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CEDARE

GREEN economy
Scoping Study

Egypt

LIST OF ACRONYMS

AFED	Arab Forum for Environment and Development
AOYE	Arab Office for Youth and Environment
BOOs	Build Own Operate Agreements
BBL/D	Billion Barrels Per Day
CO_2	Carbon Dioxide
COAE	Centre for Organic Agriculture Egypt
CER	Certified Emissions Reductions
CFLs	Compact Fluorescent Lamps
EEAA	Egyptian Environmental Affairs Agency
EBDA	Egyptian Biodynamic Association
ECOA	Egyptian Centre for Organic Agriculture
EE	Energy Efficiency
EGP	Egyptian Pound
EU	European Union
EFSD	Egyptian Forum for Sustainable Development
FDI	Foreign Direct Investments
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GESS	Green Economy Scoping Study
GIZ	German Development Organization
ISWM	Integrated Solid Waste Management
ILO	International Labour Organization
IMF	International Monetary Fund
MDGs	Millennium Development Goals
MSW	Municipal Solid Waste
MHUUC	Ministry of Housing Utilities and Urban Communities
MSEA	Ministry of State for Environmental Affairs
MWRI	Ministry of Water Resources and Irrigation
NGOs	Non-Profit Organizations
NREA	New and Renewable Energy Authority
NSWMP	National Solid Waste Management Programme
NEAP	National Environmental Action Plan
NWRP	National Water Resources Plan
OECD	Organisation for Economic Co-operation and Development
PPP	Public Private Partnership
PPAs	Power Purchase Agreements
PES	Ecosystems Service Schemes
RDF	Refuse-derived fuel
R&D	Research & Development
SEEA	System of Environmental- Economic Accounting
SWOT	Strengths, Weaknesses, Opportunities, and Threats
S&P	Standard and Poor's
SMEs	Small and Medium Enterprise
SWM	Solid Waste Management
SNA	System of National Account
UNEP	United Nations Environment Programme
UNDESA	United Nations Department of Economic and Social Affairs
UNIDO	United Nations Industrial Development Programme
UNITAR	United Nations Institute for Training and Research
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
WFP	World Food Programme
WTO	World Trade Organization
USAID	United States Agency for International Development
YENAP	Youth Employment National Action Plan

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FOREWORD

The global environmental and sustainable development agenda as reflected in the outcome of the Rio+20 Summit, which supported the setting of a post 2015 development agenda called for the adoption of a set of Sustainable Development Goals (SDGs). Based on this outcome, it is evident that there is a pressing need to acknowledge that Egypt's future is closely associated with its preparedness and readiness to deal with the inter linkages between the social, economic and environmental challenges that threatens the country's well-being and economic prosperity.

These challenges require an integrated approach of governance comprised of national strategies, enabling environment and policy tools to properly and efficiently address them. Only through integrating the social, economic and environmental dimensions in the national planning process, Egypt will be able to achieve long term sustainable development and poverty alleviation.

It is a fact that in recent years, Egypt has faced major challenges represented in environmental degradation, limited social inclusion, inequitable distribution of wealth and unsustainable economic development. However, the Government is currently adopting a transformative change where sustainable development is becoming a priority.

To complement this outlook with action, the Green Economy Scoping Study for Egypt is perceived as a first stepping-stone towards entrenching green policies into the Egyptian local context. Through focusing on four priority sectors in the economy, it aims to garner public and societal support and commitment to shift towards a Green Economy. It represents a pathway to achieve sustainable development and poverty eradication. The study aims to promote and communicate the benefits of investing in environmental infrastructure and the need to put in place policies, measures and enabling conditions to support such a transition.

The key message emerging from the study is that Green Economy can be an effective tool in transitioning Egypt into a sustainable development path that can address the main challenges facing the country. This publication is supplemented with a document showcasing successful existing green initiatives in Egypt. The *Green Economy: Egypt Success Stories* highlights local ventures, cleaner production centres, financial assistance programmes and entrepreneurial projects that are successful in generating economic, social and environmental benefits. It aims to inform policy makers and businessmen about the financial and economic viability of green investments and businesses.

Both publications provide a credible and solid reference for on the ground experiences of green investments and a road map for transitioning to a Green Economy as a mean for achieving sustainable development. They were developed through our fruitful partnership with CEDARE and UNEP. The key message is that green interventions could be a point of entry to achieve a balance between environmental accountability, social inclusiveness and economic growth. The Egyptian Ministry for Environment hopes that this Scoping Study can mark the beginning of a long-term strategy for transitioning the Egyptian economy to a more sustainable economy.

Dr Khaled Fahmy
Minister of Environment

KEY MESSAGES

GREENING THE EGYPTIAN ECONOMY

- The Egyptian Government today is seeking effective ways to lead the nation out of the current macroeconomic slowdown, political instability and social dissatisfaction. Green Economy can play an important role in meeting national aspirations in all these fronts, since it provides a framework in which development goals are achieved by integrating the economic, social and environmental dimensions at the core of policies and decision-making processes.

- Following the business as usual economic scenario is no longer an option as it has led to alarming ecological implications leading to escalating water, food, and energy scarcity.
  - Agricultural practices have led to loss of agricultural biodiversity, increased desertification, land erosion, and increased loss of soil fertility. About 35 per cent of Egyptian soil currently suffers from high salinity.
  - In 2004, water share per capita was 950 m^3/per capita, and by 2025, water per capita share is expected to reach 600 m^3/per capita and 350 m^3/per capita by 2050.
  - Fossil fuels and natural gas represent about 40 per cent and 56 per cent of total energy supply respectively, while renewables excluding hydro, contribute to about 2.4 per cent in 2012.
  - 64 per cent of current waste is collected, and only 2.5 per cent is recycled.

Green Economy policy measures are proposed as a national policy option and a new paradigm shift to redirect Egypt's development path and provide effective solutions to Egypt's economic, social and environmental issues. These policies promotes and efficient and sustainable use of resources, and stimulates economic diversification, which opens new markets and creates jobs.

- Changing consumption and production patterns are key in making a shift towards greening the economy and achieving sustainable development. This requires actions in the following fronts:
  - Public awareness and information dissemination are needed to build credibility, accessibility and transparency to facilitate the transition to a sustainable consumption path.
  - Modify heavily biased towards fossil fuels energy subsides, which have reached unsustainable levels and liberate funds for environmental and social activities, and investments in human resources and R&D.
  - Improve regulatory framework and direct government spending towards green products and investments, which creates markets and demand for green products and private sector involvement.
  - Good governance that ensures the adoption of a participatory and an all-inclusive approach to policy formulation, implementation, monitoring, and assessment as well as a transparent and accountable system is key in the realization of green and sustainable development objectives. A strong governance system that promotes transparency, accountability, and stakeholder participation with an emphasis on community-based and participatory approach is essential in making a transition to a Green Economy.

GREENING KEY SECTORS

AGRICULTURE

- In order to ensure food security there is an urgent need to introduce sustainable agricultural practices, enhance efficiency, increase agricultural productivity and reduce waste.

- Sustainable agricultural practices are vital for restoring and protecting agricultural biodiversity, which can be achieved by optimizing the use of water, land, energy and capital. Some of the most critical measures to include:
  - Promote organic and sustainable farming, which includes recycling agricultural residues into organic fertilizers and fodder.
  - Change cropping patterns (shifting to low water intensity crops; reduce the area cultivated with high water intensive non-strategic crops with low water intensive crops). Changes include moving from rice and sugar cane to horticulture and hydroponic agriculture.
  - Gradually replace conventional flood irrigation with modern water-saving irrigation systems.

- Sustainable agricultural practices have the potential of creating new additional jobs; stimulating agro-industrial processing and linking small farmers to international market value chains by promoting market access and creating new market niches.

- Greening the agriculture sector requires concerted public and private efforts and investments.
  - Investment in human resource development and R&D for improved irrigation systems and practices and improved land productivity, and crop yields.

WATER

- Failure to address inefficiencies in current water public management and use will continue to widen the gap between supply and demand.

- There is a growing need to improve water supply through the introduction of non-conventional sources of water such as water reuse and desalination of brackish and sea water, and the introduction of policies and measures that promote its sustainable use and consumption, such as:
  - Wastewater recycling and treatment for agricultural and industrial purposes.
  - Upgrade national water distribution networks in order to reduce waste and promote water use efficiency.

- Investing in water infrastructure projects coupled with adequate water management policies can lead to an improvement of Egypt's water scarcity dilemma.

ENERGY

- To ensure Egypt's energy security, there is a pressing need to facilitate and encourage the use of renewable sources of energy.

- Reforming the current energy subsidy system is necessary in order to remove market distortions, unsustainable fiscal spending, promote the efficient use of energy, reduce waste, and encourage innovation, in addition to stimulating social inclusiveness.

- Public-private partnerships provide an optimum arrangement that encourage and facilitate the transition to greening the energy sector. This will facilitate important investments on:
  - Renewable energy sources such as solar and wind infrastructure, in order to increase the percentage share of renewable energy out of total energy mix.
  - Energy efficient appliances and equipment in order to reduce energy consumption by households and economic sectors.

SOLID WASTE MANAGEMENT

- Adopting a sustainable integrated solid waste management (ISWM) system can create new business opportunities, create jobs, and improve the environment and health. It could also generate benefits for other sectors, by investing in:
  - Waste to organic fertilizers and waste to biofuel facilities.
  - Producing refuse-derived fuel (RDF) for use as an energy source for cement factories and other industrial uses.

- Egypt is facing an escalating solid waste management problem due to the increasing volume of waste resulting from municipal and economic activities.

- The problem is causing serious damage to the environment and human health, which requires the adoption of a sustainable solid waste management strategy that emphasizes waste avoidance, reduction, reuse and recycling.

- Government efforts are primarily focused on finding management solutions for solid waste collection, not on introducing a sustainable and long-term ISWM system. Some of the main short terms measures are the conversion of open dumpsites and landfills into sanitary landfills and the construction of new sites.

EXECUTIVE SUMMARY

Egypt faces today a series of significant challenges in the economic, social and environmental front. The current transition period Egypt is experiencing, further places an extra burden on the Egyptian economy. This represents an urgent need to revitalize and diversify the economy, enhance competitiveness, create new jobs, promote exports, and generate foreign external earnings. The financial reserve of Egypt has dropped from US$36 billion in December 2010 to nearly US$16.5 billion in December 2013.[1] This reserve can only cover less than three months of imports. This places the country in a critical situation and highlights the vulnerabilities in meeting import demands. Real GDP growth is now estimated at 2.2 per cent, with investments declining to 13 per cent of GDP during the period between July-December 2012.[2] Moreover, the rate of unemployed by the end of December 2012 was estimated at 13 per cent with some 3.5 million people seeking jobs.[3] This figure is expected to have increased during the last several months as a result of the current political and economic situation in the country.

In order to address challenges facing the Egyptian economy, following a conventional development paradigm is not an option. In other words, it is no longer a viable option to pursue long-term development goals without having the social and environmental dimensions at the core of policies and decision-making processes. Shortage in water, food, and energy are evidences of the mismanagement of natural resources coupled with the increased level of pollution, rate of depletion of natural resources, and land and ecosystem degradation. The riots in Damietta of nearly a year ago compelled closure of a fertilizer factory polluting the Nile River and the surrounding environment, resulted in job lost and millions of dollars. The mentioned are clear expressions of the need to ensure that environmental considerations are fully taken into account in the design of policies, plans, programs, and projects.

The United Nations Environment Programme (UNEP) in response to the 2008 world financial and economic crisis launched the Green Economy initiative.[4] The initiative advocates investment in environmental infrastructure as a way out of the financial crisis. This involves promoting environmentally conscious investments in all sectors including agriculture, industry, water, energy, building and construction, fisheries, forestry, and tourism. Green investment revitalizes and diversifies economies, creates jobs, promotes trade and creates new market niches, while at the same time conserves the environment, improves health and human welfare.

The concept has received worldwide support and acceptance with a large number of countries allocating a large percentage of their stimulus packages towards green investments. A number of developing countries and emerging economies have already followed this track of development. These include Brazil, China, Costa Rica, Indonesia, Jordan, Malaysia, Mexico, the Philippines, Qatar, South Korea, Saudi Arabia and the United Arab Emirates. For the most part, United Nations Organizations have also adopted a Green Economy approach in developing and delivering their programmes. Such organizations are ILO, UNDESA, UNDP UNIDO, UNESCO, WFP, UNITAR and the WTO in addition to the UN Regional Commissions.

The current transition period Egypt is experiencing provides a unique opportunity for the country to shift onto a sustainable development path. Greening the Egyptian economy with emphasis on adopting a community-based and participatory approach provides the potential for addressing

current challenges facing Egypt. This should result in creating jobs, revitalizing and diversifying the economy, enhancing competitiveness and promoting sustainable trade, while achieving more social justice and equity by integrating the impoverished segments of the population into mainstream economic activities.

The Green Economy Scoping Study provides an analysis of the potential benefits and opportunities offered by promoting green investments in four priority sectors in Egypt. Key messages and identified priority interventions as well as an overarching set of institutional and policy enabling conditions in order to green the sectors are summarized as follows:

AGRICULTURE

SECTOR CHALLENGES[5]

- Egypt faces a critical challenge in meeting current and future food needs of the population.
- The sector is characterized by inefficient use of resources, unsustainable agricultural practices, and consequently negative environmental impacts. Currently, agriculture contributes only about 14 per cent of the country's GDP.[6]
- Another challenge facing the sector is the encroaching of urbanization, illegal construction on agricultural land, and potential climate change impacts on arable land and crop yields.
- Conventional agricultural practices, coupled with land fragmentation have resulted in stagnant crop yields and productivity. Lack of adequate investment in the sector has led to the stagnation of labour share in the sector over the last several decades.
- Current water scarcity, climate change, and poor infrastructure continue to jeopardize the level of agricultural production, and render ambitious growth strategies for the sector speculative.

IDENTIFIED GREEN INVESTMENTS

- Organic and sustainable farming as a means to promote the efficient use of resources, enhance competitiveness of agricultural products, increase land productivity and crop yields, and create new jobs,
- Change cropping patterns (shifting to low water intensity crops; reduce the area cultivated with high water intensive non-strategic crops with low water intensive crops).
- Recycling agricultural residues into organic fertilizers and fodder.
- Gradually replace conventional flood irrigation with modern water-saving irrigation systems.
- Investment in human resource development and R&D for improved irrigation systems and practices and improved land productivity and crop yields.

WATER

SECTOR CHALLENGES

- Demand for water consumption whether by households or by different economic sectors is increasing at an alarming rate, while water supply resources remain constant, and may potentially decline in the future.
- High rates of population growth and urbanization, expected increase of economic activities, particularly, industrial, agriculture, and tourism accompanied by unsustainable production and consumption patterns in the water sector continue to increase pressure on an already scarce resource.
- In 2004, water share per capita was 950 m^3/ per capita, and by 2025, water per capita share is expected to reach 600 m^3/per capita[7] and 350 m^3/per capita[8] by 2050.

IDENTIFIED GREEN INVESTMENTS

- Non-conventional water resources such as recycling and desalination of brackish and sea water.

- Wastewater recycling and treatment for agricultural and industrial purposes.
- Upgrade national water distribution networks in order to reduce waste and promote water use efficiency.
- Investment in human resource development, and R&D for innovative water-saving equipment and technologies.

ENERGY

SECTOR CHALLENGES

- Current energy policies, including regulatory and incentive measures, particularly the subsidy system have led to unsustainable patterns of production and consumption, and have negatively impacted the economy, the environment, and human welfare.
- Since 2007, a gap between energy supply and demand has existed, and is expected to continue to increase under the business as usual scenario.
- Public expenditure on energy subsides have reached unprecedented levels, representing about 73 per cent of all subsidies and approximately 21 per cent of the country's budget.[9] This has resulted in 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.
- Heavy reliance on fossil fuel as the main source of energy supply results in increased CO_2 emissions and the resulting negative impacts on climate change, sea level rise, health, the environment, and the economy.

IDENTIFIED GREEN INVESTMENTS

- Investing heavily in renewable energy sources such as solar and wind infrastructure in order to increase the percentage share of renewable energy out of total energy mix.
- Investing in energy efficient appliances and equipment in order to reduce energy consumption by households and economic sectors.
- Investing in human resource development, R&D in renewable energy and innovative energy-saving technologies, practices and measures.

SOLID WASTE MANAGEMENT

SECTOR CHALLENGES

- Egypt is facing an escalating municipal 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.
- It is estimated that annual municipal solid waste generation has increased by more than 36 per cent since 2000, with an estimated increase of 3.4 per cent per annum.[10] It reached about 21 million tonnes in 2010, nine million tonnes of which is generated by greater Cairo.[11]
- Current state of municipal solid waste management is resulting in increased environmental damage and negative impacts on health.

IDENTIFIED GREEN INVESTMENTS

Investing in waste to organic fertilizers and waste to biofuel facilities.

- Investing in producing refuse-derived fuel (RDF) for use as an energy source for cement factories and other industrial uses.
- The conversion of open dumpsites and landfills into sanitary landfills and the construction of new sites as a short-term measure.
- Investing in human resource development, R&D and innovative recycling technologies and equipment.

CROSS-CUTTING ISSUES

In order to encourage and facilitate the transition to a Green Economy in Egypt, the study proposes a set of policies and measures that can be considered. These include the following:

- Strengthen institutional and governance structure, including promoting transparency, accountability, and public participation.
- Introduce integrated (environmental, social, economic) policymaking for sustainable development.
- Promote community-based development approaches for policy formulation, implementation, and monitoring.
- Introduce regulatory reform packages to support macroeconomic and sectoral towards a transition to Green Economy.
- Fiscal policy reform, use of economic instruments, including subsidy and tax reform to alter behaviour towards more sustainable production and consumption patterns.
- Design trade policies that encourage market access to green and environmental technologies.
- Develop and disseminate public awareness communication packages specifically designed for different target groups.
- Develop an education curriculum, vocational training and capacity development that produce the necessary calibres and skills needed to support the transition to a Green Economy.
- Encourage private sector participation and engagement.
- Investing in innovate and environmental technologies.
- Encourage green public procurement.
- Facilitate finance, particularly micro finance for small and medium size enterprises.
- Introduce integrated environmental management and economic accounting as a tool that reflects the depletion and degradation of resources and as true indicators for sustainable development.

Overall, Egypt's transition to a greener and more inclusive economy will depend on the ability of this transition to address current challenges, while promoting an efficient and sustainable use of resources, as well as stimulating economic diversification to open new markets and create more jobs. This calls for a new development framework, such as Green Economy, which can generate significant changes in consumption and production patterns by integrating the economic, social and environmental dimensions at the core of policies and decision-making processes. Meeting this challenge will require increased public awareness with information dissemination to build credibility, accessibility and transparency; and modify energy subsides, which have reached unsustainable levels. Moreover, improving regulatory framework and direct government spending towards green products, along with investments to create markets demand for green products and stimulating private sector involvement are crucial. Also to be in place is a strong governance system that promotes transparency, accountability, and stakeholder participation with an emphasis on community-based and participatory approach.

1 INTRODUCTION

1.1 SETTING THE STAGE FOR AN EGYPTIAN GREEN ECONOMY

The Egyptian Revolution that occurred in January 2011 has placed a tremendous pressure for economic, social and political reform, sustainable development and institutional restructuring. Green Economy can play a role in meeting these national aspirations and provide a conducive policy context. Greening policies and access to financial resources to achieve this end have the potential of addressing Egypt's current economic malaise, including, but not limited to an increase in foreign debt, growing macroeconomic instability, faltering growth rates, food security concerns, increasing energy demand, poverty, and high unemployment rates. Egypt is also facing severe environmental challenges and heightened climate change threats that are likely to have adverse economic and social impacts such as natural resource scarcity and ecosystem degradation. Embracing an Egyptian version of a Green Economy is a policy option that can put Egypt on a sustainable path of development. An integrated and all-inclusive economic growth strategy will enhance the competitiveness of the nation, diversify and revitalize the economy, create new jobs and achieve equity and social justice, while simultaneously preserve the environment and the ecosystem that is badly needed.

According to UNEP, 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 integrity. As defined by UNEP, a Green Economy is one that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities".[12] The concept has been gaining worldwide recognition since its launch in October 2008, especially in the wake of the financial and economic crisis. Mounting global concerns over food, energy, and water shortages and escalating prices, have further exacerbated the problem.

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 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. Agriculture, Water, Energy and Solid Waste are key sectors that can be considered for Green Economy in Egypt.

Green policy interventions and investments in the agriculture sector could promote organic and sustainable farming; change cropping patterns, recycling agricultural residues into organic fertilizers and fodder, in addition to gradually replace conventional flood irrigation with modern water-saving technology. They could also encourage the use of organic fertilizers, minimize water wastage, improve quality of soil, increase productivity, and improve health. In addition, investing in sustainable agriculture opens up new market opportunities and creates new jobs, particularly for the rural unemployed.

In the water sector, policies promoting efficient allocation and use of water and water conservation, increasing water availability to support economic activities. Increasing access to clean and safe water in rural areas contributes towards decreasing water borne diseases while improving sanitation and

health. Furthermore, integrating water efficiency measures in urban areas leads to increased water efficiency and reduced water loss and costs involved.

A shift towards renewable energy, opens up new markets, generates new economic activities and businesses, and creates new green jobs. It also addresses increasing energy demand and fluctuating prices of fossil fuels. Increasing the percentage share of energy from renewable sources reduces CO_2 emissions and its negative impact on health, the environment, and the economy.

Investing in an integrated solid waste management system that promotes waste avoidance, recycling, reuse and recovery will go a long way towards addressing the solid waste management problem in Egypt. It is important to promote innovative practices such as waste to compost and waste to energy applications. Apart from addressing the solid waste problem in the country such applications will also contribute towards solving shortages in energy as well as fertilizers. These investment opportunities open up new businesses and create new jobs.

1.2 STUDY OBJECTIVE

The objective of this scoping study is to assess the positive and negative impacts of following a business as usual scenario as opposed to a more sustainable path of development, by adopting a Green Economy approach in the four selected priority sectors. It will also identify policy interventions and investments to initiate and implement a successful green transition in the selected priority sectors.

There is no clear-cut or a particular model that fits all definition for Green Economy. Accordingly, main guiding principles for what constitutes Green Economy will have to be framed by countries to meet their specific priorities and socioeconomic conditions and circumstances. This study will identify these guiding principles as well as the country specific recommendations and enabling conditions to be achieved for transitioning to a Green Economy in Egypt.

1.3 METHODOLOGICAL APPROACH

The Green Economy Scoping Study (GESS) is intended to provide an assessment of the existing and potential socioeconomic and environmental situation in Egypt and potential implications for following a business as usual scenario as opposed to a Green Economy approach in four selected priority sectors. The study proposes a set of policy packages and recommendations to incentivize and prioritize public and private investment in green infrastructure in the four sectors.

The four sectors are: Agriculture, Water, Energy and Solid Waste Management.

The methodological approach used in this study is based on qualitative economic analysis for business as usual scenario and the potential positive outcomes of green policy driven investments. A multi stakeholder participatory approach was adopted in undertaking this study. Stakeholders included Government officials, sectoral experts, business sector, research institutes, think-tanks and NGOs. This is in addition to representatives from ILO, UNDP, UNEP, and UNESCO. The consultative and participatory process included a series of meetings, consultations and a stakeholder launching workshop to identify policy gaps and existing challenges in the target sectors. A final stakeholder's workshop to validate and review the outcomes and proposed enabling conditions for the green transformation is yet to be convened before end of 2013.

The study proposes a set of green investments for each of the selected sectors with high potential positive economic, social and environmental gains. Strengths weaknesses, opportunities, and challenges (SWOT) analysis[13] was used to assess and validate the suggested green interventions for each sector.

2 COUNTRY PROFILE AND OVERARCHING CHALLENGES

2.1 MACROECONOMIC CONTEXT[14]

Economic background: Economic growth has significantly decline since 2010 even after the fiscal stimulus, and it is expected to remain relatively low in the short run, as political uncertainty will continue to weigh on tourism and foreign direct investment. The budget deficit has declined thanks to official grants, but remains elevated, creating an unsustainable debt dynamic.[15] Significant imbalances will persist unless structural reforms and fiscal consolidation are initiated.

The country's policy reform agenda adopted in 2004 has resulted in an upward growth trajectory, increased foreign direct investments and has successfully re-positioned Egypt on the path of an emerging economy. In the span of four years, GDP annual growth rate increased from 4 per cent in 2007 to 7.2 per cent in 2008, while FDI reached US$11.1 billion during the same period.[16] In 2008, the global financial crisis has had negative repercussion on the Egyptian economy. This was reflected by slower growth rates, capital outflow, higher inflation rate and increased unemployment. This is in addition to the fact that, the country's economy did not deliver on the promised trickledown economic and social benefits. Income disparities and high poverty rates persisted, resulting in increased inequality, and illiteracy. Moreover, the country's weak governance structure, and political instability has further exacerbated the situation.

