. 				
Monitoring and assessment	<ul style="list-style-type: none"> Develop, for adaptation at the national level of a framework for the efficient monitoring, enforcement, assessment and implementation of a system that ensures compliance & adherence to sustainability principles in agriculture, green & sustainable regulations, codes of practice & standards. The framework would also include the creation of a coordination mechanism to coordinate initiatives, programmes, & funding related to green & sustainable agriculture, as well as the creation of cooperatives to facilitate access to funds to finance sustainable and organic agriculture. Provide air and water quality monitoring stations to monitor air and water pollution and main pollutants on a continuous basis, including gaseous pollutants, and those resulting from the burning and accumulation of untreated agricultural residues and animal dung, and wastewater used for irrigation. 	MALR in collaboration with MoE, Ministry of Water Resources and Irrigation	Throughout	✓	✓
Research & development	<ul style="list-style-type: none"> Design and implement a long-term R&D programme in environmentally sound agriculture, energy and water saving equipment and infrastructure, practices and new strains of crops that consumes less water and that are draught resistant and resilient to climate change. The development of this programme to be developed by the Academy of Scientific Research in close consultation and collaboration with the Ministry of Environment, and other relevant ministries and research bodies and think tanks. Provide incentives for the private sector in the form of tax cuts and rebates and other incentives to invest in R&D and invest in green and sustainable agriculture. 	Academy of Scientific Research in close consultation and collaboration with MALR and Ministry of Environment	4-6 Throughout	✓ ✓	✓ ✓
		MALR in collaboration with Ministry of Trade and Industry, and Ministry of Finance	Throughout	✓	✓
Indicators	<ul style="list-style-type: none"> Monitor and assess the achievement of the objectives and targets and implementation of road map based on the identified set of indicators. Review indicators and adjust as appropriate in order to ensure achieve the sustainability objectives identified for the sector. 	MALR in collaboration with the Ministry of Environment	3-4 Throughout	✓ ✓	✓
Regional & International Cooperation	<ul style="list-style-type: none"> Promote regional and international cooperation in the field of sustainable and green agriculture sector by being an active member/partner in organizations such is the International Federation of Agriculture (IFOAM), FAO, IFAD, WFP 	MALR in collaboration with the Ministry of Environment, Ministry of	Throughout	✓	✓

	<ul style="list-style-type: none"> Create specialized committees to promote cooperation with countries with potential investment opportunities universities (Summary, Sustainable Agricultural Development Strategy 2030, Ministry of Agriculture and Land Reclamation, January 2009) 	Foreign Affairs			122
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Acronyms

ABS	Access and Benefit Sharing
CBD	Convention Biological Diversity
EEAA	Egyptian Environmental Affairs Agency
MALR	Ministry of agriculture and Land Reclamation
MoE	Ministry of Environment
NBSAP	National Biodiversity Strategy and Action Plan
NCS	Nature Conservation Sector
PAs	Protected Areas
SDGs	Sustainable Development Goals

Introduction

Biodiversity is the sphere of life on earth that encompasses ecosystems, natural habitats, fauna and flora, microbial species, and genetic resources. Biodiversity provides food, fuel, and construction material. It also provides services such as waste purification and decomposition, climate regulation, disaster alleviation, soil fertility and renewal, disease combating, and maintains genetic resources (crops, breeds, animal wealth, medicine and other products). Biodiversity is therefore the basis for life, human prosperity, and civilization, and through its conservation it provides the essential elements for existing and future generations (Fouda, 2009).

The UN Charter defines biodiversity (1992) as the variability among species of plants, animals, and micro organisms and other forms of life. This includes genetic variations, and ecosystems that interact with one another, and with the environment.²¹⁵ It is estimated that biodiversity and ecosystem services are valued at US\$ 30-100 trillion a year, compared to US\$ 90 trillion representing the world GDP for 2013 (Sachs, 2015).²¹⁶

Accordingly, biodiversity is the pillar on which human prosperity, survival, and culture depends. Thus, conserving biodiversity is preserving humanity and making available its treasures for current and future generations. However, biodiversity faces many threats, most important of which are the destruction of habitats, the over use of natural resources such as medicinal plants and fish, pollution, and impact of invasive species and climate change. This is in addition to the negative impacts resulting from population pressures and increased economic activities. It is no longer acceptable to continue to address biodiversity in isolation from social considerations (poverty, health, and responding to environmental changes). Social and environmental considerations are in fact one of the main aspects responsible for the current state of our ecosystems (Fouda, 2009).

Biodiversity provides the basis for sustainable development and human welfare through, a) Components of biodiversity (Types, habitats, ecosystems, genetic heritage), natural wealth that is necessary for human development, including food, energy, health (medicinal plants). This is achieved through managing farming techniques and natural ecosystems. b) Biodiversity supports natural ecosystems that provide services such as clean water, pollination, controlling pests and diseases and as well as other services. c) The provisioning of ecosystems and biomes, as well as genetic diversity to satisfy current and future needs. This is represented in the form of forests, coral reefs, mangrove trees, wetlands, all of which enhances the ability of the ecosystem to deal with current threats such as changing climates (resilience and adaptation). d) Biodiversity also provides spiritual, mental, and psychological benefits.

Biodiversity and the service it provides is vital for human survival, especially for the poor and marginalized communities that directly rely on biodiversity and the proper functioning of the ecosystems. Furthermore, the natural processes that biodiversity provides are considered a social safety net. Humans utilize ecosystem services and the natural process in variety of ways, some immediately, while others take generations for their benefits to be reaped. Maintaining these ecosystems in an environmentally sound manner guarantees their continued support for economic activities that contribute to national GDP, and therefore directly improves the standard of living of people who rely on agriculture, tourism, industry and trade.

Loss of biodiversity therefore has negative implications that affect all humans, especially the poor. Furthermore loss of biodiversity is likely to threaten natural processes. On the other hand, conserving biodiversity and its sustainable management contributes towards achieving

sustainable development, as well as increasing resilience and adaptation to climate changes.

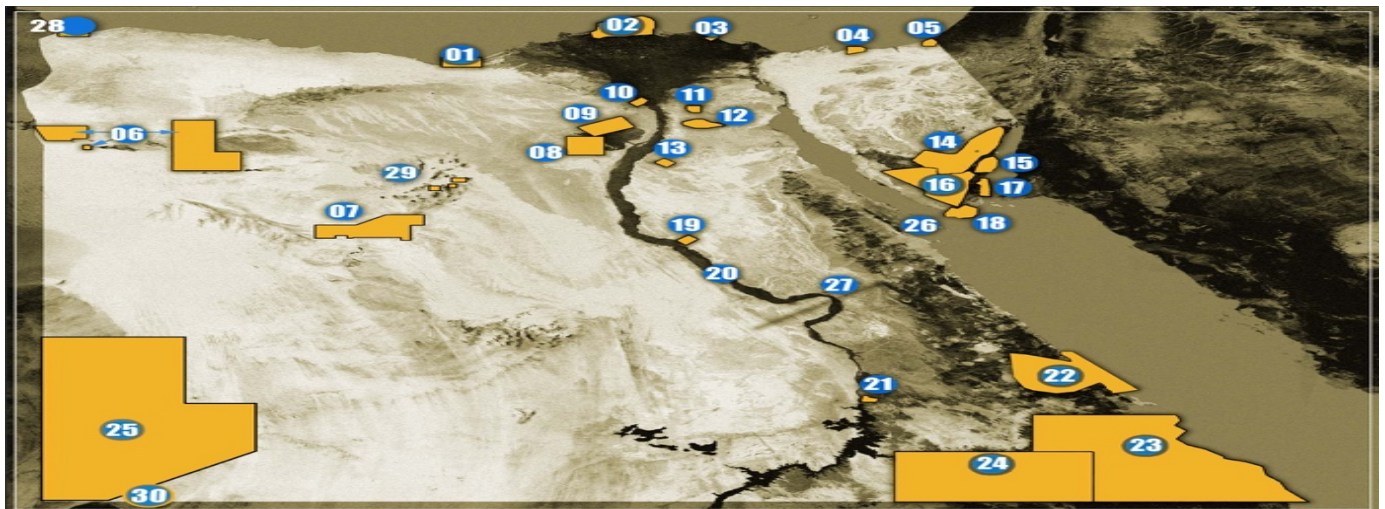
Overview

Egypt's natural wealth has been the main foundation that nurtured its civilization since ancient times.

Egypt possesses a wide range of ecosystems and habitats (valleys, lakes, sand dunes, fresh and salt water, corals, mangrove trees, sand and rocky beaches, islands, oasis, lakes, and hot springs). It is also the habitat of more than 22,000 species of plants and animals that live in the Red and Mediterranean seas, the Nile River, the Delta, the mountains of Sinai, and the Egyptian deserts and valleys²¹⁷. Along with this, Egypt contains many cultural heritage sites that are of great value to humanity as a whole, and some of these resources are related to geological time periods. This is evidenced by discoveries of skeletons of whales in the Western Desert in Wadi El-Rayan (a world heritage site). Furthermore, some of the sites can be traced to the Stone Age, more than 10,000 years ago. For example the swimmers'

cave, and the monsters in the Great Gilf National Park in the Western Desert are full of rock arts dated more than 20,000 years ago, which show human development from hunting to settlements (Fouda, 2015).

Egypt's wealth depends on its agricultural biodiversity represented in its fish diversity and food products. Biodiversity in Egypt supports economic activities such as ecotourism and medicinal industries which are based on the traditional methods and endemic plants found only in Egypt. As referred to earlier in the Agriculture Chapter, agriculture contributes 14.8% of the national income, and more than 20% of national exports, and employs 32% of the work force. Annual production of fish exceeds a million tonne, and represents more than 1% of the national income; while tourism contributes more than 11.2% of national income, and employs 12.6% of the workforce, and provides 19.2% of Egypt's foreign currency (Figures of 2010) (Fouda, 2013).



Protected Areas in Egypt

1-El Omayed 2- Lake Burullus 3-Ashtum El Gamil 4-Zaranik 5-Alahrash 6-Siwa 7-The White Desert 8- Wadi El-Rayan 9- Lake Qarun 10- El Hassana Dome 11-Maadi Petrified Forest 12- Wadi Degla 13- Wadi Sannur 14- Taba 15-Abu Galum 16-St Katherine 17- Nabq 18-Ras Mohamed 19-Wadi El Asyuti 20-The Nile River Islands 21- Saluga-Ghazal 22-Wadi El-Gemal 23-Elba 24-Wadi Alaqi 25-Gilf Kebir 26-The Northern Red Sea Islands 27-Umm Dababeyya 28-Salum 29-Bahariya 30-Nayzak Kamel Mountain

In the last three decades, Egypt has laid emphasis on conserving its natural resources, and has thus set in place a system and laws for protecting the natural heritage for the sake of current and future generations. The first law, Law No. 102 issued in 1983, relates to Protected Areas (PAs). This was followed by declaring Ras Mohamed National Park, located in southern Sinai as the first protected area in Egypt. Several protected areas were then established, now reaching 30 PAs, representing 15% of the Egypt's total area, including most of its natural ecosystems and resources. Examples of marine protected areas include Red Sea islands, Ras Mohamed, Salloum, Nabq, Elba, Wadi El-Gemal, whereas Ramsar sites (wetlands) are Nile islands, Zaranik, Burullus, Ashtoum El-Gamil, Qarun, and Wadi El-Rayan. Geological protected areas are Pertified forests, El-Hasana Dome, and Sannur Cave. Desert Protected areas include Siwa, Al Omayed, White desert, Gilf El kebir, and St. Katherine.

From the early days of the 80's till now, a multitude of skills and experiences in expanding and maintaining protected areas and biodiversity were acquired. This period was divided into 3 eras, where the first was strictly concerned with absolute protection, the second during the nineties where the main concern were conservation and sustainable development, and the current period which is mainly concerned with integrated management based on an ecosystem approach, including human beings. The main priority has now become the protection of the environment for the sake of human prosperity (Fouda, 2013).

The Egyptian national biodiversity strategy and action plan was prepared in 1997 and approved in November 1998 was incorporated into the country's plans by the Ministries of Planning and Finance (Kassas, 1998, 2000, 2008; EEAA,2007). The biodiversity strategy consists of 4 parts:

Part I includes Egypt's geographic location, climatic zones, population concentrations, renewable and non-renewable resources, conservation of natural

resources and wildlife, and protected areas, and current status of studies, research.

Part II addresses the following six main goals:

- Management of natural resources and their different components based on sound scientific and economic analysis.
- Enhance scientific and technical capacities in the field of conservation of biodiversity, as well as the managerial and executive capabilities.
- Mobilize public support and participation in biodiversity conservation efforts.
- Develop a work programme that aims at including people as individuals and communities in nature conservation efforts.
- Establish judicial groundwork, economic and social incentives that support biodiversity conservation and sustainable development of natural resources.
- Complement national efforts with regional and international work for biodiversity conservation.

Part III includes three main programmes, which are:

- Research programmes for surveying biodiversity, monitoring and evaluation.
- Applied biodiversity projects and management.
- Programmes for support and management tools.

Part IV consists of: national level projects, network of protected areas, Egyptian museum of natural history, national gene bank, captive breeding and rehabilitation of endangered species, national project for research and surveying biodiversity, national information network for biodiversity, national programme for capacity development, and the national programme to enhance awareness, knowledge, and education. This is in addition to the establishment of the necessary infrastructure in the form of national legislation and processes that supports the sustainable management of biodiversity.

Main activities used to assess biodiversity include updating databases on biodiversity, surveys and bio maps for habitat restoration, and evaluation of threatened species. Other activities include participating in combating the bird flu disease with a

complete environmental survey inside and outside protected areas, and compiling data in a central database and continuously updating it.

Furthermore, additional activities included working on protecting sensitive habitats that are not currently within protected areas, identifying gaps in the system of protecting biomes, identifying rare and endangered species, determining methods for regular updating of surveys across all protected areas, and completing the biodiversity registry for Egypt.

Currently there exists nearly three million different datasets for all species of plants and animals that are currently being collected from available surveys and research material, lab samples available within

Egypt and international museums, as well as the registries available within the protected areas (Gilbert and Zalaat, 2007, Fouda, 2009, 2013; Basouny, et al, 2010). Accordingly, there is now a reliable registry of Egypt's wildlife, which includes about 22 thousand species. Information provided includes timeframes in which the data was logged, maps and graphs predicting the size and spread of different species of plants and animals, as well as necessary precautions for protecting them. Furthermore, the database for biodiversity has recently been updated and is now available online in Arabic and English. There is also a database for information on the biodiversity forum www.EPASP.org/materials

Biodiversity Indicators

#		Unit	2010
1-	Total Space Available to Protected Areas	km ²	150000
	Percentage of Protected Areas from Egypt	%	15%
2-	Number of Species known	#	>22000
	Mammals	#	110
	Birds	#	485
	Reptiles	#	112
	Amphibians	#	9
	Fish	#	1200
	Invertebrates	#	>15000
	Vascular Plants	#	2145
	Fungi	#	>2000
	Marine Algae	#	>1000
3-	Percentage of Endangered Species		
	Mammals	72	65.5%
	Birds	60	12.6%
	Reptiles	47	42.0%
	Amphibians	2	22.2%
	Fish	52	04.3%*
	Invertebrates	205	01.7%*
	Vascular Plants	450	21.0%

Source: Fouda, 20115

Similarly, plants are preserved either in protected areas or in the herbaria of scientific institutions, universities (the herbarium at the botany department of Cairo University has the largest specimen collections in the Middle East).²¹⁸ This is in addition

to the Ministry of Agriculture and Land Reclamation, and the various botanical gardens in Cairo, Aswan, Alexandria and Sharm El-Sheikh. Information is documented in numerous books of flora in Egypt.

A new methodology for mainstreaming biodiversity within all economic sectors is currently being developed. These include tourism, fishing, and agriculture. The outcome of the RIO+20 conference held in Rio in June 2012, emphasized that the roadmap for sustainable development must include financial and institutional reforms, as well as the implementation of environmentally friendly economic strategies, co-operation between the signatories of the Rio accords regarding biodiversity, climate change, and desertification (RIO+20, 2012).

Furthermore, studies have shown that the tropical ecosystems of mangrove trees are capable of storing four times the amount of carbon dioxide that rain forests can store. The effects of coral bleaching have become obvious in the southern parts of the Egyptian Red Sea, and plant communities are heading towards higher altitude such as in the St. Katharine Mountain. Studies have also shown that many of the birds, mammals, reptiles, and aphids have undergone changes in their migratory patterns in terms of timing and locations, and this phenomenon is on the rise due to climate change.

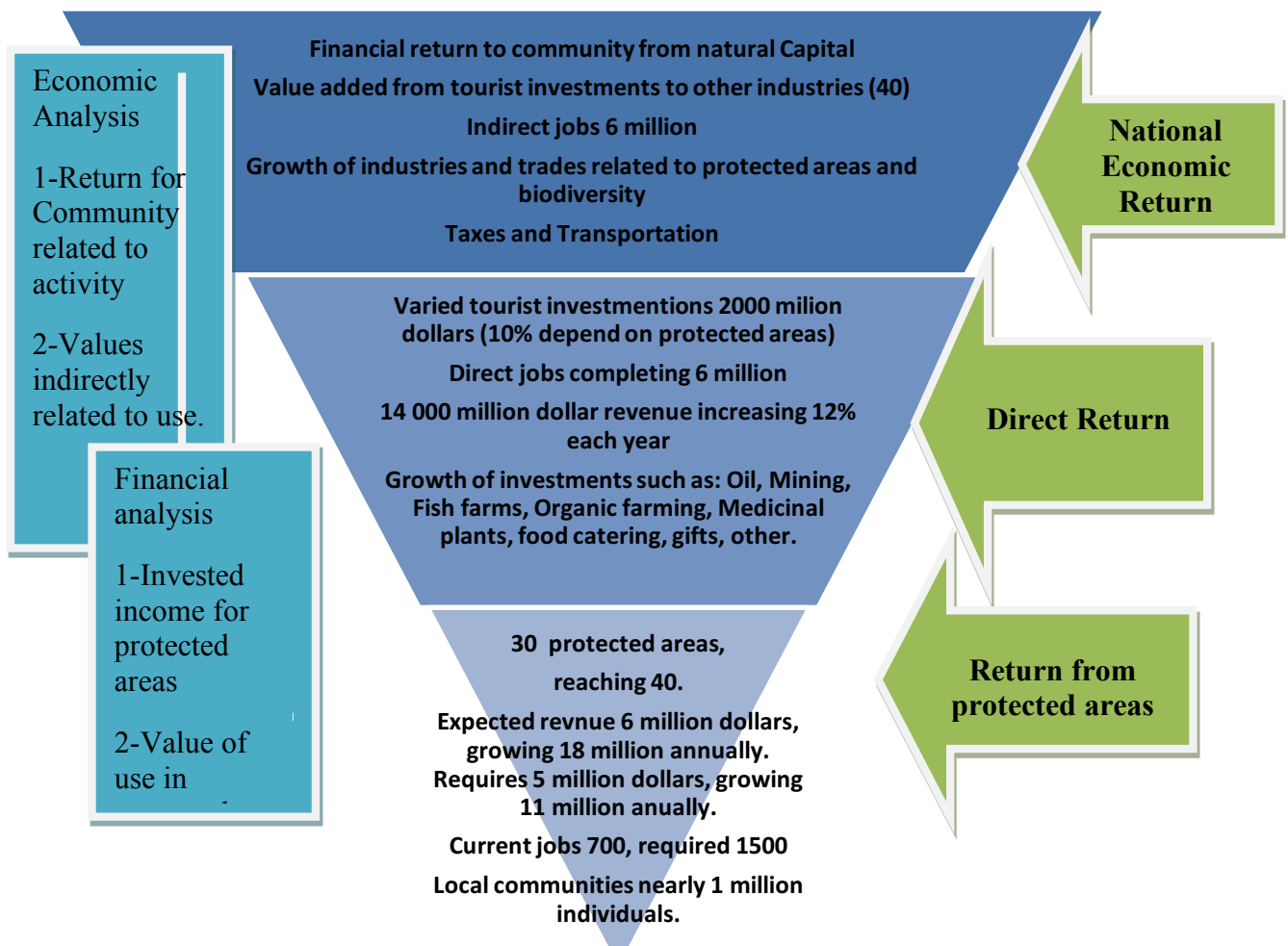
Adopting an ecosystem approach, entails the mainstreaming of biodiversity in all relevant development sectors. This requires a great deal of effort, considering that this concept is still in its early stages, and has not yet been fully understood by many decision makers.

Economic analysis related to nature conservation in Egypt estimates the value of protected areas at 2000 million EGP. Investments in the tourism sector is

estimated at US\$ 2000 million (60% of which is related to natural reserves). Full time jobs related to biodiversity is about 6 million, while revenue from tourism is US\$ 14,000 million annually, and is increasing at an annual rate of 12% as referred to in figure below. There is also an increase in investments in natural reserves including, oil production, mining, fish farms, organic farming, medicinal plants and other industrial products. More than a million citizens live within or outside protected areas (Fouda, 2013).

Despite successes in the field of nature conservation, it is no longer acceptable that these programmes are developed and implemented without taking into account human welfare. It is therefore essential that the main objective of these programmes should be to enhance living standards and human wellbeing. Maintaining the ecosystem and protecting biodiversity should result in promoting ecotourism, rural community development, and providing clean water for local communities.

Due to extreme pressures on natural resources resulting from the exponential rate of population growth, and expansions in industrial, agricultural, and tourism related activities, a new approach for protecting biodiversity that supports sustainable development is needed. This requires a full reworking and revisiting of the goals laid out for conservation, with human welfare at their core. Protected areas are vital for achieving these goals as it provides a number of benefits and services outside of their geographical borders.



Challenges facing Biodiversity Conservation in Egypt

Economic and Institutional Challenges

- Lack of an institutional setup that ensures the integration of biodiversity concerns in the different sectors.
- Lack of co-operation and co-ordination between the different economic sectors to support biodiversity conservation.
- Shortage of funding for biodiversity monitoring and maintaining Protected Areas.
- Lost opportunities due to lack of funding.
- Limited investments in Protected Areas.
- Revenues generated from eco-tourism in protected areas are not retained for their maintenance.

Social Challenges

- Limited participation by local communities in PA management (co-management).
- Poverty and limited job opportunities in many protected areas.
- Poor land use planning.
- Unsustainable production and consumption patterns.
- Limited understanding of the value and importance of biodiversity and ecosystem services for human well-being.
- Population increase and the pressure it represents on biodiversity.

Environmental challenges

- Rate of change and destruction of biomes resulting in habitat fragmentation.
- The potential negative impacts of climate change on biodiversity.
- Pollution of the natural biomes (all kinds of pollution).
- The negative impacts of invasive species on biodiversity.
- Unsustainable fishing practices resulting in over fishing and depletion of some fish species.

Strategic Plan and the AICHI Biodiversity Targets 2011-2020

The purpose of the Strategic Plan for Biodiversity 2011-2020 is to promote effective implementation of the Biodiversity Convention through a strategic approach, comprising a shared vision, a mission, and strategic goals. It also draws on and is consistent with the 20 “Aichi Biodiversity Targets”, adopted in 2010 at Nagoya Japan during the biodiversity COP 10. The Strategic Plan also provides a flexible framework for the establishment of national and regional targets and for enhancing coherence in the implementation of the provisions of the CBD Convention and the decisions of the Conference of the Parties, including the programmes of work and the Global Strategy for Plant Conservation, as well as the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising from their Utilization. It also serves as the basis for the development of communication tools capable of attracting the attention of and engaging stakeholders, thereby facilitating the mainstreaming of biodiversity into broader national and global agendas.

Vision

“Living in harmony with nature” where “By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.”

The proposed vision is based on the past, current and future biodiversity activities nationally and internationally. These include the Egyptian biodiversity strategy and action plan, strategic plan for the Convention on Biological diversity (CBD), approved sustainable development goals (post 2015), reviewing achievements and shortfalls made during the last 3 decades (EEAA, 2014)²¹⁹, and consultation with all relevant stakeholders and experts (Ministry of Planning; Abaza et al, 2013; El-Gebali, 2012; El-Lahham, 2014). Efforts are being made to update the current biodiversity strategy and action plan in accordance with the new CBD strategic plan (2010–2020).

Mission

Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet’s diversity, and contributing to human well-being, and poverty eradication. In order to ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of the utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making process is based on sound science a precautionary approach.

Strategic goals and the AICHI Biodiversity Targets

The strategic plan includes 20 targets for 2015 and 2020 for the “Aichi Biodiversity Targets”, organized under five strategic goals. The goals and targets comprise both: (i) aspirations for achieving the goals at the global level; and (ii) a flexible framework for the establishment of national or regional targets. Parties are invited to set their own targets within this flexible framework, taking into account national

needs and priorities, while also bearing in mind national contributions in order to achieve the global targets. Not all countries necessarily need to develop a national target for each and every global target. For some countries, the global threshold set through certain targets may already have been achieved. Other targets may not be relevant for some countries.

Strategic goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across Government and society by 2020

Target 1: Different stakeholders are aware of the value of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: Biodiversity values to be integrated into national and local development and poverty reduction strategies and planning processes and incorporated into national accounting and reporting systems, appropriate.

Target 3: Incentives, including, perverse subsidies to be phased out in order to minimize or avoid negative impacts on biodiversity. Positive incentives for the conservation and sustainable use of biodiversity should be developed and applied. They should be consistent with the convention and other relevant international obligations, taking into account national socio-economic circumstances.

Target 4: Governments, business and stakeholders at all levels should take steps to achieve or implement plans to promote sustainable production and consumption and ensure the use of natural resources within safe ecological limits.

Strategic goal B. Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: Rate of loss of all natural habitats, including forests, should at least be halved and where feasible brought close to zero, and degradation and fragmentation of biodiversity is significantly reduced.

Target 6: Stocks of invertebrate and aquatic plants are managed and harvested legally and sustainably. Moreover, an ecosystem based approaches should be encouraged and applied in order to avoid overfishing with recovery plans and measures for all depleted species and fisheries are introduced with threatened species and vulnerable ecosystems and the impacts of fisheries, animal species and ecosystems are kept within safe ecological limits.

Target 7: Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: Pollution, including from excessive use of nutrients, has been brought to levels that are not detrimental to ecosystem functioning and biodiversity.

Target 9: Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10: The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: At least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12: The extinction of known threatened

species have been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15: Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic goal E. Enhance implementation through participatory planning, knowledge management and capacity building

Target 17: Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18: The traditional knowledge, innovations and practices of indigenous and local communities

relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19: Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20: The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

Implementation, monitoring, review and evaluation

- Means for implementation
- Programmes of work
- Broadening political support
- Partnerships
- Reporting by Parties
- Review by the Conference of the Parties

Support Mechanisms

- Capacity-building for effective national action
- Clearing-house mechanism and technology transfer
- Financial resources
- Partnerships and initiatives to enhance cooperation
- Support mechanisms for research, monitoring and assessment

Sustainable Development Goals

The nature and scope of the post-2015 development agenda as reflected in the final document provides an ambitious vision.