Recent developments: GDP growth rate declined from 2.2 per cent in 2012 to 2 per cent in 2013.[17] This decline has strained the Government budget, which is already facing increasing pressures to meet the basic needs of the population. While the country's exports have continued to grow albeit at a lower rate[18] indicating that local businesses are withstanding

FIGURE 1[21]: GDP GROWTH RATE (PER CENT)

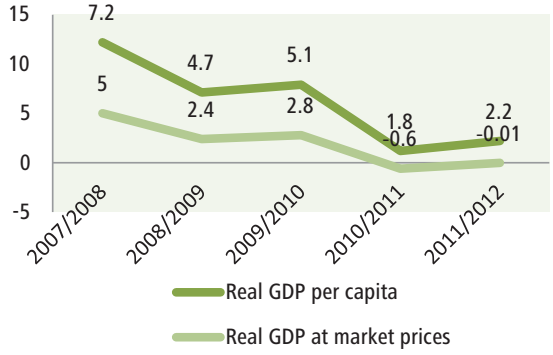


FIGURE 2[24]: TRADE AND CURRENT ACCOUNT BALANCES (PER CENT OF GDP)

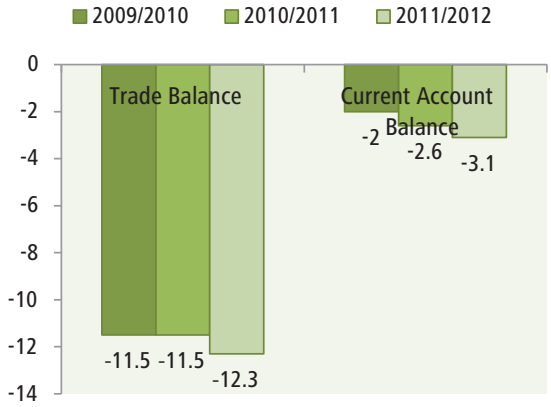


FIGURE 3[25]: NET INTERNATIONAL RESERVES (US$ MILLION)

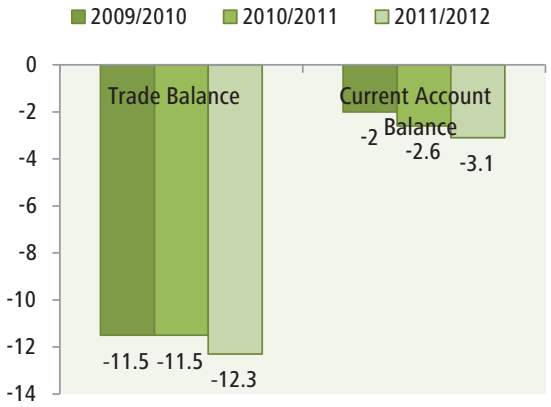


FIGURE 4[28]: BUDGET DEFICIT (PER CENT OF GDP)

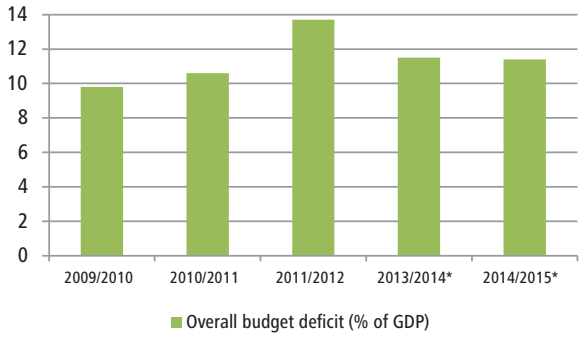


FIGURE 5[32]: TOTAL BUDGET EXPENDITURE (PER CENT OF GDP), EMPLOYEE COMPENSATIONS & INTEREST PAYMENTS (PER CENT OF TOTAL EXPENDITURE)

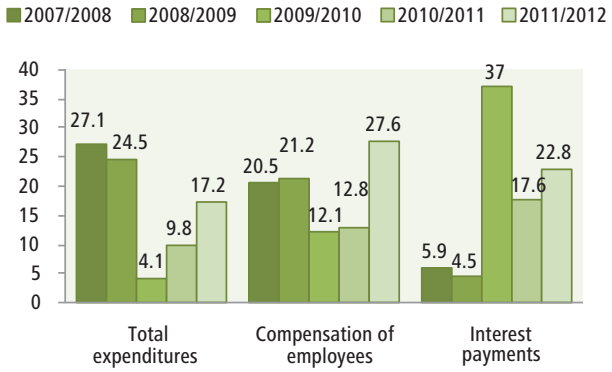
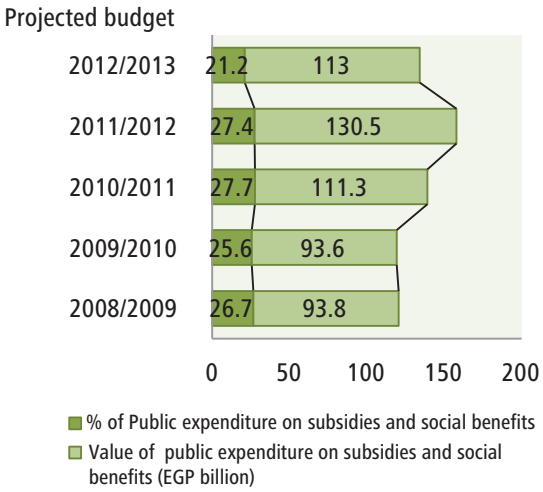


FIGURE 6[33]: PERCENTAGE OF PUBLIC EXPENDITURE DIRECTED TO SUBSIDIES AND BENEFITS



the brunt of the current economic and political instabilities, the balance of traded goods[19] showed a deficit of US$30.5 billion in 2012 higher by 8.1 per cent from the previous year. Moreover, the country's unfavourable balance of payment is showing a gap that continues to increase at an alarming rate.

In 2012-2013, the balance of payment gap reached US$10-12 billion due to increased fossil fuel imports and the global increase of food commodity prices.[22] Currently, the Government is facing a real challenge in order to pay for its import bill including essential foodstuff, diesel and oil imports to sustain local growing energy and food demand. The International reserve has drastically declined from US$36 billion in December 2010 to US$16.5 billion in December 2013.[23]

As a result, the central bank was forced to tighten liquidity by capping foreign currency withdrawals, and transfers. This was accompanied with a decision to float the Egyptian pound, which has resulted in 10 per cent devaluation against the US dollar.[26] Moreover, increased public expenditure and declining revenues have led to the widening of the country's budget deficit reaching 10.7 per cent of GDP during 2011-2012.[27]

Political instability accompanied by lack of enforcement and compliance has resulted in lower tax revenues. Labour protests have paralyzed economic activities and have pressurized the Government into an increase in public expenditure in the form of increased wages and health benefits.

In February 2011, public wages increased by 15 per cent and a minimum wage for public sector workers of EGP 700 per month was put in place.[29] This figure has further been increased to EGP 1,200 per month by the beginning of January 2013. Furthermore, subsidies, and social benefits reached 27.4 per cent of total expenditure in 2011-2012. As a result total public expenditure rose by 17.2 per cent in 2011-2012.[30]

On the other hand total revenues decreased by 1.1 per cent in 2010-2011 with a 25 per cent[31] decrease in revenues mainly from tourism and remittances from Egyptians working in conflict areas such as nearby Libya. However, in 2011-2012 non tax revenues made a recovery and registered an increase.

Local and foreign Investments have been declining due to the political instability in the country. The tourism sector was hard-hit due to the drastic decline in tourist arrivals, thus resulting in the loss of about 2 million jobs in the sector.[36] Also the construction and manufacturing sectors were negatively affected. Ever since the revolution in 2011 Egypt's international credit rating has been gradually on the decline. Standards and Poor's (S&P) and Fitch and Moody's credit have downgraded Egypt's ratings from 'B' to 'C'.

To meet the current financial deficit, the Government has been negotiating a US$4.8 billion IMF loan to inject into the economy. However, resorting to financial aid without first introducing the necessary restructuring measures to cut on costs, reduce waste, and introduce resource efficiency measures will not promote debt sustainability. Rather introducing policy reform and a national strategy directive is what can guarantee a sustainable growth path for the country.

The Government has already started to gradually phase out fuel subsidies and allowed a devaluation of the Egyptian pound. It is also encouraging the rationing of electricity usage as a tool to minimize increasing electricity outages during summer. However, as a food and oil importer, Egypt's vulnerability and fiscal woes can escalate any time international prices witness an increase. As part of its efforts to revitalize the economy and attract foreign investment, the Government is exerting efforts to revamp the investment climate through national mega projects.

Recently, with the interim Government Egypt's macroeconomic prospects have become more

FIGURE 7[34]: TOTAL REVENUES (PER CENT OF GDP), TAX REVENUES AND NON TAX REVENUES (PER CENT OF TOTAL REVENUES)

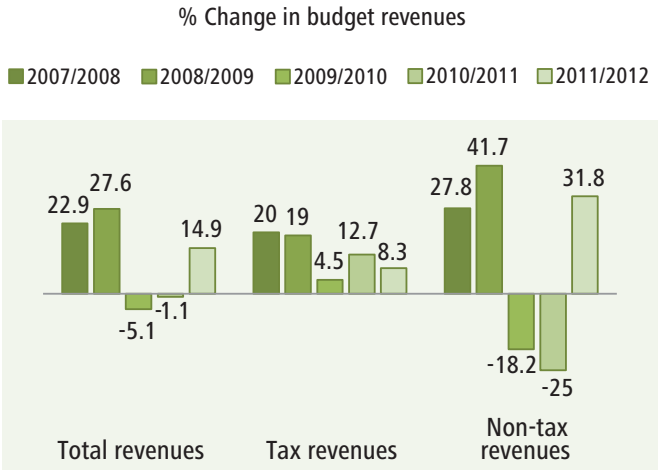
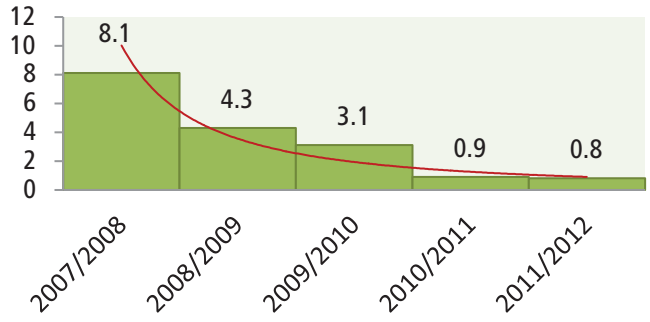


FIGURE 8[35]: CHANGE IN FOREIGN DIRECT INVESTMENTS (PER CENT OF GDP)



favourable. Countries of the Gulf Cooperation Council (GCC) have started injecting funds in the form of grants, deposits and soft loans as a form of a bailout. Funds close to US$12 billion recently transferred to Egypt could delay the further worsening of the country's balance of payments, declining foreign reserves, budget deficit, and suppress inflation. Such an immediate transfusion of funds relaxes the pressure on the urgency to finalize the IMF loan. However, the real challenge that will face any cabinet is the need to develop a new and innovative vision, strategy, and long-term national economic policy that will be able to address the country's current and future challenges and priorities.

Economic outlook and policy issues: The current transition period and political instability in the

country has had its toll on the macroeconomic situation, investment climate, policy reform and restructuring. In the short term there is an immediate need to sustain macroeconomic stability, and initiate gradual recovery through prioritizing public expenditure while attempting to reduce the growing budget deficit. In the medium term, there is an urgent need to resuscitate the economy by actively pursuing a comprehensive economic growth agenda. As challenging as it may be, a clear policy framework introducing the Green Economy concept and demonstrating its economic and social gains can reinforce new reform efforts, boost investment climate, strengthen domestic consumption, and create new markets. Working in favour of this transition, is a resilient banking system, a relatively functional public sector and institutions, cheap labour and entrepreneurial skills that can support long-term economic recovery. Egypt has the necessary infrastructure to support a business environment; globally it ranks 26 out of 185 on the ease of starting a business.[37] Transitioning to a Green Economy could attract foreign investment, create new market niches and export opportunities, revitalize the economy plus speed up economic recovery.

2.2 ENVIRONMENTAL FOOTPRINT

Resource Endowment and Ecological Profile[38]: Egypt has a unique geographical location at the centre of trade routes from east to west and north to south. It is situated along the northern corner of Africa, bordered by the Mediterranean Sea in the North, the Red Sea in the East, Libya in the West and Sudan in the South.[39] Located at the centre of diverse eco-zones has been a cause of enrichment of the country's biodiversity and wide range of terrestrial habitats and a diverse fauna and flora.

The country's topography is a combination of fertile agricultural land along the Nile valley and the Delta, vast desert areas in the Western and Eastern parts of Egypt, in addition to the Sinai Peninsula.[40] Egypt has about 10.6 million hectares of arable land divided as indicated Figure 9.[41] With a Mediterranean climate, the country is suitable for growing many crop varieties. Egypt is considered though to be a water scarce country. Conventional sources of water are limited to the Nile River, limited rain fall and groundwater with a total water supply of 59 billion cubic meters, out of which 55 billion cubic meters is Egypt's quota from the Nile.[42] Concerning minerals, Egypt has reserves of important mineral resources such as phosphates, raw iron, manganese, talc, and limestone.[43]

On the other hand, Egypt had large reserves of natural gas and oil, which positively impacted the country's GDP and trade balance. However, accelerating local demand and exports have shifted Egypt from an oil exporter to a net oil importer. Also, despite ongoing on shore and off-shore exploration, Egypt's reserves of natural gas are also rapidly depleting and there are growing concerns as to whether Egypt can continue to export natural gas rather than meeting its own local energy demand. The total resource depletion in Egypt in 2012 was 3.78 per cent and 2.80 per cent of GNI from production and consumption, respectively.[44]

Natural capital represents an essential pool of resources that can induce the building of other capital assets, such as education, health, or manufactured capital. This is why it is very important to have the tools for adequate monitoring and management of society's assets. The inclusive wealth framework allows the measurement of society's productive base, which forms the basis for sustainable development and provides a tangible measure for governments to use and track over time.[45]

Recent developments: Many factors have contributed to environmental deterioration in Egypt. These include failure to decouple economic activities from environmental degradation. Unsustainable practices accompanied by population growth, increased economic activities, high rate of urbanization, and a change in consumption patterns have all contributed

to the inefficient allocation and use of resources. Moreover, the lack of appropriate legislation and incentive measures to address environmental issues have resulted in continuous pollution and environmental degradation. Other environmental impacts include air pollution resulting from contaminants and emissions, hazardous as well as non-hazardous waste, solid waste and wastewater pollution from urban centres, industry, agriculture and other activities.

Water scarcity is a major challenge in Egypt, with water demand reaching about 81 billion m^3[47] while water supply remains fixed.[48] The urgency of the issue has resurfaced with the renegotiation of the sharing quotas of the Nile River in light of Ethiopia's decision to build the new Grand Ethiopian Renaissance Dam, and the signing of a new Nile River water-sharing framework agreement by Ethiopia, Uganda, Tanzania, Rwanda and Kenya in 2010. So far Egypt has refused to sign the new agreement and the impact these recent developments has on the country's historic Nile River quota are yet to be properly assessed.

This is further aggravated by increasing concerns related to climate change variability and associated rise in average temperatures, increased frequency of sand storms, and the potential impact on sea level rise and the possible inundation of the Delta and coastal areas. Moreover, public expenditure targeting environmental protection is almost negligible amounting to about 0.4 per cent of total expenditure.[50]

Against this backdrop, and as a result of lack of proper management of natural resources, Egypt's total bio-capacity is estimated at 51 million gha[52] according to a recent publication by the Arab Forum for Environment and Development (AFED) while its ecological foot print[53] is much higher, estimated at 133 million gha.[54] This highlights the serious gap between population needs and the country's available stock of biodiversity. According to the report, the ecological footprint per person grew by

FIGURE 9: BREAKDOWN OF ARABLE LAND IN EGYPT (MILLION HECTARES)

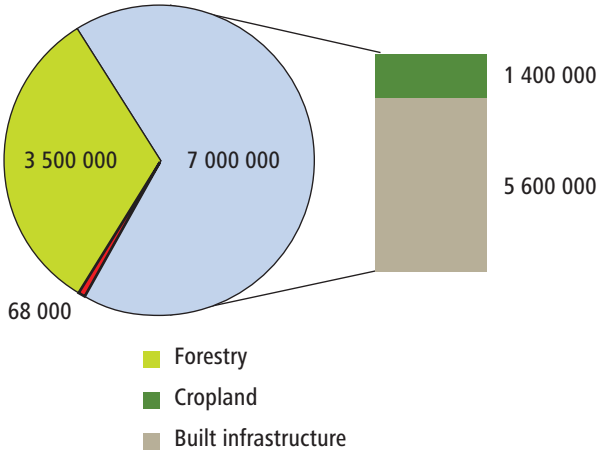


FIGURE 10[46]: PER CENT CHANGE OF CO_2 EMISSIONS (MILLION TONNES)

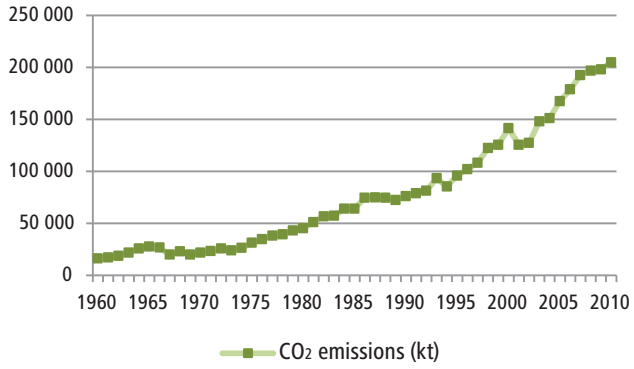
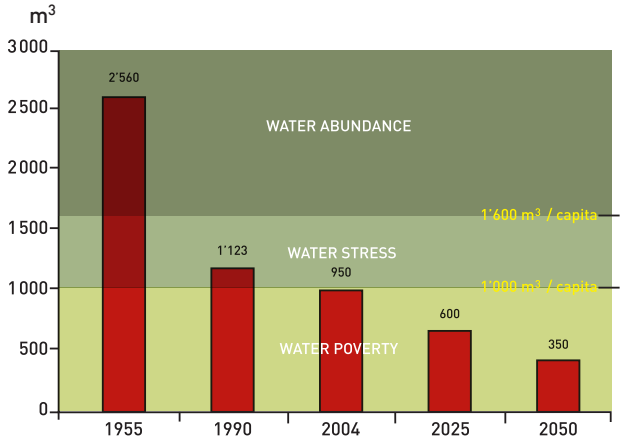
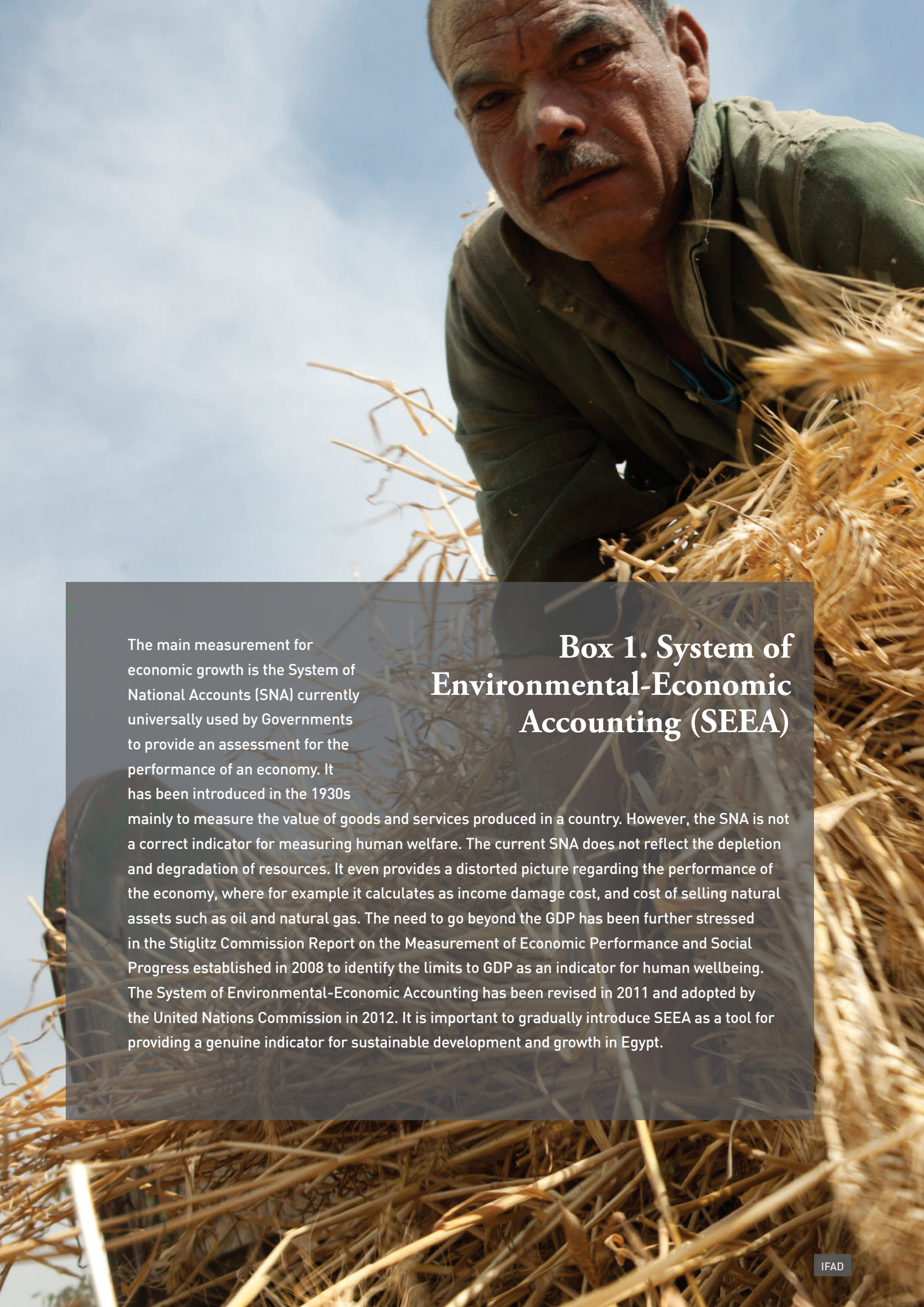


FIGURE 11[49]: STATUS OF WATER SUPPLY PER CAPITA IN EGYPT (CUBIC METER/CAPITA)





Box 1. System of Environmental-Economic Accounting (SEEA)

The main measurement for economic growth is the System of National Accounts (SNA) currently universally used by Governments to provide an assessment for the performance of an economy. It has been introduced in the 1930s mainly to measure the value of goods and services produced in a country. However, the SNA is not a correct indicator for measuring human welfare. The current SNA does not reflect the depletion and degradation of resources. 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. The need to go beyond the GDP has been further stressed in the Stiglitz Commission Report on the Measurement of Economic Performance and Social Progress established in 2008 to identify the limits to GDP as an indicator for human wellbeing. The System of Environmental-Economic Accounting has been revised in 2011 and adopted by the United Nations Commission in 2012. It is important to gradually introduce SEEA as a tool for providing a genuine indicator for sustainable development and growth in Egypt.

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94 per cent between 1961 and 2008, while the bio-capacity[55] available per person increased by only 21 per cent.[56]

The rate of CO_2 emissions is a major driver of Egypt's ecological footprint. CO_2 emissions have significantly increased, close to 170 per cent from 1990 to 2010,[57] driven by unchecked and lack of adequately monitored industrial activities, transportation, and obsolete waste disposal practices. This is in addition to a noticeable lack of a strict environmental quality control, compliance and enforcement system in the country. The lack of safety and quality control in the oil sector alone has been the main cause of 50 per cent of hazardous pollution substances and accidents in the country.[58] The damage is particularly greatest to the marine and coastal ecosystems.

Outlook and policy issues: Egypt's depleting natural resources continue to threaten its economic resilience and production capacity. Rising population and consumption have casted shadows of doubt concerning its ability to meet its current and future food, energy, and water demand. Egypt faces serious structural constraints concerning the deteriorating water treatment facilities, distribution networks, and obsolete irrigation systems. Conventional agricultural practices, unregulated use of chemical fertilizers, polluting waste disposal practices continue to negatively impact the agricultural sector.

All these factors contribute to the deteriorating conditions of Egypt's natural capital. In order to address this situation, an integrated policy reform approach needs to be introduced to mainstream environmental and social considerations in macroeconomic and sectoral policies. Green policy interventions, such as integrated natural capital management, as well as investment in pollution reduction measures, renewable energy, and non-conventional water generation technologies, can conserve resources, maintain ecosystems and safeguard species and biodiversity. Green investments can also have the potential of creating new employment opportunities.