The agenda is intended to be collaborative and transformational, and addresses, in an integrated manner, environmental, social and economic objectives, while emphasizing that poverty eradication. The sustainable development goals (17) and targets (169) were submitted to UN General Assembly, and approved on 27th of September 2015.

Goals 14 and 15 are directly related to biodiversity conservation (both marine and terrestrial biodiversity). There are also other goals that are indirectly related to biodiversity such as goal 2 (food security) goal 6 (water management), goal 11 (sustainable cities), goal 12 (sustainable production and consumption), and goal 13 (climate change).

Fundamental principles for national sustainable natural resources

- Organizational structuring and political will require changes: (1) From bureaucratic management into the culture of a more focused effort leading towards achieving the set goals, (2) From central planning related to budgets to financial and technical adaptation, using innovative approaches implemented in many countries such as South Africa (3) From taking individual decisions to taking decisions based on sector wide policies and rules, and (4) From relying on external funding to relying on local resources.
- Raising the level of co-ordination between the Ministry of the Environment and other relevant ministries, such as the Ministry of Agriculture and Land Reclamation, Water Resources, Energy, Industry, Local Development, and Tourism²²⁰.
- A fundamental change in the approach and priority setting by decision makers, and adopting a transparent and participatory approach involving all relevant stakeholders, including the private sector and the local community. This would require a change in how the Government goes about its planning process.
- There is a need to change from a top down approach to a participatory, bottom up approach, where all

options for a spatial area are identified taking into account climatic conditions, soil, topography, and the ecosystem. A scenario planning in St. Catherine PA was undertaken, with local communities given the opportunity to explore all options for future activities and involvement in co-management (UNEP, 2009).

- Create new avenues for investment in biodiversity and protected areas, including enhancing the value of environmental products.²²¹
- Plans, programmes, and projects should be flexible and adaptable to new circumstances and developments²²².
- Increase the competitiveness of local products through the organic cultivation of medicinal plants and herbs, and other local community product through. Regulatory and market incentive measures can be introduced to encourage²²³.
- Enhance the direct and indirect impacts on biodiversity conservation by promoting sustainable consumption, life styles, improved public engagement, pricing and positive incentives, efficient use of water, energy, and other natural resources²²⁴.
- The cost of conservation of biodiversity should include benefits derived from ecosystem services.
- Reinforce the law, technical know how, and measures needed to protect the environment.
- Utilize modern technologies, including upgrading communication networks and information systems related to nature conservation, preserving of natural resources, and modern methods of surveying.
- Promote public participation and co-operation, through working with local and civil communities, reinforcing the role of women, marginalized communities and the handicapped, and further enhance environmental knowledge and awareness, through the co-management of local natural resources.
- Implementing and activating an effective system for a sustainable network of protected areas in order to maintain biodiversity in Egypt, based on sound

economic analysis and finance mechanisms (traditional and innovative approaches such as payment for ecosystem services and biodiversity offsets) and through special marketing techniques.

- Develop policies that support biodiversity conservation and sustainable development.
- Reduce the financial burden on the Government by promoting the sustainability and self sufficiency of biodiversity conservation related efforts in Egypt.
- Enhance the capacity of all the workforce involved in nature conservation and protected areas.
- Lay emphasis on evaluating ecosystem services provided, and mainstreaming of biodiversity in all related sectors.
- Invest in human resources as a key component in transitioning towards a green economy and sustainable development.
- Promote social justice in the distribution of benefits of ecosystem services among the different segments of the community, without burdening future generations with the potential negative impacts from proposed strategies.
- Integrate marginalized communities and fully taking into account their needs and priorities when proposing and implementing policies.
- Create new job opportunities in the different fields related to nature conservation and protected areas, taking into account the employment needs for local and marginalized communities.
- Encourage environmentally friendly practices and technologies and use of clean and renewable sources of energy, as well as integrated land use planning that takes fully into account biodiversity conservation.
- Use indicators that reflect the economic, ecological, and social dimensions. It is important to identify who will monitor, how often indicators will be checked and reported, and who has the overall responsibility for compiling information and reporting. It is expected that EEAA will be responsible for all monitoring received from relevant sectors.

Sustainable Policies for Nature Conservation

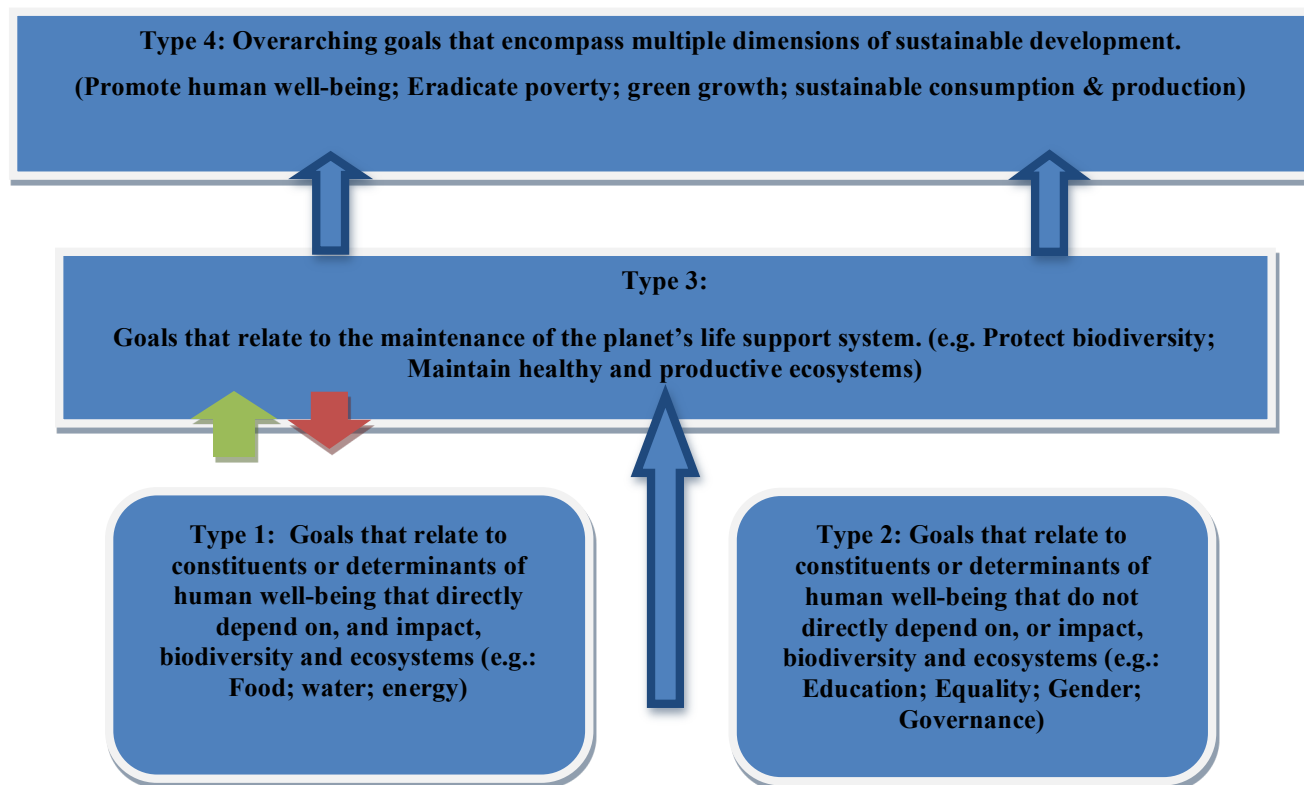
The sustainability of biodiversity resources should be achieved within a framework where conservation and benefit sharing is delicately balanced. This is based on the successes of the past 20 years, as well as the new and innovative plans and guidelines put in place for the next 20 years. This requires an institutional reform to lead this process with support from the Ministry of the Environment. At the same time this puts into perspective the strategic importance of conserving biodiversity due to its numerous benefits and services, as well as its positive support to the economy.

In order to ensure the sustainability of biodiversity resources, it is essential to take into account the potential impact of policy changes on the different segments of the population, ensuring that not one is left behind during this transformational process.

Policy packages should be developed and introduced to support sustainable production and sustainable consumption, and improve the management of natural resources. A strong governance system needs to be in place to support achieving this end. New guidelines for the sustainable management of biodiversity should be developed in accordance with the sustainable development goals.

Biodiversity should not only be considered as a natural resource that should be properly managed, but as an essential component for achieving sustainable development.

Options that are up for discussion, include the national strategy for biodiversity, which was agreed upon in 1998, where it's objective still require sometime to complete, taking into account scientific and local advancements in the field of biodiversity. Goals to be considered, include those referred to in the diagram below.



Proposed procedures and activities

This section provides a set of activities that have been identified on the basis of scientific and political analysis.

Activities

- Collection of fundamental information regarding biodiversity and relevant traditional knowledge, including the use of surveys.
- Assess the current implications of current policies on the economy, the environment, society, and local communities.
- Sharing all available data publicly and discussing them before preparing a national strategy.
- Design and selection of policy tools and measures.
- Prepare and implement plans for biodiversity conservation, including raising awareness, and enforcement.
- Strengthen human, institutional, and social capacities (all who benefit from nature conservation).
- Promote innovation, and good governance.

New and Innovative Initiatives

- Green economy
- Payment for ecosystem services
- Biodiversity offset (rewards)
- Environmental footprint
- Accounting of natural resources

Vision and Objectives of the Egyptian Biodiversity Strategy

By 2030 Biodiversity and ecosystems are recognized as necessary requirements for achieving sustainable development and poverty eradication in Egypt, while ensuring their proper and equitable use as an ethical responsibility that requires innovation, knowledge sharing, cooperation, and coordination to mainstream biodiversity in all development sectors.

Objectives of the Egyptian Biodiversity Strategy

General Objective

Promote the healthy and sustainable management of natural resources capable of supporting the needs and well-being of current and future generations. Of particular importance in this context is the need to strike a balance between the importance of nature conservation and for promoting the development in various sectors such as, agriculture, industry, mining, housing, and tourism.

Specific Objectives

- Conservation of natural resources based on scientific and economic grounds.
- Developing scientific, technological, managerial, and executive capacities in the country.
- Rallying the nation's efforts towards conserving biodiversity and ensuring its sustainability.
- Social involvement in conservation projects, through co-management.
- Developing the necessary legislation, economic and social incentives.

- Documenting national, regional, and international good practices for the sustainable management of biodiversity.

Main Pillars to achieve the set objectives

- *Pillar I* focuses on the conservation of biodiversity in the short and long term. It aims at establishing a network of protected areas for badly damaged habitats – invasive species – climate changes – slowing down the loss of biodiversity.
- *Pillar II* focuses on the integration of biodiversity into national decision and policy making. (structural organization for nature conservation – limiting the pressures on biodiversity and ecosystems – societal participation governance social justice (women rights, equality) – investment projects for sustainable production and consumption – Economic Exclusive Zone, and integrated management of coastal areas - benefit sharing and biosafety).
- *Pillar III* is concerned with the improvement of knowledge about biodiversity and ecosystems (a national programme for research and surveying of biodiversity – national database for biodiversity – updating and reviewing species conservation – implement case studies to show current situation).
- *Pillar IV* enhances awareness and educational programmes. (encouraging appreciation for social and economic values of biodiversity – encouraging volunteer work – including elements of conserving biodiversity into school curriculums – distance learning).
- *Pillar V* deals with strengthening partnerships between all beneficiaries and encouraging national co-operation. (Partnerships at all levels, including national and international – fund raising – honoring international and regional agreements – scientific and technical co-operation along with transfer of scientific knowledge and technical know how).

- *Pillar VI* aims at the translation of research and development programmes into actual projects in the different fields, including surveying biodiversity and evaluating it from the social and economic perspective, identifying rare and native species, production of medicines from medicinal plants, rehabilitation and restoration of deteriorated ecosystems, climate change and its effects on biodiversity, resilience of biodiversity and ecosystems to climate change.

Suggested Work Programme (work priorities with time frame)

- Institutional reform of the nature conservation sector into a separate authority (2016-2018).
- Integrate biodiversity in development sectors (tourism, fisheries, agriculture, planning departments of relevant Governmental agencies, civil society, local authorities and local communities) (2016-2020).
- Introduce an efficient system for the management of protected areas network (2016-2030).
- Develop an educational, and public awareness communication package for different target groups, including media, private sector, civil society, local authorities and local communities (2016-2030).
- Identify, prioritize and manage invasive species in close collaboration with agriculture-quarantine-veterinary departments, fisheries, water resources, health, local authorities, and other concerned Governmental agencies (2016-2025).
- Introduce a package of measures to promote sustainable production and consumption across sectors agriculture, fisheries, tourism, local authorities and local communities (2016-2030).
- Introduce a package of measures to promote the transitioning into a green economy in the different sectors: housing, agriculture, fisheries, tourism, local authorities and local communities (2016-2030).

- Develop a scientific research programme that includes traditional knowledge involving universities research institution, local authorities, and other concerned agencies (2016-2030).
- Launch a national capacity development programme for local authorities, and practitioners involved in tourism, fisheries, and agriculture (2016-2030).
- Promote captive breeding of endangered species with the involvement of research institutions, private sector, and international cooperation (2015-2020).
- Rehabilitation and restoration of deteriorated ecosystems (2016-2020).
- Mobilize financial resources, international cooperation, and planning for the sustainable use of biodiversity resources in tourism, agriculture, and fisheries (2016-2030).
- Support international and regional agreements and cooperation in scientific research involving relevant Governmental agencies (2016-2030).
- Create an Egyptian museum for natural history (2016-2018).
- Introduce environmental legislation related to biodiversity (2016-2018).
- Encourage private sector involvement in investment projects related to biodiversity through a package of regulatory and incentive measures (2016-2030).
- Assess the potential impacts of climate change on biodiversity and propose measure and actions to address them (2016-2030).
- Introduce measures to prevent illegal wildlife trade in conformity with CMS and CITES and in close collaboration with the focal points of these conventions, as well as customs authority, and quarantine department (2016-2020)
- Implementation of the Biosafety Protocol in close collaboration with ministries of health, agriculture, trade, industry, and research institution (2015-2030).

- Implementation of access and benefit sharing (ABS) Protocol in close collaboration with ministries of trade, industry, agriculture, local authorities, and other concerned agencies (2016-2030).
- Introduce a valuation and accounting system to value biodiversity (2015-2020).

Requirements for the Coming Years

A number of challenges face biodiversity conservation, these include the following:

- Increase in world tourism
- Increased demand for natural wealth
- Maintaining the balance between development and preservation efforts
- Nature reserve problems (infrastructure, workforce, funding).
- Invasive genetically modified species
- Fair distribution of the benefit derived from biodiversity

Required Radical Solutions through Innovative Methods

A number of immediate measures need to be introduced to limit biodiversity loss and violation of natural reserves, these include the following:

- Introduce measures to promote the financial sustainability of natural reserves and reduce the financial burden on the Government.
- Introduce a decentralized system for the sustainable management of biodiversity and natural reserves, which is flexible and capable of addressing local emerging matters on the ground.
- The strict enforcement of laws related to biodiversity conservation.

Main prerequisites for promoting the sustainable management of biodiversity and natural reserves:

- Political commitment and support.
- Social and economic viability for investing in biodiversity.
- Follow the concept of protecting natural resources now and study later.
- Create a common vision that captures the interest of the public and private sectors, as well as the local communities.

- Full engagement and participation of local communities in the conservation and management of biodiversity and natural reserves.
- Encourage the creation and development of nature reserves since they are considered the most effective tools of protection.
- Develop a long-term training programme for personnel engaged in biodiversity and natural reserves.
- Ensure the equitable distribution of benefits arising from biodiversity.
- Promote public private partnership and collaboration with regional and international institutions.

Potential Gains

Preliminary economic studies estimate the cost for the preservation and protection of the ecosystems at around (2 billion EGP in the form of infrastructure for reserves) and a yearly Governmental bill valued at 25 million EGP, with a financial return of (20 billion EGP annually from tourism and aquatic life wealth). Job opportunities created is estimated at 6 million jobs, of which, more than a million for local communities inside and outside the nature reserves. Trials have also shown that the efficient management of the “Samadi” area along the Red Sea, with an area of no more than 1 square Km can result in a sustainable annual profit of nearly 100 million EGP for nature reserves in the Red Sea, and create jobs for the locals (70 jobs). This is being monitored annually since 2004. However, the Government has not yet considered this kind of investment by applying co-management approach in protected areas (Fouda, 2013).

Considering biodiversity and the natural ecosystem as a natural capital and investing in it can effectively contribute to sustainable development in Egypt.

Protected Areas represent 15% of Egypt’s land area, which is equivalent to 150 thousand square km, mostly desert. If an area of 100 X 100 Km = 10000 km squared (equivalent to 6.7% of nature reserves’ area) is to be used in generating solar energy and wind power, enough energy would be supplied to

power all of Egypt's protected areas, and the rest would be integrated into the grid to provide all of Egypt's energy requirements as well as the Arab nations. This power supply could also be utilized in water desalination in the Mediterranean and the Red Sea, as well as ground water that is high in salt in Egypt's deserts (Nokrashy, 2015).

Recent studies have shown that if the equivalent of 100 million EGP is invested in the infrastructure of the coral reefs in the Mohamed Ras Mohamed reserve, according to the principle of upfront payment and efficient management, return in revenues would be more than 900 million EGP annually from one reserve. (Coral reefs occupy an estimated 3,800 KM squared of Egypt's area, worth an estimate of 114 billion EGP). This study was submitted to the Egyptian Cabinet which approved it within the framework of Sharm El Sheikh Green City. This project has not yet been implemented because of the political instability in the region. However, it is expected that it will be implemented soon.

According to the strategy prepared by the Ministry of Tourism, it is expected that the number of tourists would rise to 30 million by 2020. Since ecotourism accounts for nearly 60% of Egypt's tourism, it is expected that investments in several fields (bird watching, swimming with sharks and dolphins, safaris, diving, rock climbing, and others) in protected areas, would create a revenue reaching 10 billion dollars a year (an estimated 70 billion EGP according to 2014 pricings). Capacity building has been provided by NCS staff to local communities in many protected areas. Local communities in the Red Sea, South Sinai and western desert protected areas have benefited from income generated in these locations.

Total fish production is estimated at 1.4 million tonnes, with a value of nearly 19 billion EGP. If sustainable fish farming is promoted in Egypt, it is expected that its contribution to the national revenue would reach 30 billion EGP. The same applies to

sustainable agriculture, and protected areas that provide water and land resources (Fouda, 2015).

Moreover, if the concept of integrated solid waste management is applied in protected areas, there would be social, economical and environmental benefits. (job opportunities)

Carbon that is stored in mangrove trees is approximately 4-5 times the carbon stored in rainforest trees, where the carbon is stored in the soil, and from there it is pulled into the sea water via the tide.

Studies indicate that profits resulting from tourism in areas with coral reefs in just the Ras Mohamed Reserve, could reach 1.1 billion dollars a year. Mangrove trees would net 1.3 billion dollars a year per hectare in the Nabq protected area. If the payment for environmental services is applied, there would be large revenues generated, according to several studies undertaken in countries around the world (Spurgeon,2002; TEEB,2010; Tawfik,2012).

Mineral and fossil fuels in protected areas are extracted as raw ore and sold for very low prices (feldspar and titanium from the Wadi El-Gemal and the marble from Aswan). The introduction of sustainable industrial activities in protected areas has the potential of creating jobs and improving the living standards of local communities.

It is stipulated that sustainable recycling in protected areas and the conservation of biodiversity would create 5 thousand jobs during a 5 years period. However this requires the introduction of a comprehensive preservation programme based on benefit sharing, and ensures the integration of biodiversity considerations in the different economic in Egypt.

Performance Indicators for Sustainable Development through Biodiversity

In order to be able to follow up and measure the level of achievement of the set objectives, there must be a certain set of agreed upon indicators to use as a guide. These may include for example rates of

performance indicators related to mainstreaming biodiversity into all the sectors of development, green economy, awareness and education.

First indicator: Level of awareness raising, dissemination of biodiversity related information and knowledge, and the willingness to volunteer to support biodiversity and ecosystems related activities. This indicator can be measured by applying the Biodiversity Barometer (BB) of the Union for Ethical Bio Trade (UEBT), which is being implemented in many countries for almost 10 years.

Second indicator: Policy packages developed and introduced to mainstream ecosystem services in strategies, planning and decision making processes in Egypt. This indicator can be measured by applying the 10 principles of mainstreaming published by CBD.

Third indicator: Level of pressure arising on agriculture, fish farming, and water farming. This indicator will be implemented by applying sustainable agriculture and fisheries indicators approved by CBD.

Roadmap

Short Term Priorities (2016-2018)

- Reform the nature conservation programme.
- Assess current laws and legislations that impact biodiversity and nature conservation.
- Review and update laws related to biodiversity, protected areas and nature conservation, including environmental protection laws.
- Develop and adopt laws related to biosafety and access and benefit sharing (ABS).

Mid-Term Priorities (2016-2020)

- Establish a funding mechanisms for nature conservation.
- Promote innovative funding methods along with traditional ones.

- Introduce the concept of payment for ecosystem services.
- Introduce a biodiversity offsetting system.

Long Term Priorities (2016-2030)

- Establish an efficient network for protected areas that is economically viable and supports sustainable development in Egypt.
- Introduce the necessary legal, organizational, and institutional framework that supports the sustainable management of biodiversity and natural reserves.
- Promote tools and methods for the sustainable management of natural and biodiversity resources.
- Develop a communication package for different target groups.
- Create an information network that includes traditional knowledge on the management of natural reserves and biodiversity.
- Identify invasive species, prioritize and manage them.
- Introduce a package of regulatory and incentive measures to promote sustainable production and consumption patterns across sectors.
- Promote green economy as a tool for the sustainable management of biodiversity and natural reserves.
- Develop a long-term scientific research programme for the sustainable use of biodiversity.
- Mobilize financial resources to support the sustainable management and use of biodiversity and natural reserves.
- Assess the potential impacts of climate change on biodiversity and natural reserves and introduce measures to adapt to changing climatic conditions.
- Promote the role of the private sector in investment in biodiversity conservation related projects and the sustainable use of natural resources and through PPP.

- Create an Egyptian museum for natural history.
- Develop a strategic plan to support the implementation of biodiversity related international and regional agreements, in line with national priorities.

The roadmap to achieve the strategic vision of biodiversity and protected areas below, includes a number of activities related to: vision and strategy, integrated policy making, good governance and institutions, regulatory framework, economic instruments, economic analysis, trade, funding, private sector, public awareness, education, capacity development, monitoring and assessment, research and development, indicators, regional and international cooperation.

**Roadmap to achieve the strategic vision
of Biodiversity and Protected Areas
2016-2017**

Actions/ Measures	Activity	Responsibility	Months	2016	2017
<i>Vision and Strategy</i>	Review and endorse the vision, strategy and a detailed implementation plan that meets the country's needs, priorities and socioeconomic circumstances	MoE Cabinet	4-6	✓	
<i>Integrated Policymaking</i>	Develop and endorse a holistic and integrated approach that ensures the integration of social, environmental, and economic dimensions in biodiversity conservation and within integrated sustainable communities.	MoE in close consultation and collaboration with relevant Ministries	Throughout	✓	✓
	Undertake an assessment of existing regulatory & incentive measures & assess their impacts on the environment & resource efficiency with the objective of identifying measures & policies, including means of implementation that promote SCP & consequently resource efficiency in the agriculture sector and fisheries.	MoE in collaboration with MALR	4-6 months	✓	
	Develop an Action Plan for the implementation of the proposed biodiversity strategy.	MoE in collaboration with relevant ministries	4-6	✓	
	Adopt new laws and regulations that promote conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. These include the approved law on protected areas, biosafety law and access and benefit sharing (ABS) law.	MoE in collaboration with relevant ministries	Throughout	✓	
	Create an institutional set up that ensures public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through PPP - exchange of information on best available technologies and best environmental practices on sustainable biodiversity practices.	MoE in collaboration with relevant ministries	4-6	✓	
	Promote the use of a number of tools and measures that facilitate the adoption and implementation of green economy in protected areas.	MoE to take the lead role in promoting these tools and providing technical support to practitioners in the	Throughout	✓	✓
					145

		relevant Government departments			
Good governance and institutions	Identify action needed to reform/restructure or create an institutional mechanism that will be entrusted with coordinating action related to planning and implementation of biodiversity related activities in an efficient, transparent and accountable manner. A set-up that allows inter-ministerial coordination to avoid redundancy, conflict of interest and overlap of responsibilities between different ministries. In order to facilitate a transition to sustainable biodiversity and ecosystem services practices, policies related to energy, water, and land uses, which are under the jurisdiction of other sectoral ministries should be taken into account, thus necessitating close coordination with relevant ministries. Institution should function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources.	MoE in collaboration with Ministry of Planning and relevant Ministries	4-6	✓	
	Clearly identify the responsibilities of the Ministry of Environment and institutions affiliated with it in formulating policies, research, extension work, development of action plan, monitoring and follow up, data gathering, planning and provision of necessary infrastructure for reclaimed land.	MoE in collaboration with Ministry of Planning and relevant Ministries	4-6	✓	
	Clearly identify the responsibilities of relevant entities involved in biodiversity related activities, integrating entities with similar responsibilities.	MoE in collaboration with Ministry of Planning and relevant Ministries	3	✓	
	Create an institutional set up responsible for linking research centers with universities and the Academy of Scientific Research and Technology.	MoE in collaboration with Ministry of Planning and relevant Ministries	3	✓	
	Closely link the development of the different strategies by relevant ministries, particularly the Ministry of Agriculture, Water, and Tourism and ensure proper coordination between them..	MoE in collaboration with the Ministry of Planning and relevant Ministries	Throughout	✓	✓
	Institutional reform of the Nature Conservation Sector to meet changing socioeconomic conditions and in a way that they is supportive to sustainable biodiversity and ecosystem services.	MoE	4-6	✓	
					146

	<p>Ensure public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on best available technologies and best environmental practices on sustainable biodiversity and ecosystem services.</p> <p>Create within the Ministry of Environment a Unit to be entrusted with the responsibility of providing guidance and technical support related to green economy.</p> <p>Identify a Government body to be entrusted with data gathering, updating and analysis related to biodiversity.</p> <p>Introduce an effective monitoring and enforcement system to ensure compliance with regulations, including those related to land encroachment on protected areas with severe penalties as instituted in law.</p>	<p>MoE</p> <p>Ministry of Environment</p> <p>MoE in cooperation with Ministry of Planning and relevant Ministries MoE</p>	<p>Throughout</p> <p>2</p> <p>Throughout</p>	<p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p>
Regulatory framework	<p>Review biodiversity related legislation with a view to developing a package of regulatory supported by incentive measures and policies, that support sustainable biodiversity and ecosystem services.</p> <p>Include in law and implement a requirement for rangers and farmers in protected areas to introduce innovative water efficient techniques (drip irrigation) in newly reclaimed land and the improvement of the irrigation system in existing cultivated areas.</p> <p>Develop and launch a labeling and certification scheme for sustainable and organic products such as the one already implemented in St. Catherine protected area.</p> <p>Introduce and implement strict regulatory measures and control mechanisms for the use of chemical fertilizers and pesticides in protected areas.</p>	<p>MALR in collaboration with the Ministry of Environment</p> <p>MoE in collaboration with MALR</p> <p>MoE in collaboration with MALR and Ministry of Finance</p>	<p>6</p> <p>Throughout</p> <p>tThroughout</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>
Economic instruments	<p>Design market incentives to encourage investments in protected areas as means to create a market niche for Egyptian biodiversity related products. Measures may include subsidies and tax rebates and exemptions for locals and visitors using energy and water saving equipment and measures, the introduction of water resistant and climate resilient</p>	<p>MoE in collaboration with the MALR, and Ministry of Finance</p>	<p>3-4</p>	<p>✓</p>	<p>147</p>