FIGURE 12[51]: PER CENT OF PUBLIC EXPENDITURE ON ENVIRONMENTAL PROTECTION AND SERVICES

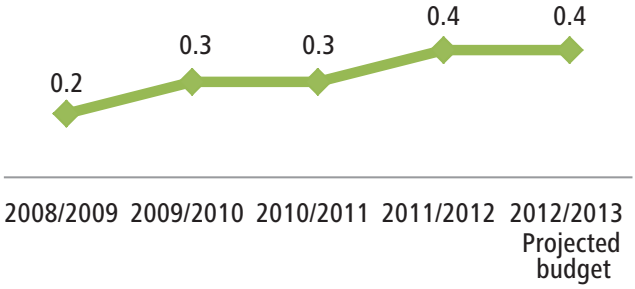


FIGURE 13[59]: EGYPT ECOLOGICAL FOOTPRINT

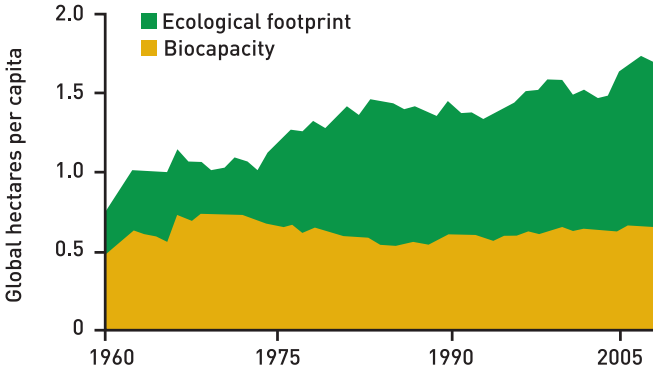


FIGURE 14[60]: NUMBER OF REGISTERED VEHICLES IN EGYPT (MILLIONS)

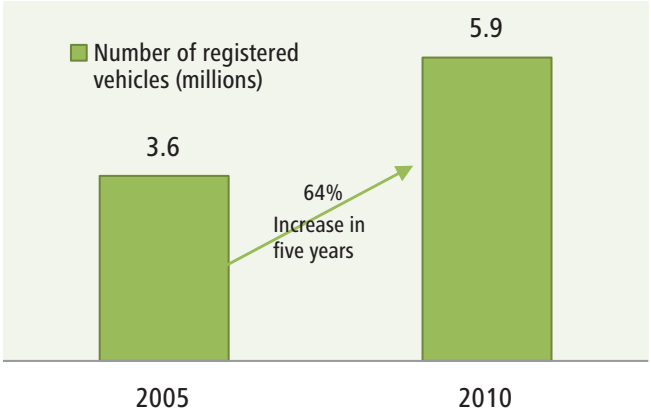


FIGURE 15[63]: CHANGE IN POPULATION GROWTH (MILLIONS)

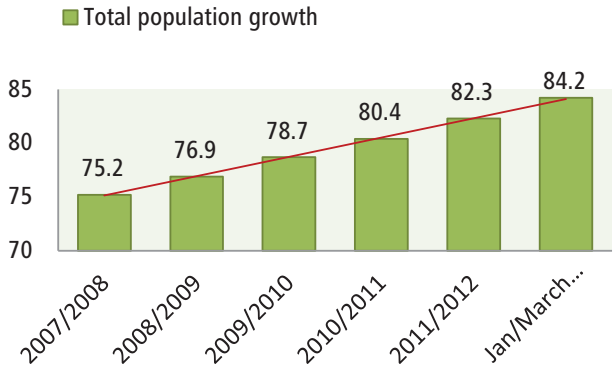


FIGURE 16[68]: COMPARATIVE SOCIAL PUBLIC EXPENDITURE (PER CENT OF GDP)

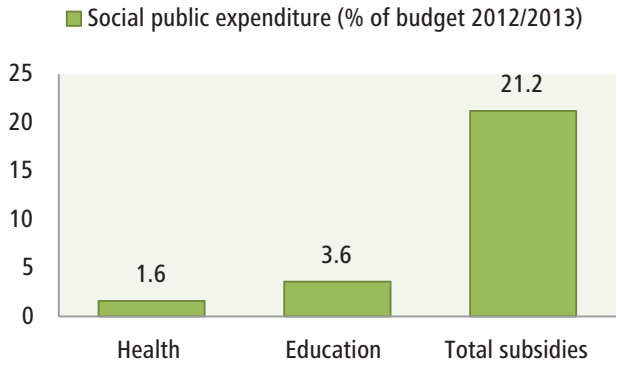
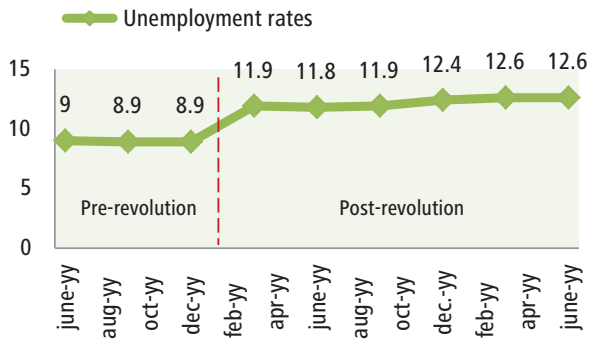


FIGURE 17[72]: CHANGE IN UNEMPLOYMENT RATES (PER CENT)



2.3 SOCIAL HIGHLIGHTS

Egypt has successfully achieved significant strides towards achieving the Millennium Development Goals (MDGs) such as the halving of infant mortality and malnutrition rates.[61] In addition, Egypt has managed to increase life expectancy rates, improve maternal health and primary education.[62] However, other existing social problems proved difficult to address. As a result, "Bread, freedom and human dignity" has been the main slogan the crowds have chanted during the 25th of January Revolution. It highlights social challenges that the previous regime had failed to address, including high unemployment, persistent poverty, income disparities and lack of social justice.

Egypt has one of the highest population growth rates in the Middle East. Relatively high population growth rates place additional pressure on the Government represented in increased public expenditure needed to provide social as well as physical infrastructure services.

By 2020, it is estimated that Egypt will have a population of over 100 million.[64] This will further call for increased public expenditure on food and energy, subsidies, health care, education in addition to other social services along with physical infrastructure. Food and energy subsidies continue to be of high concern to the Government due to the financial burden they continue to have on the budget. About 70 per cent of the population hold ration cards to receive food subsidies, conversely experts indicate that 19 per cent of the most vulnerable population are not included and do not benefit from these subsidies.[65]

There is an important leakage in the subsidy however: 12 per cent of families using ration subsidy are high income families and 55 per cent are middle income families, while 33 per cent of the beneficiaries are from the targeted group. There has also been an important increase in the amount of resources devoted to these subsidies,[66]

which has called institutions like the World Bank and International Monetary Fund to question the sustainability of such subsidies.[67]

Rapid urbanization has resulted in increased population densities in major cities. A high percentage of the population estimated at about eight million[69] live in urban slums and poverty stricken areas, with high rates of crime, unemployment, and illiteracy. Moreover, Egypt is considered a youthful population with almost 60 per cent of the population below 30 years of age.[70] Due to the current challenges facing the country, the Government's ability to satisfy the market for skilled and unskilled labour is diminishing, thus the task of job creation to meet youth expectations remains unfulfilled. The unemployment rate has increased from 9 per cent in 2011 to 12.6 per cent in 2012, and is estimated to reach 13.5 per cent in 2013.[71]

Moreover, the call for socioeconomic restructuring is yet to be addressed. This is currently hampered by existing economic strains and shortages of public funds. In 2011, the percentage of population living below the poverty line of US$2 per day reached 25.2 per cent, while income disparity reached 32.1[73] on the GINI Index.[74] According to the WFP in 2011 about 13.7 million Egyptians or 17 per cent of the population suffered from food insecurity, compared to 14 per cent in 2009.[75] The situation has worsened further during the last couple of years due to the deteriorating economic conditions the country is going through.

At the same time inflation reached 8.6 per cent in 2012 and is projected to reach 10.7 per cent by the end of 2013.[77] While prices of basic foodstuff have witnessed an increase in the local market, further straining low-income families and their ability to meet their essential needs. However, the Government has recently taken measures to fix and control prices in an attempt to reduce pressure on the population.

Poor families spend more than half of their income on food. Currently, many households are unable to

FIGURE 18[76]: CHANGE IN POVERTY RATES (PER CENT OF POPULATION)

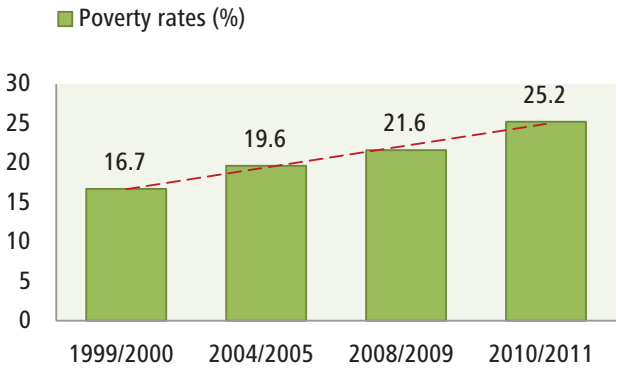


FIGURE 19[78]: INFLATION RATE (PER CENT)

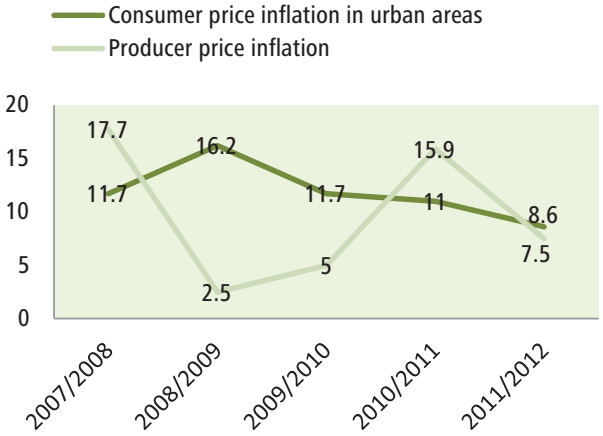
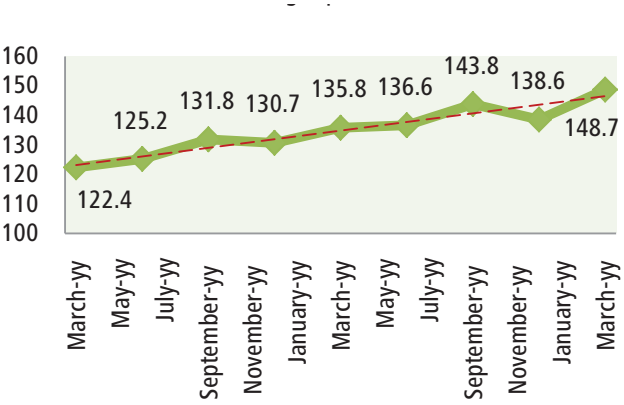


FIGURE 20[82]: FOOD AND BEVERAGES PRICE INDEX



World Bank/ Kim Eun Yeul

purchase fish, meat, milk and poultry. Approximately 58 per cent of families in Egypt are cutting down on their food consumption due to increased food prices and inflation.[79] The situation is even worse for rural areas where 44 per cent of Egypt's poor reside; approximately 60 per cent of rural families' monthly consumption requirements exceed their monthly income.[80] The main foods for poor families are bread and rice. As a result in 2012, 31 per cent of children under the age of five years were found to be malnourished as compared to 23 per cent in 2005.[81]

Outlook and policy issues: Despite impressive economic growth rates that the country has experienced before the revolution, the majority of the country's population have not benefitted from the resulting economic gains. Weak governance structure, limited spending on social services, high unemployment, high food prices and poverty have prevented the creation of an inclusive social system in Egypt. As a result, both the political and economic systems favoured a small minority of the population. Currently, Egypt's social outlook has been further complicated by setbacks in the economy, in addition to riots, strikes and inefficient social safety nets characterized by a costly and ineffective subsidies' system. The Government is also pressured to create jobs.

The current transition period the country is facing provides an opportunity for taking serious measures towards economic reform policies and restructuring that can bring sustainability into the centre of the policy mix. It can also define a new social contract, improve the quality of social services, increase expenditure on health and education and introduce new social safety nets. Policies that encourage investment in human resources and green infrastructure provide a good chance for realizing these objectives.

2.4 PUBLIC POLICY LANDSCAPE

Prior to the Revolution, the Government's long term 'Vision 2022'[83] has been considered as a national strategic framework to steer development and economic reform efforts for Egypt.[84] At the same time, a sixth national development 5 years mid-term plan covering the period between 2007-2017 was developed.[85] It aims to guide cross sectoral policies, strategies and institutional restructuring in alignment with the 2022 vision. Within this context, gender equality and empowerment was incorporated into the national plan, together with specific sector plans and strategies.

In 2008, the Government had set a national target of achieving a 20 per cent share of the total country's energy mix to be from renewable energy resources by 2020. In 2009, amendments were introduced to the National Environmental Action Plan (NEAP) covering 2002-2017.[86] The plan underscores the importance of environmental protection, pollution abatement, and waste management, improving water quality, and decentralization of environment administration. A sustainable agricultural development strategy for 2030 was developed to support modern agricultural practices, water savings technologies, and land reclamation. In 2010, with the support of the ILO, the Government issued a Youth Employment National Action Plan (YENAP) 2010–2015 that focused on entrepreneurial skills and job creation.

Although plans and strategies prepared prior to the 25th of January Revolution were ambitious, progress towards achieving equitable and sustained growth was modest. On the contrary, though the set plans may have achieved a certain degree of material or physical growth, they have resulted in negative environmental and social impacts.

In March 2012, the Government announced the launching of a "New Social Contract" with a national plan to address priority economic and social objectives that emphasizes equity, fairness and justice. The plan consisted of several pillars, including social protection, education and health, in addition to achieving macroeconomic stability conducive to investment and business. Although it is too early to evaluate the impact of the plan, political and economic instability, social unrest, in addition to a fast deteriorating macroeconomic situation have already hampered the effectiveness of this plan. Moreover, continuous instability in the country reflected by the frequency of change of cabinets, demands by unions and workers for restructuring plus salary increases has had a serious negative impact on the functioning of the different sectoral ministries.

With the new cabinet now in office after the 30th of June 2013, it is not yet clear whether it will follow the same policy track. However, there are growing hopes by the general public that a Government led by professional experts and technocrats will adopt more liberal economic policies that will also be socially inclusive. The new regime is expected to initiate a new social contract. Perhaps even reach a new model of a "welfare state" that guarantees social protection while at the same time allowing the functioning of a free market.

However, any new policy agenda will have to prioritize putting Egypt on a sustained economic growth track. This may be achieved by initially halting the fast deteriorating macroeconomic situation and initiating a transparent community-based dialogue to reach a national consensus on Egypt's future development agenda.

It should also be pointed out that while this study was being completed, the Egyptian Cabinet has approved the going ahead with the tendering procedures for constructing a nuclear power station in Daba along the Northern coast of Egypt. This decision is taken, at a time where there are rising concerns about the future of nuclear power as a main source of energy. First, though there have been technological advancements regarding the disposal of hazardous nuclear waste generated from its operation, it still represents a serious health and


“Sustainable and green growth will enable Egypt to create more jobs, improve human welfare, position the country in new industries, contribute to economic growth and enhance national security”
EGYPTIAN COMPETITIVENESS REPORT, 2012
IFAD

environmental hazard. Second, high risk associated with its maintenance and operation, lack of which can result in serious consequences.

The Chernobyl disaster has cost more than US$700 billion.[89] Japan has so far spent more than US$500 million just to contain leaks and the decontamination of highly toxic water at the Fukushima power plant.[90] Third, Egypt and the Middle East are politically fragile areas and having a nuclear facility in the country will increase Egypt's vulnerability and insecurity. Finally, having a nuclear power plant in this part of Egypt has a direct effect on tourism, which is a major source of income for the country, as well as on land values and quality of the environment along the north coast of Egypt. Clean up costs of a nuclear accident are exorbitant.

It should be pointed out that several developed countries have already decided to freeze and phase out nuclear power. Japan, Austria, Germany, Norway, Ireland, and Denmark have also banned the use of nuclear energy.

It is therefore more prudent to direct efforts towards energy efficiency measures, which could save Egypt millions of megawatts each year. Moreover, investing in renewable sources of energy is a more secure and reliable source of energy compared to nuclear energy. This is in additional to other benefits representing in releasing funds for investment in renewable energy and the creation of additional new green and decent jobs.

Turning risks into opportunities: There is an increasing recognition that Egypt's current challenges require a non-conventional approach to address them; a paradigm shift that will lead to economic transformation and sustainable development. In the latest "Egyptian Competitiveness Report" prepared by the Egyptian National Competitiveness Council in 2012, the concept of a Green Economy was introduced for the first time as a policy option for Egypt. The report stipulated that green growth is a suitable policy discourse that could help Egypt to meet the challenges related to water, food, and energy security, as well as with respect to climate change. It further indicated that though existing strategies include a number of green elements, it lacked as well a comprehensive actionable framework for a successful green transformation. The report urged the Government to propose, communicate and implement a green strategy for Egypt to enhance long-term competitiveness.

In July 2012, The Arab Office for Youth and Environment (AOYE) launched the Egyptian Forum for Sustainable Development to campaign and lobby for adopting sustainable development and green policies as well as consolidate all existing efforts in this area. It has recently formed a strategic committee made of locally renowned technical experts. Working groups were created to formulate policies and facilitate community-based dialogues to achieve sustainability in an effort to encourage the Government to adopt a national Green Economy strategy.

As can be seen from the analysis above achieving food, water and energy security are key priorities in Egypt that require immediate attention. Moreover, solid waste has also emerged as another priority that requires special attention. Accordingly, this scoping study focuses on **agriculture, water, energy, and solid waste management sectors**.

Egypt is one of the oldest agrarian civilizations. Today however, the agricultural sector faces serious challenges reflected in shortage of food supply, unsustainable agricultural practices, thus resulting in environmental threats. Currently, agriculture only contributes approximately 14 per cent of the country's GDP[91], a percentage share that is much lower than the more prominent share it had several decades ago. In fact, in 1970, contribution of the agricultural sector to GDP was twofold, estimated at about 30 per cent.[92] The sector's growth in production capacity has almost been stagnant during the last several years.

3 KEY SECTORS IDENTIFIED FOR GREENING THE ECONOMY

3.1 SUPPORTING EGYPT'S TRANSITION TO SUSTAINABLE AGRICULTURE

3.1.1 THE AGRICULTURAL SECTOR[93] – CURRENT SITUATION

In 2000, annual growth of the agriculture sector as a percentage of GDP was approximately 3.4 per cent. A decade later the annual growth rate remained more or less at 3.5 per cent.[94] Furthermore, in 2011, the annual growth rate decreased to an estimated 2.7 per cent.[95] With regards to labour, the trend is comparable. For approximately a decade, between 2000 and 2010 the percentage share of labour working in the agriculture sector remained at about 30 per cent.[96] Coupled with stagnant productivity, the employment generation potential of the sector is negligible. This situation is of particular concern, given that agricultural labour constitutes the majority of the poor in the country, where more than 50 per cent of Egypt's population lives.[97] Due to its vulnerability, the sector is facing demand and supply side challenges that require immediate attention.

On the demand side, Egypt has one of the highest annual rates of population increase. This is the result of increased overall food demand in addition to other social and physical infrastructure services. In 2009, the gap between wheat production and consumption was approximately 6.1 million tonnes, while that of corn was 4.6 million tonnes.[98] It is estimated that Egypt's imports dependency ratio reached an all-time high of 46.7 per cent in 2010.[100] Globally, escalating food prices especially for wheat have led to alarming food security concerns and increased pressure on agricultural countries to increase their production capacities, especially with the rise of biofuel production. As a net importer of wheat, the current fiscal situation and dwindling foreign currency reserves cast serious doubts on Egypt's ability to maintain it's wheat import at current levels.

On the supply side, water scarcity concerns continue to threaten the level of agricultural activity, and render ambitious growth strategies for the sector as speculative. This is accurate given that agriculture currently consumes more than 85 per cent of Egypt's water supply.[101] The situation is further exacerbated by inefficient use and loss of water resulting from widespread conventional practices represented in flood irrigation. Only 3.5 per cent of land in Egypt is considered as arable land and the rest is desert.[102] During the last three decades, land reclamation added 7 per cent to the total cultivated land.[103] There is however, a continuous need for increased land reclamation, which is costly and places considerable strain on public expenditure. This is especially relevant due to the country's high loss rate of arable land due to illegal construction and the encroachment of urban development on agricultural land.

Moreover, as indicated earlier, limited water supply together with 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. Furthermore, existing poor infrastructure (such as muddy roads, depleted water distribution networks, and lack of storage facilities) increases transportation costs and negatively impact agricultural value supply chains.

Climate change is set to pose a serious threat for Egypt's agricultural land and exacerbate the food security situation in the country. Negative impacts include the reduction of major crop production by 20 per cent within the range of 40 years[104] due to rising temperatures and increasing need for water, while possible sea level rise and salinization can

reduce up to between 12-15 per cent of the existing agricultural land in the Nile Delta.[105]

3.1.2 POLICY IMPACT

Government agricultural policies have had several negative impacts on the sector. They were initiated as early as 1952 after the first Egyptian Revolution with land reform laws, which led to land redistribution to small farmers as a form of social justice and redistribution of wealth.[106] However, this has drastically limited agricultural productivity through land fragmentation when the majority of landowners came to own less than or equal to 5 feddans.[107] The repercussions of severe land fragmentation is felt even today when almost 80 per cent of total landowners own small plots of land.[108] This represents a barrier to achieving capacity expansion, cost effectiveness and economies of scale.

The Nasser Revolutionary Government also adopted highly protectionist policies by controlling the market, fixing prices, subsidizing food and agricultural inputs such as fertilizers, pesticides and seeds.[109] The Government also encouraged the extensive use of chemical fertilizers and pesticides to intensify agricultural production. It also failed to address existing deficiencies in the legal framework and in the implementation of food safety measures for imported seed strains and environmentally damaging agricultural practices.

During the early 1990s, the Government started to encourage increased private sector investments and market liberalization, which encouraged modest investments in the sector. A partial lift on agricultural subsidies took place but the subsidies system largely remains in place. This long term trajectory of public polices has had long-term impacts on the sector.

Agricultural practices in Egypt led to loss of agricultural biodiversity, increased desertification, land erosion, and increased loss of soil fertility. It is estimated that almost 35 per cent of Egyptian soil currently suffer from high salinity.[110] Moreover, lack of adequate legislation and incentives for the sector continue to encourage unsustainable agricultural practices, including the overuse of pesticides and chemical fertilizers.

Most small farmers lack modern machinery and equipment and are highly dependent on obsolete agricultural practices that fall short of addressing climate change impacts, droughts and scarce water resources. Furthermore, most of the irrigation systems in use operate at only 50 per cent efficiency.[111] Irrigation practices such as sprinkler and drip irrigation on the other hand are only used in new lands out of the Nile Valley and Delta and in a limited scale by medium and large farmers that can afford them. The situation in rural areas is further aggravated by widespread underdevelopment, where rural communities suffer from overcrowding, undernourishment, low income, high illiteracy, as well as lack of skills, access to information and awareness, along with resistance to change.

3.1.3 OPPORTUNITIES FOR GREENING THE SECTOR[112]

The agricultural sector in Egypt holds a great promise for economic growth and enhanced human wellbeing, especially for small farmers and poor rural communities. This depends fundamentally on the willingness and commitment of the Government to adopt an integrated sustainable agriculture system that triggers a green and sustainable transition. Proceeding with the current business as usual scenario for the sector, will only further exacerbate economic and social problems currently faced by the sector, thus hampering Egypt's potential for sustainable growth and development.

There are however, growing private and public interest to support more environmentally sustainable agricultural practices due to increased environmental awareness, export demand for organic products, and increased demand for food. A number of opportunities for green interventions exist, which include improved

water management in the Nile valley and Delta using modern irrigation systems that save water which can be used for land reclamation and cultivation.

Other measures include using modern technique to increase production of cereals, using remote sensing and GIS tools to better manage land, and improve crop patterns, soil related research, as well as improving post-harvest storage facilities. The use of composting and organic fertilizers, to prevent further land degradation, promote rain water harvest in the north coast and improve water conservation to increase agricultural land offer options for improving land fertility and crop productivity. Social and economic benefits for small farmers include higher incomes, new job opportunities, improved health and the environment.

3.1.4 EXISTING POLICIES FOR GREENING THE SECTOR

In 2009, the Government prepared a new "sustainable agricultural development strategy towards 2030" in an effort to boost sector productivity. The main objective of the strategy is to promote the sustainable use of agricultural natural resources by enhancing water-use efficiency in irrigated agriculture, expanding reclaimed areas, maximizing sustainable returns from rain-fed agriculture, human resources' development, and the creation of job opportunities particularly for the youth. However, the strategy has not been followed by an actionable framework and activities to implement its provisions.

3.1.5 POTENTIAL BENEFITS FOR GREENING THE SECTOR[113]

Greening the agricultural sector can lead to poverty reduction, increased productive capacity, job creation, and human wellbeing. Based on the sector's situation analysis identified green opportunities, **include investing in organic and sustainable farming practices, changing cropping patterns (shifting to low water intensity crops), with shifting to modern water-saving irrigation systems.** Sustainable agricultural practices have many benefits. These are represented in reduced water and energy consumption costs, increased revenue resulting from increased land productivity, crop yields, reduced labour cost as well as the cost of fertilizers and pesticides. Benefits resulting from sustainable agriculture are also reflected in improved health due to improved environmental quality and the food chain.

Investing in organic farming leads to overall positive health benefits through the production of environmentally friendly grown crops with high level of nutrient content. This form of agriculture also promotes the conservation of ecosystems, especially with respect to agricultural biodiversity, soil fertility and water efficiency. It also has a higher potential for preserving biodiversity.[114] The currently adopted agricultural practices in Egypt have been using extensive chemical fertilizers and pesticides for decades, to compensate for the loss of nutrients, which used to come along the Nile River water during the flood season before the construction of the Aswan High Dam.

Though organic farming has many benefits, it is relatively limited in Egypt. In fact it has been estimated for example that the organic cultivation of 100,000 feddan reduces the amount of chemical fertilizers used by 50,000 tonnes annually. If Egypt were to convert 20 per cent of the total agricultural land from conventional to sustainable and organic cultivation, which amounts to approximately 1.44 million feddan (7.2 million feddan x 20 per cent), this could result in a saving of approximately 700,000 tonnes (0.5 tonne x 1.44 million feddan) of chemical fertilizers annually. That would result in a saving of almost EGP 1 billion annually (EGP 1,500 x 700,000 tonnes).

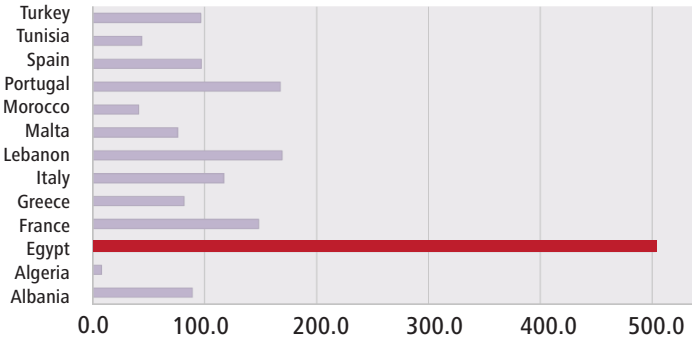
Organic farming also includes the recycling of organic residues into composting, thus strengthening nutrient cycles, which leads to carbon sequestration and reduced carbon emissions.

Average estimated compost production in Egypt reached more than 1.6 million tonnes annually.[118] The main agricultural residues used for composting is rice straw, which is mainly burnt in Egypt causing a serious air pollution problem known as the black cloud, which has adverse health and environmental impacts. It is estimated that one kg of rice straw burnt results in 56 kg of carbon monoxide released in the air. On the other hand, producing compost from 500,000 tonnes of rice straw reduces the amount of released carbon monoxide by 32,500 tonnes annually. Since 2005 to 2010, agriculture sector has contributed about 16 per cent of total GHGs emissions in Egypt.[120]

The agricultural sector in Egypt currently generates around 30 million tonnes of agricultural waste annually. Approximately less than 10 per cent is recycled and the rest is either burnt or dumped in waterways.[121] Producing organic fertilizers from agricultural residues has several benefits. It provides organic compost as a substitute for synthetic fertilizer with all the benefits associated with it. Organic compost is more effective in increases soil fertility and crop productivity, particularly to sandy soil. It is also more suited to reclaim desert land and improves efficiency in the use of water, as it possesses a better water retaining capacity. This is in addition to the reduction of CO_2 emissions in the atmosphere and the implication this is likely to have on climate change and consequently on sea level rise, in addition to the socioeconomic and environmental situation in Egypt.

It is estimated that producing compost from agricultural residues could provide more than 22 million tonnes of organic waste annually. Translated into monetary terms this is equal to EGP 9 billion annually (22 million tonnes of organic waste x EGP 400 per tonne).[122] This is in addition to reduced Government expenditures on the production of chemical fertilizers and the benefits resulting from improved health and the environment. Currently, an increasing volume of agricultural residues is directed towards producing energy for cement factories.

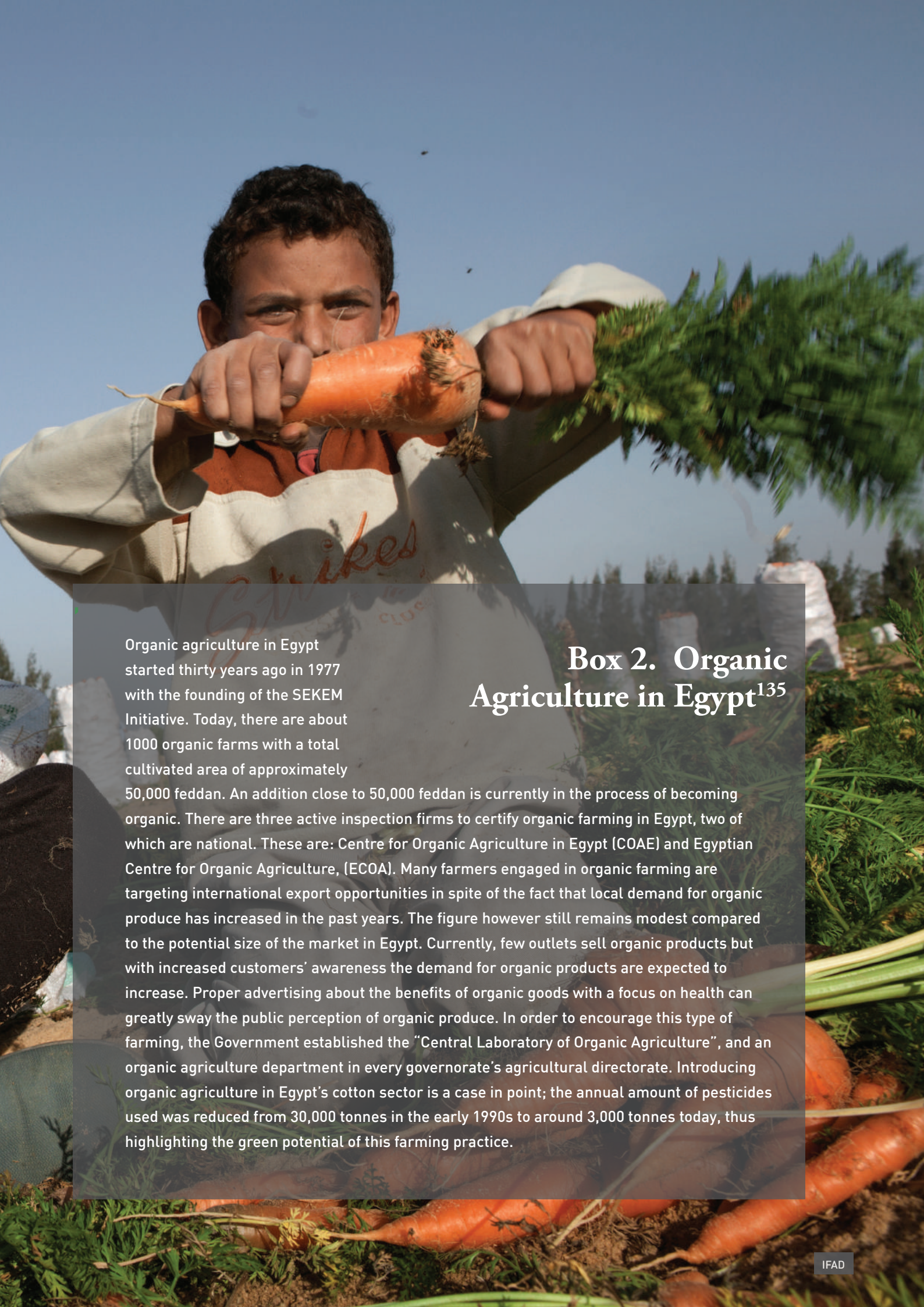
FIGURE 21[115]: OVERALL FERTILIZER CONSUMPTION (KG/HA[116])



This may not be the optimum way of using such a resource, but given the current shortage of gas and fuel, this may be considered as an interim solution. It is also estimated that emissions from organic farming per hectare are 48-66 per cent lower than in conventional farming. This translates to nearly 26,000 tonnes of emission reductions annually.[123] Moreover, nitrate leaching rates per hectare are significantly lower in organic agriculture than in conventional farming practices.

According to SEKEM a leading Egyptian company in organic farming, the Egyptian National Research Institution has estimated that the overall cost of air pollution in Egypt is in the region of EGP 10 billion annually. Adopting and expanding organic farming could reduce this cost by 10 per cent to 15 per cent. Moreover, a comparative study conducted by The Egyptian Biodynamic Association (EBDA) for its farmer members engaged in organic farming of close to 50,000 feddan found out that their health problems are reduced significantly due to reduced exposure to toxic material.[124] Experts predict that a 10 per cent shift of Egypt's agricultural land to organic farming in five years can result in significantly reducing air pollution in Egypt.

Changing cropping patterns (shifting to low water intensity crops) is another option that could be considered for greening the sector. Agriculture uses more than 85 per cent[125] of Egypt's water supply and is a major consideration for Egypt's current water scarcity issue. Existing cropping patterns



Box 2. Organic Agriculture in Egypt[135]

Organic agriculture in Egypt started thirty years ago in 1977 with the founding of the SEKEM Initiative. Today, there are about 1000 organic farms with a total cultivated area of approximately 50,000 feddan. An addition close to 50,000 feddan is currently in the process of becoming organic. There are three active inspection firms to certify organic farming in Egypt, two of which are national. These are: Centre for Organic Agriculture in Egypt (COAE) and Egyptian Centre for Organic Agriculture, (ECOA). Many farmers engaged in organic farming are targeting international export opportunities in spite of the fact that local demand for organic produce has increased in the past years. The figure however still remains modest compared to the potential size of the market in Egypt. Currently, few outlets sell organic products but with increased customers' awareness the demand for organic products are expected to increase. Proper advertising about the benefits of organic goods with a focus on health can greatly sway the public perception of organic produce. In order to encourage this type of farming, the Government established the "Central Laboratory of Organic Agriculture", and an organic agriculture department in every governorate's agricultural directorate. Introducing organic agriculture in Egypt's cotton sector is a case in point; the annual amount of pesticides used was reduced from 30,000 tonnes in the early 1990s to around 3,000 tonnes today, thus highlighting the green potential of this farming practice.

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favouring high value added crops, that use high rates of irrigated water, encouraged by the Government during the 50s, 60s and 70s remain valid today. Small farmers favour the cultivation of rice and sugarcane because of their high financial returns with disregard to the high water usage involved in their cultivation.

The consecutive growing of rice on the same cropland without applying a crop rotation system and adhering to its optimal two or three year rotation cycle have led to the deterioration of soil fertility, water overuse, wastage, and loss. It is projected that reducing the area of cultivated rice (or using early maturing varieties) and sugar cane could lead to water savings of 5 billion m^3 [126] by 2017.[127]

The issue of virtual water has increasingly been receiving attention, given the increasing concern over water scarcity in the country. This is also particularly important when considering trade of agricultural products and the resulting net water impact on the country. It is estimated that one tonne of rice requires about 4,000 m^3 of water, and a tonne of wheat requires 1,334 m^3, while one tonne of potatoes uses about 255 m^3.[128] Sustainable agricultural practices involve crop selection, which has to be strategically selected based on the weight the country gives to water security vis-à-vis food security.

Investing in horticulture[129] crops with high value added, but with less water intensity usage can increase the income of small farmers while resulting in significant water savings. Fruits and vegetables are currently among the highest value added crops in Egypt. Horticulture can also improve the income of small farmers through their engagement in post-harvest business extension activities such as processing and packaging for export purposes thus creating jobs and generating income. Moreover, horticulture cultivation using greenhouses can contribute to water efficiency by reducing evapotranspiration.[130] It is estimated that a field grown tomato generally produces 3kg/m^3 [131] while tomatoes grown in greenhouses produces 17 kg/m^3 on average.[132] However, tomatoes grown in green houses in Egypt were reported to produce 45 kg/m^3 of tomatoes.[133]

Hydroponic agriculture offers another potential to increase agriculture produce in Egypt using mainly treated and recycled water in greenhouses.[134] It is therefore worth seriously examining the potential, practicality and economic viability of introducing this concept in Egypt.

Shifting to modern irrigation systems in Egypt is very important since the agriculture sector consumes the largest share of available water resources in Egypt. Only 6 per cent of total irrigated areas use drip per sprinkler irrigation systems, while most areas use inefficient conventional flooding per surface irrigation.[136] Efforts have been made by the Government to introduce innovative techniques to surface irrigation, such as gated and Perforated Pipe System utilized for Sugarcane fields, which resulted in zero irrigated water losses and increased the yield by up to 25 per cent.[137] Water requirements for sugarcane cultivation is expected to reach 8,000-9,000 m^3/feddan[138] annually compared to 15,000 m^3/feddan annually used in conventional irrigation practices.[139] Such improvements (gated pipes, land levelling, canal lining) in surface irrigation can lead to an increase of between 50 to 75 per cent efficiency in water consumption.

Water savings resulting from the use of efficient irrigation techniques such as drip irrigation contributes to a significant reduction in water consumption. In general, it is estimated that water savings resulting from improvement in irrigation, including the introduction of modern irrigation systems and the proper scheduling for crop irrigation could save between six billion m^3 to 20 billion m^3 annually.[140] Irrigation improvements can also lead to about 30 per cent increase in agricultural productivity. Apart from water savings, drip irrigation contributes to a reduction of farm inputs, increased land utilisation, less off-site impacts of nutrients,

savings in energy, and fertilizers. It also contributes to increased production and greater weed control.

It is estimated that using drip irrigation could save up to 40 per cent of water as compared to flood irrigation.[141] This will result in water savings amounting to about 23 billion m^3 (57 billion cm^3 x 40 per cent). The savings could be used to reclaim additional arable land and support other economic activities in Egypt. Utilizing water saved for agriculture can result in at least doubling cultivated land in Egypt. If we assume that the amount of water saved is to be allocated to produce wheat, approximately 17 million tonnes of wheat can be grown annually in Egypt, which is more than double the current production, estimated at around 8 million tonnes annually.[142]

Drip irrigation increases crop productivity by about 30 per cent. If average wheat production per feddan is about 2.5 tonnes, introducing drip irrigation for land cultivated wheat is expected to increase yields by 0.75 tonnes (2.5 tonnes x 30 per cent) to 3.25 tonne per feddan.[143] Translated into monetary terms, this will result in increased revenue amounting to EGP 1,710 per feddan.[144] Wheat production in 2013 reached 8.5 million tonnes.[145] Using drip irrigation for cultivating wheat would result in an increase of 2.55 million additional tonnes of wheat equivalent to roughly EGP 970 million (2.55 million tonnes x local EGP 380 price per tonne).[146]

According to the Minister of Agriculture, Dr Ayman Abu Hadid, improved post-harvest and storage is estimated to save about 1.5 million tonnes of wheat annually.[147]

In terms of job creation, according to UNEP a 1.06 per cent investment of global GDP in sustainable agriculture is expected to generate roughly 50 million green jobs in that sector by 2050.[148] According to the World Bank total labour force in Egypt in 2012 was estimated at about 27 million out of which approximately 31 per cent are employed in the agricultural sector.[149] It is estimated that sustainable agriculture uses in the region of 30 per cent more labour than conventional agriculture. This gives an estimate of eight million additional jobs created in this sector over the next five years, if this transformation is achieved over that period.

As referred to earlier, 44 per cent of the poor live in rural areas. Creating additional new jobs in the agricultural sector will lift a large percentage of the unemployed rural poor above the poverty line. This will also contribute to improving the human welfare of the rural poor due to their increased ability to afford health and educational services. Directing investments to rural areas will also reduce rural to urban migration and the pressure this creates on the physical and social infrastructure and services in urban areas. It will also contribute to enhancing equity, social cohesion and improved distribution of wealth and opportunities, particularly among the poor and marginalized segments of the Egyptian population. Reduced use of chemical pesticides and fertilizers will improve the quality of the food chain, thus resulting in a reduction in the incidence of disease and improve overall health conditions of the population. This will result in reduced expenditures on health services by individuals and the Government in the form of medical services, insurance, and the building of hospitals and medical facilities. Other benefits resulting from improved health, includes reduced absence from work due to illnesses and increase in productivity of the labour force.

Egypt, like many developing countries, faces fierce competition in trading in agriculture products. This is due to two main reasons. The first is due to strict environmental requirements imposed by importing countries, thus restricting access of agricultural products into international markets. The other reason is the large amounts of direct and indirect subsidies paid by the United States and European countries for the agriculture sector. It is estimated that agricultural subsidies by the OECD countries amounted to US$252 billion in 2012.[150] Promoting sustainable and organic agriculture in Egypt provides Egyptian agriculture products with a competitive

TABLE 2: SWOT ANALYSIS – AGRICULTURE

	Strengths	Opportunities
• Organic farming • Changing cropping patterns • Modern irrigation systems	— Water savings and decrease water demand — Increase productive capacity of land — Limit environmental degradation — Limit climate change threats — Introduce new farming technologies — Long term cost effectiveness — Promote sustainable consumption and production — Promote agricultural biodiversity — Improved health conditions — Reduce rural to urban migration — Poverty reduction — Promote social cohesion — Integration of marginalized and poorer segments of the population — Improve waste water management — Facilitate crop rotation patterns	— Create new market niche — Create local agro and processing industries — Job creation and skills development — Encourage entrepreneurship — Contribute to economic growth — Revitalize the rural sector — Reduction in CO_2 emissions and potential negative impacts of climate change — Encourage organic compost — Promote urban agriculture business opportunities and greening of roofs — Increase export opportunities by shifting to horticultural products — Increase revenues of farmers and small holders — Increase overall regional and international competitiveness of agricultural products — Increased returns for producers & growers — Increase crop yields and productivity
	Weaknesses	**Threats**
	— Lack of skilled labour and professionals — Lack of detailed knowledge and information about sustainable production practices — Lack of financial resources for infrastructure investments — Need for specialized knowledge Successful implementation requires planning, design, regulations and policy support by the Government. — Need for continuous system maintenance	— Lack of Government's long-term planning — Political economy concerns in particular those related to entities opposing change whether politicians or private sector — Regional and international competition — Lack of public awareness — Lack of available information and knowledge pool — Lack of a unified Government plan — Lack of public funding — Limited access to small farmers

edge and a market niche. Increasing export of organically grown medicinal plants and organic products can therefore positively contribute to GDP and create additional new jobs in the country.

3.1.6 VIABILITY AND REPLICABILITY

During last several years, the agricultural sector in Egypt has not been receiving the due attention it deserves. Providing the right kind of policies and incentive measures, as well as adopting a participatory with a community-based approach has the potential of deep rooting change along a more sustainable path. Benefits accruing to local communities in the form of investments in physical and social infrastructure and services, economic opportunities, and jobs created are likely to reduce the trend of rural to urban migration and encourage rural communities to remain in rural areas and support efforts to revitalize the agricultural sector.

The starting point for implementing green investments and interventions in the agricultural sector is to assess the economic viability and suitability of these interventions to the local socioeconomic conditions, and the potential of expansion on a wider scale. Towards this end, a SWOT (strengths, weaknesses, opportunities and threats) analysis is used to understand key factors affecting the proposed intervention. The SWOT analysis closely examines possible threats, opportunities, weaknesses and potential benefits offered by the proposed intervention. Table 2[151] exhibits key findings of the SWOT analysis.

3.1.7 SECTOR SPECIFIC ENABLING CONDITIONS

Table 3[152] propose a package of enabling conditions and measures for greening the sector. Proposed enabling conditions include: Institutional setup and

TABLE 3: SECTOR SPECIFIC ENABLING CONDITIONS – AGRICULTURE

Enabling condition	Rationale: How it enables	Policy tools that can create the enabling condition
Good governance & institutional setup	– Institutions that function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources.	– Long-term national strategies for sustainable agricultural practices and resource conservation translated into actionable polices with a practical implementation mechanism. – Adopting a targeted integrated policy approach to reform that adds value to each stage of the agricultural supply chain, from on farm production to sales, distribution, marketing and exporting. – Mainstreaming sustainable agricultural practices, measures, and policies into the macroeconomic and the decision-making process. – Promote community-based agricultural related activities and the role of private sector and voluntary work.
Regulatory Framework	– Ensure through the design of relevant laws and regulations the integrity of the ecosystem and conservation of natural resources and agricultural biodiversity, waste avoidance, reduction, and improved environment and health.	– Introduce regulations, land tenure reform, and adequate property rights regime, and farmers' cooperatives laws that prevent the loss of agricultural land, prohibit the use of harmful chemical pesticides and fertilizers. And finally promote the efficient use of water and other inputs, and the burning of agricultural residues. – Introduces legislations that facilitate land ownership through concessional terms to be devoted to organic and sustainable agriculture. – Prohibit and enforce through a strict monitoring and penalty system the use of agricultural land for other purposes. – Prohibit the burning of agricultural residues. – Encourage the use of treated wastewater primarily for the irrigation of tree plantations and fodder crops. – Encourage the use of properly treated sludge (free from metals and harmful substances) as a fertilizer.
Market Tools & fiscal support	– Provide incentives to encourage: – Investment in green agricultural businesses. – Efficient use of natural resources and other factor inputs. – Green agricultural technologies. – Organic and sustainably grown agricultural products.	– Provide farmers with tax rebates and cuts and targeted subsidies for innovative and resource efficient irrigation and farming techniques. – Facilitate access to modern and innovative equipment and technologies by lowering trade tariffs and custom barriers. – Phasing out subsidies on chemical fertilizers and shifting it to organic fertilizers can attract investment and lower market entry barriers. – Reform the subsidy system to target environmentally negative agricultural practices and encourage positive ones. – Provide disincentives for the wasteful use of water resources through inefficient irrigation systems, energy, and fertilizers. – Provide incentive measure to promote trade in organic and sustainable agricultural products. – Provide incentives and subsidies to encourage the production of compost and fodder from agricultural residues. – Provide incentives for the introduction and expansion of hydroponic cultivation. – Provide incentives for research in innovative agricultural technologies, practices, and breeds.
Public Procurement and expenditure	– Public procurement of sustainably grown products contributes to creating markets and increasing demand on organic and sustainably grown products. Public expenditure upgrades utilities and infrastructure of the sector.	– Prioritization of public expenditure for land reclamation projects, investing in modern irrigation systems, and equipment, and water efficient and post-harvest practices and techniques. – Investment in storage and processing facilities. – Investment in physical infrastructure such as roads, schools, public clubs, and sewerage and electricity networks as a necessary prerequisite for developing and upgrading the agricultural sector. – Invest in much needed social infrastructural services in rural areas in the form of health, sanitation, and education to raise the standard of living of the rural population, their productivity, and sense of belonging. – Investment in urban agriculture and the greening of roofs. – Empower poor local communities by establishing technical agricultural schools in rural areas, providing technical assistance to cooperatives. – Overhauling public agricultural extension services to train farmers and disseminate information, knowledge, and expertise regarding seed, fertilizers, pesticides selection, irrigation techniques, recycling of agricultural residues and other practices.

TABLE 3: SECTOR SPECIFIC ENABLING CONDITIONS – AGRICULTURE (CONTINUED)

Enabling Condition	Rationale: How it enables	Policy tools that can create the enabling condition
Capacity Building and education	— Provide the necessary skills and professional human power to support organic and sustainable agricultural practices. — Develop the necessary research capabilities for research and development in green technologies and practices in the sector.	— Provide extension and training services to rural communities. — Empower poor local communities by establishing technical agricultural schools in rural areas, providing technical assistance to cooperatives. — Overhauling public agricultural extension services to train farmers and disseminate information, knowledge, and expertise regarding seed, fertilizers, pesticides selection, irrigation techniques, recycling of agricultural residues and other practices.
Research and Development	— Encourage the development of cost effective environmentally sound agricultural technologies and make it accessible to agrarian communities.	— Overall allocation of funding for R&D could be increased to at least 2 per cent of GDP, with a large share allocated to agricultural research in efficient irrigation systems, composting, water saving and draught and insect resistant breeds, organic pesticides and fertilizers.
Access to Finance	— Encourage investment in organic and sustainable agriculture infrastructure and activities, innovative technologies, and trade.	— Provide micro finance for small farmers, farmers' organizations, and small businesses to encourage environmentally sound agricultural practices such as organic farming

governance, regulatory framework, market tools, public procurement and expenditure, research along with development, access to finance and financial support.

3.2 ADDRESSING EGYPT'S WATER SCARCITY WATER SECTOR

3.2.1 CURRENT SITUATION[153]

The Water Sector in Egypt is at a critical crossroad; local water demand is increasing at an alarming rate, while renewable water supply resources are constant. In 1955, available water share per capita was 2,560 m^3.[154] Egypt then was considered a water abundant country, with a fixed supply of conventional water resources, including a water withdrawal quota from the Nile River set at 55.5 billion m^3.[155] The quota that was determined according to the 1959 agreement with Sudan constitutes almost 82 per cent of Egypt's water needs.[156] Though set in 1959, this quota did not increase since that date. Other resources are limited and include rainfall, floods, and deep ground water in the desert and arid land, including the Sinai Peninsula and wastewater treatment plants. Egypt's 2017 national water resources plan called upon the Government to encourage projects and investments in water infrastructure in order to generate water from non-conventional resources.

Water generated from non-conventional resources such as seawater desalination constitutes a negligible percentage of 0.76 per cent out of the total aggregate water supply used for Red sea resorts.[157] Other non-conventional resources include agricultural drainage, and treated sewage water reuse, desalination of brackish groundwater. However, the share of these resources is very limited.

Population growths, urbanization, agricultural and industrial expansion, accompanied by unsustainable water use have resulted in increased pressure on water demand, and consequently a low per capita water. In 2004, water per capita was 950 m^3 and by 2011 it decreased to 700 m^3 per capita,[158] well below the UN definition of water scarcity and nearing the 500 m^3 per capita stress level. By 2025, water per capita is expected to significantly diminish to 600 m^3 per capita and further decrease to 350 m^3 per capita by 2050.[159] On the other hand, aggregate water demand is also expected to increase. By 2017,

total water demand in Egypt is estimated to be 87.9 billion m^3, representing a 30 per cent increase over current consumption, while back in 2000 total water demand was 67.6 billion m^3.[160]

The Government continues to exert efforts to extend water and sanitation services to urban and rural areas. However, the sector continues to experience weak enforcement of effective legislation and lack of a long-term strategy. Moreover, lack of pollution abatement efforts continues to constrain water conservation efforts. A system for an incremental increase in municipal water tariffs is already implemented, but water-pricing system remains far below recovery cost. Water tariffs are still considered to be low, and do not cover cost of production. There is also a lack of adequate number of meters at the household level. A more efficient metering system to accurately measure household consumption and apply rising tariffs to encourage users to conserve water is required. As a result consumption is estimated in many areas by the average area of each flat. There is a need to reform the system with a long-term national vision, strategy, and program.

Furthermore, the absence of scientific specifications and standards, centralization of decision-making, lack of reliable data, inefficient municipal and industrial water and wastewater networks, lack of proper maintenance of networks, water and wastewater facilities, and lack of inter-governmental institutional coordination have exacerbated water losses and overuse.

3.2.2 POLICY IMPACT

In support of the United Nations Millennium Development Goal 7 related to environmental sustainability, the Government has successfully extended safe drinking water coverage by 98 per cent, while wastewater coverage ranges between 90 per cent in urban areas and down to 12 per cent in rural areas.[161] However about 5.6 thousand cases of typhoid fever was registered in 2010 due to contaminated drinking water in Egypt.