	<p>crops.</p> <p>Introduce tax reform to promote sustainable agriculture, tourism, and fisheries in protected areas.</p> <p>Provide incentives to introduce sustainable mining industry in protected areas.</p>	MoE in collaboration with MALR & Ministry of Tourism	4-6	✓	
Economic analysis	Undertake an economic analysis to assess the financial viability of the proposed plan to include costs and benefits. This should include the expected social and environmental benefits resulting from the proposed plan, including number of new jobs created. It should also identify budgetary requirements needed to finance the programme and sources of funding.	MoE in collaboration with, Ministry of Finance	3-4	✓	
Trade	Design trade policies to support sustainable tourism, agriculture and fisheries in protected areas through a tariff system that encourages the import of environmentally friendly technologies and encouraging the export of locally produced products and technologies.	MoE in collaboration with MALR, Ministry of Trade & Industry, and Ministry of Tourism	4	✓	
Funding	<p>Secure a stable and predictable sources of funding for sustainable biodiversity and ecosystem services in order to ensure the continuity of services provided and meeting the set objectives of the programme.</p> <p>Financial institutions should be requested to support financing green investment in protected areas.</p> <p>Provide sufficient budgetary allocations to support a long term R&D strategy for the sustainable management of biodiversity .</p> <p>Direct investments to biodiversity related economic activities to increase the value added of protected areas, diversify rural areas, and create new jobs for the local community.</p>	<p>Ministry of Planning, Monitoring, and Administrative Reform in collaboration with MoE and Ministry of International Cooperation</p> <p>MoE</p> <p>MoE</p>	Throughout	✓	✓
			Throughout	✓	✓
			Throughout	✓	✓
Private sector	Encourage the private sector through a package of incentives and measures to be engaged directly and through Public-Private-Partnership in investments in sustainable tourism, agriculture, and fisheries in protected areas.	MALR in collaboration with Ministry of Environment, Ministry of Tourism	4-6	✓	
Public Awareness	Develop and implement public awareness campaigns targeting different target groups highlighting the economic, social, health and environmental benefits of biodiversity and ecosystem services.	MoE in collaboration with the MALR, and Ministry of Education	Throughout	✓	✓

	<p>Promoting the role of media in demonstrating the economic, social, environmental, as well as the financial benefits of sustainable biodiversity and ecosystem services to different stakeholders.</p> <p>Designate a TV channel for promoting public awareness and education on sustainable biodiversity and ecosystem services.</p>				
Education	<p>Integrate biodiversity considerations in the education system in order to provide the necessary calibres to support a sustainable biodiversity and ecosystem services within integrated sustainable communities.</p> <p>Develop and implement a curriculum for green and sustainable communities and buildings to be offered at the Egyptian Universities. This can be at the undergraduate and the post graduate level.</p> <p>Increase public investment in the education system for biodiversity, including training programmes for teachers and training the trainers programmes, special programmes for rangers, farmers, women, youth and the elderly.</p>	MoE in collaboration with Ministry of Education in close collaboration with public and private universities (Cairo and Ain shams University, the October 6 th University, and the British University etc.	Throughout	✓	✓
			Throughout	✓	✓
			Throughout	✓	✓
Capacity Development	<p>Develop and implement a capacity building, educational, and a research and technology development programme that supports biodiversity conservation, as well as tools and concepts that support this transition such as integrated assessment, green economy, and circular economy/closed loop economy.</p> <p>Promote the role of extension programmes to train rangers of the protected areas, raise their awareness and innovative environmentally friendly cultivation techniques and practices.</p> <p>Assist rangers with innovative environmentally sound technologies, socio-economic analysis, invasive species and risk assessment.</p>	MoE in collaboration with the Ministry of MALR, Ministry of Education, Ministry of Labour	Throughout	✓	✓
Monitoring and assessment	<p>Develop, for adaptation at the national level of a framework for the efficient monitoring, enforcement, assessment and implementation of a system that ensures compliance & adherence to sustainability principles in biodiversity, green & sustainable regulations, codes of practice & standards. The framework would also include the creation of a coordination mechanism to coordinate initiatives, programmes, activities & sources of funding.</p>	MoE in collaboration with MALR, Ministry of Water Resources and Irrigation	Throughout	✓	✓

Research & development	Design and implement a long-term R&D programme for environmentally sound fisheries, agriculture, energy and water saving equipment and infrastructure, and new strains of crops that consume less water and that are draught resistant and resilient to climate change. The development of this programme to be developed by the Academy of Scientific Research in close consultation and collaboration with the Ministry of Environment, and other relevant ministries and research bodies and think tanks.	Academy of Scientific Research in close consultation & collaboration with MALR and Ministry of Environment	Throughout	✓	✓
	Provide incentives for the private sector in the form of tax cuts and rebates and other incentives to invest in R&D and in green and sustainable biodiversity and ecosystem services.	MoE in collaboration with MALR, Ministry of Trade and Industry, and Ministry of Finance	Throughout	✓	✓
Indicators	Monitor and assess the achievement of the objectives and targets and implementation of road map against the identified set of indicators.	MoE in collaboration with relevant ministries	3-4	✓	✓
	Review indicators and adjust as appropriate in order to ensure the achievement of the biodiversity strategy and the set objectives.		Throughout	✓	✓
Regional & International Cooperation	Promote regional and international cooperation in the field of biodiversity by being an active member/partner in conventions and organizations such as CBD, RAMSAR, CMS, CITES, PERSGA, MAP, and Arab League. Create specialized committees to promote cooperation with countries with potential investment opportunities.	MoE in collaboration with the Ministry of Foreign Affairs and relevant ministries	Throughout	✓	✓
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Integrated Human Settlements

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Acronyms

CUSCRE	Central Unit for Sustainable Cities and Renewable Energy
CO ₂	Carbon Dioxide
EIA	Environmental Impact Assessment
EPR	Extended Producer Responsibility
GDP	Gross Domestic Product
GUDF	Green Urban Development Fund
GOPP	General Organization for Physical Planning
GPRS	Green Pyramids Rating System
EGBC	Egyptian Green Building Council
ISDF	Informal Settlement Development Facility
LCA	Life Cycle Assessment
MHUUD	Ministry of Housing, Utilities, and Urban Development
MPMAR	Ministry of Planning, Monitoring, and Administrative Reform
MURIS	Ministry of Urban Renewal and Informal Settlements
MoI	Ministry of Investment
MoLD	Ministry of Local Development
MERE	Ministry Electricity and Renewable Energy
MWRI	Ministry of Water Resources and Irrigation
MoD	Ministry of Defence
MID	Ministry of Industrial Development
MoT	Ministry of Transportation
MTI	Ministry of Trade and Industry
NUCA	New Urban Communities Authority
PPP	Polluter Pays Principle
P-P-P	Public-Private-Partnership
R&D	Research and Development
SDI	Slum/Shack Dwellers International

Introduction

The last several decades have witnessed an increased rate of urbanization worldwide. While this is resulting in increased pressure on the environment and ecosystem, it also provides opportunities for the adoption of more sustainable lifestyles and efficiency in resource use. About half of the world population live in urban areas. Low and middle-income countries are experiencing growing urbanization, where more people are moving from rural to urban areas. Urban centres provide investment and employment opportunities as well as social and cultural activities. As recognized by the Cities Alliance, cities are essential for economic and social development. Economic growth has been generally associated with rapid urbanization.²²⁵

Informal settlement continues to be one of the main problems facing countries around the world. It is estimated that one in seven of the total world's population live in informal settlements in urban areas. In middle and low-income countries, it is estimated that one third of the population live in informal settlements. In order to address this phenomenon, the city and national federations or networks of slum/shack dwellers (Slum/Shack Dwellers International – SDI) has been created and is now active in over 30 countries²²⁶

According to the Geneva UN Charter on Sustainable Housing, positive impacts of housing can be enhanced by ensuring the adoption of the following four main principles: environmental protection, economic effectiveness, social inclusion and participation, and cultural adequacy. The Charter contributes to the implementation of relevant Sustainable Development Goals on cities and human settlements and the implementation of the UN HABITAT Global Housing Strategy Framework.²²⁷

The role of cities in addressing global environmental issues has become prominent with the launch of the Liveable Cities report in 2007 “Liveable Cities: the benefits of urban environmental planning”. Since then a number of cities worldwide have taken actions to promote sustainable cities. These included cities in the

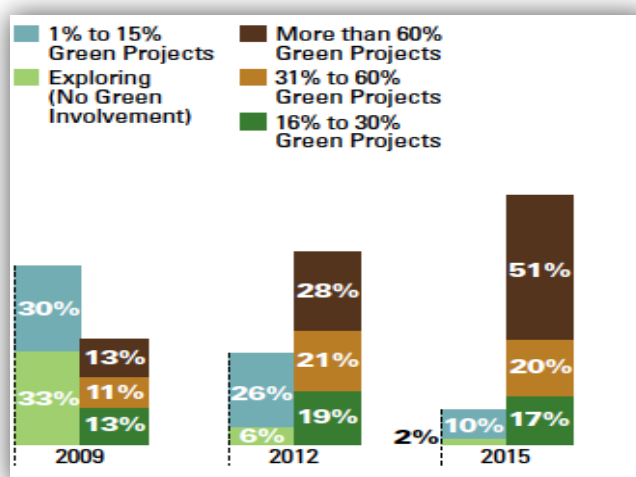
developed world such as Stockholm to developing countries such as Curitiba, Ahmedabad in India, and Bogota in Colombia. The experience of such cities and other demonstrate that taking environmental concerns into account result in economic and social benefits. This actually draws and builds on the main underlying principles and approach behind the “Green Economy”.

Sustainable urban development does not only result in positive outcomes for the cities and towns in question, but also results in global benefits. This is represented in the opportunities provided by urban areas to reduce pressure on the Earth's ecosystems.²²⁸

Overview

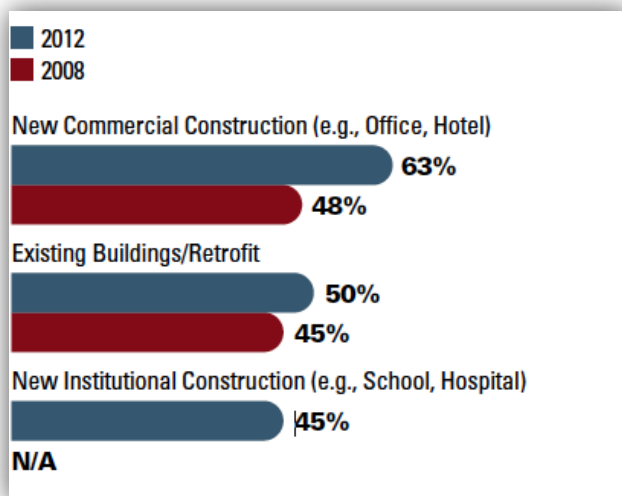
The concept of green building is growing at a rapid pace worldwide. As can be seen from the two figures below, new construction and renovation projects have the largest opportunities for green building worldwide. It is estimated that about 63% of firms around the world have new commercial projects planned between now and 2025, 45% have plans for new green projects and 50% have plans for green renovation projects. This demonstrates the growing international trend in investments in green building.

Levels of Green Building Activity by Firm around the world (2009-2015 Expected)



Source: McGraw-Hill Construction 2013

Top Sectors with Planned Green Building Activity over the next three year



Source: McGraw-Hill Construction 2013

Apart from representing a clear business opportunity, investing in green buildings results in improved environment, health and productivity. It is reported that 55% of firms rate wellbeing and health as top priorities for going green. Other environmental benefits are water and energy savings, reduced CO₂ emissions and waste generation, and improved natural resource conservation.

Based on the survey conducted by McGraw-Hill, construction in 2008 for firms around the world, reported business benefits from new green building investment resulted in 15% and 13% increase in profits for green retrofitting and reduction in operating costs over a five-years period, respectively. Payback period for green investments was reported as 8 years and 7 years for new green buildings and green retrofitting, respectively.²²⁹

Urban concentrations generally face a number of challenges, with urban poverty being a dominant element in most African countries. This is further exacerbated by rapid population growth, increased rate of urbanization, and environmental and climate change concerns. About slightly less than half of the African population live in urban centres.

Moreover, the proliferation of informal settlement continues to represent one of the main problems facing urban areas in Africa, as well as other cities around the world.

With these challenges, it is evidently clear that there is a need to adopt a non-conventional approach to urban development. Greening the urbanization process in Africa seems to hold the solution for many of the ills African cities are currently facing. Financing sustainable urban development through the establishment of a green urban development fund can go a long way in facilitating this transition.²³⁰

As far as the North African sub-region is concerned (Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, and Western Sahara), population in these countries has grown from 200 million in 2010 to 202.7 million in 2011. About 51.1% or 104.4 million live in urban areas while 48.5% or 98.3 million in rural area. Most of the population of North African cities live in urban areas with the exception of Egypt 43.4% and Sudan 33.1%. Countries with predominant urban population experience a growth rate of urban population of 2% and are expected to decline to 1.7% annually from 2020 to 2030. Cairo remains the largest North African city with a projected annual population increase of 220,000 annually until 2020. It is estimated though that population growth for Cairo over the period between 1996-2006 was estimated at 1.512 % annually.²³¹ However, it is estimated to reach 2.11% annually from 2015-2025. This figure though is slightly lower than the national population rate of increase estimated at 2.4%.²³²

Sustainable urban development and cities offer a number of opportunities on the economic, social and environmental fronts. These include the following:

- Lower economic and biophysical costs per capita of providing water, sewer systems, waste collection and other infrastructure such as the electrical grid and road network.

- Reduced per capita demand for land.
- A larger potential for wastewater treatment and solid waste recycling and reuse.
- Greater potential solutions of district heating and cooling, co-generation and generation of energy from waste.
- Public transport systems that reduce reliance on individual cars, thus reducing fossil fuel consumption, traffic congestion and sound pollution.
- Promote the concept of low throughput industrial ecology, where material waste from some industries is used as an input for other industries.
- Promote design that reduces commuting by vehicle, promote public transport systems, cycling and walking to access work, commercial, social and recreational services.

Cities cannot be sustainable without ensuring reliable access to safe drinking water and adequate sanitation. Two main challenges related to water are affecting the sustainability of human urban settlements: the lack of access to safe water and sanitation, and increasing water-related disasters such as floods and droughts. These problems have enormous consequences on human health and wellbeing, safety, the environment, and economic growth and development. The lack of adequate water and sanitation facilities leads to negative health impacts. Those who suffer the most of these water-related challenges are the urban poor, often living in slum areas or informal settlements following rapid urban growth. Rapid urban population growth creates unprecedented challenges, particularly for large urban centers, among which the provision of water and sanitation have been pressing.

Sustainable and green communities offer opportunities for meeting many of the challenges most urban centres face today.

In addition to creating new jobs resulting from the new economic opportunities offered by greening cities, environmental and health benefits are numerous. These include improved ecosystem

services in the form of energy, water, and improved environmental conditions, which is reflected in a healthy and better quality of life for inhabitants.

Several countries worldwide have had successful experiences with sustainable communities these include Potragia, the administrative capital of Malaysia, which is considered to be an intelligent garden city, providing a model of a well connected city, an attractive environment for living and working, with vast green areas and public space, taking into account the environmental and cultural heritage of the area. The city of Dong Tan was designed to be a carbon neutral city producing its own energy needs from bio fuel, recycling of solid waste, use of sustainable technologies in transport systems and production processes and provide a network of walkways for pedestrian. The city also promotes organic agriculture in cultivation.²³³

It is estimated that cities consume between 60-80% of electricity, which is responsible for 33% of CO₂ emissions, while buildings consumed 52% of electricity in 2013 and 68% in 2014. Energy subsidies in Egypt have resulted in the excessive use of energy resulting in excessive demand that far exceeded supply.

In Egypt, building and construction contribute 6-12% of GDP and employs 8-10% of the total labour force. Moreover, the sector is considered to be one of the most strategic economic sectors in Egypt due to the large number of associated industries estimated at more than 90 industries. These include the steel and cement industries, gypsum, ceramics, paint, wood, marble, and electric and sanitary equipment.

Urban Development and Housing in Egypt Institutional framework

While a number of agencies are concerned with urban development in Egypt, few have a clear mandate; overlapping jurisdictions are furthermore common.

Apart from the Ministry of Housing, Utilities, and Urban Development (MHUUD), there are several

other entities involved in the sector, one way or another. These include Ministry of Urban Renewal and Informal Settlements (MURIS), Ministry of Local Development (MoLD), Ministry Electricity and Renewable Energy, (MERE) Ministry of Water Resources and Irrigation (MWRI), Ministry of Defence (MoD), and Ministry of Transportation (MoT).

MHUUD is responsible for housing and public utilities. Within this ministry, the General Organization for Physical Planning (GOPP) plays an important role in urban land management and indirectly influences the scope of land management opportunities available to the governorates. And the New Urban Communities Authority (NUCA) is in charge of planning new communities.

Moreover, ministries such as the Ministry of Planning, Monitoring, and Administrative Reform (MPMAR) and the MoLD can modify local development projects without coordination with other agencies.

Due to overlapping responsibilities and lack of effective coordination between ministries and agencies incoherence abounds in the implementation of urban development projects.

The Planning Process in Egypt

The Physical Planning Law of 1981 established the necessary planning framework for physical development by providing the mandatory preparation of master plans for cities and villages. All subdivisions and building permit approvals in cities and urban parts of villages must be consistent with the adopted master plans.

Detailed plans should be prepared by local units (city/village) following the approval of master plans. The development of the master plan should

be done with the assistance of the GOPP and the governorates' departments of housing and development.

The MoLD has the authority after consultation with the governor and approval of the local

popular council to modify previously approved subdivisions of the plan.

Master planning is of limited effectiveness to guide urban development in Egypt. The GOPP prepared master plans for many Egyptian cities, which were not implemented. The main reason for not implementing these master plans is that they greatly exceed the limited resources of the concerned cities. Another reason for not implementing master plans is the gap between planning and design and the reality on the ground; planning policies are designed at the central level without giving due consideration to the local resources and priorities.

This centralization has often contributed to widen the gap between the planning process and the executive system at the local level with conflicting chains of command and insufficient coordination between central and local Government.²³⁴

Urban Development & Housing Policies in Egypt Housing Policies Creating the Gap

Prior to the 1952 Revolution, the private sector dominated investments in the housing sector. In 1954 the Government took over the housing sector and created the Housing and Development Company, which was given the responsibility of providing housing for the poor segments of the population. However, housing fell short of supply due to inappropriate policies and the inability to fill the gap created by private investors. This was coupled by increased demand on housing created by rural to urban migration, particularly to large cities such as Cairo and Alexandria.²³⁵

During the late 70s, the "Open Door" policy was adopted by the State attracting private investments back to the housing sector. However, the rise in construction costs along with the State restraining from developing further housing units left the sector to be monopolized by private investors focusing on upper middle and luxurious housing with no social agenda, leading to an enormous rise in units' prices and rental units scarcity²³⁶.

During the 1990's the Government planned to provide 750,000 units annually for the newly low-income couples and for those living in informal settlements, and as replacement for the demolished housing. Able to provide only 100,000 units, the Government had to resort once again to the private sector to support its efforts. Incentives for the private sector were provided in the form of providing land, and necessary infrastructure for low-income housing (Specialized National Councils 1969). The formal housing sector in Egypt continue to suffer from a big gap between supply and demand. Housing shortage is particularly acute for lower-income and poor families across Egypt. However, if we consider the period between 1996-2006, housing supply was higher than the change in the number of households. This has resulted in a high percentage of unused units.²³⁷ It is estimated that there are about 2 million unoccupied housing units in Egypt.²³⁸

However, the gap in housing supply for low-income and poor families has further been exacerbated by increased levels of rural to urban migration, particularly to major cities such as Cairo and Alexandria as stated earlier. It is estimated that the population living in poor settlements in Egypt is around 17% of the total population of.²³⁹ This figure may be higher and continues to increase mainly due the lack of Government long-term strategic policy to address the problem and its root causes. Low priority given by the Government to develop rural Egypt and lack of employment opportunities has been one of the main causes for rural to urban migration. Most rural areas in Egypt lack adequate physical infrastructure in the form of roads sanitation and water networks, social services such as education and health, and economic opportunities and consequently jobs.

One of the Government policies that have had negative impacts on the housing sector in Egypt is introducing controls on rents for housing units. This has resulted in discouraging the private sector

from investing in housing units to be made available in the market for rent, resorting to providing housing units for sale. This outcome has contributed to shortages in housing supply available for rent, particularly for low-income and poor families, and increasing cost of housing units available for sale.

The Government realizing the negative impact this decision has had on the housing market, has reversed it, by issuing a new renting law in 2001, which changed the trend back to renting. Rent levels are now being determined by supply and demand. Yet, the new rents exceeded the affordability of low and low middle income households, in addition to the insecurity of tenure.

Moreover, some generational inequalities still exist due to coexistence of the old and new rent laws (the rents for a 200m² unit rented since the 60s in an elite district costs less than a 50m² unit in an informal area. As a continuum to focusing on luxurious housing, many neighbourhoods and gated communities were developed in cities surrounding Cairo, creating an over stock of upper middle and high level dwellings, while the shortage in units for the less fortunate remains. The policy of selling all state owned lands in auctions has added to the housing market bubble.²⁴⁰

In order to meet the shortage in housing, the Government therefore resorted to a number of measures since the seventies. These included offering land at a reduced cost for investors, encouraged building cooperatives, and invested heavily in the development of new urban settlements.

In order to support home ownership, the Government initiated housing programmes, such as *Ebny Beita* programme (build your home) targeting lower middle income households. The programme included providing subsidized land parcels along with the necessary infrastructure and services in addition to 15,000 LE as a contribution

towards construction costs. Additional exemption from land costs was provided in case of construction completion being within one year.

However, this project benefited mainly middle class households rather than low income and poor families. It should be pointed out that in 2006, there were almost 8 million closed and vacant units comprising of around 30% of the overall stock in Egypt. These are mainly houses built under existing building codes and licensed by the Government. The main reason for not achieving the objectives of public housing programmes such as *Ebny Beita* was mainly due to the failure of providing job opportunities close to residential areas. The National Housing Programme was designed on the basis of availability with little considerations given to the potential for job opportunities.²⁴¹

New Urban Communities Lagging Behind Targets

The concept of new urban developments started in Egypt in the late seventies with the objective of reducing pressure on large cities such as Cairo and Alexandria, and as a means to absorb population increase in the country. The New Urban Communities Organization was created according to Government Law 59 for the year 1979 to be responsible for the development of new cities in Egypt. A number of model cities were created since then, including what may be referred to as satellite cities near the City of Cairo. Twin cities on desert land were also developed, still though close to existing cities and are considered as natural extension of these cities. Other independent cities such as the 10th of Ramadan city, Sadat city, and the new Bourg el Arab city and el Salehia were also constructed.

Positive impacts of the new developments constructed on about 750,000 feddans, include reducing encroachment on cultivated land, construction of industrial establishments accessible to markets and the creation of job opportunities. Public investments estimated at 60 billion EGY and 300 billion EGY by the private sector. Total inhabitants of the new cities are estimated at 5 million in 2011.

Negative impacts of new communities include failure to attract the planned number of inhabitants, with more than 40% of the residential units lying vacant, 25% of commercial assets unutilized, excessive use of fuel used in commuting between cities due to either lack of job opportunities in the city or lack of affordable housing for the incoming labour force. Moreover, new cities did not reduce pressure on major big cities like Cairo and Alexandria with densities continuing to increase. Population of these cities failed to reach the targeted level with residents in new cities not exceeding 19.6% of the planned target. This is mainly attributed to the lack of important factors that attracts new inhabitants, these include: diversification of activities, administrative centres

for ministries, educational, health and recreational services, lack of affordable public means of transport, high cost of housing units. This is in addition to the non-compliance with the original master plans of new cities. For example, land allocated for agriculture in cities such as 6 October, Sadat, and New Menia was transformed into residential areas due to the lack of sufficient irrigation water. The Government is currently taking serious measures in the form of penalties for investors using land originally designated for agricultural for housing.

Other factors contributing to the problems associated with the experience of new communities in Egypt, include planning for a number of large developments at the same time, flaws in the selection of sites along existing road networks, thus contributing to the gradual outward expansion of cities and failure to create independent self-sustained cities. Lack of proper management of cities and finance and absence of factors that attract private investment contribute to the problems facing new communities in Egypt.²⁴²

Moreover, the last several decades have experienced the development of a large number of urban settlements mainly in and around the Greater Cairo region (22 new developments). The experience of these new developments has not all

been positive. This is reflected in the failure of these new settlements to attract new inhabitants, investments, support economic activities, provide housing for the different segments of the population, particularly affordable housing for middle and low income families, as well as other health, social, and cultural services. About 22% of total Government investments directed towards these new developments have drawn heavily on Government budgets, while succeeding in providing housing for only about 4.3% of the target inhabitants.²⁴³

Informal Settlements

one of the challenges facing large cities in Egypt such as Cairo and Alexandria is uncontrolled informal settlements in many parts of these cities. This phenomenon, which has occurred during the last several decades has been the result of increased levels of rural to urban migration, and increased population growth in major urban centres, which have exceeded national population growth rates. Increased rural to urban migration has been mainly due to the neglect by the Government of rural areas resulting in inadequate physical infrastructure (roads, public transport system, waste collection and disposal system, wastewater collection and treatment system, and clean water supply. This is in addition to inadequate social services mainly health and education system provided in rural areas.

Informal settlements in Egypt are in most of the cases built illegally on Government owned land. They are characterized by being unsafe as they do not follow minimum acceptable building standards, either lacking proper or some of the basic amenities such as solid waste collection and disposal systems, and or illegally connected to the electricity grid. Building standards provided by the central Government and monitored at the local level by Governorates lack strong enforcement capabilities. These settlements are therefore a source of major pollution to urban centres due to the amount of solid waste generated that is either not collected or treated.

Informal settlements continue to represent a social as well as an economic and environmental challenge in Egypt. Inhabitants in these areas lack basic water and sanitary connections and other basic social services.

According to the Informal Settlement Development Facility (ISDF) (2014), unplanned areas constitute about 95% of the built up areas in Egyptian villages, and about 37.5 % of the built up area in Egyptian cities. In 2006 the informal population was about 11 million accounting for 35% of urban population.²⁴⁴

In order to address this challenge, the Government has initiated in 1993 (1993-2007) the National Programme for Upgrading Informal Settlements to extend potable water and sanitary drainage to informal areas. Moreover, the Government in 2014 has created MURIS in order to specifically address the problem of informal settlements in Egypt. The programme with total investments of LE 3.1 billion (1993-2007) has contributed to improving living conditions of inhabitants of informal settlements. At present, 97 % of urban residents have safe drinking water and 90% have sanitation services.²⁴⁵

Impacts of Urban Planning and Housing Policies in Egypt

Urban Development in Egypt has been lacking an integrated and holistic approach where the social, economic and environmental considerations are fully integrated in the planning and design of new urban settlements. The planning of new communities and housing lack giving due attention to sustainability considerations. Apart from increased pressure on existing water and electricity networks due to increased number of inhabitants attributed to population growth and rural to urban migration, adequate and reliable public transport systems are also lacking. One of the main consequences of uncontrolled urbanization is the fast and sporadic development of informal settlements in major cities such as Cairo and Alexandria.

The following section identifies the main economic, social and environmental impacts of urban planning and housing policies in Egypt.

Economic impacts

Middle and low-income housing is generally provided by the public sector, as the private sector has no incentive to invest in housing to cater for these income groups compared to housing for high – income housing. Providing housing for low-income groups and poor segments of the population represent a real challenge in Egypt. This has been aggravated by increases in land and construction costs beyond the reach of most of the low middle and low-income families.

A number of laws have been introduced, which discouraged investment by the private entrepreneurs in the housing sector, such as the one controlling rents that was introduced by the Government in the seventies.

This is further exacerbated by increased demand on Government budget to build roads, provide transport systems, and health and education services. Although statistics show that poverty represents 50% in upper Egypt, the number of proposed housing units and Government's direct investment in this region are very low in comparison to other geographical areas. Due consideration should therefore be given when planning and designing for sustainable communities to the needs of low-income and poor families.

A reduction in land available for construction in urban areas, which represents about 4% of the total area of the country, continue to increase the value of land for housing construction purposes.

It should be pointed out that communal social housing projects in Egypt during the last several decades have experienced implementation problems and flaws in design and planning. This is represented in realizing 11% only of planned housing units during 2012-2014. This is also in spite of billions of Egyptian pounds spent on these

projects, which were made available to a small segment of the population. On the other hand the private sector has succeeded during the last three years to build about 6.5 million units mostly for high-income families.²⁴⁶

Moreover, urban development has not always been designed in a way that drives economic activities, attracts investments, and supports the development process in the country and contribute to GDP.

Social impacts

In most cases the planning of new communities in Egypt did not fully take into account the social and cultural dimensions of local communities in different locations.

Involving local communities and inhabitants has also been lacking in the planning and design process. The outcome has been in many instances, the rise of new urban areas that did not necessarily reflect the needs and priorities of local communities as well as prospective inhabitants in terms of social services, jobs, and housing. This has resulted in the failure of new communities to attract inhabitants.

Moreover, new communities lacked in many instances taking into account cultural and social aspects related to the local community as well the geographic characteristics of the location of the new community. The result has been new settlements that do not reflect the needs as well as the cultural background and prevailing customs and living habits of the local communities.

It has also resulted in physical structures that do not rely on local building material most suited to local environment and climatic conditions and that do not consequently reflect the nature and character of the surrounding environment in different locations.

Housing provided in new communities do not necessarily cater for low-income and poor families, lacking the necessary social (health and education) and recreational services for low-income and poor families.

Considerations were not given to maintaining cohesion between the local community and the incoming new inhabitants, which resulted in lack of social cohesion and integration of the different income groups in the same community.

Environmental impacts

Most of the Egyptian cities have suffered from lack of proper planning. Moreover, necessary physical and social infrastructure could not be provided to cope with the rapid expansion of cities.

The consequence has been the deficiency of existing networks and services to support the inhabitants. Rapid rate of urbanization has also resulted in crowded suburbs, traffic congestion, inability to deal with wastewater and solid waste generated, and increased pollution levels of air and waterways. Pollution in most of the Egyptian cities has reached alarming levels threatening health and wellbeing of the inhabitants.

Negative environmental implications have had their social as well as economic consequences threatening economic activities such as agriculture due to increased incidence of encroachment on arable land.

Neglecting the environmental dimension, and failure to adopt a full life cycle assessment (LCA) approach in the planning and design of new communities resulted in inefficient allocation and use of natural resources, including land, water and energy, and other factor inputs.

Existing facilities fall short of the required capacity to deal with the generated volumes of waste, thus resulting in the dumping of waste along roads, in waterways and in open dumpsites, with negative consequences on the environment and health.

Besides, the existing capacities of wastewater treatment plants fall short of volumes of wastewater generated by existing and new communities. This is resulting in the dumping of large volumes of untreated wastewater in waterways and the use of untreated wastewater for irrigation of agricultural crops.

The use of fossil fuel, as the main source of energy and the mismanagement of solid waste and wastewater generated by existing and new urban communities in addition to congested roads and poorly maintained vehicles, industrial pollution, and smog are resulting in negative environmental and health impacts in Egypt. This situation will be further exacerbated if new urban communities continue to be developed in the same old conventional way.

Towards Sustainable Urban Development

Greening the urbanization process in Egypt and creating sustainable and green communities have the potential to offer opportunities for meeting many of the challenges the Egyptian cities are currently facing today; mainly increased energy prices, increased pressures on solid waste and wastewater networks accompanied by increased demand on housing to meet population growth estimated at 2.4% annually.²⁴⁷

There are now compelling reasons to build houses and communities that are energy and water efficient, drive economic activities and are more resilient, economically viable and sustainable.

In addition to creating new jobs resulting from the new economic opportunities offered by greening cities, environmental and health benefits are numerous.

These include improved ecosystem services in the form of energy, water, and improved environmental conditions, which are reflected in a healthy and better quality of life for inhabitants.

In order to create sustainable and green communities in Egypt there is a need for a clear long-term vision and strategy for urban settlements and housing. One that is designed to function within limited water and energy resources in the country and which does not result in increased pressure on the environment, ecosystem and biodiversity.

New housing units and communities should be designed to be resource efficient, drive economic

activities, by creating new and innovative investment opportunities, creating employment opportunities, providing housing to the different segments of the population, and that are resilient to climate change and economic shocks.

In order to achieve this end, new communities would need to rely on an energy mix that is tilted towards a higher percentage of renewable energy, reuse of recycled water for irrigating green areas and public spaces, recycling, reuse and recovery of solid waste, and the production of compost, and biogas and biofuel from generated waste. This all contributes to the more efficient use of resources, reducing pressure on primary sources of energy water, and factor inputs.

Moreover, sustainable and resource efficient communities and housing projects should be considered when planning for mega national projects including the Suez corridor, Al-Alamein, New capital, and Sinai national development project. Furthermore, the design of new communities should be considered in light of the new Governorate administrative boundaries the proposed Egypt 2052 National Development Plan.²⁴⁸

Financing sustainable urban development through the establishment of a Green Urban Development Fund (GUDF) can go a long way in facilitating this transition.

In order to provide affordable housing for the middle and low income families in Egypt, it is proposed that the Government offers housing units provided through the Social Housing Project for rent and not for sale.²⁴⁹

Vision

Sustainable and resilient communities that sustain and drive economic development, and where current and future generations enjoy a high quality of life within the ecological limits of the site

Approach

The main approach to be adopted in satisfying the housing needs of existing and future population is to plan and design new communities that drive economic activities, create new economic opportunities, jobs, and provide housing and social, cultural and social services that meet the needs and requirements of the different segments of the community, while fully respecting the ecological limits of the ecosystem. In doing so a participatory approach should be adopted in order to ensure that the needs and priorities of local communities, as well as the incoming new inhabitants are taken into account.

Challenges

In order to achieve this end a number of challenges have to be addressed. These include the following:

- Lack of a comprehensive vision for sustainable development for Egypt on the long term.
- Lack of a long-term predictable and stable policies to make a transition to sustainable urban development and housing.
- Lack of a good governance system that ensures transparency, accountability and the adoption of a participatory approach in the design and planning for new communities.
- Lack of awareness to the economic, social, environmental and health benefits resulting from sustainable communities.
- Lack of an integrated approach to planning for new communities that takes into account economic, social and environmental considerations.
- Lack of public participation in the design of communities and housing units to reflect the needs and priorities of the local community and potential new inhabitants.
- Lack of a well-designed management and operational system, including sufficient budgetary allocations for maintenance of existing housing

stock, road networks and electricity, water, and waste collection and recycling facilities.

- Insufficient financial resources allocated to support the development of new communities and the construction of housing units, particularly for the middle and low-income families. Though initial costs of sustainable communities and green housing are relatively higher as compared to conventional housing and construction the long-term operational costs are lower than in the case of conventional construction.
- Lack of a regulatory framework that promotes green and sustainable communities and housing. On the contrary, the system may not be geared to support such an approach. While urban agriculture and green roofs can provide a solution to reduce energy consumption, a means to absorb CO₂ emissions, and at the same time provide families with basic foodstuff that they would have otherwise had to buy, the current coding system in Egypt don't permit growing agricultural crops in public spaces.
- Lack of inter-ministerial coordination between MHUUD, MURIS, MoE, and other relevant ministries such as MoLD, MERE, MWRI, and MoT.
- Low returns on investment for low-income and poor housing as compared to housing for high – housing represents a challenge for engaging the private sector in investments in the housing sector for these income groups.
- Lack of incentives for the private sector to invest in green buildings and construction, particularly for low and poor income families. This may be in the form of access to affordable mortgage finance, with the Government providing guarantees to buy down interest rates from commercial borrowers (but still require full due-diligence by the lender).
- Encroachment of housing and construction activities on agricultural land.
- Developing projects based on a political agenda without due consideration given to environmental and sustainability considerations.

Opportunities

Despite the challenges facing the transition to sustainable cities and green buildings in Egypt, the current situation presented a number of opportunities, those included the following:

- The creation of the Central Unit for Sustainable Cities and Renewable Energy (CUSCRE) (Cabinet Decision 512 for the year 2014). The Unit which was created as part of the NUCA is entrusted with the planning, design, construction and operation of green and sustainable communities that aim at achieving energy and water efficiency, water integrated solid waste management, sustainable transportation, and the application of the green economy concept in general. One of the main projects of the Unit is the joint project with the MoE transfer the City of Sheikh Zayed in Cairo into a green sustainable city as a pilot city.²⁵⁰ Other new communities in Egypt implementing green projects include Bourg El Arab, El Sadat, El Obour, and Toshka.
- On the Government level, there are tendencies to provide incentives for new constructions to be more energy efficient.
- Building the new administrative capital for Egypt provides a good opportunity to adopt the green buildings codes, LEED Programme and all other sustainable development considerations.
- The handbook developed by The Green Building Council (GBC) which can be used by the public to understand and implement green building practices.
- Guidelines for sustainable urban new cities are currently being finalized as a joint effort between the MoE, MHUUD and sponsored by the Ministry of Ministry of Planning, Monitoring, and Administrative Reform (MPMAR).
- The MHUUD has revitalized and enforced since a year ago, its Environmental Units attached to the Urban Planning Authority in the new urban settlements to monitor polluting activities and provide technical support for remedial action. These units are assigned the responsibility of promoting clean energy, including the introduction of solar energy where it finances and builds these systems, and through the Trustee Council provide

solutions for problems. It also promotes the engagement of the local community in urban development.

- The emergence of the new rating system “TARSHEED” could be instrumental for injecting new approaches in the market. In addition, there are a number of local initiatives that promote efficient use of resources. Some of these initiatives are; the Ecocitizen World Map project comprised of a Public-Private partnership that is led by the US NGO Ecocity Builders and joined by Esri, the Association of American Geographers, Eye on Earth (a partnership of UNEP + Abu Dhabi Environmental Data Initiative), Cairo University, Mundiapolis University, University of California at Berkeley and a number of local NGOs and community partners. This project, which started in 2013, provides tools and training to citizens, public officials and others who want to ensure a more sustainable and resilient urban environment through more informed decision-making.

Strategy

Economic, social and environmental considerations should be fully taken into account and guide the planning, design and construction of newly proposed cities and communities in Egypt. The development of such communities should ensure sustainability from the environmental, social, economic standpoint, as well as in terms of the financial viability and sustainability of proposed economic activities in new communities.

New housing units and communities should be designed to be resource efficient, drive economic activities, create new and innovative investment opportunities, create new employment opportunities, provide housing for the different segments of the population. They should also and be resilient to climate change and economic shocks. In order to achieve this end, new communities would need to rely on an energy mix with a higher share of renewable energy in the total energy mix, reuse of recycled water for irrigating green areas and public spaces, recycling, reuse and recovery of

solid waste, and the production of compost, and biogas and biofuel from generated waste. This all contributes to the more efficient use of resources, reducing pressure on primary sources of energy water, and factor inputs.

The proposed community should be designed and developed as an integrated self-contained self-sufficient sustainable entity. It should be designed to provide economic and investment opportunities for its inhabitants, employment, housing, health, educational, cultural and recreational services that are affordable and meet the needs of the different segments of the population. It should aim at driving economic activities thus contributing to GDP, social cohesion and integration, and environmental integrity.

The community or city to be developed should follow the Polycyclic concept with core units developed around specific economic, social, and cultural functions and activities that may be developed at different stages, and should ensure supportiveness and complementarities to other core units, and can also function as stand-alone developments.

Strategic Objectives

Three main strategic objectives are identified to realize the vision.

Strategic objective 1

The first strategic objective is to Promote the development and implementation of practices and solutions that enhance efficiency of the sector

While it is essential to have a master plan with clear land use and zoning, uniform building codes for housing units, location of economic and service activities, roads, public transport system, social and commercial services, it is important that building codes and land use and zoning regulations are strictly monitored and enforced throughout the development and functioning of a community.

One of the main guiding principles in the planning of new communities and design of houses is the efficient use of resources, natural as well as

produced goods. A life cycle assessment approach should be adopted to ensure the efficient and sustainable use of resources and in the functioning of new communities and housing units. This entails ensuring that buildings and communities are designed to reduce material use, and energy and water consumption and other factor inputs. It should also ensure the reduction, recycling, and reuse of construction and demolition waste as well as solid waste and wastewater generated.

Buildings should be designed not only to be self sufficient in the use of energy, but also to generate electricity beyond their needs and which can be fed into the national grid. Water saving equipment should be installed in buildings to reduce water consumption. Used water should be recycled and reused for irrigating green areas and public spaces. Solid waste should be separated at source to allow for its reuse and the production of compost out of organic material.

The use of local material should be encouraged to reduce costs, including transport cost. Reducing energy consumption and promoting the use of renewable sources of energy will contribute to CO₂ reduction and consequently positive environmental and health impacts.

Special care should be taken in the selection of the site for the new community and its optimum size. Both are critical in planning for the new community, the extent to which it will be able to support and drive economic activities, attract investment, and inhabitants. Planning for small and medium size communities of between 100,000 and 150,000 to reach a maximum size of 250,000 in special situations may be an ideal size for new communities. This provides a size of a community, which can be easily managed and financed and is able to achieve its set target of inhabitants. This will also help achieve self-sufficiency, competitiveness and economic viability of the community. The selection of the site should be based on a feasibility study that considers the site from all aspects, including topography, soil

conditions, availability of water and sources of energy, and accessibility to main transport routes.²⁵¹

Promoting sustainable communities and green construction, buildings and infrastructure should therefore be encouraged due to economic and financial gains, and positive social and environmental impacts.

Strategic objective 2

The second strategic objective is to enhance the contribution of urban development, housing and construction to sustainable economic development, social integration and cohesion, and environmental integrity

Sustainable communities should follow the concept of urban metabolism, where the design and planning of the community should carefully consider the interactions of the natural and human system in the designated location of the community. New communities and housing units should be designed with careful considerations given to water and energy requirements for the planned housing units, mobility and transportation, and solid waste management systems.

Access to employment opportunities, social, health, and recreational services are key for a sustainable community. It should be mentioned in this context that five new urban communities were established in Upper Egypt since 1999, which have not been inhabited up till now due to flaws in the way the communities were conceptualized, designed and implemented.²⁵²

The conceptual development and design of communities and cities should therefore aim at developing a carbon neutral environment, with full considerations given to the use of renewable energy (solar, wind, biogas), recycled seawater using solar energy (in case the site of the proposed city or community is located close to the sea), irrigation using water efficient and saving techniques (drip, sprinkler, hydroponic agriculture), recycled wastewater for fodder and green areas, and the use of waste for biofuel and compost.

The concept of sustainable communities should be promoted along desert coastal areas, particularly along the northern coast of Egypt to absorb future population growth in the country. The development of communities along the northern coast following this concept holds the future for solving Egypt's energy, water and food problems. This is in addition to reducing pressure on existing urban centres, infrastructure, services, traffic, air pollution, and pollution of waterways, as well as encroachment on agricultural land.

Applying the concept of a circular economy on the coastline desert areas will mainly rely on using solar energy for water desalination, use of water efficient and saving techniques and technologies to support economic activities, including the use of recycled water, production of energy from renewable resources, including biogas for waste and the use of organic fertilizers from organic municipal and agricultural waste. These desert communities should be self-sustaining, based on sound and viable economic activities that attract investments, create jobs and provide livelihood for its inhabitants within ecologically sustainable boundaries and carrying capacity of the site.

The design and layout of the city should emphasize the provision of public transport as the main transportation system as opposed to private car ownership. Space for pedestrians and cyclers along shaded areas should be included in the design of the city. Considerations should be given to providing easy access to employing opportunities, health and educational services as well as commercial, recreational, and cultural services, in order to reduce the reliance on motorized transport systems.

It should be emphasized that environmental, social, and economic considerations should be fully integrated in the different phases of the planning and implementation of new communities.

The Economic Dimension

The planning, design and construction of the proposed city or community should aim at

maximizing its contribution to the sustainable economic development of the region in which it is located and the country as a whole.

The physical planning, design, and construction of new communities should give due consideration to the efficient use of resources and other factor inputs as earlier stated, which will result in reduced costs. Identified economic activities for the new community should be self-sustaining, generate income for its inhabitants, and contribute to GDP.

In order to ensure the economic sustainability of the core units within the community, activities have to be identified on the basis of the unique characteristics of geographic location of the site, available resources and potential natural endowment in the area: water, energy generating potential, soil, and other resources, trends of regional and international markets for the identified products and services, and expected population growth and economic/financial payback period. The development and functioning of the community should rely primarily on the resource base available at the geographic location of the new community.²⁵³

The design of the new community should be in line with and supportive of the overall socioeconomic development strategy of the country, which should aim at achieving sustainable development.

Priority economic activities identified for the city or community may be one main driving activity or a mix of complementary and interconnected activities. The main driving activity may be agriculture for example, with agriculture related industrial activities to support the sector and provide value added for agricultural activities. In case the main economic activity is agriculture, industrial activities should therefore be directly linked to that sector.

Serving as a major educational, research, cultural, administrative and conference service hub may also be considered as a driver for the development

of the proposed new city or community.

The characteristics and main features of the new community should therefore be designed to support the economic activity, which has been identified based on the potentials offered by the specific location in question and its natural resource endowment. Priority should be given to economic activities with the highest contribution to GDP and job creation. Tourism is one of the sectors that offer such an opportunity in Egypt, due to the unique geographic location, cultural and social heritage, climate, extended coastline and beaches along the Mediterranean and the Red Sea, and scenic beauty in many locations in Egypt. Investing in the agriculture sector offer another option provided water resources are used in the most prudent and efficient manner. Achieving food security is a key objective in Egypt, in order to meet increased demand for food due to population increase, changes in consumption patterns, and high world food prices.

The community should be built to be self-sufficient, generating income for its operations and creating economic and job opportunities for its inhabitants. Identified economic activities should be competitive and attractive for local and foreign investors.

In order to attract new inhabitants to the new communities and encourage the purchase of new residential units, the Government should support housing finance programmes for low income and poor families.

The following are some basic principles to be considered in the design and planning of new communities and housing:

- An integrated assessment (social, economic and environmental) should be undertaken to ensure the viability of the new settlement from all aspects, to be accompanied by a full feasibility study.
- The new development should respect the local culture, tradition and architecture, and use local material that is most suited for the local environment and climatic conditions of the location of the project.

- Efficient use of natural resources and factor inputs using innovative building techniques to produce smart and efficient structures.
- Optimum land use planning to provide easy access to jobs, social, commercial, and cultural services, reducing heavy dependence on transportation for commuting, thus reducing energy consumption and CO₂ emissions.
- Promote a fair and transparent rental market and balanced rights for both landlords and tenants, through adequate legislation and a conflict resolution system.²⁵⁴ This can only be achieved if the availability of rental properties does not exceed demand by a high margin. The Government in this instance would need to leverage construction of rental properties. This may be in the form of writing off a percentage of mortgage payments against federal tax.

The Social Dimension

Adopting an all-inclusive participatory approach is an indispensable process in the development of the proposed city or community. This process ensures that the needs, concerns, and priorities of the local community are fully taken into account in the design plan. It will also ensure the integration and active engagement and contribution of the local community in the development and implementation of the action plan of the city.

The design and planning for the new community should ensure the preservation of the cultural and traditional identity of the local community and the specific characteristics of the site as earlier emphasized. Housing units provided in sustainable communities should be compatible with the local identity, and cultural and traditional background for the local community and potential future inhabitants.²⁵⁵ They should take into account the cultural identity of its inhabitants. This includes the protection of existing landscapes, historical and cultural heritage.²⁵⁶

Social considerations as well as the main occupational functions of the targeted community, as well as the specific geographic characteristics of

the selected location should be taken into account in the development of new communities. This includes planning concepts, building material, design of housing units, size and orientation. What suits farmers in the Delta for example would not be suitable for fishermen living along coastal areas, or Bedouins in Sinai.²⁵⁷

This includes the provision of housing; social services such as education, health, and cultural and recreational services reflect the socioeconomic circumstances and needs of the different segments of the population. Job creation, particularly for the local community should be an important component of the new community.

New centres should aim at achieving social cohesion, including between local communities and incoming new inhabitants. This can be achieved by providing accessibility to the different segments of the population to education, cultural, and recreational services that meets the needs of different income groups, ensure fair and equitable distribution of resources and accessibility to economic opportunities, jobs, and affordable housing. Sufficient public space and green areas should be made available in communities to provide green public and recreational areas for middle and low-income families. Women should be well integrated in communities' activities, economic, social and cultural life, with suitable jobs made available for them.

Developing social mixed communities should therefore be promoted as opposed to gated communities as the former contribute to social cohesion and integration.²⁵⁸

The main labour force to be engaged in construction related activities, as well as economic activities generated in the new community should be mainly drawn from the location of the city and the region. This may entail the development of training and capacity building programmes for the local community to provide the required skills and calibres needed to support local activities.

Human resource development should therefore

accompany physical development in order to ensure the necessary engagement and integration of local communities in the development process of their community. This should be in the form of extensive short term vocational and on site training campaigns and long term formal education, training and public awareness packages.

The Environmental Dimension

The development and design of the proposed community should fully take into account the prevailing environmental and ecosystem conditions, including the geophysical and climatological characteristics of the area. This is essential in order to ensure the integrity of the ecosystem, and that it continues to provide the resources and services needed to support and sustain the new community and its activities. Investing in the environment as well as in human resources should be considered as the basis for the sustainable development of the new community and the country as a whole.

Sustainable communities should contribute to reducing the carbon footprint throughout the life cycle of housing, constructions, and buildings.

The conceptual design of the proposed community should emphasize investing in renewable energy as the main source of energy to support all forms of activities and developments. It should also emphasize investing in water conservation, recycling, and reuse. This is in addition to investing in solid waste management in order to promote resource efficiency, produce organic compost, and biofuel. This will result in providing for a clean and healthy environment for the inhabitants of the community.

Ensuring the provision of a sustained and secure source of water is a crucial element for the long-term viability and sustainability of the proposed new community. Relying mainly on depleting underground water, as the main source of water is not an option. Investing in the desalination of seawater using solar energy should be given a priority for communities located along coastal

areas. This should be accompanied by the adoption of water efficiency measures and techniques, including the recycling and reuse of wastewater to provide the needed water supply to support human settlements and economic activities in the proposed community.

Building, construction and design should fully take into account the introduction of innovative environmentally sound solutions for the efficient use of water and energy, as well as other factor inputs. Building and construction activities should mainly rely on local material available in the proposed site as referred to earlier.

Moreover, new communities should provide for compact housing and allow for future growth in order to avoid urban sprawl.²⁵⁹

Public transit system should represent the main means of transportation, with space provided for pedestrians and cyclers to reduce use of vehicles. Design of communities should ensure mixed use and easy access to jobs, social, commercial, cultural and recreational services to reduce commuting time and encourage the use of non-motorized means of transportation.

Emphasis should also be laid on the use of environmentally sound technologies and production processes that avoids and minimizes waste and promotes the recycling of solid waste and wastewater into usable material, biogas, and compost.

The recycling and the reuse of demolition waste should be promoted as its share in total solid waste has been increasing with increased construction and renovation activities in Egypt.

Resilience in a changing climate

Egypt is one of the countries that are expected to be severely affected by the consequences of climate change represented by sea level rise and extreme weather variations. The projected impacts of climate change include:

- Increased frequency and severity of storm events

- Reduced average rainfall
- More days over 35°C and higher annual mean temperature
- Potential impact of possible sea-level rise
- Uncertainty or disrupted supply of electricity, water, food and fuel

Increased temperatures due to climate change have implications on water supply needed for human use, flora and fauna. This includes implications for food production and fodder for cattle and water availability needed to support municipal and economic activities.

It is therefore necessary that Egypt introduces measures that enhances the resilience and adaptation of new communities and cities to current and potential future climate change impacts.

Different alternatives and solutions for building design and the development of new communities should address the different potential scenarios for climate change implications: best-case scenario, worst case scenario, and business as usual scenario. This should be supported by an action plan with clear timeframes and responsibilities, including the role of different Government entities, as well as the role of the private sector for the different scenarios.

New cities and communities should aim at ensuring the realization of the following:

- Sustainable built environment
- Sustainable housing and construction
- Sustainable living and working environment
- Ecosystem and biodiversity conservation
- Sustainable transport system
- Sustainable business
- Integrated waste management
- Greenhouse gas emission reduction
- Water and energy efficiency

Strategic Objective 3

The third strategic objective is to promote efficient functioning and management of the building sector.

A good governance structure is necessary in order to ensure the efficient management and operation of existing and new communities and housing. Transparency, accountability and public participation should govern the functioning of the sector. While there are many laws and regulations related to urban settlements, housing and construction, three main aspects are lacking. The first is local capabilities to assess the potential economic, social and environmental implications of laws.