The business as usual scenario has led to unprecedented water quality deterioration. Egypt's main freshwater source of water is the Nile River, which is being exposed to heavy pollution that negatively affects the quality of water. At the same time, water treatment is limited and existing supply networks needs upgrading. Untreated industrial wastewater, sewage water, agricultural drainage water continues to be discharged into the Nile. There are nearly 4000 factories that dispose of their wastewater into the Nile, 74 per cent of which do not treat their water effluent.[162] The level of bacteria found in the water is also higher than normal acceptable standards. In the Rosetta branch, high levels of ammonia are found, while the Damietta branch suffers from high levels of salinity and ammonia.[163] Groundwater aquifers in the Delta are affected by high concentration of iron and manganese discharged by industrial facilities. Drainage from agricultural land and urban centres from stations and networks in the same region suffer from the infiltration of chemical and biological waste.

Water scarcity will eventually negatively affect the growth of economic sectors: agricultural, industrial, tourism, and the services sector, thus constraining development while further aggravating poverty and unemployment. Current public policies do not reflect the required urgency to restructure the water governance regime in Egypt. Moreover, the construction of The Grand Ethiopian Renaissance Dam on the Nile River with a capacity of 6,000 MW[164] is causing a national debate on the possible negative impact it can have on Egypt's Nile water supply quota. The dam is expected to be the largest hydroelectric power plant in Africa.

3.2.3 OPPORTUNITIES FOR GREENING THE SECTOR

Investments should be directed towards water efficiency projects and unconventional water resources, including desalination, wastewater reuse (agricultural, industrial and sewage waste), rain harvesting and groundwater extraction in order to

meet future water demands. Increased role of private sector involvement can make up for the shortage in Government resources to finance water projects. Other investment opportunities include improving the efficiency of existing public water supply system and distribution networks to detect leakages and prevent excessive water loss through improved maintenance, introduction of technologies and rehabilitation can accelerate the transition to greening the sector. Introducing water saving techniques through the shifting of agricultural crop patterns to target low water intensive crops, such as horticulture and to introduce modern irrigation practices (drip irrigation), land levelling, water storage facilities and night irrigation offer other opportunities.

3.2.4 EXISTING POLICIES FOR GREENING THE SECTOR

Currently, there is the 2017 National Water Resources Plan (NWRP) that addresses water scarcity and takes into account the efficient use and conservation of water resources. NWRP is currently being updated and a national wastewater strategy has recently been developed to extend wastewater treatment and sanitation projects. This strategy aims to promote the construction of desalination plants for the supply of municipal water for coastal cities. The State Ministry of the Environment has also proposed new changes in the executive regulations of law 9/2009 for the environment to allow for the discharge of brine water into the sea. This is allowed under specific regulations in areas that do not have sensitive marine ecosystems to allow for the expansion of water desalination. A Public private partnership (PPP) concessional law issued in 2010 has encouraged increased private sector involvement in the water sector. As a result, the construction stage of the New Cairo Wastewater Treatment plant, the first PPP in the water sector, was launched in February 2010. Also, a recent strategy for wastewater reuse in Egypt 2030 has been prepared.[165]

3.2.5 POTENTIAL BENEFITS FOR GREENING THE SECTOR[166]

Water is essential for all aspects of life and economic activities. It is essential for ensuring food security, health, and poverty reduction – and in sustaining the economic growth of main economic sectors, including agriculture, industry, energy, and tourism. Greening the sector is expected to lead to a better access to water provisions, improvement in public health and sanitation and preservation of vital natural ecosystems. Given the sector's situation analysis and identified green opportunities, changes in the way water resources are allocated and managed are necessary. **Investing in non-conventional water resources development such as desalination of brackish and sea water; waste water reuse and treatment, upgrading and expansion of national water infrastructure to promote water use-efficiency** are the main green investment opportunities identified and prioritized by experts during the consultation process.

Investing in household water saving devices for domestic use, including residential building is estimated to result in water savings between 10 to 20 per cent.[167] If the current average domestic water consumption including residential buildings is around 7 billion m^3 annually.[168] These saving could surpass 1.4 billion m^3 annually. While investing in water saving equipment and practices in the agricultural sector is estimated to result in water savings of at least 40 per cent or about 23 billion m^3 annually (67 billion m^3 x 85 per cent x 40 per cent).

Other benefits for water efficiency measures include increased land productivity and yields estimated at between 20 to 30 per cent. Considering corn is a strategic crop for Egypt, this can translate to an estimated increase in corn production of about 1.4 million tonnes annually 5.6 million tonnes x 25 per cent),[169] which translates to about EGP 2 billion.[170]

Efficiency in the use and allocation of water resulting from good governance and regulatory framework is

expected to result in 10 per cent savings in water consumption estimated at about LE. 6.75 billion annually (67.5 billion m^3 x 10 per cent).[171]

The selection of water saving crops and the importing of high water content crops is also expected to save large quantities of water. This will depend on the crops selected to be grown locally and those to be exported. This process involves a strategic decision that weighs the importance of food security against water saving. In terms of new jobs created, it can be assumed that additional investments in the water sector may result in an increase in jobs in the sector of between 20 to 30 per cent.

Greening the sector can lead to providing necessary water resources needed for social and economic development and ensure adequate water for maintaining ecosystems. It can effectively contribute towards the sustainable use of water for current and future generations, and harness its productive power, avoid pollution as well as conserve water resources. Green growth creates new water market niches and employment opportunities.

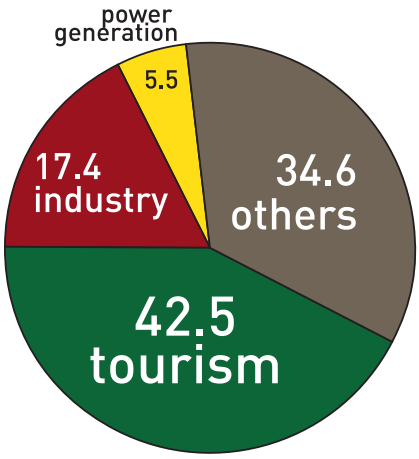
Investing in wastewater reuse and treatment offers one potential solution for meeting Egypt's increasing water demand. Recycling and reusing both municipal and industrial wastewater increases the quantity of water available for human use, in addition to economic activities. Sewage water, agricultural drainage water and industrial wastewater can be treated, utilized for forest plantations. Depending on the level of treatment, it could be used for growing crops as well.[172]

Currently, the amount of collected wastewater is in the region of 6.5 billion m^3 annually out of which only 3.65 billion m^3 annually is being treated.[173] Only 0.7 billion m^3 annually of treated wastewater is being used for irrigation.[174] The Egyptian Holding Company for Water and Wastewater has allocated 88,000 feddan for forest cultivation using treated wastewater. However, only 14,000 feddan are actually cultivated. There is a potential to cultivate up to 14 million feddan as per available facilities and resources in the future.[175] The current average cost for the wastewater reuse in irrigating non-fodder crops is estimated to be around EGP 1-1.25/m^3,[176] which is considered to be cost effective.[177] Estimated investments needed for wastewater treatment infrastructure and unrestricted reuse could reach 1.75 Euro/m^3.[178] Meanwhile, increasing the percentage of water supply from agricultural reused drainage water by 2017 could lead to 4.5 billion m^3 in water savings.[179]

The rate of investing in water desalination needs to be accelerated since it provides a reliable and safe supply of water to communities, especially those within coastal cities and those facing increased threats of droughts and high temperature resulting from climate change. Considering the different available options, desalination though expensive, produces a high yield of consumable water. It is also a better option than transporting fresh water to remote areas, which is costly and time consuming. Energy used in desalination could be generated from renewable sources, which increases the rate of fossil fuel substitution by clean energy resources and reduces CO_2 emissions. Solar and wind powered desalination systems could lead to a potential decrease of costs of desalinated water production from 30 per cent to 60 per cent.

There is a considerable potential for desalination in Egypt in coastal desert cities. Water desalination has been in use since the 1960s, which has gradually resulted in cost reduction making it a competitive business. This competitiveness has attracted private sector investments in desalination facilities. The current average costs for desalinated water is estimated to range between EGP 4-7/m^3.[180] Water desalination of both brackish and seawater is mainly used in the tourism sector, while only 20 per cent of water generated from such projects goes to electricity generation or industry. The Government is striving to increase the rate of water desalination to be used by other sectors especially in the industrial sector in the coastal cities of the country. Figure 22

FIGURE 22[181]: DISTRIBUTION OF WATER DESALINATION USAGE (PER CENT)



shows the distribution of water desalination usage among different sectors.

The expansion in using desalination and wastewater reuse will provide non-conventional water resources that can fill the nation gap in water demand. The current legal framework must be revised to promote private sector participation to invest in water projects by providing economic and financial incentives.

The upgrading and expansion of national water supply, storage and distribution networks are vital for the Government to undertake when targeting water use-efficiency and cutting water losses across the country. It is estimated that water losses in the municipal water supply sector is around 50 per cent while on-farm agriculture water losses due to obsolete irrigation systems and practices can reach up to 40 per cent.[182]

Additional policy measures that the Egyptian Government may wish to consider include the following:

– Phase in full-cost pricing of water while phasing out water subsidies in a progressive manner without affecting the poor segments of the society.
– Lower cost of water for the poor up to an average household consumption and progressively increasing rate above average.[183]
– Introduce full cost pricing for sectors such as industry and tourism.
– Encourage water condensation practices in farmland and on roof tops of buildings.

3.2.6 VIABILITY AND REPLICABILITY

The identification and selection of green interventions is subject to proper economic analysis and assessment to determine the viability of proposed solution or mix of solutions within existing local socio-economic conditions. Moreover, the potential of the replicability of projects should be a determining factor for project selection. Towards this end, a SWOT analysis has been conducted to explain the suggested interventions better, identify possible threats, capitalize on opportunities, address weaknesses and take advantage of strengths. Table 4[184] exhibits key findings of the SWOT analysis.

3.2.7 SECTOR SPECIFIC ENABLING CONDITIONS

When investments in the sector are coupled with improvements in institutional arrangements, public awareness, and research and development, the transitioning process to Green Economy will be accelerated. The introduction of fiscal market tools, altering the national water entitlement and allocation system, and improving the tariff system can determine the amount that needs to be invested in the water sector along with halt on-going depletion and degradation of the water stock. (See Table 5[185] for more details)

3.3 MEETING EGYPT'S ENERGY CHALLENGE

3.3.1 CURRENT SITUATION[186]

Energy is a critical resource that is essential to support economic activities and development. The sector's share of GDP was 15 per cent in 2009-2011.[187] Similar to other countries in the region, Egypt's energy production and consumption mix relies mainly on conventional resources. Nearly 90

TABLE 4: SWOT ANALYSIS SUMMARY – WATER

	Strengths	Opportunities
• Upgrade and expand national water distribution networks • Non-conventional water generation	— Promote water efficiency — Limit water losses — Provide clean and safe water — Improved health and sanitation — Long-term cost effectiveness — Promote sustainable consumption and production — Increase water supply — Limit environmental degradation — Overall economic growth — Reduces the release of nutrient-rich wastewater into environmentally stressed water streams and rivers. — Address climate change threats and impacts — Poverty reduction	— Provide water access to citizens — Increase geographic outreach for water provisions — Lower the costs of water wastage — Save water to be used for other economic purposes (industrial, agriculture. Etc.) — Increase welfare for women and children — Job creation and skills development — Improve business competitiveness — Create new market niche and increased revenue streams. — Increased private sector investments — Irrigation of non-food crops and pasture — Increase of cultivated agricultural land
	Weaknesses	**Threats**
	— Lack of skilled expert pool for operation and maintenance and new facilities — Lack of long-term vision and strategy for the sustainable management of water resources — Lack of regulations, incentive measures, and policy support — High cost of initial capital investment in infrastructure — Need for specialized knowledge to provide advisory services and technical support — Successful implementation requires planning, design, regulations and policy support by Government — Need for continuous maintenance High operation and maintenance costs — Lack of legislative enforcement	— Low quality networks can increase water leakage — Lack of a unified Government plan — Lack of existing local expertise — Lack of available information and knowledge pool — Lack of public funding — Lack of long-term Government commitment — Political economy concerns in particular those related to entities opposing change whether politicians or private sector — Lack of public awareness — Limited access to small farmers

per cent of total energy needs come from fossil fuels and natural gas, while the contribution of renewable energy is relatively minor.[188] Fossil fuels and natural gas represent about 40 per cent and 56 per cent[189] of total energy supply respectively, while renewables excluding hydro, contribute to about 2.4 per cent in 2012.[190] Energy sector is the largest sector that contributed about 46 per cent of total GHGs emissions in 2010.

The sector is characterized by a long history of Government control and intervention that began as early as 1952. The Government had put in place an energy subsidy policy to support national industrialization. Today the sector is still heavily subsidized thus representing a great financial burden on the Government, particularly during the current transition period the country is going through.

During 2011/2012, oil and petroleum subsidies have reached a staggering EGP 95 billion.[191] This is about 72 per cent of total Government financial subsidy allocations compared to just five per cent in 1981-1982.[192] This increase is mainly attributed to an increase in domestic and international prices of fossil fuels experienced in recent years.

The Government is also subsidizing electricity at about 3.7 per cent of total subsidy allocations. In 2011-2012 subsidies for electricity amounted to EGP 5 billion. This figure represents roughly 42.9 per cent increase compared to 2007-2008 figures.[193] This trend reflects the rapid increase of electricity demand as a result of population growth, urbanization, increased economic activities, and changing life styles. Low energy prices due to subsidies have led to the inefficient use and

TABLE 5: SECTOR SPECIFIC ENABLING CONDITIONS – WATER ENABLING CONDITION

Enabling condition	Rationale: How it enables	Policy tools that can create the enabling condition
Good governance & institutional setup	– Institutions that function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources. – Optimum solutions and options for providing water and energy saving measures should be considered when designing water policies. – Provide water through the network piping system, pumping of underground water, and through wastewater and water treatment plants, and desalination.	– A long-term national strategy and action plan should be developed. The strategy should oversee an action plan for supplying water from non-conventional resources, replenish water ecosystems and conserve water. – Harmonization of existing water policies under the national strategy. This should lead to an overarching integrated water management framework. – Creation of an agency/ authority or departments for water generation from non-conventional resources development – An institutional capacity building program to strengthen the management side of public governance. – The issue of virtual water should also be taken into account as a means of enhancing the potential of water availability in Egypt. The selection of crops to be grown locally should be strategically selected based on the water content of the crop, weighed against food security considerations. – Increase the percentage of recycled wastewater and its use in agriculture and Introduce water-harvesting techniques to capture water, coastal rain and floods.
Regulatory Framework	– Ensure through the design of relevant laws and regulations the integrity of the ecosystem and conservation of natural resources especially water biodiversity, and improved environment and health. – The need to develop legislations and maintain actions to ensure conservation and efficient use of water. – Promote, mainstream and enforce non-conventional water supply.	– Enforce related existing legislation and ensure environmental compliance. – Introduce new legislations and standards for wastewater treatments and water desalination. – Introducing water contamination and pollution penalties and related compliance laws and promote the strict use of permits and access certifications as well as efficient metering – Introduce building codes and standards that require the installation of water saving equipment and installations. – Introduce water efficiency minimum standards for the industry and tourism sectors.
Market Tools & fiscal support	– Encouraging environmental compliance and the efficient use of natural resources and other factor inputs. – Encourage investment in innovative technologies. – Support the emergence and expansion of green businesses. – Prompt water conservation and influence consumption behaviour.	– Removal of flat rate water tariffs and a new tariff system strategy for consumption to reflect cost recovery of generation, coverage, maintenance and environmental externalities, while cross subsidizing the poor. – Water subsidy reform and introduce tariff system to charge the various economic sectors differently and households according to different income brackets. – Incentives in the form of tax rebates and exemptions for private sector investments. – Facilitate access to modern and innovative equipment and technologies by lowering of trade tariffs and custom barriers. – Provide disincentives for the wasteful use of water resources through inefficient irrigation systems, energy, and fertilizers. – Provide incentives for research in innovative water management research
Public Procurement and expenditure	– Public procurement of sustainably grown products contributes to creating markets and increasing demand on organic and sustainably grown products. – Public expenditure to upgrade utilities and infrastructure of the sector. – Invest in new infrastructure for treatment and wastewater reuse. – Government setting an example for water efficiency practices and measures.	– Prioritization of public expenditure while coordinating between sectors and integrated planning to upgrade water distribution and sewerage networks to reduce wastage in supplying water by proper maintenance, repair, and upgrading of the water network system. Investment in storage and processing facilities. – Invest in non-conventional methods of water generation through desalination and treatment infrastructure.
Capacity Building and education	– Provide the necessary skills and professional human power to support water efficiency management and introduction of non-conventional water generation. – Develop the necessary research capabilities for research and development in green technologies and practices in the sector.	– Provide extension and training services to rural communities. – Provide training and on field learning for experts, local scientists and professionals of the sector. – Introduce trainings to Government officials and decision makers to optimize efficient water management. – Upgrade the skills pool regarding water infrastructure maintenance and operation. – Introduce water management related degrees in universities, vocational schools and graduate studies.
Research and Development	– Encourage the development of cost effective environmentally sound water efficiency polices and solutions. – Encourage research and development, and innovation in water saving technologies and equipment.	– Overall allocation of funding for R&D should be increased to at least 2 per cent of GDP, with a large share allocated to water research in efficient irrigation systems, water desalination technologies and integrating the use of solar energy, and water saving among other things
Access to Finance	– Promote cost effectiveness of water resource development and use. – Facilitate access to finance for investors.	– Facilitate access to finance in order to encourage investment in water infrastructure, water conservation, and water saving measures

allocation of energy. Moreover, applied energy tariffs are considered low and do not reflect the true costs of production, operation and maintenance of supplied energy.

In 2012, the Government increased fuel prices for electricity generation by 33 per cent 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 between 10-17 per cent for different income groups in a step that has not been taken for decades. It has already set a plan to gradually reduce fuel subsidies, which is expected to further increase the overall electricity bill. Egypt's relatively low electricity rates have been one of the main reasons rendering renewable energy as uncompetitive and hence discouraging investments in this source of energy.

3.3.2 POLICY IMPACT

Adopted policies 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 vagaries of world energy prices. The deficit in the energy supply and demand is expected to reach 30-50 m.t.o.e[194] during the period between 2022-2050. This represents about 24-35 per cent of total energy demand.

Public expenditure on energy subsides has diverted Government spending from priority public services such as, education, health, and the environment, as well as public services and infrastructure. Since 2007, a gap between energy supply and demand has emerged, and is expected to continue to increase if current policies continue to be in place. Egypt's total oil production peaked during the 1990s at 900,000 barrels per day.[195] By 2011, production had fallen to 560,000 bbl/d[196], while oil consumption has grown by over 30 per cent over the last decade from 500,000 bbl/d in 2000 to 815,000 bbl/d in 2011.[197] Egypt's oil consumption has surpassed domestic production making the country a net importer of oil. Oil production is further threatened by an expected decrease in oil reserves from 4.3 billion barrels annually to 1.5 billion barrels by 2030.[198] As for natural gas, the situation is equally alarming. Although Egypt is a current gas exporter, the Government is forced to direct its production to local consumption, thus losing much needed foreign currency. This is in addition to the long-term contractual obligation of exporting natural gas at a much lower rate than international prices. According to latest updates Egypt is exporting natural gas to Israel with a price tag of US$7 per million BTU[199], while it has lately imported natural gas with a price tag of between US$10-14 per million BTU.[200] It is projected that by 2030 gas reserves in Egypt will be completely depleted, if the current trends continue, if no additional oil reserves are discovered.

Increased demand over supply accompanied by policies that encourage the inefficient allocation and use of energy is resulting in frequent blackouts in peak times raising serious concerns about the sustainability of electricity supply in Egypt. Both consumption and production have grown exponentially in the last decade. However, consumption of electricity is expected to grow much faster than production capacities. The main sources of electricity production remain to be fossil based thermal facilities with a generation capacity of 121.4 billion kWh[201] annually, while generation from wind energy was only about 1.2 billion kWh in 2011.[202]

As far as the environment is concerned, Egypt is experiencing serious negative impacts due to the heavy reliance on fossil fuel and gas. CO_2 emissions in 2011 from fuel and gas consumption reached 201.667 million metric tonnes showing an increase of 68 per cent compared to the year 2000.[203] The Government has estimated that the environmental cost of CO_2 emissions was about US$14.2 million in 2009-2010. In 2010 about 10 pollution incidences caused by oil leakages were registered around the country.[204] Increased air pollution has direct negative

impacts on health. It is estimated that 7.8 per cent of children less than five years old suffer from severe respiratory diseases.[205]

CO_2 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.

Given the present status of the Egyptian energy sector, the Government cannot continue to follow a business as usual scenario. New and innovative policies need to be adopted to promote the efficient allocation and use of energy, and shift from its heavy reliance on fossil fuels to renewable sources of energy. The potential for greening the energy sector, including the challenges and opportunities this transition represents, should be seriously considered.

3.3.3 OPPORTUNITIES FOR GREENING THE SECTOR

Energy generation from wind and solar resources offers a promising way forward. Located in the "Sunbelt region", Egypt has one of the highest levels of solar irradiance in the World. In 1991, results of the solar Atlas indicated that the average direct normal solar radiation in the country ranges between 2,000 – 200 kWh/m^2 [206] annually in Egypt.[207] The solar atlas also indicates that sunshine ranges between 9 – 11 h/day[208] from North to South increasing the rate of reliability on solar energy generation.[209] Egypt also has a strong potential for wind energy. The Western part of the Gulf of Suez experience average annual wind speeds exceeding seven meters per second.[210] Ras-Ghareb north up to El Zeit Gulf has an excellent wind pattern exceeding 10m/sec, which would host 3,000 – 4,000 MW wind farms projects.[211] Moreover, the area west of Suez Gulf can host about 20,000 MW[212] installed capacities of wind farms.[213]

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. With the right legislative framework and incentive package, investing in renewable energy infrastructure in Egypt can be competitive. 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. This is particularly so, if we also take into consideration that Egypt currently imports fossil fuels and its natural gas reserves are gradually depleting.

3.3.4 EXISTING POLICIES FOR GREENING THE SECTOR

In 2008, the Supreme Council of Energy, headed by the Prime Minister, endorsed a plan to satisfy 20 per cent of the country's generated electricity from renewable energy, 12 per cent from wind and 8 per cent from hydropower. Towards this end, the Government has established a program to install another 600 MW of solar energy by 2017. It also plans to install 7.2 GW[214] of wind power by 2020. To support these new targets, a new electricity legislation has been drafted to encourage renewable energy utilization and encourage private sector involvement. However, the law has not yet been enacted and is subject to review to keep in par with new sector priorities and emerging needs.

A comprehensive incentive package was also endorsed to attract local and foreign investments which include approval of zero customs duties on wind equipment, land use policy for wind power developers, subsidies for large scale production plants and soft loans, carbon credits, foreign currency denominated Power Purchase Agreements (PPAs), and confirmation of central bank guarantees for all Build Own Operate agreements (BOOs)

projects. A new decree that aims to introduce a feed-in-tariff system has been finalized but not yet legislated and ratified. A renewable energy fund was established in 2011 to cover the deficit between renewable energy generation costs and market prices, but has not yet been activated.

As for energy efficiency measures, Egypt started to recognize the importance of energy efficiency in 2007. A target was set to reduce energy consumption by 20 per cent by 2020. An Energy Efficiency Unit was set up in 2009 in order to meet this target and coordinate across sectors and between different public authorities. Focus was laid on public buildings, street lighting and replacement of incandescent light bulbs with compact fluorescent lamps (CFLs). By 2012, 10.25 million CFLs have already been distributed. Until now no general legal framework for energy efficiency (EE) measures have been put in place. However, the Ministry of Electricity and Energy have also subsidized 50 per cent of the retail price of good quality CFLs.

Recently the Ministry has also signed an agreement with the Arab Organization for Industrialization to start with the installation of solar panels on buildings and companies affiliated with the Ministry. This represents a step to promote energy efficiency that will be replicated in other public buildings. A joint energy efficiency street lighting program is currently being implemented by the Ministry of Finance, Ministry of Local Development, and Ministry of Electricity and Energy. In addition, accredited EE testing laboratories have been constructed at the New and Renewable Energy Authority (NREA), while the Ministry of Housing Utilities and Urban Communities have initiated energy efficiency building codes, although no buildings have adopted the codes yet. Minimum energy performance standards with mandatory labelling schemes have also been designed for select electric appliances. Additional measures proposed to be introduced by the Egyptian Government include the following:

- Energy efficiency requirements by different sectors (industry, building and construction, tourism, transport) e.g. energy efficiency codes for buildings
- Performance ratings and labelling schemes
- Progressive electricity tariffs based on energy efficiency.
- Promote investment in energy infrastructure to facilitate export of renewable energy in future
- Promote private sector involvement and Public-Private Partnership in investing and operating energy facilities and networks.[215]
- Set standards for energy efficiency in water pumps and vehicles.
- Develop a national program to reduce gas flaring.[216]
- Carbon pricing, to be reflected in a carbon tax, as one of the most effective ways in reducing emissions.[217]

3.3.5 POTENTIAL BENEFITS FOR GREENING THE SECTOR[218]

Greening the sector has the potential of addressing Egypt's escalating energy security concerns and reinforce its ability to meet a potential rise in energy demand. Given the sector's situation analysis and identified green opportunities, **investing in renewable energy (solar and wind) and in energy efficiency are the two main green investment opportunities identified during consultations**.

Investing in renewable energy can restore Egypt's energy security status, while at the same time it can reduce CO_2 emissions and the environmental and health impacts associated with it. Renewable Energy could eliminate rural energy poverty and grant access to unplanned slum areas and informal settlements that have become part of Egypt's urban feature. It can provide electricity to people living without these basic needs, due to scattered geographic locations, high energy prices and technical difficulties for grid connections. It could also be a driver for job creation, with an estimated 75,000 new job opportunities created through investment in solar and wind systems. This includes design,

manufacturing, installation, operational services, sales and maintenance.[219]

Solar and wind-based electricity generation is becoming financially competitive and would be even more so if promoters would avoid selecting expensive technologies, and operating in remote and costly locations.[220] Renewable energy is an ecologically sustainable and economically viable means for electricity production and can easily feed into the existing national power grid. It can contribute to, the diversification of the electricity generation portfolio, and save and redirect the consumption of natural gas to other uses and exports. Renewable energy infrastructure can take advantage of Egypt's vast desert areas that are hardly economically utilized.