The second is the development of laws and regulations that promote the efficient use of resources and promote sustainability. The third is an efficient law enforcement, monitoring and evaluation mechanism. It is therefore imperative at this stage that existing laws are reviewed against a set of sustainability criteria and principles and new laws introduced to achieve this end. This should be supported by community education, the strengthening of the judicial system, and the training of prosecutors and judges and enforcement agencies.

The Government should provide a secure and stable macroeconomic environment for investing in the housing sector, including regulatory procedures and mortgage rules in order to ensure appropriate mortgage availability, protect consumers, enhance their housing security, widen housing choices and reduce the risk associated with home investments. There are a number of financial instruments that the Government can use to make lending more attractive to both banks and borrowers. These include mortgage insurance and loan guarantee programmes.

Moreover, national policies and programmes should be designed to allow inhabitants of informal settlements to regularize and upgrade their dwellings provided that the geographic location among other factors allow minimum safety requirements to be met.²⁶⁰

It should be emphasized that relevant stakeholders, including the local community, Government, academia, private sector, civil society, should be engaged in the planning and implementation phase of any proposed city or community. The role of Government, central and local has to be clearly identified in the implementation, management, and construction activities, as well as economic and services activities. The private sector should also be actively involved in the various community development activities, including through Public-Private-Partnership.

Community engagement and participation from the outset in the various phases of the development of the proposed community is key to its success. A mechanism should be established to ensure that the local community and inhabitants are involved in the planning and implementation of the action plan of community and its proposed economic activities.

Attracting private sector investment is also important in providing necessary financial resources required to fund housing and physical as well as social infrastructure related activities. A package of measures need to be introduced to encourage the engagement of businesses and the private sector in the development of new communities. These include a package of incentive and regulatory measures, and communicating a convincing message to entrepreneurs and businesses about the gains derived from internalizing the financial and environmental externalities of their operations (environmental degradation, emissions, waste, etc.). The private sector should have a better understanding of the economic and financial gains resulting from investing in sustainable communities, housing and construction.

Environmental and green building codes and standards should be introduced and enforced in the development and construction of new urban development, housing and construction and their enforcement. The Green Pyramids Rating System (GPRS) launched in 2011 by the EGBC, currently

being tested and under review should provide a strong and effective tool in promoting green and sustainable building structures in Egypt. About 30% of the current version of the rating system cover water use mainly in terms of efficiency and quality. The review process, however, should ensure the engagement of a multi disciplinary team of experts in order to ensure that the rating system covers all aspects of buildings. It is also suggested that the Green Building Handbook produced by the EGBC should also be reviewed to reflect the

experience gained on the ground and ensure that all aspects are incorporated in the handbook. The system is currently being tested in a number of locations in Egypt, and will be applied in the development of the new building of the MoE, which is yet to be constructed.²⁶¹

One of the necessary requirements for sound planning and projecting future housing needs for the different segments of the population is a reliable and continuously updated database for the housing and construction sector. It is therefore important to create and continuously update a database on the existing housing stock in order to support the planning decision making process.²⁶²

A package of incentives should be provided by the Government to encourage private sector investment in housing for low and poor income families, investing in green and sustainable communities and housing. This can be through concessionary loans, the provision of land at reduced costs, tax rebates, and subsidies.

The Government should also encourage investments in economic activities to make new communities self-sustaining, create jobs, attract local and foreign investment, and attract new inhabitants. This should be accompanied by measures and policies to provide disincentives to invest and live in major cities such as Cairo and Alexandria.

Effective monitoring and enforcement of laws and regulations has been generally lacking in Egypt.

It is therefore essential that strict measures be taken to ensure the enforcement of law and penalties are raised and paid for violators.

As indicate earlier new communities and housing units should cater for the specific needs and social and cultural backgrounds of the local communities. In order to achieve this end, it is proposed that a decentralized system should be introduced in Egypt, where governorates are given the responsibility and or the lead in the planning and designing of new communities and housing units.

Structural changes should therefore be considered to give more authority at the governorate level for land use planning and community development within a general framework to be provided by the central Government. Governorates are generally more aware of priorities and needs at the local level and are in most of the cases better positioned to provide the best solutions for local conditions.

There is a need to strengthen inter-ministerial coordination between MHUUD, MURIS, MoE, and other relevant ministries such as the MoLD, MERE, MWRI, and MoT.

There is a need to enhance the knowledge base and expertise of practitioners to deal with the environmental component in housing and communities, including the potential impacts of climate change on communities developed along coastal areas. Consideration should be given to creating a unit within the MoE to be entrusted with the responsibility of providing technical support and guidance for practitioners and decision makers working in this area. This would also apply to other sectors as well, including agriculture, industry, tourism, and transport.

Continuous assessment and evaluation of the status of implementation and functioning of new developments and housing projects should be undertaken with corrective actions introduced in order to ensure compliance with standards, guidelines, and action plans.

Human resource development and capacity building through formal education and training is necessary in order to provide the required skills at the different levels to support the development and construction of sustainable communities and housing.

A long-term research and development programme should be developed to provide innovative technologies, techniques and measures to support the development and construction of sustainable communities and housing.

A communication package targeting different stakeholders should be developed to raise awareness to the importance of transitioning to sustainable communities and housing and to adopting sustainable production and consumption patterns.

A strategy with three tracks

Track 1: The transition track

This track will give priority to physical conversion that can start immediately due to the cost effectiveness of available technologies. It also involves reasonable investments that can contribute to realizing short and medium-term objectives. This includes retrofitting of the existing building stock making existing units more energy and water efficient, increase the use of biomass as a source of energy, widespread waste to energy applications, and expansion of solar energy uses. This phase also involves community engagement to deal with municipal solid waste and regulatory reform and incentive packages that can influence change in the housing and construction sector towards a more sustainable path.

Track 2: The planning and preparation track

This track will focus on directing efforts and investments in areas that ensure the development of the necessary infrastructure to enable the achievement of the intermediate and long-term objectives. This includes the construction of necessary infrastructure for renewable energy, including biogas and district heating systems, solid waste and wastewater recycling and treatment plants, biogas and compost production facilities,

and factories for the manufacturing of environmentally friendly building materials.

Track 3: The technology development track

The design of new communities should include smart housing units that rely on technologies that provide saving in the use of resources, including natural resources such as energy and water. It should also promote the use of local material and help maintain the endogenous character of the community.²⁶³ This track is therefore concerned with investing in knowledge generation, and research and development (R&D) to support sustainable urban development, green housing and construction that are efficient, resilient and affordable.

This includes R&D in innovative design for green buildings, the use of wind and solar power energy sources, the use of solar energy for seawater desalination and other industrial processes, urban agriculture, transport systems, and building material.

Potential Benefits

Investing in green buildings though may result in an increase in initial costs, is expected to result in savings exceeding initial costs by about 10 times, due to long term savings in energy, water, waste generation, pollution, maintenance. This is in addition to improved health, productivity and human welfare of inhabitants of the community.

The transition to sustainable communities and green buildings and construction creates new economic activities and businesses, thus diversifying the economy and creating new economic opportunities.

Investing in sustainable communities and buildings creates new job opportunities. It is estimated that in the USA the refurbishing of buildings creates between 10-14 new direct jobs and 3-4 indirect jobs for every 1 million US \$ spent. It is expected that this figure will be double in the Arab region due to lower labour productivity. Investing one billion US\$ in Egypt should result in around 20,000 jobs.

It is estimated that investment of \$1 million in the refurbishing of buildings has the potential of creating 4-10 direct jobs and 3-4 indirect jobs (AFED). It is also expected to result in a reduction in maintenance and operating costs of refurbished commercial buildings with a payback period of less than 6 months.

It is estimated that energy saving measures and investing in renewable energy will reduce fossil fuel consumption by at least 35%. Environmental benefits include reduction in CO₂ emissions and the resulting positive impacts on health and the environment. Reducing climate change impacts, where buildings are estimated to be the cause of 35% of CO₂ emissions.

This is in addition to the reduction of water consumption (650-1250 litre/day as compared to 350 litre/day in green cities and buildings). Separation between grey and black water, its treatment and reuse in irrigation is estimated to save about 50% of water usage.²⁶⁴

Enabling conditions

If cities in Egypt are to become sustainable; places where natural resources are used efficiently, pollution levels are kept to a minimum, energy consumption is effectively controlled, and water resources are managed in a sustainable way, considerable reconfiguration of how these cities are planned, managed, and governed will need to take place.

This will require enabling conditions, through a variety of administrative, regulatory, and financing tools. The Government can create policies for procurement, contract specifications, building performance, and building codes regulating municipal standards. Municipalities can also enact regulations and develop training and education programmes that focus attention on sustainable building design.

Urban planning

One of the most effective urban planning policies for city and municipality administrators is planning regulations. Planning regulations determine what may be built and where, and how

much may be built. This is an essential urban planning tool that can be used to (re-) configure cities in a manner that supports energy efficiency, environmental protection, and greater sustainability.

It is essential to assess the economic, social, and environmental impacts of proposed planning regulations, as they will greatly influence the intensity and distribution of economic activity taking place in various parts of the city, and will direct economic activity to certain localities and away from others.

Care should be taken to ensure that zoning regulations will not negatively affect existing social structures, and protect agricultural land and green areas. Within built-up areas, the best way through which zoning may help achieve more sustainable cities is by promoting healthy densities.²⁶⁵

There is a great need to turn from functional zoning into mixed uses inside city cores to enable walkability and improve proximity to various uses and services, thus improving liveability. It is crucial to plan the urban mass of the city to improve the urban environment, reduce energy use and maximize efficiency.

Integrated planning will promote synergies and complementarities between social, economic, and environmental objectives. Industrial zones have to be subjected to comprehensive environmental impact assessment (EIA), in order to identify the industries to be allocated in each zone according to the type of industries; clean or polluting industries. There is a need to promote strategic land use planning for different uses; industrial, tourism, trade, transportation and infrastructure facilities that take into account environmental as well as social considerations into account. It is important to preserve and increase urban green areas, improve the urban environment and reduce pollution.

Egypt's urban planning needs for the coming 50 years at least have to be included in its master plan, identifying urban policies for the new settlements.

This master plan has to be updated according to new projects such as the One Million Housing Units Project, taking into consideration the impact of such projects on urban development, water and energy consumption in Egypt.

Adequate services and employment opportunities should be provided in new urban settlements to attract inhabitants to the new communities. There is a need to undertake a needs assessment before designing the urban plan at the national and local levels that should be a part of the national master plan of all of Egypt, and according to regional sub divisions.

Finally, it is important to ensure the provision of affordable housing to cater for the needs of the different segments of the population, particularly low income and poor families. It is also important to provide mixed housing in various districts of the city to improve efficient use of housing space and enhance social cohesion.²⁶⁶

Public policy

The most important factors that affect urban outcomes are outside the urban development, housing and construction sector, mainly policies that deal with energy, water, finance, and social protection. Promoting sustainable urban development in Egypt depends on other public policy interventions that are not directly connected to urban planning.

Fossil fuel subsidies discourage investments in resource efficient green buildings. Moreover, regulations and fiscal incentives will determine the costs and benefits of alternative sources of renewable energy.

There is a need to promote energy efficient buildings through regulations, encourage green buildings, enact and reinforce the GPRS for new buildings and create a rating/assessment tool for existing building (Current research about Green retrofitability Index).

Enforcing energy conservation policies will result in a greener and more sustainable urban environment. Energy efficiency measures and the use of renewable sources of energy in the housing

and construction sector should be promoted. This will support the transformation to a more environmentally responsive urban environment. Moreover, promoting cleaner production and the greening of building material in the housing sector will further facilitate this transformation process.

The Government should introduce measures to enforce green applications with investors and contractors. Furthermore, concepts such as the extended producer responsibility (EPR) has to be considered and the Polluter Pays Principle (PPP) should be introduced and applied.

Collaboration between the private and industry and research centres and universities should be promoted. These institutions should continuously provide the private sector and industry knowledge, innovative technologies and practices that enhances resource efficiency, reduce waste and pollution.

Moreover, the Government should encourage partnership with the private sectors and other relevant stakeholders in managing natural resources including land, water, and energy and other factor inputs.

Building Regulations

The building sector is a key target for pursuing green transformation strategies. Promoting green practices in buildings and cities involves a wide range of activities. These include developing energy-efficient, non-polluting transportation systems as well as energy-efficient building practices, water-conserving open green areas, and renewable energy resources. They also include rethinking the concept of waste management to incorporate extensive recycling and water treatment.

There is a need to enforce green building practices in Government sponsored projects. Adopting a LCA and enforcing it will ensure that products and materials used in the construction process are manufactured through clean production processes and techniques, and that material used and disposed of do not result in negative environmental

and health impacts. Environmental mitigation measures should be included in contracts designed and concluded with investors and contractors.

Green pyramids guidelines Index initiated by the GBC should be mandatory and used in buildings constructed in new urban development projects. Violators should be penalized by being denied access to services. This index is to be discussed by the incoming Parliament for approval.

Building materials, practices, and insulation techniques that reduce the heat load inside buildings should be promoted and encouraged through the introduction of relevant regulations and incentive measures. Other practices and techniques include the use of glass in facades should be minimized, while using light colours should be promoted. The use of recycled materials in the construction process, including the use of recycled demolition waste should be enhanced. In addition, promoting the use of green roofs can help improve the environment in cities.²⁶⁷

Carbon footprint tagging for building raw materials will encourage greener building practices. Buildings should ensure the integration of environmental consideration from the outset of the planning and design phase throughout execution and operation. Building design and operation should promote an integrated solid waste management (ISWM) system. The latter should be based on source separation and recycling to eventually achieve zero waste in the long-run.

Institutional Reform

Mandatory energy efficiency requirements through building codes have been acknowledged for their effectiveness. However, the success of implementation is subject to the institutional capacity of implementing agencies at municipal and national levels, and technological capacity within the national building supply chain to meet the requirements without considerable increase in costs.

This necessitates building the capacities of technicians and engineers to enable them review

tender documents submitted by contractors and investors. Moreover, architects and engineers should be trained in implementing environmental codes and standards.²⁶⁸

A first step towards green and sustainable transition is a review process for existing policies, plans and programmes in order to identify gaps and update policies and laws according to sustainability and green applications measures. Ministries have to work closely together in order to ensure harmonization of their laws and legislations, according to the State strategy.

A participatory process involving relevant stakeholders should be adopted in the formulation of policies and action plans.

The absence of clear roles and responsibilities of different ministries in the development of new urban communities represents a challenge for the building and construction sector. Closer cooperation is needed between MHUUD, MoE, MURIS, MERE, MoLD and Ministry of Trade and Industry (MTI). Collaboration with MTI should facilitate the promotion and introduction of cleaner and green technologies and products in the building and construction sector. There is a need for a strict approval and screening process for industrial and economic activities in urban areas in order to ensure that they not result in negative environmental and health impacts.

Capacity development and training programmes should be a key component of institutional reform. This is needed at all levels to produce the needed calibres at all levels from policy makers to skilled and manual labour. Professional staff working with the environmental units within the New Urban Communities' Authority have be well qualified and trained to be able to discharge their duties in the most competent and professional manner.

Urban Mobility

Mobility in urban areas in Egypt rely mainly on motorized means of transportation. Little consideration is given to making adequate space for pedestrians, thus making pedestrian

accessibility extremely limited, and often non-existent. This further strengthens the dominance of private car ownership over public mass transit systems in cities. Increased pedestrian access in the city has multiple advantages, including lowering air pollution levels, allowing residents to lead healthier lifestyles, lowering transportation costs, and encouraging higher levels of direct accessibility to public and service centres.

Alternative modes of transportation in the city such as cycling should also be encouraged. This will greatly depend on creating a reliable and affordable public transport system making available dedicated bike lanes, which will reduce traffic congestion and consequently pollution, in addition to integrating the existing formal and informal bus services which can produce an enhanced network.

Moreover, banning the use of pavement by shops and increasing trees on pavements would provide shaded areas to encourage pedestrian movement and enhance services.

The prevailing policy in Egypt to invest in road construction and not public transportation prevents the achievement of sustainable mobility with multiple opportunities of walking and cycling. Public transport systems can be promoted through Public-Private-Partnerships (PPP) that would have the potential improving the quality of the public transportation network and extend services to various locations but in a more reliable and clean manner.

Urban Management

Various interventions are partly constrained by existing policies affecting sustainable urban management in Egypt. Each urban centre and neighbourhood has its own socioeconomic and geographic characteristics. Residents in different areas within the city should have a say in the manner in which they are administered. This requires giving elected city councils significant authority in running the city and promoting

mechanisms that ensure that municipal institutions and their staff are responsive to the needs of their residents, and are also accountable to their constituency.

The current planning process for new Egyptian cities lack public participation at all levels. Participation of different stakeholders in the planning and decision making process is a key element in planning for new communities and cities. There is a need to provide some space for the decentralization of activities, accompanied by the adoption of participatory urban planning processes, to include local communities.

There is a need to enforce the local environmental monitoring body at the New Urban Communities Authority to monitor, enforce the law, ensure that activities do not result on negative impacts on the environment, and propose corrective measures as and when required.

Many decisions could more appropriately be made at the local, rather than the national level. Measures should be taken to decentralize the planning and decision making process at the local level.²⁶⁹

However, one cannot ignore the fact that certain aspects of urban management, such as waste management, urban transportation, or the provision of infrastructure services, depend on economies of scale and need to cover metropolitan urban areas as a whole. This requires considerable coordination between various urban districts within a given metropolitan centre.

There is a need to greening wastewater treatment facilities, ensuring the presence of a green solid waste management system, including an efficient solid waste collection, recycling, and disposal system.

A sustainable development unit should be created in each city or community to monitor industrial and economic activities and practices and ensure that they are operating in accordance with agreed sustainability principles and environmental

guidelines. This entity may be given the authority to impose sanctions and penalties for violators of environmental and sustainability rules and regulations.

Market incentives

Regulations need to be complemented with market enabling measures in order to foster the emergence of a sustainable market for green buildings. The extent to which the green buildings market will grow is determined to a large extent by the economic incentives provided to developers and property owners.

Construction companies and property developers will respond to the level of demand for green buildings and the price that property owners are willing to pay.

Green buildings cost more upfront, but save money in the longer term. Thus the scale of the savings should by itself create growing demand for green buildings, if property owners themselves reap the benefits of savings, and if they are aware of these savings. The extent of the savings, and thus the exact payoff period, will depend very much on the policy context.

Governorates should be able to have flexibility in managing their own budgets to support the development, management and operations of urban settlements in a more efficient manner.

Fiscal and economic tools, such as tax exemptions, subsidies, soft loans, incentives and grants can be used to encourage green building practices. Currently there are no incentives in Egypt for green practices in Egypt.

The Government needs to facilitate the availability of green technologies and equipment such as solar panels, smart meters, energy saving bulbs, etc., through customs exemption, loans and subsidies.

There is a need to create incentives and partially mandating the GPRS code/system at least for the commercial and industrial sectors. Industries and economic activities that integrate environmental consideration in their operations should be rewarded.

Incentives for green buildings can be applied through exemption from real state taxes for more than 5 years. And misuse and wastage in the use of energy should be strictly penalized.

Withdrawal of license of factories performing improper environmental practices can be a tool to ensure proper environmental impacts of the industrial sector. Besides, carbon Footprint on products can encourage buying environment friendly products.

Public awareness

Promoting transformation in the practices of the building and construction sector in Egypt will require considerable efforts in capacity building among builders, architects, engineers, and private developers.

Public awareness encompasses a broad range of measures for creating spontaneous demand through targeted communication campaigns. For example, capacity building and training programmes can be offered for designers and engineers to foster the development of a local, responsive supply chain. Other initiatives may include public recognition for voluntary labelling schemes and public leadership programmes and awards.

The use of green procurement in the commissioning of public buildings should not only target high profile projects, but also low income housing projects, with conditions for cost control. These initiatives typically spur the kind of innovations that are needed to enhance the knowledge base within local construction supply chains, including architects, engineers, material suppliers, and builders.

Awareness can tackle first behavioural patterns of consumption then can go beyond to implementing actual interventions that are locally appropriate and financially viable to improve the current building stock. Further awareness is needed to promote the construction of new green buildings despite the apparent increase in the initial cost.

However, through promoting life cycle assessment, people could see and judge the return of their initial investment over time.²⁷⁰

On the other side many decision makers lack the understanding of the concept of sustainable urban development. And it is important to promote integrated policy making to ensure the integration of the three dimensions of sustainability, including health considerations in planning and decision making.

There is a need to raise the public awareness to the improper use of manufactured disposals, and finding a simple mechanism for the civil society to complain on improper practices of using disposals. The civil society can be a monitoring body aiding the Government in ensuring green practices for disposals.

Besides, the media can play an important role in raising public awareness to the importance of sustainable consumption and production.

Indicators

A set of indicators have been identified in order to assess the level of performance of cities and communities and whether they have been able to meet the set environmental and sustainability standards.

- 60% of new developments to use local material and introduce measures to reduce resource consumption and promote reuse and recycling of waste.
- A 20% efficiency in the use of energy and water and factor inputs in green buildings.
- By 2030, 20% of the existing housing stock refurbished, including retrofitting in order to reduce energy and water consumption.
- All public buildings to use solar energy for lighting
- Gap between housing demand and supply to be reduced at an annual rate of 10%.
- Increase the number of green building by 15% in the next five years with an annual increase of 3%.
- New urban development, cities and housing to be designed, planned and implanted following sustainable development principles.
- Green public procurement related to housing and construction to represent at least 60% of total purchases.
- All new cities and urban centres to follow the principles of sustainability and green buildings.
- Contribution of the sector to GDP to increase by 5% annually until 2030.
- Gap between housing demand and supply to be reduced at an annual rate of 10%.
- 25% Share of labour force involved in sustainable and green building and construction.
- CO₂ emissions from the housing sector to be reduced by 20%.
- Achieve 20% efficiency in the use of energy and water and factor inputs in green buildings.
- Convert 20% of the existing housing stock into green buildings by 2030.
- All public buildings to use solar energy for lighting.
- 25% share of labour force involved in sustainable and green building and construction
- 40% of street lighting to use solar energy.
- 30% of rural houses to use biogas for cooking.

**Roadmap that identifies legislation, capacity building, and investments needed to achieve the strategic vision
2016-2017**

Actions/ Measures	Activity	Responsibility	Months	2016	2017
<i>Vision and Strategy</i>	<ul style="list-style-type: none"> Endorsement by the Cabinet of the vision, strategy and a detailed implementation plan for sustainable communities and housing that meets the country's needs, priorities and socioeconomic circumstances 		4-6	✓	
<i>Integrated Policymaking</i>	<ul style="list-style-type: none"> Develop and endorse a holistic and integrated approach that ensures the integration of social, environmental, and economic dimensions in housing design and construction as well as in the surrounding built environment (coastal, rural, urban and desert areas), and the development of sustainable coastal carbon negative cities that drive economic activities. Undertake an assessment of existing regulatory & incentive measures & assess their impacts on the environment & resource efficiency with the objective of identifying measures & policies, including means of implementation that promote SCP & consequently resource efficiency. Develop an Action Plan for the rehabilitation and upgrading of informal settlements that takes into account environmental, social and economic considerations. Develop innovative planning and construction models leading to smart cities that promote sustainable urban development and land use, green infrastructure, the provision of housing that is compact and accessible to work place, commercial, social, recreation and cultural services in order to reduce commuting, congestion, and consequently fuel consumption, CO2 emissions, and air and noise pollution Provide an institutional set up that ensures public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on Best Available Technologies and Best Environmental Practices on sustainable physical and urban development. Promote the use of a number of tools and measures that facilitates the design and implementation of sustainable and green buildings and communities, these include: 	<p>The High Council for Planning and Development (HCPD) in close consultation and collaboration with relevant Ministries</p> <p>Ministry of Urban Renewal and Informal Settlements</p> <p>Ministry of Environment to</p>	<p>Throughout</p> <p>4-6</p> <p>Throughout</p>	<p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p></p> <p>✓</p>

	<p>life cycle analysis, producer responsibility, eco labelling schemes, and environmental management systems. The main aim is to ensure the integration of environmental considerations in the design and manufacturing of products. Introducing the concept of producer responsibility entails the application of the polluter pays principle, thus encouraging industry to design products that avoids and reduces waste and promotes reuse and recycling.</p> <ul style="list-style-type: none"> Create and continuously update a database on the existing housing stock in order to support the planning decision making process. 	<p>take the lead role in promoting these tools and providing technical support to practitioners in the relevant Government departments</p> <p>CAPMAS in closes consultation and collaboration with the Ministry of housing, Utilities, and Urban Development</p>	Throughout	✓	✓
Good governance and institutions	<ul style="list-style-type: none"> Identify action needed to reform/restructure or create an institution that will be entrusted with coordinating action related to planning, implementation, operation and maintenance of existing and planned housing and communities in an efficient, transparent and accountable manner. The already existing High Council for Planning and Development may be considered to take on this role. Ensure public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on Best Available Technologies and Best Environmental Practices on sustainable physical and urban development. The institutional set-up should facilitate inter-ministerial coordination to avoid redundancy, conflict of interest and overlap of responsibilities between different ministries. Institution should function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources. Create within the Ministry of Environment a Unit that will be entrusted with the responsibility of providing guidance and technical support related to green and sustainable building and construction. Initiate action to decentralize the decision making process with more powers given to governorates and local authorities in the design, planning, and management of new sustainable communities and the upgrading and retrofitting of existing housing 	<p>The Cabinet</p> <p>(HCPD)</p> <p>(HCPD)</p> <p>(HCPD)</p> <p>Ministry of Environment</p> <p>(HCPD)</p>	<p>1-2</p> <p>Throughout</p> <p>Throughout</p> <p>Throughout</p> <p>1-2</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>182</p>

	stock. ⁷				
Regulatory framework	<ul style="list-style-type: none"> • Develop a package of regulatory and incentive measures and policies, that support sustainable urban development, green construction and infrastructure, use of renewable energy, and sustainable practices, throughout the entire life cycle of a building, resulting in the efficiency in the use of natural resources (water, energy) and factor inputs and consequently in the conservation of the natural resource base, biodiversity, and coastal and marine ecosystems. The framework should be designed to support market incentive measures. • Develop a regulatory and incentive package that promotes eco-design and the construction of sustainable and affordable housing that caters for the needs of the different social income groups, particularly medium and poor income families. • Finalize and introduce green building and sustainable urban development codes, (including, the provision of space for pedestrians and cyclers, green roofs, a public space and green areas) in residential areas for communal use, as a means to promote social integration and cohesion, while at the same contributing to a clean, healthy, and productive environment. • Introduce in law a requirement for all public buildings to be constructed following green and environmental friendly codes and standards, including energy efficient systems, use of renewable sources of energy, water efficient system, and recycling and reuse of treated wastewater, conversion of sewage water into biogas, source separation of municipal waste, recycling, reuse, and recover, and the production of compost from organic waste. • Develop and launch a labelling and certification scheme for green and sustainable housing. • Introduce regulatory and incentive measures, sustainable practices in housing and construction to promote the use of national traditional & cultural environmentally friendly housing & construction practices & knowledge & the development of a procedural guidelines document for the introduction of design adjustments & modifications to cater for the environment and socioeconomic circumstances of different geographic locations. • Introduce regulatory and incentive measures that promote integrated sustainable 	(HCPD) in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC Ministry of Finance	6	✓	183

⁷Nisrin El Laham, Towards Creating New Sustainable Cities and Communities in Egypt, A critical View for Planning for New Cities, 2011

	<p>management practices for cities. Including the proper maintenance, restoration, and operational efficiency of the existing housing stock (i.e. retrofitting, refurbishing and upgrading of existing housing stock, including informal settlements) in order to maximize the use and efficiency of the housing stock. Private sector should be encouraged through incentives to contribute to this process.</p> <ul style="list-style-type: none"> • Institute in law the requirement for economic activities, including industry and agriculture related activities in communities to adopt cleaner production and provide incentive measures to encourage SCP. • Institute in law the requirement for waste generated from the building and construction process and demolition waste to be recycled and provide facilities. • Introduce and enforce a law that allocates between 10%-13% of the community to be allocated to green areas. • Introduce and enforce regulatory measures that encourage compact buildings, mixed use areas to promote easy access to service and employment opportunities, district lighting and heating, and the provision of public green space. • Introduce laws that prohibit the use of freshwater in irrigating green areas (public and private). • Institute in law a requirement for coastal communities to use desalinated water as the main source of water supply for municipal and economic activities. 				
Economic instruments	<ul style="list-style-type: none"> • Design market incentives to encourage investments in sustainable communities, green buildings and construction, including the use of renewable sources of energy, recycling of municipal solid waste, wastewater recycling and reuse, and demolition waste. These can also be designed to ensure a balanced distribution of the population attracting investments and inhabitants to new communities and discourage investment and the concentration of populations in already dense and populated centres. • Provide a package of incentive measures to encourage green roofs and urban agriculture. 	HCPD in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC Ministry of Finance	3-4	✓	
Economic analysis	<ul style="list-style-type: none"> • Undertake an economic analysis to assess the financial viability of the proposed plan to include costs and benefits. The latter should include the expected social and environmental benefits resulting from the proposed plan, including number of new jobs created. It should also identify budgetary requirements needed to finance the programme and sources of funding. 	HCPD in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC Ministry of Finance	3-4	✓	184

Government Procurement	<ul style="list-style-type: none"> Government to take the lead in promoting green and sustainable communities, infrastructure, and buildings by directing public spending towards this area, by retrofitting of public buildings (Offices, schools, hospitals, post offices, roads, etc.), with energy and water efficient equipment and the construction of new communities on a sustainable basis. 	Action to start immediately by developing an action plan by the different governorates to be coordinated by the MHUUD	Throughout	✓	✓
Trade	<ul style="list-style-type: none"> Design trade policies to support sustainable and green building and construction through a tariff system that encourages the import of environmentally friendly building and construction technologies and encouraging the export of locally produced technologies. 		2	✓	
Funding	<ul style="list-style-type: none"> Secure a stable and predictable source of funding for sustainable and green buildings in order to ensure the continuity of services provided and meeting the set objectives of the programme Financial institutions should be requested to support financing investments in green buildings and infrastructure, and sustainable communities. In order to encourage low-income and poor families to inhabit new communities, the Government may consider subsidizing housing for them.⁸ 	Ministry of Planning, Monitoring, and Administrative Reform in collaboration with Ministry of Finance, and MHUUD	Throughout	✓	✓
Private sector	<ul style="list-style-type: none"> Develop a package of incentives and measures to encourage and promote the engagement of the private sector in green and sustainable communities and buildings directly and through Public-Private-Partnership. In the latter case the Government could enter into partnership arrangement where it could provide easy access for land, introduce tax exemptions, provide concessionary loans in order to encourage private sector engagement. 	HCPD in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC Ministry of Finance	4-6	✓	
Public Awareness	<ul style="list-style-type: none"> Develop and implement public awareness campaigns targeting different target groups, including policy & decision makers, the general public, academia, civil society, private sector and business, builders & contractors, & clients, highlighting the economic, social, health and environmental benefits of developing and implementing sustainable communities. The role of media is significant in promoting sustainable patterns of production and consumption in the housing and construction sector by demonstrating their economic and financial benefits to different stakeholders. 	HCPD in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC, Ministry of Education	4	✓	✓

⁸Ibid

Education	<ul style="list-style-type: none"> Develop and implement a curriculum for green and sustainable communities and buildings to be offered at the Egyptian Universities. This can be at the undergraduate and the post graduate level 	Ministry of Education in close collaboration with public and private universities (Cairo and Ain shams University, the October 6 th University, and the British University etc.	6	✓	✓
Capacity Development	<ul style="list-style-type: none"> Develop a capacity building, educational, and a research and technology development programme that supports sustainable urban development and green housing and construction, including innovative green and carbon removal (carbon negative) technologies and their applications in housing and construction, as well as tools and concepts that support this transition such as integrated assessment, life cycle assessment, green economy, and circular economy/closed loop economy. 	HCPD in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC, Ministry of Education, Ministry of Labour	4-6	✓	✓
Monitoring and assessment	<ul style="list-style-type: none"> Develop, for adaptation at the national level of a framework for the efficient monitoring, enforcement & assessment system that ensures compliance & adherence to sustainability principles in physical & urban planning & development, green & sustainable building regulations, codes of practice & standards. The framework would also include the creation of a coordination mechanism to coordinate initiatives, programmes, & funding related to green & sustainable housing & construction, as well as the creation of cooperatives to facilitate access to funds to financed sustainable & smart housing & construction. Provide air quality monitoring stations to monitor air pollution and main pollutants on a continuous basis, including gaseous pollutants, noise, and electro magnetic waves. 	HCPD	Throughout	✓	✓
Research & development	<ul style="list-style-type: none"> Design a long-term R&D programme in environmentally sound building and construction material, energy and water saving equipment for housing and infrastructure. The development of this programme to be developed by the Academy of Scientific Research in close consultation and collaboration with the Ministry of Environment, Ministry of Housing, Utilities and urban Development, Ministry of Urban Renewal and Informal Settlements and other relevant ministries and research bodies and think tanks. 	Academy of Scientific Research in close consultation and collaboration with the Ministry of Environment, MHUUD, MURIS	4-6	✓	✓
Indicators	<ul style="list-style-type: none"> Develop a set of indicators to monitor the achievement of the set objectives and targets. 	HCPD in collaboration with the Ministry of	3-4	✓	186

		Environment, Ministry of Housing, Utilities and Urban Development, EGBC			
Regional & International Cooperation	<ul style="list-style-type: none"> Promote regional and international cooperation in the field of sustainable and green buildings and cities by being active members/partners in, Sustainable Cities Programme, Habitat, the African Urban Metabolism Network (AUMRN), and the C40 Initiative, etc. 	HCPD in collaboration with the Ministry of Environment, Ministry of Housing, Utilities and Urban Development, EGBC, Ministry of Foreign Affairs	Throughout	✓	✓

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in Egypt**

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Acronyms

CDM	Construction and Demolition Waste
CSR	Corporate Social Responsibility
EEAA	Egyptian Environmental Affairs Agency
EHSIMS	Egyptian Hazardous Substances Information and Management System
EPR	Extended Producer Responsibility
GDP	Gross Domestic Product
GHG	Green House Gas
CO ²	Carbon Dioxide
CH ₄	Methane
LCA	Life Cycle Assessment
ICT	Communications Technology
IMC	Inter-Ministerial Committee
ISWM	Integrated Solid Waste Management
MoLD	Ministry of Local Development
MURIS	Ministry of Urban Renewal and Informal Settlements
MSW	Municipal Solid Waste
N ₂ O	Nitrous Oxide
OECD	Organization for Economic Cooperation and Development
POPs	Persistent Organic Pollutants
PPP	Public-Private-Partnerships
RDF	Refuse-Derived Fuel
R&D	Research and Development
SDGs	Sustainable Development Goals
SMSEs	Small and Medium Size Enterprises
SO ₂	Sulphur Dioxide
SWM	Solid Waste Management

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Introduction

Rapid urbanization, increased incomes, and changing consumption patterns are driving unprecedented levels of waste generation, in low and middle-income countries. A recent study published by the World Bank (Hoornweg and Bhada-Tata, 2012), suggests that quantities of waste generated by the world's cities will nearly double by 2025²⁷¹. This rising tide of waste represents an increasing environmental, social and economic burden, particularly for the poorer segments of the community. In many parts of the world, waste collection is limited to more affluent areas and communities, disposal via open dumping and uncontrolled landfill is still widespread, and many of the world's poorest people depend on informal recycling activities to survive.²⁷²

It is estimated that municipal solid waste alone amounted to 2 billion tones annually, while urban solid waste from households, commerce, industry and construction is estimated at between 7-10 billion tonnes. It is also estimated that 2 billion people around the world lack access to solid waste collection and 3 billion people lack access to controlled waste disposal facilities.²⁷³

Improving solid waste management (SWM) services in developing and emerging economies is fundamental to economic growth and has the potential to boost local economies, while at the same time protect human health and the environment and conserve resources and mitigate climate change impacts (Wilson, 2007).

The dominant focus of development co-operation assistance in the waste sector is on solid waste. This is in line with the overarching objective of development co-operation activities in tackling poverty, which in the context of waste management, is closely associated with inadequate disposal of waste in urban areas (particularly urban slums), and informal sector recycling activities.

However, it is important to recognize that development co-operation also plays a role in improving the management of a range of other

types of waste, including the following waste streams:²⁷⁴

- **Health waste** receives a particularly strong focus due to the level of risk associated with managing this waste stream. About 10% of SWM development co-operation projects in 2012 were focused on healthcare waste.
- **E-Waste** has been the subject of considerable development co-operation activity and can be expected to continue to be so given the increasing levels of electronic waste and equipment being generated globally. There are also increased concerns surrounding illegal shipment of E-Waste from developed to developing countries and the health and environmental risks associated with the burning of E-Waste to extract precious metals.
- **Hazardous waste** was the specific target of 14% of SWM development co-operation projects in 2012.
- **Agricultural waste** was identified as the focus of 11% of projects in 2012, often as part of a biogas scheme or biomass-based waste to energy projects.
- **Radioactive waste** represented 5% of committed projects in 2012.
- **Industrial waste** represented 4% of committed projects in 2012.

The figure below shows the percentage share of development cooperation projects worldwide in 2102.

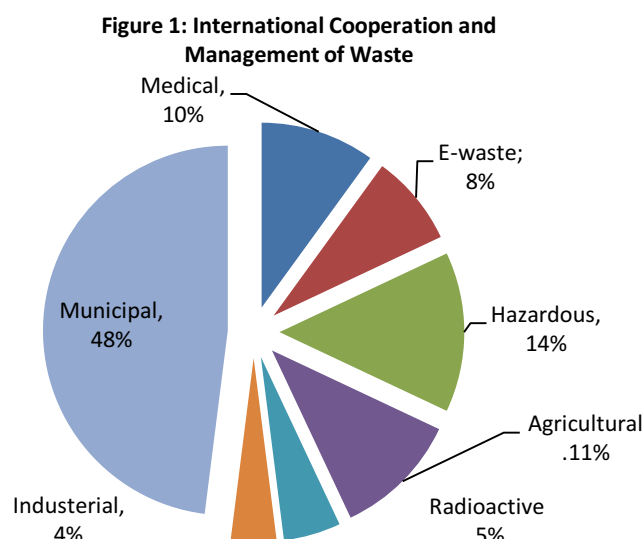
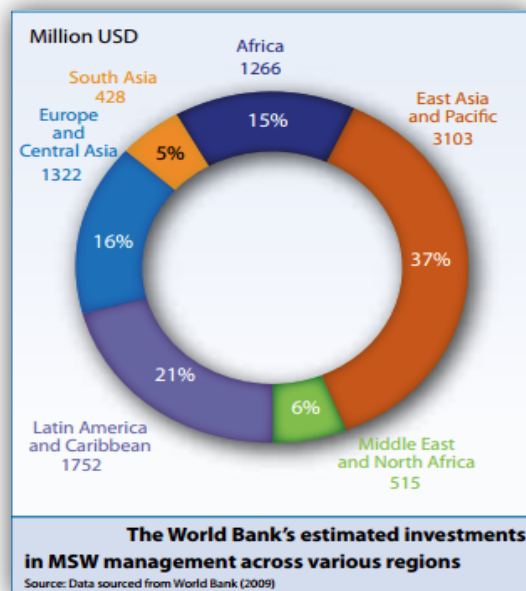


Figure 2 below shows the share of world investments in the different continents with the East Asia and Pacific region receiving the highest share, amounting to 37%, followed by the Latin American region with 21%, then Africa with 15% of total world investments.

Figure 2



Overview

The amount of solid waste humans generate is rising fast and will not wane this century without transformational changes in how material is used and reused, according to former World Bank urban development specialist Dan Hoornweg and two colleagues. They have estimated that by 2100, the growing global urban population will be producing three times as much waste as it does today. That level of waste carries serious consequences – physical and fiscal – for cities around the world.

In an earlier report dated 2012, they warned that global solid waste generation was expected to increase 70% by 2025, rising from more than 3.5 million tonnes per day in 2010 to more than 6 million tonnes per day by 2025. Waste from cities alone is already enough to fill a line of trash trucks 5,000 kilometers long every day.

The global cost of dealing with all that trash is rising from \$205 billion a year in 2010 to \$375 billion by 2025, with the sharpest cost increases in developing countries.

It is forecasted that if business continues as usual, solid waste generation rates will more than triple to exceed 11 million tonnes per day by 2100. In the Organization for Economic Cooperation and Development (OECD) countries, where waste levels are the highest, estimated at around 1.75 million tonnes per day. With population not growing as fast and waste reduction efforts being underway, OECD countries are likely to see their trash levels peak by 2050 and then start to decline. Asia-Pacific countries are not expected to peak until 2075. When will Sub-Saharan Africa's waste increase is expected to peak will determine when the world's trash problem will begin to decline.²⁷⁵

The results hold serious consequences for public services, Government budgets, and the space consumed by landfills. Already, Mexico City's Bordo Poniente and Shanghai's Laogang receive more than 10,000 tonnes of waste per day, and the world's more than 2,000 waste incinerators raise concerns about ash disposal and air pollution. Landfills, and uncollected waste, also contribute to climate change through the emission of methane, a potent greenhouse gas more polluting than carbon dioxide (CO²).

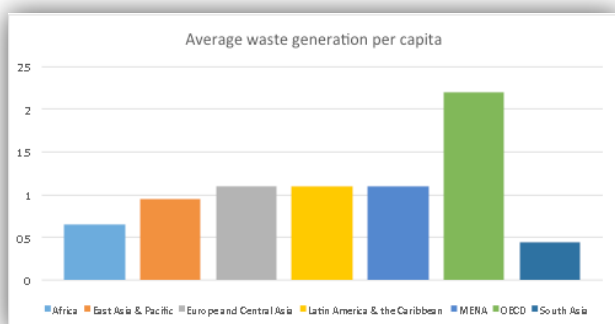
It is estimated that municipal waste generation in sub-Saharan Africa is approximately 62 million tonnes per year. However, per capita waste generation is generally low in the sub-Saharan African region, but ranges from 0.09 to 3.0 kg/person/day, with an average of 0.65 kg/person/day. However, for several African countries, data are not readily available; a per capita amount of 0.5 kg/capita/day is assumed for urban areas for 2005. Countries with the highest per capita rates are island states, due to the additional waste generated by the tourism industry, and a more complete accounting of wastes generated from different sources.²⁷⁶

For the Middle Eastern and North African countries, municipal solid waste generation is estimated at 63 million tonnes per year. Per capita waste generation is 0.16 to 5.7 kg per person per day, and has an average of 1.1 kg/capita/day.²⁷⁷

In the West Asian Arab region population increase, economic progress, rapid industrial development, expansion of urban areas, and rising standards of living have all contributed to a sharp rise in solid waste generation. It is estimated that municipal waste generation rates in West Asian Arab states alone have increased from 4.5 million tonnes per year in 1970 to as high as 25 million tonnes in 1995.²⁷⁸

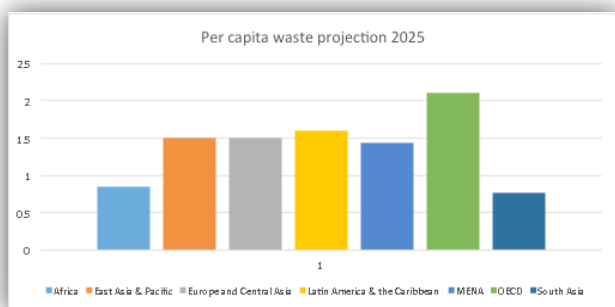
Figure 3 below shows the average waste generation per capita in the different regions, with OECD showing the highest rate of per capita waste generation, while figure 4 shows projections for 2025 by region.

Figure 3



Source:
INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf

Figure 4

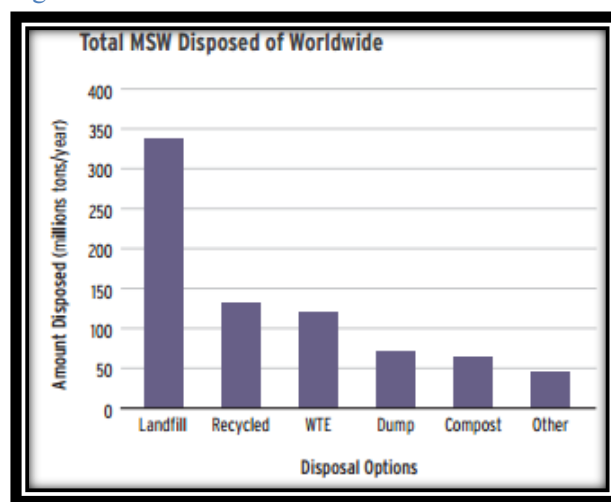


Source:
INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf

The development of Integrated Solid Waste Management (ISWM) systems necessitate following a hierarchy based on a waste management pyramid starting with prevention, source reduction, resource recovery, reuse and recycling.

Figure 5 below shows the disposal options of municipal solid waste (MSW) worldwide in 2012, with the most of the waste being discharged in landfills.

Figure 5



<http://siteresources.worldbank.org>

Solid Waste Management (SWM) in Egypt

According to Egyptian Environmental Affairs Agency (EEAA) statistics, about 89.28 million tonnes of solid waste were generated in Egypt during 2012.²⁷⁹ Composition of the waste is estimated as follows: 32% Agriculture, 27% Municipal, 27% Industrial, 7% Dredging, 3% Sewage and 5% Construction.²⁸⁰

The current situation shows that agricultural waste in Egypt represents a dual problem. A problem in its raw form, as accumulated waste in the agricultural governorates along waterways in rural areas and districts, and the practice of getting rid of it by burning.

There are numerous difficulties facing Egypt in its endeavors to develop and implement an ISWM system. These maybe categorized as technical, economic, institutional, social and behavioral.

However, there is a general trend towards increasing reuse/recycling of wastes components. Land filling is the predominant practice to SWM in Egypt, while other practices such as composting and recycling are limited. Nonetheless, composting should also be seriously considered, along with sorting and recycling, due to the large percentage of organic degradable components and recyclable materials generated from the MSW in Egypt.²⁸¹

Difficulties in developing and implementing an ISWM system in Egypt include lack of a reliable database for solid waste across the country, diversity of operating agencies, lack of SWM equipment, and insufficient budgetary allocations. This is in addition to lack of appropriate legislation, planning and enforcement, technical staff and skilled labour, training, inefficient management processes, and lack of public awareness and participation.

The solid waste problem in Egypt is due to inherent problems in the system. The current system neither meet the needs of the society nor provide appropriate services to the different segments of the population.²⁸²

Facts and Figures

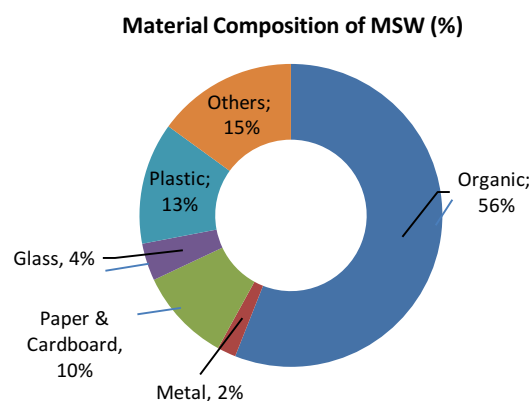
As is the case in many developing countries, Egypt is currently struggling to cover the costs of its waste management services. Most governorates in Egypt barely cover 50% of the cost of waste services, which is one of the main contributing factors to the deterioration of collection services and the inability of the Government to invest in upgrading those services. It is estimated that only 60% of generated waste is currently collected.²⁸³

Solid waste is considered to be one of the main sources of pollution in Egypt. It continues to be a challenge, with respect to prevention, collection, transport, treatment, recycling, recovery and final disposal. The current waste collection system neglects large areas of cities, and the majority of collected waste ends up in open dumps with no effective treatment or control procedures.

The average generation of municipal waste per

capita in Egypt is between 0.7 and 1.0 kg/day for urban areas and 0.4 to 0.5kg/day for rural areas. As shown in figure 6, the composition of municipal solid waste in Egypt is as follows: organic (56%); paper and cardboard (10%); plastics (13%); glass (4%); metals (2%); and others (15%).²⁸⁴

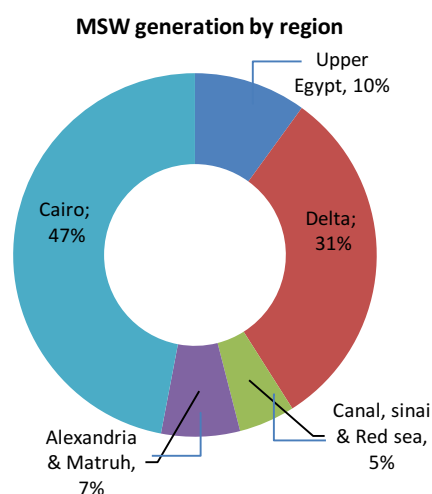
Figure 6



Source: Annual report for solid waste management in Egypt, 2013 (Volume 1: Summary)

Figure 7 below shows waste generation by governorates

Figure 7



The total annual municipal solid waste generation in Egypt has increased more than 36% since 2000,

to the current level of more than 20.5 million tonnes per year (2010). Solid waste generation is projected to exceed 30 million tonnes yearly by 2025, as given in Egypt's Country Report of 2004.²⁸⁵

Table below shows generated waste by sector in in 2001, 2006, and 2012.

Generated solid waste in Egypt, 2001, 2006, and 2012

Waste Type	2001	2006	2012
MSW	14.5	17	21
Construction & demolition	3.5	4.6	4.0
Agriculture	23.5	27.5	30
Industrial	4.25	4.75	6.0
Medical	0.12	0.15	0.28
Waterway cleansing waste	20	30	25
Sludge	1.75	2	3
total	67.12	86	89.28

Source: EEAA

The industrial sector is an important sector in Egypt contributing 37.6% to Egypt's gross domestic product (GDP) in 2011, with 64,997 industrial enterprises operating in the same year. Pollution and solid waste generated by the industrial sector has negative health and environmental implication in Egypt. According to EEAA, industrial waste generated in 2001, 2006 and 2012 were estimated at 4,250,000, 4,750,000 and 6,000,000 tonnes, respectively.²⁸⁶

Out of the total industrial waste generated, about 100-150 thousand tonnes is estimated to be hazardous. This is in addition to hazardous waste included in municipal and commercial waste, which is currently not subjected to a special treatment system.

Mercury resulting from the improper disposal of fluorescent bulbs represents a health hazard in Egypt. This requires an efficient collection and

disposal system for fluorescent bulbs in the country. Current practices do not involve separation and special treatment of fluorescent bulbs. Moreover, it is not exactly clear how and where unused and disposed of bulbs are disposed of. While mercury is classified as a hazardous waste, fluorescent bulbs municipal waste including mercury is not. This requires specific measures to be taken for the separation of fluorescent bulbs from municipal and commercial waste. Efforts should be made to encourage the replacement of goods containing mercury with other goods with no mercury content.²⁸⁷

It has been estimated that in 2012 the total amount of defected/returned fluorescent bulbs was 9,495 in Greater Cairo and Alexandria alone. This figure is likely to be higher for Egypt as a whole taking also into account the increased levels of use and consumption during the last several years to accommodate increased population and commercial activities. Lack of assigning a clear responsibility to a Government entity for the collection, treatment and disposal of hazardous waste, including mercury is one of the main problems facing the proper handling of hazardous waste. Moreover, lack of awareness of the health hazard associate with the improper handling and disposal of fluorescent bulbs is another problem.

Measures that need to be introduced include:

- Clearly identifying entity to deal with mercury.
- Preparation of guidelines for the handling of used fluorescent bulbs.
- A safe and reliable collection system
- Recycling and disposal system²⁸⁸

Another type of solid waste that has its value is the E-waste. It was estimated that in 2012 Egypt generated from the Information and Communications Technology (ICT) sector (not including the stock of waste generated in preceding years) ranged between 5,000 to 8,000 tonnes. It is estimated that E-waste will reach around 9,000 tonnes in 2015.

Currently there are no regulations governing the management of E-waste in Egypt. The only requirement is that those involved in E-waste need to obtain a license as per article 29 and 31 of Law N0. 4. There are however a number of regulations controlling the import of electronic waste.²⁸⁹

Since E-waste include valuable material, proper separation and processing of E-waste can be a profitable undertaking for both the public and private sector. Adequate measures should be introduced to promote the adequate separation, collection, and recycling of e-waste. This includes a legal framework to control the discharging of E-waste, promoting extended producer responsibility (EPR), consumer deposit and exchange system and collection centers. Other measures include Eco-assurance system for electric and electronic products, adopted in many countries. The system promotes the recycling of electric and electronic products together with other measures which include the following:

- Standards compliance for the content of hazardous material.
- Information disclosure.
- The requirement for manufacturers and importers to collect and recycle e-waste they generate.
- Obligation on the part of sellers to collect e-waste once disposed of.
- Apply the polluter pays principle.²⁹⁰

Beside municipal and industrial waste, a third waste stream which is becoming increasingly important, is construction and demolition waste (CDW). The estimated figure provided by the Ministry of local development (MoLD) is more than 10-folds that is quoted by EEAA. MoLD estimated the generation of 41,748,603 tonnes of CDW in 2010, whereas the corresponding estimation by EEAA is 4,000,000 tonnes in 2012. This wide variation arises from the lack of an accurate measurement and classification system for the different types of generated solid waste.