Experts also indicate that solar energy infrastructure has the flexibility to be integrated into existing energy generating facilities, cutting short the need for heavy investments. Investing in integrated mixed energy generating facilities that use both renewable and non-renewable resources could increase the reliability of energy supply, gain both customer and investor confidence, as well as achieve significant savings in fossil fuel consumption.

There is already a successful track record in the commercial viability of renewable energy projects in Egypt. The Kuraymat solar plant is a project based on parabolic trough technology integrating solar energy with natural gas in a combined cycle power plant. The capacity of the project is 140 MW including the solar share of 20 MW.[221] Total cost of the project reached US$340 million. It was completed and put in commercial operation on June 29th, 2011. The Kuraymat plant generates net electric energy capacity of 852 GWh[222] annually, the solar share is 34GWh. Savings in fossil fuel resulting from solar energy production was 1000 T.O.E/annually.[223]

On the other hand, the Zafarana wind farms another successful project located at the West coast of the Red Sea with an average wind speed of 8 – 9 m/s, first initiated in 2008. The project is made up of four phases. The generating electricity capacity of the first three phases reached 80 MW with 137 wind turbines.[224] The fourth stage produces 300 GWh annually with electricity capacity of 80 MW. The generated electricity is being fed into the national grid at the Zafarana substation. The project is profitable and commercially viable. Phase 4 of the Zafarana wind farm has annual sales revenue of 6 million Euro and electricity selling price of 20 Euro per MWh[225] while carbon credits sell at 10[226] Euro per CER.[227]

It is estimated that the Zafarana wind farms production results in emission reduction of 360,000 tonnes of CO_2 annually. It is also considered as being among one the most cost effective and efficient installations worldwide. Another wind farm is underway in Kar EL Zayat with total generating capacity of 200 MW with expected generation of 400,000 in CERs annually.

Renewable energy applications can meet the increasing energy demand of industries and household located in remote areas where no connection to the electricity network 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. Solar hot water systems are being locally manufactured with as much as 96 per cent solar fraction[228] at relatively affordable prices.[229] The annual production of 3,000 units of these systems, results in an annual energy supply of 6.3 GWh and about 8000 tonnes of carbon emission reductions.[230] They are used in public facilities, schools, hotels and medical centres especially in remote and poor Governorates. Off the grid solar systems are especially relevant, since land in Egypt are mostly desert and the increasing rate of population growth is constantly forcing the increased inhabitation of desert land.

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 per cent of residential energy consumption is attributed to lightening.[231]

TABLE 6: SWOT SUMMARY – ENERGY

	Strengths	Opportunities
• Upgrade and expand national water distribution networks • Non-conventional water generation	– Suitability of Egypt's geographic location for solar and wind energy – Increase capacity of energy supply – Face the challenge of increasing demand – Limit environmental degradation – Limit climate change threats – Introduce new technologies – Long term cost effectiveness – Increase rural and off gird energy access – Promote sustainable consumption and production – Overall economic growth – Improve access to utilities and social services – Moderate initial investments for households – Financial saving for households	– Create new market niche – Create local manufacturing industries – Job creation and skills development – Alter public consumption behaviour – Empower local communities – Encourage Entrepreneurship – Increase number of SMEs – Contribute to economic growth and export potential – Tradable credit in emission Reduction – Improve long term business competitiveness – Increase private sector investments – Increase energy available for exports – Lower import bill – Community and rural development
	Weaknesses	**Threats**
	– Use of relatively new technologies – Need for high skilled and specialized labour – High cost of establishment and operations – Skilled expert pool for establishment, operation and maintenance – Requires planning, design, regulations and policy support – Need for continuous system maintenance – Need for infrastructure – Skills for management and knowledge	– Lack of public awareness – Lack of existing local expertise – Lack of available information and knowledge pool – Lack of public funding – Lack of a unified Government plan – Lack of long-term Government commitment – Political economy concerns in particular those related to entities opposing change whether politicians or private sector – Regional and international competition – Moderate market demand

The use of CFL lamp saves 80 per cent of the electricity consumption as compared to 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 CO_2 reductions.[232]

Moreover, the use of low wattage tubular fluorescent lamps can lead to energy savings of about 10 per cent of its current consumption. Based on current market prices and electricity tariff, switching to CFL lamps is financially feasible for residential, commercial and industrial users. Energy efficiency measures in Egypt are expected to result in approximately 30 per cent in energy savings estimated at 33 billion kW (109 billion kW x 30 per cent) based on 2012 estimated energy consumption in Egypt.

Reduction In oil consumption by 20 per cent is estimated to cut down CO_2 emissions by 18,000,000 tonnes of CO_2 annually.[233] While phasing out of energy subsidies and replacing them by direct payment to poor and middle income families is likely to result in reductions of 13 per cent of CO_2 emissions, amounting to about 26,140,000 tonnes of CO_2 annually.[234] This is in addition to ensuring that benefits of the subsidy go directly to the segments of the society that need to be supported.

Investing in energy efficient buildings through retrofitting, new construction and in renewables opens up new economic opportunities and creates new jobs. Moreover, it should be pointed out that investing in solar photovoltaic energy generates the highest employment rate of between 7–11 jobs per mega watt for a plant with average capacity.[235] 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 mega watt for a plant with average capacity, respectively.[236]

According to projected energy requirements by 2020 based on an average increase in energy consumption of 3 per cent annually, it is estimated that an additional 23 additional billion kW will be needed. Achieving a target of 20 per cent of the energy from renewables is estimated at 26.5 billion kW (109 billion kW +23) (3 per cent annual increase x 7 years x 20 per cent). This is equivalent to about 3,025 MW, which is estimated to create about 21,000 additional new jobs (3,025 MW X 7 jobs), based on the lower estimate.

3.3.6 VIABILITY AND REPLICABILITY

As has been previously mentioned, the selection of the proposed green intervention is subject to proper economic analysis and assessment to determine its viability within existing local socioeconomic conditions. Moreover, the potential of the replicability of projects should be a determining factor for the selection of the proposed solution or mix of solutions. Towards this end, a SWOT analysis has been conducted to support public decision-making and attempt to properly measure feasibility. (See Table 6[237] for more information)

3.3.7 SECTOR SPECIFIC ENABLING CONDITIONS

Building a strong institutional and regulatory framework has been identified as an essential prerequisite to support the greening of the sector. Other enabling conditions include incentive measures, the gradual phasing out of subsidies and public awareness campaigns. (See Table 7[238] for more information)

3.4 MANAGING EGYPT'S SOLID WASTE SECTOR

3.4.1 CURRENT SITUATION[239]

Management for solid waste in Egypt has been significantly deteriorating, particularly during the last several years. This has been caused by a lack of a long-term vision and action plan, strong governance structure, legal framework and an efficient implementation mechanism. Solid waste in Egypt is mainly generated by households, the commercial sector, industry, agriculture, medical hospitals, the building and construction sector. However, municipal solid waste, which mainly include household, commercial, medical, and construction waste represent the most problematic waste stream requiring immediate attention.

Challenges facing municipal solid waste in Egypt have been further aggravated by rapid increase in population, changing consumption and production patterns, rising trends of rural to urban migration and rapid growth of urban centres. The latter has contributed to high population densities in cities, especially greater Cairo, Alexandria and the Nile Delta. This has resulted in a fatigued and overwhelmed traditional waste collection and disposal system comprised of local and foreign companies in addition to a parallel informal system (Zabaleen or garbage collectors) of collection and sorting. The country's efforts to increase the number of transfer stations, dumpsites, sanitary landfills, and treatment facilities failed to catch up with the increasing volume of generated waste. It is estimated that annual municipal solid waste generation has increased by more than 36 per cent since 2000 with an increase of an estimated 3.4 per cent per annum.[240] It reached about 21 million tonnes in 2010, nine million tonnes of which is generated by greater Cairo.[241] Furthermore, waste sector has contributed about nine per cent of total GHGs emissions in 2010. Just about 64 per cent of current waste is collected.[242] The rest can be found accumulating in streets and residential areas, a pattern that is becoming part of the country's everyday life. Of the 64 per cent that is collected, only 2.5 per cent is recycled, while nine per cent is used for composting, five per cent is disposed through sanitary landfills but the remainder is traditionally disposed of through open dumpsites.[243]

TABLE 7: SECTOR SPECIFIC ENABLING CONDITION – ENERGY

Enabling condition	Rationale: How it enables	Policy tools that can create the enabling condition
Good governance & institutional setup	– Institutions that function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources. – A long-term strategy, vision and action plan for sustainable energy – Optimum solutions and options for providing energy efficient and saving measures and solutions	– A long-term national strategy and action should be developed. The strategy should oversee action plans for supplying renewable energy from wind and solar. – An institutional capacity building program to strengthen the management side of public governance. – Harmonizing existing renewable energy policy targets with other energy related laws that account for electricity and conventional energy sources under a uniformed national energy policy framework. – Encourage waste to energy practices. – Replace traditional bulbs with energy saving bulbs in streets, Government buildings and residential homes.
Regulatory Framework	– Ensures through the design of relevant laws and regulations the efficient use and allocation of energy. – Promotes CO_2 reduction hence improved environment and health. – Address climate change concerns and their potential negative environmental, social, and economic impacts.	– Monitor, enforce related legislation and ensure environmental compliance. – Introduce energy efficient codes and regulations for the different sectors (building and construction sector, industry, tourism, and agriculture). – Introduce strict penalties for non-compliance. – Introduce regulations that encourage the use of renewable energy, including solar, wind, and biofuel.
Market Tools & fiscal support	– Encourage environmental compliance and the efficient use of natural resources and other factor inputs. – Encourage investment in innovative technologies. – of green businesses. – Encouraging environmental compliance and the switching to renewable energy sources. – Encourage sustainable patterns of production and consumption of energy.	– Remove tariffs on renewable energy technologies to facilitate their importation and use. – Introduce feed-in-tariff system. – Energy subsidy reform should be gradually introduced and designed to account for equity considerations and the poor segments of the population. – Replacing energy subsidies with cash payments to household based on average family size. – Energy pricing should be designed to reflect the purchasing power of different income groups of the population as well as different categories of users (agriculture, industry, tourism, public sector). – Introduce polluter pays schemes internalizing costs and encouraging a shift to cleaner and green energy practices and technologies. – Increase taxes on CO_2 emitting industries and other economic activities based on the level of emissions. – Introduce incentive measures, including tax cuts, rebates, and other incentives to encourage efficient and energy saving measures and the use of renewable energy by household and different economic sectors.
Public Procurement and expenditure	– Set an example for others sectors to pursue energy efficient technologies and practices and the use of renewable energy as opposed to fossil fuel. – Creates a demand for energy efficient equipment and appliances. – Public expenditure upgrades utilities and infrastructure with emphasis on renewable sources of energy, thus promoting private sector investment and export of energy.	– Prioritization of public expenditure to support and provide infrastructure for renewable energy. – Integrating energy efficiency measures in designing, constructing and functioning of public buildings. – Gradually replace existing public transport system with an efficient hybrid and electric run fleet. – Encourage private sector investments through private public partnership and long term purchasing contracts for renewable energy generated by private sector projects.
Capacity Building and education	– Provide the necessary skills and professional human power to support water efficiency management and introduction of non-conventional water generation. – Develop the necessary research capabilities for research and development in green technologies and practices in the sector.	– Provide extension and training services to rural communities for efficient uses of energy and use of renewables – Provide formal and on the field training for practitioner, local scientists and professionals. – Provide trainings to Government officials and decision makers to optimize efficient energy use and mainstream renewable energy. – Upgrade skills for energy infrastructure maintenance and operation. – Introduce renewable and efficient energy related degrees and certifications in universities, vocational schools and graduate studies.
Research and Development	– Encourage the development of cost effective environmentally sound. Energy efficiency polices and solutions – Encourage research and development, and innovation in renewable energy technologies.	– Overall allocation of funding for R&D should be increased to at least 2 per cent of GDP, with a large share targeting innovative, efficient and renewable energy generation technologies and lower the cost of current related applications.
Access to Finance	– Encourage commercial renewable energy applications for households and consumer markets. – Promote cost effectiveness of renewable energy production and facilitate access to finance to investors – Facilitate access of private sector, including SMEs.	– Micro-finance for small and medium size enterprises, and local communities. – Create a renewable energy fund supported by international donors and Government.

Lack of awareness and illiteracy has resulted in harmful disposal practices in poor areas and informal settlements. High costs of proper disposal procedures, inadequate public services and lack of awareness have made waste burning a normal practice in many areas in Egypt. This is also associated with people's resistance to change and willingness to adopt more responsible behavioral patterns. Disposal often takes place in open dumpsites, where waste pickers mainly from the informal sector separate recyclable materials and the rest is left out in the streets or burned. As a result, incidences of fires and harmful landfill gases are very frequent, negatively impacting health and the environment. There is a general direct trend to be observed between GDP and waste generation, and Egypt is no exception. Along with Egypt's projected economic growth, the problem is to worsen still by 2025 when municipal waste alone is expected to exceed 30 million tonnes annually.[244]

3.4.2 POLICY IMPACT

In 2000, the Government adopted the "National Strategy for Integrated Municipal Solid Waste Management" in an effort to gradually introduce a nationally integrated solid waste management (ISWM) system. The main objectives of the system are to eliminate unhygienic waste accumulations and embrace new innovative applications for waste reduction, reuse, recycling, and the safe disposal of waste in sanitary landfills. Strategic policies including the application of the "polluter pays principle", promotion of recycling industries, and involving the private sector for waste collection, are all measures that can contribute towards addressing challenges facing the sector. A tax break for five years and custom duty exemptions for SWM equipment were introduced to provide an incentive for private sector investments.[245] In 2006, a strategic framework for the recycling of MSW was also introduced. Twelve years later, the results of the strategy have been modest at best, due to the lack of a tight implementation mechanism, monitoring and follow up, and the absence of a SWM legal framework.

As a result of weak implementation, the sector continues to suffer from structural problems. An inefficient waste collection system continues to dominate the sector. This is in spite of the subcontracting of private local and multinational companies in Cairo and other large cities to manage solid waste. In fact waste accumulations in streets and residential areas have increased.[246] The average collection rate in urban areas is between 30 to 77 per cent,[247] while in Cairo it ranges between 0 per cent in the slums and poor neighbourhoods and 90 per cent in the private residential compounds, while in rural areas collection systems are almost non-existent.

The sector has been impaired by partial cost recovery due to the lack of public acceptance and awareness. Law 10/2005 was issued to levy a solid waste collection fee to be included in the electricity bill that is set according to income levels and residential area. However, cost recovery remains an issue. In Cairo and Alexandria the true cost of collecting, transporting, treating and disposing of a tonne of waste is about EGP 100 to 110. On the other hand, recovered costs, on average is about EGP 70 per tonne.[248] A cost gap of about 35 – 40 per cent exists. Limited financing abilities is constraining efficient waste management and further exacerbating cost gaps.

By law, Governorates are responsible for allocating public funds for solid waste management. Budgets allocated for SWM are very limited and influenced by other economic and social priorities. Disposal, stream sorting and recycling infrastructure facilities are limited; there are more than 66 composting plants across the country.[249] Only two are operational and the rest have turned into open dumpsites. There are five operational sanitary landfills while three more are in the pipeline.[250] However, construction of sanitary landfills is limited and dumping sites are still the main disposal venue. Moreover, there is no strict implementation of safety, health and environmental codes in operational landfills, and the staff involved generally, lack the required technical and managerial skills.

Health and safety concerns are major concerns for the sector; informal waste pickers, scavengers, and collectors face hazardous working conditions. Municipal waste is often mixed with hazardous waste and household waste, where workers are required to handle, pick, collect and transport without safety procedures or standards. Proceeding with the current business as usual scenario for the sector is not an option. The current state of affairs poses serious health and hygiene problem that threatens human life, while it has a degenerative environmental impact on soil, water and land, thus affecting vital economic sectors.

The main Government body responsible for managing and regulating the sector is the Egyptian Environment Affairs Agency (EEAA), supported by local Municipalities working under the Ministry of Local Development. Recently, the State Ministry of the Environment has established a SWM Think Tank to develop a strategy, policy framework and action plan, which is a good step in the right direction.

3.4.3 OPPORTUNITIES FOR GREENING THE SECTOR

There is a need to change the perception of viewing solid waste as mainly being one that represents a burden on the Government's budget into a sector that can also provide an opportunity. Growth of a new market and revenue options for product reuse, recycling, waste to energy, organic fertilizers and trading in secondary materials represent an opportunity for private sector investments in SWM. **Greening the sector through the "Four Rs": Reduce, Reuse, Recovery, and Recycle** approach for ISWM offers many opportunities and benefits.

This is represented in reduced waste contamination and increased health benefits, including reduced respiratory diseases related to the burning of waste, and water-borne disease caused by the dumping of municipal waste in waterways. Integrating the informal sector and providing better working conditions for waste collectors is another opportunity that is offered by investing in the sector. Other benefits include resource efficiency and conservation, and environmental and climate change mitigation through reduced methane and CO_2 emissions, as well as reduced soil pollution, improved water and air quality.

3.4.4 EXISTING POLICIES FOR GREENING THE SECTOR

Past Government policies did not particularly take into account waste related environmental degradation nor did it promote resource efficiency and environmental conservation. Also there is a lack of an ISWM framework for the sector. Introducing an overall sector directive of the 4Rs is therefore imperative, the absence of which limits the greening potential of the sector. Lack of public outreach, awareness and a culture of waste prevention necessitate a more proactive policy framework. Several activities related to policies and sector reforms are under way through the National Solid Waste Management Programme (NSWMP) with support from the European Union (EU) and German Development Cooperation Agency (GIZ).

3.4.5 POTENTIAL BENEFITS FOR GREENING THE SECTOR[251]

Adopting an ISWM system would assist in facilitating the greening of the sector.[252] This scoping study has identified and prioritized green opportunities that embody a comprehensive integrated management system. This can be achieved through **investing in solid waste collection and sorting in addition to landfilling 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.

Potential investment options can have considerable benefits for the sector, especially if efforts to implement them are well coordinated and managed.

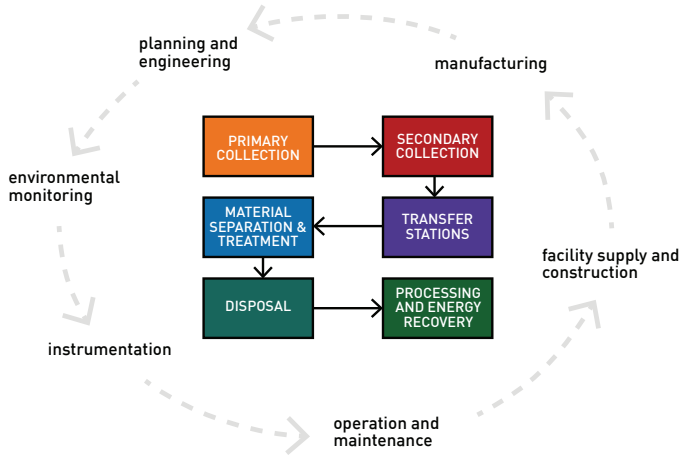
Most importantly it will significantly reduce waste accumulation in streets and waterways. This can be achieved when waste goes through a full systemized cycle starting from sorting at source, transfer to sorting stations, where sorting is carried out to segregate recyclables – organic matters and rejects. Recyclables can then be sold while organic matter can be sent to a composting or biofuel 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. Other sorted materials could be used to produce energy, as well as organic fertilizers needed for sustainable agriculture or to produce biogas. These options reduce demand for natural resources and raw materials. This is particularly important as manufacturing of recycled materials requires less energy and is less costly than manufacturing the same products from virgin raw materials. For example, recycled granules of plastic cost EGP 1,500, while exporting virgin granules powder costs EGP 3,500.[254] (See Box 3 on page 58.)

Sustainable production and consumption reduces the amount of waste generated and transferred to landfills, which should be considered as the last option in the lifecycle of a waste item. Moreover, waste avoidance and reduction reduces pressure on land and cost involved in constructing new landfills. The average cost of one cell of landfill in Egypt is estimated to cost no less than EGP 2.5 million.[256]

The generation of refuse derived fuels (RDF) from waste appears to be very promising in supporting energy efficiency for industry and households and in contributing to addressing Egypt's rising energy insecurity. On a large scale, RDF is currently the primary fuel in the residential sector in many developing countries. For instance, it accounts for over 90 per cent of total household use in the poorer

FIGURE 23[253]: SUGGESTED INTEGRATED WASTE MANAGEMENT SYSTEM



countries of Africa and Central America and 35 per cent in Latin America and Asia. Currently the average cost of producing one tonne of RDF is EGP 270, while its selling price reaches 450[257] EGP/tonne.[258] Biogas is produced from organic waste and widely used globally. On average it costs 80 EGP/tonne, while its price is 0.25 EGP/Kilowatt of electricity.[259]

This alternative fuel generation option could lead to reduced Government capital expenditure, saves expenditure on energy subsidies, increases foreign exchange earnings, and create new jobs. It is estimated that the potential energy share generated from waste to energy in the next five years can reach up to three per cent of the energy mix in Egypt. This is provided that necessary investments are directed towards achieving this end.

Adopting an integrated green solid waste management system could lead to a fast rising new market niche in recyclables, which can translate to new market opportunities and income generation. 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.

Plastic: EGP 3 500/Tonne
Organic Fertilizer: EGP 450/Tonne
Recycled Paper: EGP 800/Tonne
Glue: EGP 900/ Tonne
Glass: EGP 700 / Tonne
Metal: EGP 2 500 / Tonne

Box 3.[255] Local selling prices of recycled materials

Flickr Creative Commons/Franklin Oliveira

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.[260] Moreover, an integrated system will also lead to an increase in efficiency and labour productivity. When waste is collected based on a 'Pooling Site' system rather than on a door-to-door system, this will reduce the collection time by about 98 per cent and will affect positively labour and costs involved in waste collection.

On the other hand, the estimated health potential of these investments is significant. Adequate waste management services reduce risks to health and the environment. These services also contribute to improved air quality due to reduced air pollution and gas emissions and particulate matter released from solid waste. Exposure to these matters increases risks for developing heart disease, respiratory disease, asthma and emphysema. Recycling and waste to energy applications lead to the reduction of greenhouse gas emissions such as methane, sulphur dioxide, carbon dioxide and reduce landfill related gas emissions and leachate.

Investing in SWM promotes resource efficiency. Rather than using primary input to produce wood, paper, glass, and metals, the same can be produced through recycling. This does not only reduce costs, but also releases resources for other uses. This is in addition to the potential savings in energy consumption due to reduced resource use.

Investing in waste to biofuel in Egypt has the potential of producing about 31.4 m tonnes/annually (56 per cent organic waste x 57,000/tpd[261] x 60 per cent waste collection efficiency/2.228 x 365 days).[262] While, producing wood from waste (plastics, textiles, and paper) can produce about 1.4 million tonnes of wood annually (23 per cent of waste x 57, 000 tpd x

60 per cent waste collection efficiency x 50 per cent of this waste already used for further recycling activities x 365 days).

On the other hand, producing diesel from rubber tires is estimated to produce about 27,675 tonnes of diesel/annually (4.1 m tires x 0.015 to/tire x 45 per cent conversion efficiency). Production of RDF is estimated to produce 2.4 million KC[263]/day (23 per cent of total amount of waste x 57,000 x 60 per cent waste collection efficiency x 50 per cent of this waste is already used for further waste recycling activities = 3,900 tpd of RDF x 600 Kilo Calorie/ tonne (field experiment by the National Centre for Cleaner Production for Beni Suef and Alexandria Cement Plants)[264] = 2,360,628 KC/day.

Investing in SWM creates several economic activities in the form of waste to biofuel, waste to compost, RDF and business opportunities for big entrepreneurs as well as small and medium size enterprises. These new activities all have the potential of creating new job opportunities. It is estimated that about 28 employment opportunities are created to produce one tonne of recycled waste.

According to UNEP, about 10 per cent additional jobs are expected to be created globally by 2050 in waste collection activities alone.[265] Applying this figure to Egypt would mean that an additional 24,000 jobs would be employed in this activity alone by 2050. This in addition to jobs created in recycling, composting, and the production of biofuels and RDF.

3.4.6 VIABILITY AND REPLICABILITY

Through an extensive consultation process, this scoping study has taken into account the viability of the proposed green interventions in order to ensure their suitability and potential replicability within the Egyptian context. As seen in table 8[266] a SWOT (strengths, weaknesses, opportunities and threats) analysis has been conducted to provide public institutions an insight to support decision-making.

However, it should be emphasized the importance that the selection of the mix of solid waste options is based on the relative priorities given to the different options and the economic viability of the selected package.

3.4.7 SECTOR SPECIFIC ENABLING CONDITIONS

The provision of a number of sector specific enabling conditions can significantly facilitate greening the sector and tailor it to the unique challenges and existing opportunities. Providing the necessary institutional and regulatory framework is crucial in encouraging a green and ISWM system in Egypt. This could be supported by an incentive system that influences production and consumption towards more sustainable patterns together with other policies and measures. (For more details see Table 9[267].)