As for agricultural waste, it is estimated that in 2012, Egypt generated about 30 million tonnes of

agricultural waste (around 82,200 tonnes per day). A large portion of agricultural waste is either burned in the fields or dumped on the banks of canals and drains, creating obstacles to water flow and endangering water quality²⁹¹

Burning of agricultural residues, especially rice straw is a problem in Egypt. It is estimated that about 360,000 hectares of rice were grown in Egypt in 2008. According to the MoLD statistics, 12 governorates cultivated rice in 2009/2010. After harvesting, the produced rice straw was 2,189,086 tonnes out of which 1,969,701 tonnes were recycled.²⁹²

Regarding medical waste, Egypt has approximately 2,352 hospitals and 150,740 healthcare facilities (without beds) providing primary, secondary and tertiary healthcare services in all Egyptian governorates. The overall estimated quantities of hazardous waste generated from all hospitals and healthcare facilities of various categories and affiliations is estimated at 103.8 tonnes/day, with the total capacity of treatment technologies in operation estimated at 45.1 tonnes/day. It is estimated that 53.4 tonnes/day of hazardous medical waste is left untreated every day.²⁹³

Although the Egyptian Government launched several initiatives to develop the waste management sector with the start of the new millennium, these efforts resulted in modest improvement. Less than 65% of generated waste is managed by some form of public or private sector

collection, disposal or recycling operations.²⁹⁴ The remainder accumulates on city streets and at illegal dumping sites.

As far as recycling is concerned, the proportion of recycled organic waste does not exceed 20% of the total generated solid waste in Egypt. There are only 66 composting plants across the country.²⁹⁵

Moreover, waste management remains, for the most part, both inefficient and inadequate. This is causing serious environmental and public health problems.

In fact, the improper disposal of municipal solid waste as well as agricultural and industrial waste in waterways and drains has contributed to the contamination of water supply in many areas around the country, and is resulting in negative health and environmental impacts.

Solid Waste Policies

Institutional Framework

There are currently a number of Government entities involved in solid waste management with no adequate delineation of responsibilities and coordination between them. Ministries involved include, the Ministry of Environment, responsible for the overall strategic direction of solid waste with direct responsibility for (agricultural waste), Ministry of Urban Renewal and Informal Settlements (MURIS - recently abolished in the last Cabinet reshuffling, (municipal solid waste and demolition waste), Ministry of Health (MoH) (medical waste), Ministry of Trade and Industry and Small and Medium Size Enterprises (industrial waste, including hazardous waste), and with Ministry of Communication and Information Technology (MCIT) (E-waste). MoLD and governorates are involved in the collection of all types of solid waste.

A clear case for the complexity of the institutional set up is the responsibility earlier given to MURIS to handle municipal as distinct from commercial and industrial waste and other types of waste generated by cities.

Another case in point is the disposal of healthcare waste entrusted to the Ministry of Health (MoH) and its directorates in the governorates and cities, without clear assignment of responsibilities and coordination with MoE, MURIS, and MoLD.

As far as hazardous medical waste is concerned, the MoE has the overall responsibility for setting the principles and procedures for its management, the issuance of licenses, and the supervision of operations and facilities. In April 2010 the MoH and EEAA presented a national strategy including a hazardous medical waste system, currently being implemented by MoH. A coordinating committee was established at the MoH, including MoE and

other relevant stakeholders for the implementation of the strategy.

The strategy was based on a centralized collection, treatment and disposal system to be implemented by MoE or subcontracted and relied mainly on the creation of centralized incineration facilities.²⁹⁶

This current institutional set up is not resulting in an efficient management of solid waste in Egypt.

This is due to overlapping of responsibilities, lack of clear division of labor, and a coordination mechanism between different Government entities involved. The “Framework for Integrating Environmental Considerations in Solid Waste Management” is intended to address this issue and provide recommendations for streamlining activities in this area.

Moreover, waste management law need to cover all aspects, including waste generation, services, monitoring and enforcement with clear assignment of responsibilities and involvement of the public and civil society.

It should be emphasized, that without the active involvement and participation of the general public, civil society as well as the private sector, it would be difficult to have an effective and successful ISWM system in Egypt.

The central Government is the entity that develops policies, legislations, enforcement procedures, and cost-recovery mechanisms for the sector. In July 2014, the MURIS was created and was responsible for municipal solid waste management nationwide. With the recent Cabinet reshuffling this responsibility was assigned to MoE. Other types of waste continue to be the responsibility of different ministries as referred to above.

A steering committee had been established consisting of the MoE, MURIS, MoLD and the Ministry of Finance to deal with implementation issues.

Governorates have the overall responsibility for SWM related activities either directly or by contracting private companies. Municipalities on the other hand are responsible for the

implementation of the system, monitoring, inspection and training. Civil society organizations in several governorates are also involved to a certain extent in solid waste activities, including treatment, recycling, community development and public awareness.²⁹⁷

In order to ensure an effective SWM system, a decentralized system is more likely to operate more efficiently responding to local needs and providing local solutions that are more relevant to local conditions on the ground.²⁹⁸

The Ministry of Environment in collaboration with the State Ministry for Urban Renewal and Informal Settlements and other relevant ministries and stakeholders have recently initiated the development of a comprehensive strategic plan for integrated solid waste management (First strategy developed in 2000). The strategic plan will include a regulatory framework to support it and will be based on the policy document prepared by the Ministry of Environment in 2014.

There is however a need for an umbrella institution to deal with all aspects of solid waste in Egypt to ensure proper coordination and management of SW in Egypt. There has been a recommendation lately by a number of ministries that the new proposed Authority for Solid Waste Management is to be directly attached to the MoE.

It should be emphasized that a review of the current institutional set up should be undertaken to clearly assign responsibilities and coordination of activities between different ministries, and the effective implementation of strategies, plans and programmes. In order to achieve this end and in line with the new Constitution that Egypt follows a sustainable development path, it is proposed to create a High Council for Sustainable Development directly attached to the Prime Minister's Office, which will be entrusted with overall coordination and oversight over the work of the different ministries. Subcommittees or specialized entities may be created to assist the High Council discharge its functions.

In order to ensure full engagement and participation of relevant stakeholders, civil society and the private sector, a Civil Society Council may also be created to work closely with the High Council.

Legal Framework

Egypt doesn't have a specific law that deals with SWM. The legal framework for SWM is scattered in many pieces of legislation. However, the most significant legislations are the following:

- Law 38/1967, its Executive Regulations and subsequent amendments deals with General Public Cleaning.
- Law 4/1994 deals with the Protection of the Environment.
- Law 10/2005 establishes a solid waste collection fee system, where citizens pay according to their income level and residential area.
- Prime Minister Decree 1741/2005 amended the Executive Regulations of Law 4/1994. Article 11 covers regulations for the selection of recycling and land filling sites and equipment requirements for waste collection and transfer.
- Law 9/2009 and amended Law 4/1994 for the protection of the environment and regulates collection, treatment and disposal of hazardous waste (Articles 29 – 33). Moreover, Article 37 (2) of this law prohibits open burning of garbage and solid waste and prohibits discharging, sorting, and treatment of wastes in areas other than those specified.

The most recent Presidential Decree (86/2010) was issued on April 15, 2010, regulating the closure of existing dumping sites and landfills in Greater Cairo, rehabilitation of its sites, and allocation of five new sites for sorting, recycling and final disposal of solid waste, outside the residential and commercial belt of Greater Cairo. Implementation of the directives of this decree has been slow due to lack of funding and implementation capacity.

A number of strategies have been developed for the management of solid waste in Egypt during the last fifteen years:

- In September, 2013, a decision was made to establish an ISWM system, under the MoE.²⁹⁹
- A strategic framework for the municipal solid waste recycling (2006).
- The EEAA plan (2007-2012) (EEAA, “Egypt State of the Environment Report 2005, Chapter 11: Management of solid wastes” December 2006).
- The National Strategy for Healthcare Facility and Hazardous Waste Management add date of the document.
- An Integrated Strategy for Hazardous Substances and Waste Management was developed within the framework of national strategy presented by the MoH and EEAA in April 2010.
- A strategy for private sector participation in SWM is currently under preparation as referred to earlier.
- Environmental Law 4/1994, and amendments in Law 9/2009, specify that farmers who practice rice straw burning can be fined up to LE 20,000 and prohibit dumping of waste in areas other than those specified, namely in residential, industrial and agricultural areas and waterways.
- Moreover, Directive 63/2002 of the MoLD prohibits the growing and burning of rice in the Kalyobiya Governorate to minimize air pollution in Greater Cairo.
- MoLD Decree 100/1967, required that fertilizers made from household waste should meet the special specifications.
- Article 39 of Law 4/1994 and Article 41 of the executive regulations (Prime Minister Decree Number 338/1995) addresses the management of construction and demolition waste.
- There are no policies or legislation governing E-waste management. The closest reference is Law 4/1994 and Law 9/2009 regarding hazardous waste.

There are a number of laws have been introduced to deal with medical waste in Egypt. Those include the following:

- Law N0.4 dated 1994 for the Protection of the Environment and the Executive Regulation of Law N0.4 (Ministerial Decree N0. 338 of 1995) provide the legal framework for addressing hazardous substances, including storage, permits, transport, labelling, and packaging.
 - Moreover, the Egyptian Hazardous Substances Information and Management System (EHSIMS) was also introduced to provide an online service to facilitate the procedure for obtaining licenses for handling hazardous substances.
 - This was followed by a series of Resolutions amending Law N0 4: Resolution N0. 1095 of 2011, N0. 1741 of 2005, N0. 1445 of 2003, N0. 165 of 2002, N0. 495 of 2001, and Decree N0. 338 of 1995 regarding the implementation regulation of environmental Law N0.4 of 1994.³⁰⁰
- In 2010 a healthcare waste management strategy was finalized and adopted in April 2010 with the following main components:
- Provision of a centralized treatment facility instead of small scale units to be provided at the premises of health care facilities.
 - Provide training and guidelines for separation, collection, storage and transportation of medical waste.
 - Revise the code of practice including those related to treatment technologies under the supervision of the MoH and the MoE.

Since then a number of centralized health care facilities have been established in a number of governorates. However, the code of practice has not yet been revised. Moreover, in 2013 an Inter-Ministerial Committee (IMC) was established by the Ex-vice Prime Minister and the Minister of Higher Education, including the Minister of Health and Population and the State Minister of Environment, and Secretary General of the Supreme Council of Universities.³⁰¹

There are 296 treatment facilities out of which there are 253 incinerators and 43 steam sterilizers with shredding equipment. About 35.1% of that capacity is non-operational. This is attributed mainly to quality of treatment facilities, lack of trained personnel, and lack of adequate maintenance.³⁰²

There are about 188 thermal incinerators for the treatment of hazardous medical waste in Egypt. This is in addition to 48 units of shredding autoclaves.³⁰³

Impacts of current policies socioeconomic impacts

A large, though undetermined, number of waste pickers currently derive their livelihood from open waste dumps. There are also a large number of waste pickers in Egypt. These communities, who work on open waste dumps, remain highly vulnerable. They lack access to basic services and are frequently subjected to exploitative relationships with middlemen who monopolize access to secondary markets for recycled products. A large and disproportionate number of these waste pickers are children.

The negative economic implications of the current solid waste situation in Egypt is represented in the lost opportunity that can be derived from the proper management of solid waste in the country, and the amount of savings in the use of primary resources that can be achieved. Investing in the recycling of waste can generate large volumes of material that can be used as an input in many industrial and manufacturing processes and consequently releasing primary resources that can be used as an input in industrial processes and economic activities.

Promoting sustainable production and consumption patterns can also go a long way in reducing waste generated by the different economic activities and in the consumption of final products, thus resulting in large savings for the economy.

Environmental Impacts

Egypt's 27 governorates produce approximately 55,250 tonnes/day of solid waste, or about 20,453

MT/year. About 40,000 tonnes of the annual total waste generated from healthcare facilities are infectious medical waste. The distribution of the other types of waste is 6.2 MT/year industrial waste, 23 MT/year agricultural waste and 0.2 MT/year hazardous waste.³⁰⁴ It is estimated that a large proportion of this waste is being disposed of inadequately in open dump sites, waterways and other environmentally unsustainable sites. Inadequate disposal results in environmental and health problems, including surface and groundwater contamination, air pollution, and increased transmission of illness by vectors including flies and rodents. Moreover, uncollected waste is a source of methane emissions with detrimental effects to human health and the environment.

Open burning of waste including incineration of medical waste and industrial waste were identified as the main three sources of unintentionally produced persistent organic pollutants (POPs) in Egypt according to the 2005 National Implementation Plan.³⁰⁵

Challenges facing solid waste management in Egypt

Egypt is facing an escalating solid waste management problem due to the increasing volume of waste resulting from increased economic activity, rapid population growth, urbanization, and the uncontrolled urban dwellings and slum areas. Government efforts are primarily focused on finding short-term management solutions for solid waste collection, without addressing the root causes of the problem, and introducing long-term non-conventional solutions for waste avoidance, reduction, reuse and recycling. The current state of solid waste management is resulting in increased environmental damage and negative impacts on health and the environment.

One of the main challenges facing SWM is the lack and unreliability of data. In most instances data related to SWM in Egypt is either lacking or conflicting, which makes it quite difficult for

managing and planning for the sector and projecting future trends in waste generation in different geographic locations, and consequently for planning for the future. Most of the data available are rough estimates derived from a study that was undertaken in 2000/2001.

Despite efforts exerted by the Government to address the waste problem, the current system of waste management is characterized by being inadequate. The present situation is facing a number of challenges and constraints. These challenges are outlined in the following section.

Institutional Challenges

A number of institutional challenges face SWM in Egypt. One of the primary challenges is the absence of Government endorsed and approved long-term strategy, with a clear vision and action plan. However, as earlier stated the Government has recently decided to initiate the preparation of such a strategy to be completed by the end of 2015.

Another main challenge is the multiplicity of institutions engaged in SWM, unclear demarcation of responsibilities between them, and lack of coordination between the different Government entities involved.

Another challenge is the centralization of overall management of MSW at the Central Government level with limited authority given to governorates to plan and finance the management of MSW at the local governorate level.

Implementation of Government directives continue to represent another impediment for addressing the solid waste management in Egypt. This is mainly attributed to one or several of the current challenges facing SWM in Egypt. Monitoring and enforcement capabilities fall short of what is needed to ensure an effective solid waste management system in Egypt. There has been for example a number of initiatives launched by the Government, particularly in the last several years, but have not been successfully implemented on the ground.

The last decade has witnessed the involvement of foreign contracted companies to deal with SWM in Egypt. The performance of these companies have been varied leading to a decision by the Government either to terminate the contracts of some of these companies or to discontinue further engagement of others ones. This is creating a vacuum in providing the service in some governorates requiring the Government to step in and provide the service.

The following are the main institutional challenges facing SWM in Egypt:

- Absence of Government endorsed and approved long-term strategy, with a clear vision and action plan.
- Multiplicity and lack of clear delineation of responsibilities and coordination between different Government entities involved in SWM.
- Lack of a central body responsible for data collection, analysis and projections for SWM.
- Centralization of the management of the system at the Central Government level, with limited authority given to governorates.
- Lack of a specific law dealing with SWM in Egypt.
- Lack of an efficient institutional and administrative, monitoring and control system.
- Undeveloped and unorganized performance of the informal sector (garbage collectors).
- Lack of technical capacity at various levels.
- Marginal investment in human resource development, R&D and innovative recycling and treatment technologies, practices and measures.
- Ineffective institutional capacity building programme to strengthen the management capacity of the Government.
- Level of involvement and investments by the private sector in SWM related activities.
- Insufficient training and awareness of staff and human resources allocated to HCWM at national, governorate and HCF level

- Lack of sufficient budgetary allocations, and consequently adequate sanitary dumping facilities, recycling and transfer station, equipment and transportation network.

Economic Challenges

On the economic front a number of challenges face the SWM in Egypt, these include the following:

- Absence of an integrated framework for SWM that determines the optimum and most economically viable solution.
- lack of an efficient and functional SWM system that contributes to the efficient use of resources and increased to support economic activities.
- The link between economic growth and waste generation and the need to devise processes and techniques to delink waste generation from increased level of economic activities.
- Potential negative impacts on tourism and consequently the loss of income generated from this important economic sector.
- The uncaptured value from waste due to the lack of understanding of the economic gains that can be derived from waste as a source of secondary raw material, as well as income generated as a result of jobs creation.
- The deteriorated public health conditions due to the negative effects of burning waste in open air and the poor sanitation represents a burden on the economy in terms of lower productivity as well as the increase of national spending on healthcare by the public sector.

Social Challenges

About 150,000 informal workers (Zabbaleen) are involved in SWM in Egypt. Though this segment of the population continues to operate outside the formal sector, it is the intention of the Government to develop a framework for integrating them in the formal sector and the economy. Such integration is overdue, as it is essential that those involved in SWM work in an acceptable working environment and health

conditions, and receive their full entitlements in terms of salaries and health insurance coverage.

Failure to integrate the informal sector is resulting in the marginalization of a relatively large segment of the working force and subjecting them to unfavorable working conditions. If adequately integrated, the working and living conditions of those involved can be immensely improved, which can in turn result in increased productivity of labour involved their and their integration in the national economy. However, if this approach may not be feasible and difficult to achieve on the ground, informal pickers may be allowed to form cooperative businesses licensed by the Government or through a PPP arrangement, with middlemen buyers arranged to facilitate the business.

During the last several years, the phenomenon of what is referred to in Egypt as “scavengers” have arisen, particularly in the streets of Cairo and Giza. Those are individuals who sort out garbage in the streets and sell material of value such as plastics and metal to dealers leaving other waste scattered along roads and main avenues. Integration of the informal sector, including “scavengers” within the formal sector will help solve the problem resulting from these practices.

Apart from the integration of SWM informal sector, main social challenges include the following:

- Lack of engagement of local communities and stakeholder participation in SWM.
- Unsustainable consumption and production practices resulting in increased waste generation.
- Random sorting of waste by “scavengers” either in streets, or at waste collection sites as stated above.
- Lack of knowledge with respect to sustainable waste management practices, techniques, waste recycling and treatment technologies and practices.
- Child labour, with a large number of children involved in the sector working under unacceptable

conditions and denied basic education and health services.

- Adopting an ISWM system would assist in facilitating the greening of the sector. This can be achieved through investing in solid waste collection and sorting, in addition to land filling and processing services (waste reuse, energy recovery, and recycling) and all related infrastructure. These interventions should simultaneously complement each other and fill existing investment gaps that act as barriers against the proper management of the sector.

Environmental Challenges

Main environmental challenges facing SWM include the following:

- Lack of properly built and managed Government constructed sanitary landfills that meet environmental and health standards.¹
- Land filling of rejects is not conducted according to appropriate international standards and procedures.
- Lack of efficiency of waste collection leading to waste accumulation, random sorting and open burning.
- Methane generated from accumulated waste represents a health hazard and contributes to climate change.
- Uncollected solid waste is a source of disease, particularly for rural and poor communities, where the accumulation of waste for long periods is a common phenomenon.

Opportunities

Potential investment options in solid waste can have considerable benefits for the sector, especially if efforts to implement them are well coordinated and managed. Most importantly it will significantly reduce waste accumulation in streets and waterways. This can be achieved when waste goes through a full systemized cycle starting from sorting at source, transfer to sorting stations, where sorting is carried out to segregate

recyclables – organic matters and rejects. Recyclables can then be sold while organic matter can be sent to a composting or bio-fuel generating facility. The remaining rejects can be further screened to either be used for generating refuse-derived fuel (RDF), or for final disposal in sanitary landfills.

Investing in waste segregation and sorting can lead to economic benefits by producing recyclables that can be processed and used as an input to produce new products. It can also promote organic agriculture, increase productivity and food production.

Due to the need to bridge the gap between energy supply and demand in Egypt, priority should be given to directing investments towards energy production. Large quantities of RDF are already being directed to cement factories to be used as a source of energy for this sector.

Investing in the e-waste is promising, as there are limited number of private entities and NGO's working in collection, recycling and exporting activities, with a great potential for the market in investment in this field.

Opportunities offered in investing in integrated sustainable solid waste management promotes resource efficiency, supports economic sectors particularly agriculture, industry, and tourism, improves health and the environment, and consequently contributes to the national income.

Vision

In 2013 the then State Ministry of Environment has initiated the development of a national strategy for solid waste management with the support of a Think Tank established for the purpose. The document entitled “National Strategic Directives for Waste Management in Egypt” was released in November 2014. These Strategic Directives stipulate the responsibility of the MoE for policy-making and the preparation of strategic plans required for environmental preservation and development in coordination with competent administrative authorities.

¹ Expensive to operate and if not built and monitored properly they can be dangerous and result in negative environmental impacts through methane production and burn-off.

These Directives are a result of a comprehensive assessment of the current state of solid waste management in the country. The following is the vision as stipulated in the document.

“A clean and aesthetic, inclusive and economically vibrant, well regulated and environmentally safe, sustainable community”

It further states that the Strategic Directives “aim at improving public health & safety and maintaining resource sustainability based on strategic planning which address social, economic and environmental aspects.

The following is a proposed vision that reflects more the three dimensions of sustainability:

“A resource efficient, competitive, equitable clean and healthy sustainable community”

It should be emphasized that this “Framework for Integrated Solid Waste Management” should support the achievement of the sustainable development goals (SDGS), as well as address climate change concerns. Particular reference is made to the proposed SDG number 13 “Take urgent action to combat climate change and its impacts. Another related SDG is number 11 “Make cities and human settlements inclusive, safe, resilient and sustainable”

Achieving the proposed vision in a framework of good governance will require:

- Legal and institutional reform and enforcement.
- Financial and economic restructuring.
- Technical/operational investments and capacity building of practitioners.
- Social capital generation and mobilization.

Targets by 2030

In order to be able to set realistic targets, it is essential to have reliable and consistent data that is properly analyzed with projections for future solid waste generation estimated. For example, per capita waste generation in Egypt has been cited in one study as 11.5kg/day, while in another study it was .5kg/day.

Moreover, deciding on specific targets should be based on the most economically viable solution taking as well into account the social and environmental dimensions. However initial findings indicate that waste to energy is the most viable solution globally and nationally.

Furthermore, it is essential that future Government plans and directions are clear and predictable, particularly with regard to the institutional set up with clear delineation of responsibilities, supported by a regulatory framework and sufficient budgetary allocations. Moreover, targets should be set on the basis of existing and potential future capabilities and based on the overall future strategic objectives of the Government and budgetary allocations.

It is therefore essential that a decision be taken by the Government to create a High Council for Sustainable Development that is entrusted with overall coordination of activities undertaken by ministries and Government entities, including solid waste management related activities. Moreover, it is also proposed that the Government departs from a centralized to a decentralized system of management that provides authority to governorates to develop their own localized action plans with the necessary financial resources needed to manage SWM at the local level. This should all be done within the framework of a long-term national strategy and plan.

In the absence of reliable and consistent data, a long-term strategy, institutional set up and budgetary allocations, it is difficult to set targets that are realistic and achievable. It is therefore essential that priority should be given to the development of a strategy for SWM in Egypt, creation of an institution to function such as a Holding Company to deal with solid waste, with clear mandate and responsibilities supported by a legal framework.

However, in light of the existing situation, the following are the set of targets proposed to be achieved by 2030:

- Reduce per capita waste kg/ per day from 0.7 to 0.5 in urban area and from 0.4 kg/per day to 0.3 kg/per day in rural areas.
- Reduce emission from solid waste by 20%.
- Increase number of small scale waste collection companies from 58 to 200.
- Increase the percentage of municipal waste collected out of total generated waste from 60% to 90%.
- Increase number of operational sanitary landfills from 8 to 20.
- Percentage of waste properly disposed of out of total generated waste increased from 6% to 20%.
- Increase percentage of waste recovered and recycled from 15% to 25%.
- Increase percentage of recycled waste into compost from 8% to 15%.
- Increase percentage of non-organic waste recycled from 9-10% to 15%.
- RDF recovery increased from 2-3% to 10% (Sustainable Development Strategy 2030).
- Every healthcare facility is to have either an incinerator (with the least emitter of toxics) or a sterilizer depending on the capacity of the establishment.

A strategic framework with Three Tracks

Innovative approaches for solid waste management are now increasingly being adopted by countries around the world, viewing waste as an opportunity rather than a liability and a risk. The proper management of solid waste contributes to resource efficiency, opens up new economic opportunities and businesses, creates jobs, while at the same time improves health, the environment and human welfare.

It is proposed to adopt a three-track strategy to realize the SWM vision as stipulated in the strategic document “National Strategic Directives for Waste Management in Egypt” and the one proposed in this document. These tracks focus on specific set of actions that may not necessary be

undertaken sequentially and could be initiated and implemented simultaneously.

Track 1 - The transition track

Due to the risks associated with solid waste and the high opportunity cost associated with it, there is a need to address the problem as a matter of urgency. There are areas where action can start immediately and that can result in quick outcomes, particularly when reform of the SWM sector is a priority on the national policy-making agenda. Since data is an essential planning tool and though it is a continuous long-term process, the creation of the data bank for all kinds of waste, including solid waste comes out as a necessary prerequisite for sound planning.

Other measures that are proposed to be implemented in the short-run, include the following:

- Develop and institutionalize as a priority a comprehensive legal and institutional framework for SWM.
- Assess the current SWM situation at the national and governorates levels and the development of local decentralized Action Plans.
- Assess the financial needs of the solid waste sector and potential sources of funding, including through the proceeds from the charging of fees for solid waste collection and disposal taking into account the different income groups in the society and through the application of a cross subsidization system.
- Promote engagement of the general public, civil society and the private sector in solid waste management related activities.
- Encourage a multi-stakeholder approach that enables the participation of different stakeholders within their communities in SWM.
- Integrate solid waste management across sectors in order to ensure that it is part and parcel of the planning and design of the functioning and operation of different activities: industry, agriculture, tourism, housing and construction.

- The inclusion of a well designed SWM system with intermediate stations and landfills will ensure the adequate handling and disposal of solid waste for new communities.³⁰⁶
- A decentralized model for solid waste management that would promote community participation and incorporate the informal sector into public-private-partnerships (PPP), microenterprises, or cooperatives.
- Identify the regulatory requirements and institutional roles at the national, governorate, and local levels.
- Design and introduction of economic instruments for waste reduction.
- Develop operator/business models for service providers at governorate and local levels.
- Ensure an environmentally compliant and safe treatment and disposal of non-recyclable waste.
- Enhance technical and financial mechanisms to promote recycling, reuse and waste reduction.
- Optimize resource recovery and control of solid waste by implementing more efficient and sustainable collection methods.
- Create awareness through education and public awareness campaigns on the benefits of a clean environment and disseminate information on good and sustainable SWM practices.

Track 2 -The planning and preparation track

Integrated planning and investments in major infrastructure facilities is necessary to facilitate the realization of the proposed long-term strategic objectives of the framework.