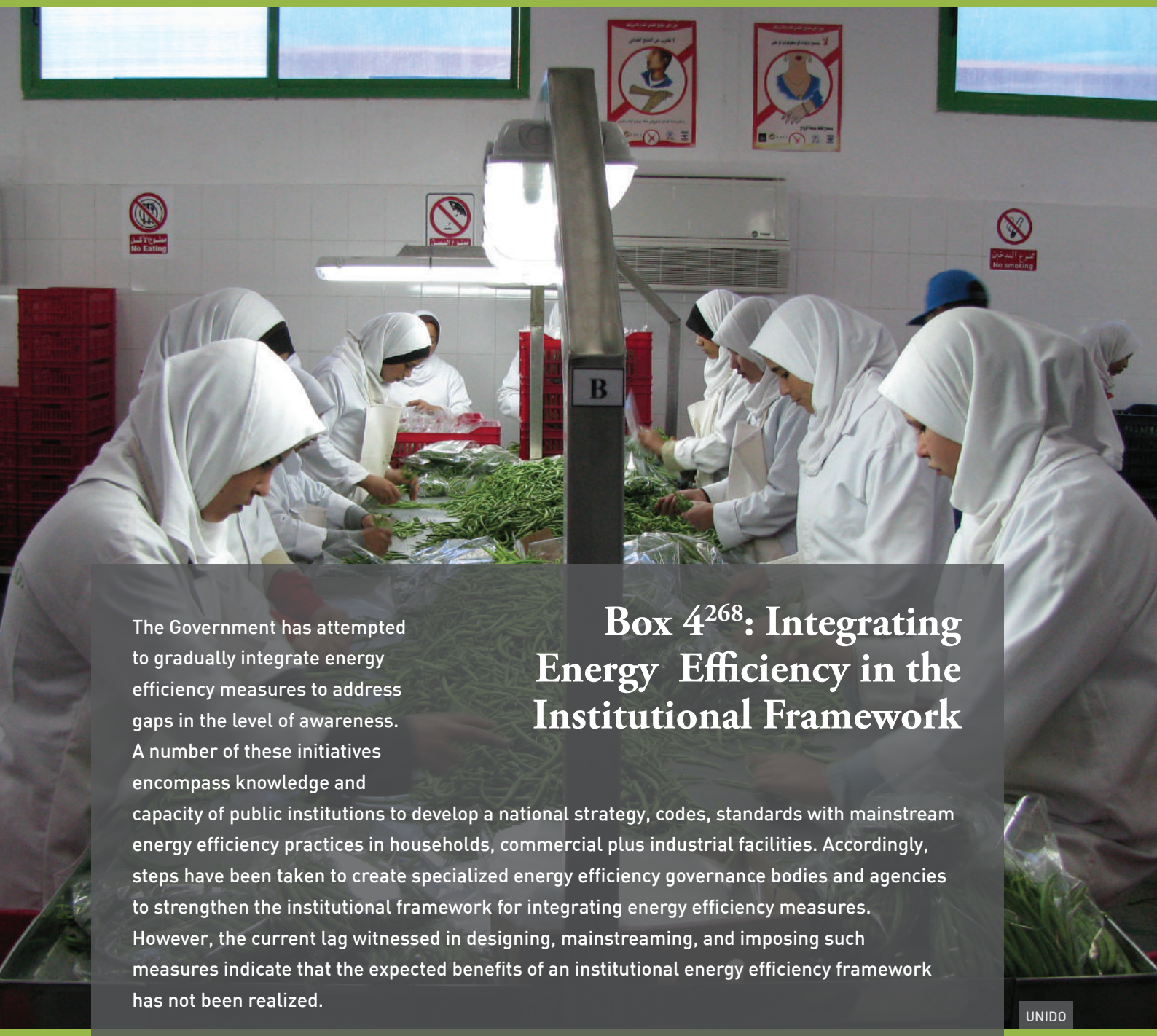
TABLE 8: SWOT SUMMARY – SOLID WASTE MANAGEMENT

	Strengths	Opportunities
• Upgrade and expand national water distribution networks • Non-conventional water generation	— Resource efficiency — Improved health and environmental conditions — Provide solutions and alternative options — Limit Environmental degradation — High recovery rates of materials — Speedy return on investment — Introduce new technologies — Long-term cost effectiveness — Promote sustainable consumption and production — Decoupling economic growth from waste generation — Improved access to waste collection services — Improved municipal governance — Pollution prevention and improved living environment	— Create new market niche and trade opportunities — Create new businesses — Job creation and increased revenue streams — Encourage Entrepreneurship — Increase number of SMEs — Alter production and consumption practices — Empower local communities — Increased private sector investments — Community and rural development — Emissions reduction — Lower import bill — Reduce the need for landfilling and incineration
	Weaknesses	**Threats**
	— Need for specialized knowledge and skills — Lack of available infrastructure — Lack of existing local expertise — Lack of public funding — Lack of available information and knowledge — Unsustainable production and consumption patterns	— Political economy concerns in particular those related to entities opposing change whether politicians or private sector — Change in Government priorities and commitments — Lack of public awareness — Reduced budgetary allocations for sector — Lack of public participation and engagement

Creative Commons/Robert Sander - Waste

TABLE 9: SECTOR SPECIFIC ENABLING CONDITION – SOLID WASTE MANAGEMENT

Enabling Condition	Rationale: How it enables	Policy tools that can create the enabling condition
Good governance & institutional setup	— Institutions that function in a transparent, accountable, and in a participatory manner promotes efficiency and optimum use of resources. — Optimum solutions and options for mainstreaming an integrated waste management system when designing national policies.	— Develop a long-term vision, strategy, guidelines, action plan with clear timeframe and responsibilities for implementation. — Encourage community-based SWM approaches and practices through the engagement of local NGOs and small and medium size enterprises. — Promote sustainable integrated SWM (ISWM) practices with emphasis on 4Rs; waste avoidance in the first place, reduce, reuse, recycling, and recovery. — Promote producer responsibility to reduce the generation of waste in the manufacturing process. — Encourage on-site sorting and separation of waste streams by different actors. — Build institutional capacities on the municipality level targeting waste efficient budgeting, monitoring and planning. — Encourage waste to energy practices.
Regulatory Framework	— Provide the necessary legal framework that promotes the integrity of the ecosystem and the efficient use of natural resources, biodiversity, and improved environment, health, and human welfare. — Encourage private sector engagement and investment in SWM activities. — Encourage sustainable production and consumption patterns. — Identify responsibilities and role of different Government entities in SWM.	— Enforce related existing legislation and ensure environmental compliance. — Introduce specific waste related compliance laws with strong penalties against irresponsible behaviour and illegal dumping, strict land use permits and access certifications. — Introduce penalties for the burning of solid waste, dumping in open dumpsites and waterways. — Introduce laws that facilitate the engagement of private sector in SWM activities.
Market Tools & fiscal support	— Encourage environmental compliance and the efficient use of natural resources and other factor inputs. — Support the emergence and expansion of green businesses. — Support the mainstreaming of an integrated solid waste management system in public policy.	— Develop a recycling market through market-based instruments such as recycling credits, tax reductions, market driven certification, and performance bonds. — Facilitate and provide incentives for the export of locally produced waste technologies and products. — Reflect full cost recovery through user pay and polluter-pays principles accompanied. However any cost recovery policies should not impose extra burdens on poor and low-income families and communities. — Incentive measures including tax cuts, rebates, and other incentive. — Introduce incentive measures including tax cuts, rebates, for private sector involvement. — Provide incentives for R&D and human resource development.
Public Procurement and expenditure	— Public procurement of sustainable products contributes to creating markets and increasing demand of green and recycled products. — Public expenditure upgrades utilities and infrastructure needed to support sector development. — Provide necessary space for SWM facilities, transfer stations, and sanitary landfills.	— Prioritization of public expenditure to support and provide infrastructure, and equipment for an ISWM system. — Encourage private sector investments through private public partnership and long term purchasing contracts for renewable energy generated by private sector projects. — Give priority to the purchase of recycled products and material for use by Government entities and as an input in production processes and building and construction. — Allocate sufficient funding for human resource development and R&D.
Capacity Building and education	— Provide the necessary skills and professional human power to support water efficiency management and introduction of non-conventional water generation. — Develop the necessary research capabilities for research and development in green technologies and practices in the sector.	— Provide extension and training services to rural communities. — Provide training and on field learning for experts, local scientists and professionals of the sector. — Introduce trainings to Government officials and decision makers to optimize efficient water management. — Introduce waste management related degrees in universities, vocational schools and graduate studies.
Research and Development	— Provide the necessary know-how and technologies needed for the development of the sector, including supporting waste to energy and waste to compost investment.	— Allocate sufficient funding for R &D and innovation in SWM equipment, products, and processes.
Access to Finance	— Encourage commercialization of solid waste management solutions and applications.	— Develop financial frameworks to facilitate access to finance, through credits, long-term low interest loans, micro funding for entrepreneurs and SMEs in addition to promoting public private partnerships.



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Box 4[268]: Integrating Energy Efficiency in the Institutional Framework

The Government has attempted to gradually integrate energy efficiency measures to address gaps in the level of awareness. A number of these initiatives encompass knowledge and capacity of public institutions to develop a national strategy, codes, standards with mainstream energy efficiency practices in households, commercial plus industrial facilities. Accordingly, steps have been taken to create specialized energy efficiency governance bodies and agencies to strengthen the institutional framework for integrating energy efficiency measures. However, the current lag witnessed in designing, mainstreaming, and imposing such measures indicate that the expected benefits of an institutional energy efficiency framework has not been realized.

- Energy Supreme Council (1979), re-established in 2007
- New and Renewable Energy Authority (NREA) (1986)
- Energy conservation branch of the Council of Electricity and Energy Researches (National Academy for Science and Technology) (1987)
- Egyptian Energy Efficiency Council (EEC) (2000)
- Electric Utility and Customer Protection Regulatory Agency (2000)
- Energy efficiency unit (EEU) at Cabinet of Ministers to support Supreme Council of Energy (2009)

4 CROSS CUTTING ENABLING CONDITIONS FOR A GREEN ECONOMY IN EGYPT

This section of the scoping study identifies priority enabling conditions necessary for facilitating a transition to a Green Economy. Proposed enabling conditions were selected 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.

4.1 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.

A good governance system will ensure the effectiveness of the proposed policies, plans and programs and their proper implementation. Adopting a participatory approach in the design and implementation of green strategies will ensure that the different interests of community stakeholders are taken into account, hence the inclusiveness of the policy design process. It is critical that officials, civil servants and decision makers are provided with information, managerial capacity training, and the ability to analyze challenges, assess opportunities and ensure coordination to avoid redundant and inefficient policies. Robust measures could 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 polices could significantly facilitate and put in place necessary policy tools and measures to green the economy. It is important that decision makers 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.

4.2 INTEGRATED POLICYMAKING

Integrating environmental and social considerations with economic sectoral and macroeconomic policies are essential in making a transition to a Green Economy successful. Such integration could be achieved in designing overall Government strategy and in formulating, plans, programs, and projects. A strong and good governance system will facilitate the realization of this integration. It will also facilitate the implementation of the proposed strategy, plans, programs, 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. 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.

4.3 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 labeling, 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, harmonize global as well as regional standards with the ones developed at the local level to avoid inefficiency, redundancy along with 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.

4.4 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 could also be designed to encourage private sector engagement and investment in green infrastructure projects.

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 is important to take into account in the design the operationalization of the polluter-pays principle, attempt to reflect full cost pricing of natural resources, internalization of 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, payments for providing natural capital or ecosystem service schemes (PES) to promote ecosystem and biodiversity preservation.

More specifically the Government could reform the subsidies system to encourage the efficient allocation and use of resources and discourage environmentally harmful activities. Such a reform would 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.

4.5 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 calibre 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. 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.

4.6 TRADE POLICY

Trade policies could 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, environmentally produced plus manufactured products create 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.

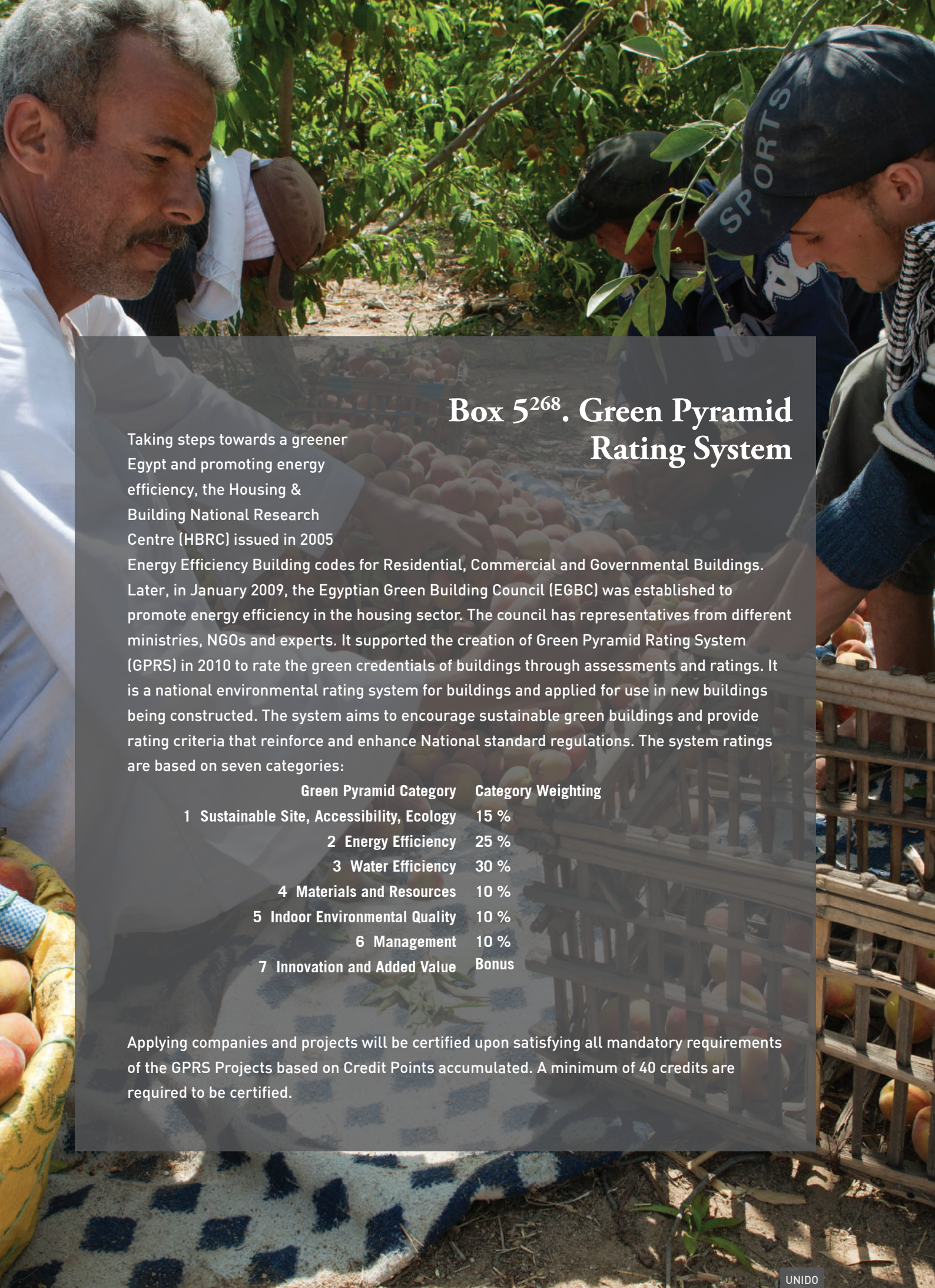
4.7 RESEARCH AND DEVELOPMENT

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 emphasize 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 per cent of GDP to R&D. It is proposed that this percentage share to be increased to between 2-4 per cent of GDP. The Republic of South Korea currently allocates about 7 per cent of GDP to R&D, while Israel allocates more than 4 per cent. It is critical to encourage the private sector to invest in R&D. This can be achieved through tax cuts and rebates and other incentive measures.

Research and development in the four targeted priority areas subject of this scoping study include research in water desalination and wastewater treatment technologies; water saving irrigation equipment; water-saving building and construction equipment and appliances. In the energy sector, research in renewable sources of energy – solar, wind, wave – producing inexpensive technologies suiting the Egyptian climate needs to be undertaken. For solid waste, research needs to focus on waste to energy, waste to compost, recycling, reuse of waste residues as an input in the manufacturing of products and most importantly waste prevention.

4.8 ACCESS TO FINANCE AND FACILITATING INVESTMENTS

Regarding finance, a starting point could be gradually redirecting existing financial resources towards green investments. Innovative financial mechanisms include the introduction of soft loan programs, 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



Box 5[268]. Green Pyramid Rating System

Taking steps towards a greener Egypt and promoting energy efficiency, the Housing & Building National Research Centre (HBRC) issued in 2005 Energy Efficiency Building codes for Residential, Commercial and Governmental Buildings. Later, in January 2009, the Egyptian Green Building Council (EGBC) was established to promote energy efficiency in the housing sector. The council has representatives from different ministries, NGOs and experts. It supported the creation of Green Pyramid Rating System (GPRS) in 2010 to rate the green credentials of buildings through assessments and ratings. It is a national environmental rating system for buildings and applied for use in new buildings being constructed. The system aims to encourage sustainable green buildings and provide rating criteria that reinforce and enhance National standard regulations. The system ratings are based on seven categories:

Green Pyramid Category	Category Weighting
1 Sustainable Site, Accessibility, Ecology	15 %
2 Energy Efficiency	25 %
3 Water Efficiency	30 %
4 Materials and Resources	10 %
5 Indoor Environmental Quality	10 %
6 Management	10 %
7 Innovation and Added Value	Bonus

Applying companies and projects will be certified upon satisfying all mandatory requirements of the GPRS Projects based on Credit Points accumulated. A minimum of 40 credits are required to be certified.

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and endorsed by the Government could target small and medium size enterprises as they represent a vast majority of companies in Egypt. Financial tools could 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.

4.9 GREEN PUBLIC PROCUREMENT

Government spending can be an effective tool in stimulating the economy. However, Government spending could 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 could 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 programs to purchase locally made green goods. These programs 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.

4.10 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 is important to emphasize though that these communication packages could be designed to address different target groups in simple language and in a manner that caters for their specific interests, priorities and concerns.

5 CONCLUSION

5.1 KEY FINDINGS

The research and extensive expert consultation process undertaken for this scoping study has resulted in a number of proposed interventions and investment options for greening the agricultural, water, energy, and solid waste sectors.

AGRICULTURE

IDENTIFIED GREEN INTERVENTIONS

- Investing in Organic farming.
- Changing cropping patterns (shifting to low water intensity crops) awareness to promote efficient consumption.
- Shifting to modern irrigation systems.

EXPECTED BENEFITS

- If Egypt were to convert 20 per cent of the total agricultural land from conventional to sustainable and organic cultivation amounting to about 1.44 million feddan could result in a saving of approximately 700, 000 tonnes of chemical fertilizers annually. That would result in a saving of about EGP 1 billion annually.
- The potential of producing compost from agricultural residues could provide more than 22 million tonnes of organic waste annually. Translated into monetary terms this is equal to approximately EGP 9 billion annually.
- Producing compost from 500,000 tonnes of rice straw reduces the amount of released carbon emission by 32,500 tonnes annually.
- It is also estimated that carbon emissions from organic farming is between 48 to 66 per cent lower than in conventional farming. This translates to about 26,000 tonnes of carbon emission reductions annually.
- Reducing the area cultivated rice (or using early maturing varieties) and sugar cane could lead to water savings of EGP 4-7 five billion by 2017.
- It is estimated that using drip irrigation could save up to 40 per cent of water as compared to flood irrigation. This will result in water savings amounting to about EGP 23 billion m^3.
- If we assume that the amount of water saved is to be allocated to produce wheat, about 17 million tonnes of wheat can be grown annually in Egypt, which is more than double the current production, estimated at around 8 million tonnes annually.
- Irrigation increases crop productivity by about 30 per cent. If average wheat production per feddan is about 2.5 tonnes, introducing drip irrigation for land-cultivated wheat is expected to increase yields by 0.75 tonnes to 3.25 tonne per feddan.
- Using drip irrigation for cultivating wheat would result in an increase of 2.55 million additional tonnes of wheat equivalent to about EGP 970 million.

WATER

IDENTIFIED GREEN INTERVENTIONS

- Investing in non-conventional water resources development such as desalination and treated wastewater.
- Upgrading and expansion of national water infrastructure to promote water use-efficiency.

EXPECTED BENEFITS

- Investing in household water saving devices for domestic use including residential building is estimated to result in water savings between 10 to 20 per cent. In Egypt this could translate to 1.4 billion m^3 of water savings annually.
- Investing in water saving equipment and practices in the agricultural sector is estimated to result in water savings of at least 40 per cent or about 23 billion m^3 annually.

- Other benefits of water efficiency approaches include increased land productivity and yields estimated at between 20 to 30 per cent.
- This can translate to an estimated corn production of about 1.4 million tonnes annually or about EGP 2 billion.
- Efficiency in the use and allocation of water resulting from good governance and regulatory framework is expected to result in 10 per cent savings in water consumption estimated at EGP 6.75 billion annually.
- Increasing the percentage of water supply from agricultural reused drainage water by 2017 could reach 4.5 billion m^3 in water savings.

ENERGY

IDENTIFIED GREEN INTERVENTIONS

- Investing in renewable energy (solar and wind) infrastructure and production capacity.
- Investing in energy efficiency to promote efficient production and consumption.

EXPECTED BENEFITS

- Investing in renewable energy can restore Egypt's energy security status, while at the same time reduce CO_2 emissions and the environmental and health impacts associated with it.
- 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.
- Investing in energy efficiency practices such the installation of efficient lighting equipment lead to significant energy savings especially that 34 per cent of residential energy consumption is for lightening purposes.
- The use of CFL lamp saves 80 per cent of the electricity consumed by incandescent one.
- This leads to average energy savings per one lamp over its lifetime of about 750 kWh and a corresponding fuel savings of 225 kg oil equivalent and 675 kg CO_2 reductions.
- Energy efficiency measures in Egypt is expected to result in about 30 per cent in energy savings estimated at 33 billion kW based on 2012 estimated of energy consumption in Egypt.
- Reduction in oil consumption by 20 per cent is estimated to cut down CO_2 emissions by 18 million tonnes of CO_2 annually.
- Phasing out of energy subsidies and replacing them by direct payment to poor and middle income families is likely to result in reductions of about 13 per cent of CO_2 emissions, amounting to about 26.1 million tonnes of CO_2 annually.
- Investing in solar photovoltaic energy generates the highest employment rate of between 7 to 11 jobs per mega watt for a plant with average capacity.
- This is compared to coal-fired energy of 0.27-0.95 and natural gas of between 0.25-0.95 jobs per mega watt for a plant with average capacity respectively.

SOLID WASTE MANAGEMENT

IDENTIFIED GREEN INTERVENTIONS

- Investing in an integrated solid waste management system including waste collection and sorting systems.
- In addition to landfilling and processing services such waste reuse, energy recovery, and recycling and all related infrastructure.

EXPECTED BENEFITS

- Adopting waste segregation and sorting leads to economic benefits by producing recyclables that can be processed, sold in the market and used as an input in the production of final products
- Energy generation from waste can save expenditure on energy subsidies, save foreign currency paid for imports and create jobs.
- According to experts, the potential energy share in Egypt from waste in the next five years can reach up to three per cent of the energy mix in Egypt.
- It is also estimated that waste to energy and recycling infrastructure could employ up to 28 workers per ton, which can translate into thousands of jobs.

- Investing in waste to biofuel in Egypt has the potential of producing about 31.4 million tonnes/year.
- Investing in the production of wood from waste (plastics, textiles, and paper) has the potential to produce about 1.4 million tonnes of wood annually.
- Investing in the production of diesel from rubber tires is estimated to produce about 27,675 tonnes of diesel/annually.
- Investing in the production of RDF has the potential to reach 2.4 million KC/day.
- According to UNEP, about 10 per cent additional jobs are expected to be created globally by 2050 in waste collection activities alone.
- Applying this figure for Egypt would mean that an additional 24,000 jobs would be employed in this activity alone by 2050.

5.2 POLICY OPTIONS AND ROADMAP

Given Egypt's current transitional political period and economic slowdown there is urgency for a paradigm shift to effect change and radical reform that can solve Egypt's chronic poverty, unemployment, water, energy and food shortages. Adopting a Green Economy could present Egypt with the required change and fulfill its aspirations for long-term prosperity and human welfare.

Nonetheless, managing a successful transition to Green Economy requires taking into account the dynamic nature of the Egyptian economy and it's constantly evolving socioeconomic and environmental changing patterns and considerations. While planning for this transition, the Government could adopt an integrated green policy approach that targets sustainability, and efficient resource use.

This approach could focus on greening key economic sectors and issues such as agriculture, waste, energy, water, tourism, industry and transportation simultaneously. It could be based on promoting an overall circular economy concept[270] across sectors by focusing on the 4Rs of reducing, reusing and recycling through:

- Decoupling environmental degradation and economic development
- Sustainable consumption and production
- Cleaner Production and polluter pays measures
- Consumption reduction of resources, emissions and waste minimization in general
- Waste prevention, reduction, reuse, recovery, and recycling

The 4Rs could be integrated and scrutinized throughout a broader system that encompasses all key sectors and main natural resources of the country. At the same time, measures could be taken to mitigate possible negative side effects including job reductions that might face some sectors while implementing the transition to a Green Economy.

The scoping study is intended to enhance the awareness of decision makers, practitioners, and the general public to the opportunities and challenges associated with a Green Economy. It has also suggested possible interventions and investments to green the four selected priority sectors and has proposed sector specific enabling conditions to facilitate and maximize the benefits of a green transition. To further support decision makers, the study has also identified main crosscutting enabling conditions that can facilitate and accelerate an overall transition to a Green Economy in Egypt.