Measures that need to be introduced, include the following:

- Enforce standards for environmental, health & safety for waste management activities.
- Develop action plans at the national and governorate level in line with the national framework strategic directions.
- Subdivide Egypt into main sub regions for the

- management of solid waste to ensure coverage of the entire country and reduce transportation cost involved in collecting waste and distribution of recyclables.
- Follow a bottom up approach and public participation and engagement is key in a successful SWM system.
- Engage all ministries, including the MoH in the planning and implementation of SWM activities.
- Set standards for the processing and reuse of recyclables.
- Increase the number of social enterprises and youth-driven Small and Medium Size Enterprises (SMEs) involved in SWM activities.
- Foster an investment-friendly environment for small, medium, and large SWM enterprises.
- Develop financial sustainability measures and cost recovery frameworks.
- Build a national network consisting of relevant stakeholders to consolidate information on SWM related policies, programmes, solid waste facilities, operations, and disposal sites in order to support the work of planners, researchers and decision makers.

Track 3 - The technology development track

A robust solid waste management programme will need to be supported by innovative ideas, techniques and technologies, which require a long term research and development R&D programme to be developed. This needs to be supported by a long-term capacity development programme supported by a package of measures. These include the following:

- Develop a long-term R&D programme for innovative technologies and practices that promotes ISWM.
- Introduce in the educational curricula ISWM as a discipline with an academic diploma or certificate.
- Consolidated capacity development programme in order to strengthen the professional capabilities of

SWM institutions and Egyptian experts, practitioners, and workers involved in this field.

- Greater investments in SWM infrastructure considering population and urban growth.
- Establishment of SWM as a professional employment sector.
- A sustainable and cost-recovery financial structure for the SWM sector.

Strategic objective 1

Promote the development and implementation of practices and solutions that reduce waste and enhance efficiency in the use of resources

Efficient use of resources, including natural resources and factor inputs is essential in a world with diminishing resources and increased demand on resources to support higher levels of economic activities, population growth, increased incomes and changing consumption patterns.

Improve the efficient functioning of the SWM system through the development and implementation of an efficient collection, storage, transportation, treatment and disposal system.

Measures should be introduced to allocate and use resources in the most efficient manner, reduce waste and pollution. This entails adopting production processes and technologies that are resource efficient, reduce and ultimately avoid waste, and increase productivity and competitiveness. Concepts like EPR for example should be promoted and supported by regulatory and incentive measures to encourage producers to adopt more sustainable production processes.

Moreover, tools like life cycle assessment (LCA) should be used in order to ensure that sustainable production processes are adopted throughout the entire life cycle of a product, thus ensuring that resources are used efficiently to the maximum extent possible and that waste is minimized, recycled, reused, and recovered.

Develop a communication package targeting different stakeholders. Public awareness campaigns targeting consumers should be directed

towards reducing wasteful consumption practices resulting in increased volumes of generated food waste and related organic material, plastics, paper, glass, and metals.

Source separation of waste should be encouraged at the household level to facilitate the recycling, reuse, and recovery of waste, and increase the value of separated items. A number of measures may be introduced to encourage achieve this at the household level. Apart from highlighting the importance of such practices through public awareness campaigns, households can be encouraged to follow such practices by the free distribution of biodegradable plastic bags to be used for the separation of waste, or by providing garbage collection services at reduced or concessionary rates.

Other solutions, include the introduction of a waste collection and disposal system. The former is in the form of payments by waste collection authority for households, businesses and NGOs providing separated waste. The latter could be in the form of payments or credits made to entities depositing separated waste in designated waste sites. This system was introduced in UK through the UK Environment Protection Act of 1990.

Strategic objective 2

Enhance the contribution of solid waste management to sustainable economic development, social integration and cohesion, and environmental integrity

As referred to earlier, activities identified to realize the stipulated vision and the set targets need to ensure that it aims at achieving economic, social and environmental objectives.

Economic Dimension

As indicated earlier, an efficient SWM system will result in savings in resources, including natural resources. This will free primary resources for other uses, hence reduce costs, increase efficiency, competitiveness, and consequently increase the contribution of the sector to the national economy.

An efficient SWM sector will support the tourism

sector by providing a clean, healthy and attractive environment for tourists with its positive implications on the economy.

In order to encourage investment in SWM related activities the Government should ensure a stable and predictable macroeconomic environment for large enterprises as well as for small and medium size enterprises.

Investment in SWM related activities should aim at creating new economic activities and businesses that can contribute directly and indirectly to the national economy. Investments in SWM include the following:

- Developing a SWM system that generates new economic opportunities, promotes resource efficiency and creates new jobs.
- Promote private sector engagement in different SWM activities such as dumpsites under clear standards and strict guidelines.
- Small and large-scale projects for converting agricultural waste into compost and energy.
- Production of biogas from organic waste, including animal manure in rural area.
- Recycling of solid waste into intermediate products that can be used as inputs in industrial and manufacturing processes.
- Promote the use of RDF as a source of energy for industries such as the cement industry.
- Long-term R&D and innovative solutions and equipment programme for use locally and for export, to eventually be a source of external earnings. This may include waste segregation, recycling, and processing equipment
- Enforce the polluter pays principle on all industries and economic activities.

Social Dimension

Investing in solid waste management should result in creating new job opportunities. It is estimated that investing in composting of organic waste creates 7 jobs per 1000 tonnes of processed waste³⁰⁷.

The design and implementation of an ISWM system should ensure the provision of basic waste management services to the different segments of the population irrespective of their income category.

The other important positive social outcome is the integration of the informal sector into the formal economy, with all the positive impacts associated with it. The integration of the informal sector involved in SWM related activities include providing job security for that segment of labor involved in SWM, improve their working and health conditions, and promote their integration in the economy.

A clean and healthy environment will improve the health conditions of the population, reduce disease, morbidity and mortality rates. The economic implications are reflected in increased productivity of the labour force, reduced expenses on medical care related expenses and generally improved welfare of the population.

Public awareness campaigns should be launched using different media in order to influence production and consumption towards more sustainable paths. These campaigns should target the general public as well as policy and decision makers and practitioners involved in the different activities: industrial, agricultural, tourism, housing and construction, etc.

Environmental Dimension

Investing in the SWM sector will result in positive impacts on the economy, as well as on the social and environment fronts.

Necessary environmental safeguards and actions related to SWM solutions and processes include the following:

- Ensure that basic environmental, safety and health standards are adopted and adhered to in all SWM related activities.
- Improve existing waste management facilities, including transfer stations and dump sites to meet minimum acceptable sanitary standards.
- Encourage investments in recycling and resource

recovery facilities for materials and energy generation.

- Provision of adequate and appropriate collection facilities and services and adequate and transport systems for segregated waste.
- Build and operate transfer stations and sanitary landfills.
- Encourage the construction of composting facilities.

Strategic Objective 3

Promote the efficient functioning and management of the solid waste sector

As proposed in the National Strategy document for SWM a central regulatory body should be created to deal with SWM. This new entity will be entrusted with (i) developing a regulatory framework for SWM, continuously reviewing and updating the national waste management strategy and action plan, and develop guidelines for reporting and accounting related to SWM activities (ii) Formulating policies, legislations and economic instruments to promote ISWM in a way that supports sustainable economic development through the following measures:

- Introduce regulatory measures supported by a package of economic instruments to support an ISWM system. Adequate financial resources should be budgeted to support SWM activities at the governorate level. The central Government body to be created should be entrusted with making recommendations for the Government based on actual requirements on the ground.
- Develop and introduce an effective monitoring and enforcement mechanisms that ensures adherence to the set standards and regulations.
- Develop a long-term capacity building programme to support an integrated waste management system.
- Establish a training centre to train workers in source separation, recycling, and managing SW.
- Introduce in the academic curricula a discipline on SWM to produce well-trained calibers.
- Promote the adoption of concepts and approaches

such as LCA, EPR and Corporate Social Responsibility (CSR) across sectors.

- Ensure engagement and public participation in the identification and implementation of waste management activities and programmes.
- Promote the engagement and active participation of the civil society and the private sector, including through PPP.
- Develop a communication and public awareness package targeting different stakeholders on sustainable production and consumption patterns and appropriate waste management practices and solutions.
- Sensitize policy and decision makers on responsible waste management options and the economic and development dimensions of integrated SWM.

Potential benefits of an ISWM system

Promote Resource Efficiency

A well designed, monitored and implemented ISWM system has the potential of contributing positively to resource efficiency. This is achieved through the following:

- Rather than relying mainly on using primary resources in the production and manufacturing process segregated waste in the form of wood, paper, glass, and metals, can be reused. This does not only reduce costs, but also releases resources for other uses.
- Producing energy from solid waste contribute to energy supply in the country thus reducing pressure on primary energy sources and costs involved.
- Producing compost from organic solid waste provides a safe and nutritional source of fertilizers for plants thus reducing demand on costly, and in many instances harmful synthetic fertilizers.
- Reduced volume of generated solid waste due to enhanced public awareness and consumers' responsibility, and following more sustainable consumption patterns, will reduce per capita waste generated, and consequently level of management

and operation related activities and associated costs.

Support Energy Efficiency

Waste is a significant renewable energy resource whose energy value can be exploited through thermal processes (incineration and industrial co-combustion), landfill gas utilization and the use of anaerobic digester biogas.

This is important as manufacturing of recycled materials requires less energy and is less costly than manufacturing the same products from primary raw materials. This alternative fuel generation option could lead to reduced Government expenditure, saves expenditure on energy subsidies, increases foreign exchange earnings, and creates new jobs.³⁰⁸

Job Creation

Adopting an ISWM system could lead to a fast rising new market niche in recyclables, which can translate into new market opportunities and income generation. As referred to earlier, it is estimated that investing in composting of organic waste creates 7 jobs per 1,000 tonnes of processed waste. The recycling of 10 million tonnes of agricultural organic waste would alone result in creating 70,000 jobs. Converting waste into biogas is another job creating solution. This is in addition to activities related to waste separation and processing, which provide yet another job creating opportunity.

Moreover, it could also start a fast rising national solid waste processing industry, encourage entrepreneurship, SMEs start-ups and attractive private sector involvement. Possible business opportunities can be generated through waste collecting enterprises, sorting equipment and processing manufacturers, and recycling companies. As a result, the potential for job creation can be significant. Experts estimate that waste to energy and recycling infrastructure would require up to 28 workers per tonne, which can translate into thousands of job if accounting for the volume of solid waste produced annually.³⁰⁹

Emission Reduction

Rapid increases in population and urbanization in developing countries are resulting in increases in green house gas (GHG) emissions from waste, especially methane (CH₄) from landfills and both CH₄ and nitrous oxide (N₂O) from wastewater. CH₄ emissions from wastewater alone are expected to increase almost 50% between 1990 and 2020, particularly in the rapidly developing countries of Southern and Eastern Asia. Global N₂O emissions from wastewater are incomplete and are only based on human sewage treatment. They however, but indicate an increase of 25% between 1990 and 2020.³¹⁰

Sustainable waste-management practices can effectively contribute to mitigation of GHG. A wide range of environmentally conscious measures, procedures, and technologies if properly deployed can reduce and eventually avoid GHG emissions, including methane from accumulated waste and CO₂ emissions from the burning of waste. The result is improved public health, environmental protection, and sustainable development co-benefits. In addition, waste minimization, recycling and re-use represent an important and increasing potential for indirect conservation of raw materials, improved energy and resource efficiency and reduced use of fossil fuel and harmful chemical fertilizers.

Improved health conditions

The potential of improved health conditions of developing and implementing an ISWM system are significant. Adequate waste management services reduce risks to health and the environment. These services contribute to improved air quality due to reduced air pollution and gas emissions and particulate matter released from solid waste.

Reducing and eventually preventing exposure to air pollutants increase risks for developing heart disease, respiratory diseases, asthma and emphysema.

Recycling waste into energy applications lead to the reduction of greenhouse gas emissions such as methane, sulphur dioxide SO₂, carbon dioxide and reduce landfill related gas emissions and leachate.

Indicators

- Achieve by 2030 a percentage share of 30% of waste composted, 20% recycled, 20% land filled and 30% open-dump sites.
- Percentage of energy generated from waste is increased by 30% annually.
- Increased number of people sensitized on responsible waste management measured by reduction of capita waste generated (5% annually).
- The full integration of the formal sector into the formal sector.
- Increase demand of recyclables by 20% over current levels.
- Increase number of workers in SWM related activities by 15% annually.
- Increase in the budgetary allocation to the waste sector by 20% by the public sector and 30% by the private sector.
- Improved conditions of workers (increase wages, improved working conditions, including women, health and insurance schemes, training and education).
- Decrease in the number of child-labour by 25%.
- Increased number of the informal labours that are integrated and enjoying improved social and health insurance scheme.
- Increase budgetary allocations spent on research and development related to this subject by 10% of total allocations to R&D.
- Increase coverage of SWM in rural areas 35-70% and in urban areas 70-90%.
- Incinerators or sterilizers provided for healthcare facilities.
- 15% annual increase in the share of organic waste recycled.
- Burning of waste completely banned and open dumps are all closed by 2030.
- Number of laws and regulations related to the greening and sustainable management of the

sector developed, instituted in law and implemented.

- Reduction of identified and reported incidence of non-compliance to laws and regulations by a 20% annual rate.
- An annual increase of 30% of the percentage share of educated and trained personnel in sustainable waste practices and waste related industries.
- Increased awareness by different stakeholders to the importance of adopting a more sustainable path in the waste sector to the economy, health and human welfare.

Roadmap to achieve the strategic vision

2016-2017

Actions/ Measures	Activity	Responsibility	Months	2016	2017
Strategy	<ul style="list-style-type: none"> Initiate the development of strategy and a detailed implementation action plan for ISWM that meets the country's needs, priorities and socioeconomic circumstances, and extends its services nationwide. 	Ministry of Environment in collaboration with the Ministry of Local Development, and governorates	4-6	✓	
Integrated Policymaking	<ul style="list-style-type: none"> Develop and endorse a holistic and integrated approach that ensures the integration of social, environmental, and economic dimensions in SWM. Undertake an assessment of existing regulatory & incentive measures & assess their impacts on the environment & resource efficiency with the objective of identifying measures & policies, including means of implementation that promote SCP & consequently resource efficiency. Develop an Action Plan for the rehabilitation and upgrading of existing recycling facilities and transfer stations. Develop a framework to help integrate the informal sector in SWM. Develop action plans at the national and governorate level in line with the national framework strategy. Provide an institutional set up that ensures public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on Best Available Technologies and Best Environmental Practices for ISWM practices. Integrate solid waste management across sectors in order to ensure that it is part and parcel of the planning and design of the functioning and operation of different activities: industry, agriculture, tourism, housing and construction. Increase the number of social enterprises and youth-driven Small and Medium Size Enterprises (SMEs) involved in SWM activities. Foster an investment-friendly environment for small, medium, and large SWM enterprises. Promote the use of a number of tools and measures that facilitates the design and implementation of ISWM within the framework of green and sustainable communities, these include: life cycle analysis, producer responsibility, eco labelling schemes, and 	<p>Ministry of Urban Renewal Informal Settlements in collaboration with Ministry of Environment and Ministry of Local Development</p> <p>Ministry of Environment and Ministry of Local Development</p> <p>Ministry of Environment to take the lead role in promoting these tools and providing technical support to practitioners in the</p>	<p>4-6</p> <p>Throughout</p> <p>Throughout</p>	<p>✓</p> <p>✓</p> <p>✓</p>	<p></p> <p>✓</p> <p>✓</p> <p>213</p>

	<p>environmental management systems. The main aim is to ensure the integration of environmental considerations in the design and manufacturing of products. Introducing the concept of producer responsibility entails the application of the polluter pays principle, thus encouraging industry to design products that avoids and reduces waste and promotes reuse and recycling.</p> <ul style="list-style-type: none"> • Ensure engagement and public participation in the implementation of waste management activities. 	relevant Government department			
Good governance and institutions	<ul style="list-style-type: none"> • Review the responsibilities and jurisdictions of existing institutions involved in waste management and determine the best organizational structure to manage SWM in the most efficient and effective manner. • Identify action needed to reform/restructure or create an institution that will be entrusted with coordinating action related to planning, implementation, and operations related to solid waste management. • The institutional set-up should facilitate inter-ministerial coordination to avoid redundancy, conflict of interest and overlap of responsibilities between different ministries. • Institution should function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources. • Develop a decentralized model for solid waste management that would promote community participation and incorporate the informal sector into public-private partnerships, microenterprises, or cooperatives. • Initiate action to decentralize the decision making process with more powers given to governorates and local authorities in the design, planning, and management of SWM related activities. • Ensure public participation, involvement of relevant stakeholders, including the private sector and civil society, transparency, accountability, collaboration and coordination between various Government entities, and between the public and private sector - through Public-Private-Partnership (PPP) - exchange of information on Best Available Technologies and Best Environmental Practices on sustainable physical and urban development. • Engage different stakeholders and local communities to separate waste at source, and engage in recycling and energy recovery activities. • Strengthen the technical capacity of the Ministry of Environment to provide guidance and technical support on related to ISWM. 	<p>Ministry of Environment in collaboration with the Ministry of Planning, Monitoring and Administrative Reform</p> <p>Ministry of Environment in collaboration Ministry of Planning, Monitoring and Administrative Reform</p>	<p>4-6</p> <p>Throughout</p>	<p>✓</p> <p>✓</p>	<p>✓</p>
Regulatory framework	<ul style="list-style-type: none"> • Review the existing regulations related to solid waste and assess their effectiveness and impact on the economy, the environment, and society. • Develop a package of regulatory and incentive measures and policies that support ISWM. • Institute in law the mandatory creation of sanitary dumpsites, transfer stations, and 	Ministry of Environment in collaboration with the Ministry of Planning, Monitoring and Administrative Reform	6	✓	214

	<p>recycling centres for waste according to minimum acceptable sanitary and safety standards and the eradication of illegal dumpsites.</p> <ul style="list-style-type: none"> • Support initiatives through incentives to increase the number of recycling and energy generation plants by the private sector • Introduce strict penalties for the burning of waste and for the use of open dumps, while at the same time facilitating through direct Government support and incentives of converting the risk of burning into an opportunity. The framework should be designed to support market incentive measures. • Develop a regulatory and incentive package that promotes eco-design and the construction of sustainable and affordable housing that caters for the needs of the different social income groups, particularly medium and poor income families. • Finalize and introduce green building and sustainable urban development codes, (including, the provision of space for pedestrians and cyclers, green roofs, a public space and green areas) in residential areas for communal use, as a means to promote social integration and cohesion, while at the same contributing to a clean, healthy, and productive environment. • Introduce in law a requirement for all public buildings to be constructed following green and environmental friendly codes and standards, including energy efficient systems, use of renewable sources of energy, water efficient system, and recycling and reuse of treated wastewater, conversion of sewage water into biogas, source separation of waste, recycling, reuse, and recover, and the production of compost from organic waste. • Strengthen monitoring and enforcement mechanism in order to ensure compliance with regulations and policies. • Develop and launch a labelling and certification scheme for green and sustainable urban settlements. • Institute in law the requirement for economic activities, including industry and agriculture related activities in communities to adopt cleaner production and provide incentive measures to encourage SCP. • Institute in law the requirement for waste generated from the building and construction process and demolition waste to be recycled and provide facilities. 				
Economic instruments	<ul style="list-style-type: none"> • Design market incentives to encourage investments in sustainable communities, green buildings and construction, including the use of renewable sources of energy, recycling of municipal solid waste, wastewater recycling and reuse, and demolition waste. These can also be designed to ensure a balanced distribution of the population attracting investments and inhabitants to new communities and discourage investment and the concentration of populations in already dense and populated centers. • Develop a package of incentives for the private sector to invest in ISWM, including R&D and capacity development. 	Ministry of Environment and Ministry of Finance	3-4	✓	215

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	<ul style="list-style-type: none"> • Revisit user charges for solid waste incrementally using cross subsidization and appropriate tariff rates and regulatory reform (Egyptian Strategy document). • Encourage through incentives and awareness raising and training the recycling of organic waste and the production of compost and biogas as well as fodder for animal feed. • Provide incentives to encourage the construction of composting facilities • Provide a package of incentive measures to encourage green roofs and urban agriculture. • Provide incentives to the private sector to invest in the waste sector not only to satisfy local demand but also for export. • Provide incentives for investing in small and large-scale projects for converting agricultural waste into compost and energy, production of biogas from organic waste, including animal manure in rural area, recycling of solid waste into intermediate products that can be used as inputs in industrial and manufacturing processes, and promote the use of RDF as a source of energy for industries such as the cement industry. • Streamline collection fees complementing the input from other private public activities. • Introduce of a waste collection system and a waste disposal system. The former is in the form of payments by waste collection authority for households, businesses and NGOs providing separated waste. The latter would be payments or credits made to entities depositing separated waste in designated waste sites. 				
Economic analysis	<ul style="list-style-type: none"> • Undertake an economic analysis to assess the financial viability of the most economically viable solution proposed plan to include the expected social and environmental benefits resulting from the proposed plan, including number of new jobs created. • Assess the financial needs and budgetary requirements needed to finance the programme and sources of funding. • Develop financial sustainability measures and cost recovery frameworks. 	Ministry of Environment, Ministry of Local Development, Ministry of Finance	3-4	✓	
Government Procurement	<ul style="list-style-type: none"> • Government to take the lead in promoting green and sustainable procurement practices that reduces waste generation and promote the use of recyclables. • Create market demand for recyclables through green Government procurement and other incentive packages. • Develop a guidelines document to assist ministries incorporate in its purchases and contracts considerations that encourage waste reduction and the use of recycled waste. 	All Ministries Ministry of Environment in collaboration with	Throughout 4	✓ ✓	✓
Trade	<ul style="list-style-type: none"> • Design trade policies to support sustainable and green buildings and waste management schemes by reducing or waiving tariffs on waste management technologies and 	collaboration with Ministry of Trade and Industry	2	✓	216

	encouraging the export of locally produced technologies.				
Funding	<ul style="list-style-type: none"> Secure a stable and predictable source of funding for ISWM in order to ensure the continuity of services provided and meeting the set objectives of the programme. Provide sufficient budgetary allocations to build and operate transfer stations and sanitary landfills provision of adequate and appropriate transport systems for waste collection. Financial institutions should be requested to support financing investments in green buildings and infrastructure, and sustainable communities. Direct public investment towards the waste sector as a lead economic sector Increased access to capital finance to help deliver essential SWM infrastructure (Finance and Cost Recovery). Application of the extended producer responsibility principle, recommended by the strategic framework for enhancing solid waste recycling. Exploring the potential revenue deriving systems from the existing composting facilities after their rehabilitation.⁹ 	Ministry of Environment in collaboration with Ministry of Planning, Monitoring, and Administrative Reform in collaboration with Ministry of Finance	Throughout	✓	✓
Private sector	<ul style="list-style-type: none"> Develop a package of incentives and measures to encourage and promote the engagement of the private sector in green and sustainable communities and buildings directly and through Public-Private-Partnership, to include investments in SWM projects. In the latter case the Government could enter into partnership arrangement where it could provide easy access for land, introduce tax exemptions, provide concessionary loans in order to encourage private sector engagement. Develop partnerships arrangements between donors, organizations, NGOs and, the public and private sector. Strategic alignment and recognition of partners through a public private partnership approach. Strengthen resource recovery material and energy with value addition. Upscale the activities of the informal sector to link up with the existing formal recycling industries. It is estimated that informal sector in Manshiet Nasser in Cairo processes about 5,000 tonnes of waste daily. 	Ministry of Environment in collaboration with Ministry of Planning	4-6	✓	
Public Awareness	<ul style="list-style-type: none"> Develop and implement public awareness campaigns targeting different target groups, including policy & decision makers, the general public, academia, civil society, private sector and business, builders & contractors, & clients, highlighting the economic, social, health and environmental benefits of developing and implementing sustainable and clean communities. The role of media is significant in promoting sustainable patterns of production and consumption in the housing and construction sector by demonstrating their economic and financial benefits to different stakeholders. Develop a communication package targeting different stakeholders about the importance and social, economic, and environmental benefits resulting from sustainable consumption and production patterns that leads to waste reduction, reuse, recycling, and recovery. Initiate public campaigns for waste segregation involving different stakeholders supported by public awareness and incentive measures 	Ministry of Environment in collaboration with the Ministry of Education and the Ministry of Culture	4	✓	✓

	<ul style="list-style-type: none"> Develop public awareness packages for different stakeholders to include policy and decision maker, entrepreneurs, private sector, informal sector and general public Sensitize policy and decision makers on responsible waste management options A better evidence-based approach is needed to raise the profile of SWM and to illustrate how action on SWM issues can help meet development goals. This includes increasing the efforts that will contribute towards achieving the following 				
Education	<ul style="list-style-type: none"> Develop and implement a curriculum for ISWM to be offered at the Egyptian Universities. This can be at the undergraduate and the post graduate level offering an academic diploma in public and private universities (Cairo and Ain shams University, the October 6th University, and the British University etc. 	Ministry of Environment in collaboration with Ministry of Education	Throughout	✓	✓
Capacity Development	<ul style="list-style-type: none"> Develop and implement a capacity-building programmes through a phased stakeholder engagement plan to systematically and incrementally develop the capacities of various stakeholder groups involved in solid waste management. Target groups will include practitioners and stakeholders from central Government, governorate and local administrations; as well as private companies, SMEs, NGO's, and informal actors. Develop a long-term capacity building programme to provide needed skills in the waste sector at all levels. This should be based on a needs assessment to determine immediate, short and long term requirements at different levels Train solid waste and extension workers on the proper and safe handling of waste. Educate the public on integrated waste management Develop a capacity development programme that supports ISWM, including technology development and their applications, as well as tools and concepts that support this transition such as integrated assessment, life cycle assessment, green economy, and circular economy/closed loop economy. 	Ministry of Environment in collaboration with Ministry of Education	Throughout	✓	✓
Monitoring and assessment	<ul style="list-style-type: none"> Develop, for adaptation at the national level and implement a framework for the efficient monitoring, enforcement & assessment system that ensures compliance & adherence to sustainability principles in physical & urban planning & development, green & sustainable building regulations, codes of practice & standards. The framework would also include the creation of a coordination mechanism to coordinate initiatives, programmes, & funding related to solid waste management within the framework of green & sustainable communities, as well as the creation of cooperatives to facilitate access to funds to finance locally-based SWM action plans. Provide air quality monitoring stations to monitor air pollution and main pollutants on a continuous basis, including gaseous pollutants, noise, and electro magnetic waves. 	Ministry of Environment	Throughout	✓	✓
Research & development	<ul style="list-style-type: none"> Develop a long-term R&D programme to support ISWM, including innovative technologies and process needed across sectors to promote responsible and more sustainable production practice and process 	Academy of Scientific Research in close consultation and collaboration with the	4-6	✓	✓

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		Ministry of Environment			
Indicators	<ul style="list-style-type: none"> Develop a set of indicators to monitor the achievement of the set objectives and targets. 	Ministry of Environment	3-4	✓	
Regional & International Cooperation	<ul style="list-style-type: none"> Promote regional and international cooperation in the field of ISWM programmes such as the International Solid Waste Association (ISWA) and SWEEP Net, etc. 	Ministry of Environment	Throughout	✓	✓

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