However, the success of a national Green Economy policy approach requires more than highlighting possible benefits of a Green Economy or proposing green interventions and possible enabling conditions. Decision-makers need to identify, communicate and adhere to a set of principles and guidelines while planning and formulating a successful transition to a Green Economy. Possible guiding principles for a Green Economy framework for Egypt include:

- **Good governance:** to ensure transparency, accountability, and public participation

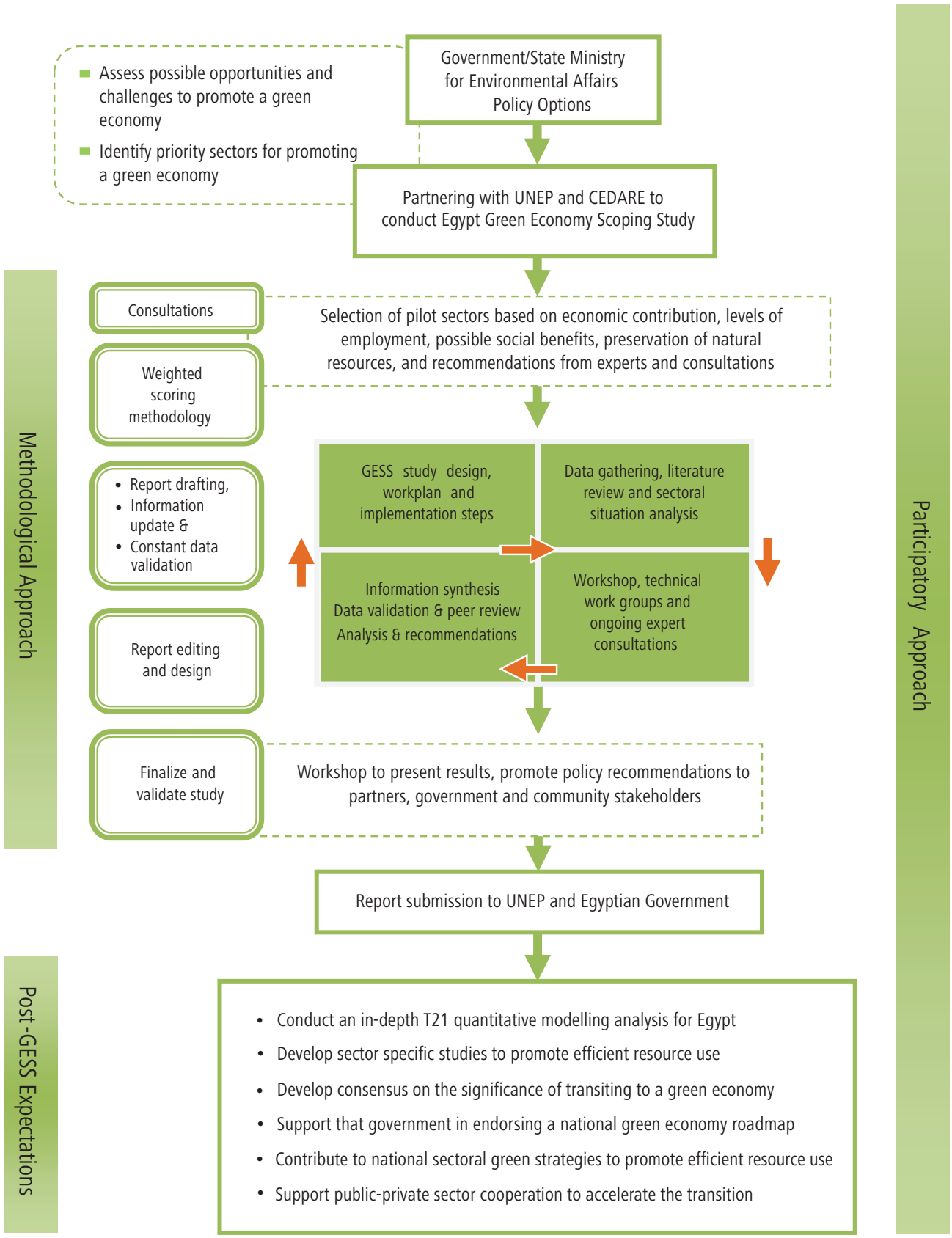
throughout policy formulation, implementation, monitoring and assessment.

- **Inter-ministerial coordination:** to avoid redundancy, conflict of interests, and overlap between different sectors.
- **Sustainability and continuity:** policies should also ensure sustainability from the environmental, social and economic standpoint.
- **Integrated policymaking:** environmental, social and economic considerations should be integrated throughout the planning process.
- **Inter-generational equity:** future generations should not bear costs and negative implications of proposed policies.
- **Equity and inclusiveness:** policies should ensure the equitable distribution of wealth providing equal opportunities for the different segments of the population, and promote social justice and cohesion.
- **Competitiveness and market access:** policies should facilitate the transition to a Green Economy should ensure enhanced competitiveness and market access for locally produced products and services.
- **Revitalization and diversification of the economy:** A transition to a Green Economy should encourage and stimulate public spending and foreign direct investment. It should also open up new businesses and investment opportunities.
- **Practicality:** the information and outputs provided by the planning process are readily usable in decision-making and implementation.
- **Flexibility:** Proposed green policies should be flexible and be easily implemented in juncture with changing events and circumstances.
- **Human resource development:** Investing in human resources is a necessary prerequisite for a qualitative shift towards a Green Economy.
- **Polluter pays principle:** It is important to operate the polluter pays principle among other market incentive tools and mechanisms to influence consumption and production towards more sustainable patterns.
- **Efficiency:** A Green Economy should promote the efficient allocation and use of resources, including waste prevention, minimization, reuse, recovery, and recycling.
- **Job creation and economic diversification:** selected policy should contribute to generating new economic sectors and have a high potential for job creation, particularly for the poorer segments of the population.
- **Environmental conservation:** Environmental and ecosystems integrity is key for long-term sustainability and economic resilience.
- **Research and development:** Environmentally sound innovative technologies and practices are key in achieving green and sustainable development
- **Sustainable development indicators:** Use of integrated environmental and economic accounting should be promoted and used as a more realistic indicator for sustainable development and genuine welfare.

5.3 FUTURE WORK AGENDA

This scoping study for Egypt provides the several possible guiding principles for Green Economy framework for policy makers in Egypt. This could be followed by a quantitative assessment of Green Economy in Egypt (e.g. green jobs creation of green investment in four key sectors in Egypt) which would provide the more comprehensive and practical assessment for Green Economy framework in Egypt.

ANNEX. EGYPT GREEN ECONOMY SCOPING STUDY METHODOLOGICAL DEVELOPMENT AND EXPECTATIONS STORYBOARD



BIBLIOGRAPHY

Abaza, Deya. "Let them eat vegetables: Egypt's wheat farmers hit hard by diesel price hikes." Ahram Online. April 2013. http://english.ahram.org.eg/News/69016.aspx.

Abaza, Hussein. "Economic Considerations for Supplying Waterthrough Desalination in South Mediterranean Countries." 2012.

Abdel-Maksoud, Bahgat M., and Mohamed F. S. Abdel-Salam. "Agricultural Sustainability in Egypt." OIDA International Journal of Sustainable Development, 2012.

Abdin A.E., Gaafar I. "Technological Perspectives for Rational Use: Rational Water use in Egypt." Options Méditerranéennes, 2009.

Abouhadid, Dr Ayman. "Green Agriculture: Opportunities and Challenges ." Egypt Green Economy Workshop. 2013.

Abouhadid, Dr Ayman F. "High Value Products for Smallholder Markets in West Asia and North Africa – Trends, opportunities and research priorities." 2006.

Abouliesh, Helmy. Organic agriculture and food Utilisation - An Egyptian Case Study. 2011.

Abul-Naga, Adel M. "Sustainable Agricultural Development Strategy Towards 2030." 2009.

AbuZeid, Dr Khaled. Egypt 2030 Wastewater Reuse Strategy,Water Management Program CEDARE, 2013.

AbuZeid, Dr Khaled. Water in the Green Economy:Greening the Water Sector. Water Management Program CEDARE, 2013.

African Development Bank. "2012-2013 Interim Strategy Paper." October 2012.

African Development Bank. "Clean Energy Development in Egypt ." 2012.

Ahmed, Essam Hassan M. "Renewable Energy for Sustainable Development." 2010.

Ali, Dr Ibrahim Siddki. "Sustainable Agriculture Strategy ." 2010.

Allam M.N., El Gamal F., Hesham M. Irrigation Systems Performance in Egypt. CIHEAM, 2005.

Allam, Dr Mohamed Nasr. Water Resources In Egypt: Future Challanges and Opportunties. International Water Resources Association: Water International, Volume 32, Number 2, Pg. 205-218., 2007.

Amer, Eng. Hatem. Renewable Energy Strategy for 2020 and Regulatory Framework. Egyptian Electric Regulatory and Consumer Protection Agency, 2010.

Amr M.Abdel Kader, and S.M Abdel Rassoul. "Prospects of Water Conservation In Egypt (Special Reference to Wastewater Reuse)." Fourteenth International Water Technology Conference. Cairo, 2010.

Arab Forum for Environment and Development. "Arab Environment Survival Options: Ecological Footprint of Arab Countries." 2012.

Aref, Amr. Difficult Oil. Egypt Business Today, March 2013.

Attaher S.M., El Gindy A., Medany M.A. Feasibility of some adaptation meas ures of on- farm irrigation in Egypt under water scarcity conditions. CIHEAM, 2010.

Ayad, Samir S. "Solar Energy in Egypt: Advantages and Obstacles." 2010.

Bakr, Thoraia Abou. "History repeats itself and wheat." Daily News Egypt. May 2013. http://www.dailynewsegypt.com/2013/05/19/op-ed-review-history-repeats-itself-and-wheat/.

Bank Audi. "Egypt Economic Report: In the Midst of Fiscal Challenges and Monetary Concerns." March 2013.

Concord International Investments. "Egypt Country Profile." 2012.

Cortas, Dr Adel. Agribusiness and Agro-Industrial Strategies, Policies and Priorities for Achieving Pro-Poor Economic Growth in the MENA Region. FAO, February 2012.

EcoConServ Environmental Solutions. Skills for Green Jobs in Egypt. ILO, 2010.

EcoConServ Environmental Solutions. Up Stream Poverty and Social Impact Analysis (PSIA) for Egypt's Solid Waste Management Reform. THE MINISTRY OF LOCAL DEVELOPMENT,UNDP and World Bank, 2010.

Egypt Independent. Egypt finalizing plan to raise gas export prices. Cairo, January 3rd , 2013.

Egypt Independnet. Turning to gas imports will weigh on Egypt's budget. Cairo, 12 27th , 2012.

Egyptian Cabinet Informaiton and Decision Support Centre. "Status of Electricity in Egypt." 2012.

Egyptian Cabinet Information and Decision Support Centre. "Economic and Social Conditions of Egyptian Families after the Revolution." 2012.

Egyptian Cabinet Information and Decision Support Centre. "Status of Waste in Egypt and Possible Solutions." 2012.

Egyptian Cabinet Information and Decision Support Centre. "The Actual Public Expenditure in Egypt." 2012.

Egyptian Cabinet Information and Decision Support, Centre. "Status of Pollution in Egyptian." 2012.

Egyptian Cabinet Information and Decision Support, Centre. "The Subsidy System in Egypt." 2012.

Egyptian Ministry of Finance. "The Financial Monthly". May 2013.

Egyptian National Competitiveness Council. "A sustainable Competitiveness Strategy for Egypt." 2012.

Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environmental. "Impact of Energy Demand on Egypt's Oil and Natural Gas Reserves." 2010.

El Hamaki, Dr Youmn. Green Economy and Human Capacity Building. Egyptian Forum for Sustainable Development, 2012.

El-Din, Dr Mohamed M Nour. Proposed Climate Change Adaptation Strategy for the Ministry of Water Resources & Irrigation in Egypt. Cairo: Ministry of Water Resources and Irrigation, 2013.

El-Gindy, Dr Abdel-Ghany .M. Sustainable Use Of Agricultural Resources Program . Ministry of Agriculture and Land Reclamation, 2011.

Ellis, Karen. Green Growth Opportunities and Requirements in Egypt.GIZ, 2012.

Energy Sector Management. "Public Procurement of Energy Efficient Products Assistance Program." 2010.

Environics. Prospects of the Renewable Energy Sector in Egypt:Focus on Photovoltaics and Wind Energy. Egyptian-German Private Sector, 2010.

European Bank for Reconstruction and Development. "Egypt Country Assesment." 2012.

Export Finance and Insurance Corporation. Egypt Country Profile. Australian Government, November 2012.

Farouh, Dr Hend. A Greener Cairo - Visions & Realities. Cairo Climate Talks, 2012.

Farouk, Eng. Ihab. "Egyptian Renewable Energy Activities and Strategy ." 2013.

FDI Intellegence. "The FDI Report 2012." 2012.

Gaber, Dr Ahmed. "Green Municipal Solid Waste Management." Green Economy Egypt Workshop. 2013.

GAFI. "Invest in Egypt:Renewable Energy." 2012.

Georgy, Eng. Rafik Youssef, and Dr Adel Tawfik Soliman. Energy Effeciency and Renewable Energy Egypt National. Plan Bleu, 2007.

Gismatullin, Eduard. "Egypt Importing Gas for First Time as Exports." Bloomberg, December 2012.

GmbH, Internationale Zusammenarbeit (GIZ). "Recovering resources, creating opportunities: Integrating the informal sector into solid waste management." 2011.

Goodland, Robert, The Urgent Transition to Environmental Sustainability, Libya, 2013

H.K.Soussa. Effects of Drip Irrigation Water Amount on Crop Yield, Productivity and Efficiency of Water Use in Desert Regions in Egypt. Nile Basin Water Science& Engineering Journal, 2010.

HAKIM, Mme Tahani ABDEL. Agricultural And Rural Development National Study Egypt. Plan Bleu, 2008.

Hall, Andy, and Kumuda Dorai. The Greening of Agriculture:Agricultural Innovation and Sustainable Growth. OECD Synthesis Report on Agriculture and Green Growth, 2011, 2010.

Handoussa, Heba. Situation Analysis:Key Development Challanges Facing Egypt. UNDP, 2010.

Harrigan, Jane. Economic Brief: The Political Economy of Food Security in North African. African Development Bank, 2012.

Hassan R. El Ramady Samia M. El-Marsafawy, and Lowell N. Lewis. Sustainable Agriculture and Climate Changes in Egypt. Sustainable Agriculture Reviews,Dordrecht, 2013.

Hebat Allah El Deken, Noran Farag, and Noha Hamdy. Does Non-Renewable Energy Utilization in Egypt Generate Net Gain or Net Loss. The Economic Research Forum, 2011.

Hegazi, Dr Anhar. "Green Economy: Energy Issues." Green Economy Workshop Egypt. CEDARE, 2013.

Hussein Abaza at el. Green Economy: Sustainable Transition in a Changing Arab World. Arab Forum for Environment and Development, 2011.

Hussein Abaza, Najib Saab, and Bachar Zaitoon. Arab Environment Green Economy:Sustainable Transition in a Changing Arab World. Arab Forum for Environment and Development.

Hussien, Eng Salma. Renewable Energy 20-20 Strategy Plan. Egyptian Electric Regulatory and Consumer Protection Agency, 2011.

IEA. "CO_2 Emmisions from Fuel Combustion:Highlights." 2012.

IFAD. "Enabling the Rural Poor to Overcome Poverty in Egypt." 2012.

ILO. "Skills for Green Jobs: A Global View." 2011.

IMF. "Middle East and North Africa:Economic Outlook and Key Challenges." Deauville Partnership Ministerial Meeting. Washington, DC, April 2012.

IMF. World Economic Outlook: Hopes, Realities and Risk. World Economic and Financial Surveys, April 2013.

International Energy Agency. "World Key Energy Statistics ." 2012.

Justin McCurry, Japan earmarks 300m+for Fukushima cleanup. The Guardian 4 September 2013.

Kaupp, Albrecht. DESERTEC – Energy from the Desert Opportunities for Egypt. Cairo Climate Talks, 2012.

Kinninmont, Jane. 'Bread, Dignity, and Social Justice':The Political Economy of Egypt's Transition. CHATHAM House, April 2012.

Lixia He, Wallace Tyner, and Gamal Siam Siam. "Improving Irrigation Water Allocation Efficiency:Using Alternative Policy Options in Egypt." American Agricultural Economics Association Annual Meeting. Denver, Colorado, 2004.

Maxime Goualin, The Nuclear Debate: Nuclear Power energy vs Renewable Energy Sources. March 24, 2011.

Mervat Doss & Milne Grant. "Water as an Economic Good: An Approach to the Egyptian Economy." 2001.

Ministry of Agriculture and Land Reclamation . "Sustainable Agricultural Strategy 2030." 2009.

Ministry of Finance. "Financial Statement of State's General Budget." Cairo, 2012/2013.

Moawad, Dr Ahmed. Achieving the MDGs for Water and Sanitation Sector in Egypt. Egyptian Holding Company for Water and Wastewater, Technical Support and Planning Sector, 2011.

Moawad, Dr Ahmed. Unconventional Water Resources in Egypt. Egyptian Holding Company for Water and Wastewater, 2012.

Moawad, Dr Ahmed. Water Utilities Reform in the Arab Region: Water and Sanitation Sector Reform In Egypt. Arab Countries Water Utilities Association (ACWUA), 2011.

Modak, Prasad. Integrated Solid Waste Management towards Green Economy. India: Environmental Management Centre, 2010.

Moneim, Mostafa Abdel. "Integrated Solar Combined Cycle of Kuraymat." 2010.

MWRI, National Water Resources Plan 2017, 2005.

New & Renewable Energy Authority (NREA). Annual Report. State Ministry of Environment , 2011.

Prime Minister Cabinet, Information and Decision Making Centre. "Waste Problem in Egypt: Realities and Solutions." 2012.

Regional Centre for Renewable Energy and Energy Efficiency. "Egypt Energy Efficiency Country Profile." 2012.

Regional Centre for Renewable Energy and Energy Efficiency. "Egypt Renewable Energy Country Profile." 2012.

Reuters. “Farmers say Egypt’s wheat crop hopes are ‘a dream’ .” Egypt Independent. September 2013. http://www.egyptindependent.com/news/farmers-say-egypt-s-wheat-crop-hopes-are-dream.

Riad, Maggie. The Energy Market in Egypt . Tri Ocean Carbon and Renewables , 2009.

Saif, Ibrahim. Challenges of Egypt’s Economic Transition. Carnegie Middle East Centre, 2011.

Salmawy, Dr Hafez A. El. “Status of Energy Efficiency in Egypt and Its Regulatory Framework.” 2010.

Samuela Bassi and E. Nada. “Analysis forEuropean Neighbourhood Policy (ENP) Countries and the Russian Federation on social and economic benefits of enhanced environmental protection - Arab Republic of Egypt Country Report.” 2011.

Santiago Herrera and Hoda Youssef. Macroeconomic Shocks and Banking Sector Developments in Egypt. The World Bank,Middle East and North Africa Region,Poverty Reduction & Economic Management Department, January 2013.

Sena, Ali Abo. “Towards Integrated Solid Waste Managment in Small Cities.” 2011.

Shafi, Hussein Abdel. Short Notes on Water and Wastewater in Egypt. National Research Institute , 2012.

Shalaby, M. Y. “Threats and Challenges to Sustainable Agriculture and Rural development in Egypt: Implications for Agricultural Extension.” The Journal of Animal & Plant Sciences, 2011.

Shelaby, Enas E. Sadek and Ayman A. Organic Agriculture in Egypt: Production Economics and Challenges (A Case Study of Fayoum Governorate). Journal of American Science, 2011.

Sherif, Dr Hisham. Municipal Solid Waste Treatment & Disposal Projects in Egypt. ENTAG, 2013.

Sherif, Dr Hisham. Municipal Solid Waste Treatment and Disposal Projects in Egypt Regional Challanges and Opportunties. ENTAG, 2012.

Sobki, Mohamed Salah EL. “Wind Energy in Egypt.” 2010.

State Ministry for Environmental Affairs. “National Environmental Action Plan of Egypt:2012/2017.” 2001.

State Ministry for the Environment. “Egypt’s Status of the Environment.” 2010.

Stevens, Candice. “Agriculture and Green Growth.” 2012.

Sun, Wind and Energy Magazine. “Wind Energy Egypt.” 2012.

Sünnen, Rainer. “Clean Development Mechanism in Egypt: Project Example Zafarana.” 2010.

SWEEP Net. “Country Profile on the Solid Waste Management Situation in Egypt.” 2012.

SweepNet. Country Report on The Solid Waste Management Egypt. SWEEP Net, July 2010.

Sweg, Elsewedy for Wind Energy Generation. “A Local Manufacturer’s Experience In Establishing Production Capacities.” Trena Expert Dialogue. 2009.

Tashima, Robert. “Power Shortage.” Egypt Business Today (Egypt Business Today), February 2012.

Tashima, Robert. Keeping Pace with Robust Demand. Egypt Business Today, April 2013.

The Egyptian Centre for Economic Study. “Egypt’s Economic Profile and Statistics.” 2011.

The Egyptian Green Building Council. The Green Pyramid Rating System. Ministry of Housing, Utilities and Urban Development, 2011.

The International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), “Agricultural Observatory: Egypt .” 2012.

The Met Office Hadley Centre. “Climate: Observations,Projections and Impacts.” 2010.

The World Bank and the International Finance Corporation. “Doing Business 2013: Egypt Profile.” 2013.

UN News Centre. “Hunger, poverty rates in Egypt up sharply over past three years – UN report.” May 2013.

UNCTAD. “Best Practices of Organic Policy.” 2008.

UNEP. “Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.” 2011.

US Energy Information Administration. “Egypt Country Analysis.” July 2012,2013.

Vidican, Georgeta. Building Domestic Capabilities in Renewable Energy: A Case Study of Egypt. German Development Institue , 2012.

Wagdy, Ahmad. “Progress in Water Resources

Management: Egypt." Technical Meeting of Muslim Water Researchers Cooperation (MUWAREC). 2008.

Wahaab, Dr Rifaat Abdel. Wastewater Reuse in Egypt: Opportunities and Challenges. Holding Company for Water & Wastewater (HCWW) & Ministry of Water Resources & Irrigation (MWRI), 2011.

Wahbi, Dr Hassan. Situation of the Water Sector in Egypt. Arabic Water Forum, National Water Research Centre , 2011.

Wamda. "Understanding the Economy: Macroeconomic Indicators." 2012.

Wastewater, Holding Company for Water and. Egypt National Rural Sanitation Strategy. Ministry of Water Resources and Irrigation, 2008.

WFP, and Egyptian Cabinet Information and Decision Support Centre. "Egyptian Food Observatory Quarterly Bulletin." February 2012.

WFP, and Egyptian Cabinet's Information and Decision Support. "Egyptian Food Observatory Quarterly Bulletin." March 2013.

Yassin, Dr Anhar Higazi & Dr Ibrahim. "Towards a More Sustainable Energy Economy." 2013.

Yehya, Sherif. "Macroeconomic Prospects, Egypt." Egypt: Thai Trade Centre, 2013.

Yousef, Reham Mohamed and Mostafa Lotfy Sakr. "Desalination Technology Roadmap 2030." 2007.

Zayani, Amin. Solid Waste Management:Overview and current state in Egypt. *Tri Ocean Carbon*, February 2010.

NOTES

[1] Central Bank of Egypt Statistics,2013 and IMF (2014) http://www.imf.org/external/np/sta/ir/IRProcessWeb/data/egy/eng/curegy.htm

[2] IMF World Outlook Report April 2013, Egyptian Ministry of Finance Bulletin, May 2013

[3] Ibid.

[4] For more detailed information about the Green Economy Initiative by UNEP visit: http://www.unep.org/greeneconomy

[5] Challenges for each sector have been identified and discussed through expert consultations, study launching workshop and existing reports mentioned in the references.

[6] Ministry of Finance Statistical Bulletin, May 2013

[7] Measurement of Volume in Cubic Meters

[8] Ahmed Magdy, Progress in Water Resources Management: Egypt, 2008

[9] Petroleum subsidies increased from 40 billion of Egyptian Pounds (LE) (equivalent to about US$ 7.2 billion) in 2005/2006 fiscal year (FY) to EGP 68 billion (equivalent to US$11.9 billion) in the 2009/2010 FY. See Castel, Vincent (2012) "Reforming Energy Subsidies in Egypt". AfDB Chief Economist Complex. March 2012.

[10] SWEEP Net, Country Profile on the Solid Waste Management Situation in Egypt, 2010

[11] Ibid.

[12] UNEP, 2010.

[13] SWOT is as an assessment tool meant to evaluate positive and negative factors that impact strategic planning and decision-making for identified green interventions per sector.

[14] Mentioned Macroeconomic analysis is built on expert feedback, international reports, academic papers, country and official reports and author own input to present an accurate and realistic portrait of Egypt's current economic status. All graphs in this section are adapted from the Monthly Statistical Publication of The Ministry of Finance, May 2013.

[15] The fiscal deficit reduced from 13.7 per cent of GDP in 2012 to 11.5 per cent of GDP in 2013 according to IMF projections. See Arab Countries in Transition: An Update on Economic Outlook and Key Challenges. April 9th 2014.

[16] IMF (2014). World Economy Outlook. April 2014.

[17] The Monthly Statistical Publication of The Ministry Of Finance, May 2013 and Financial Statement of State's General Budget for Fiscal year, 2012/2013

[18] IMF World Outlook, April 2013

[19] Balance of Traded Goods by definition is the difference in value over a period of time of a country's imports and exports of merchandise

[20] The Monthly Statistical Publication of The Ministry Of Finance, May 2013 and Financial Statement of State's General Budget for Fiscal year, 2012/2013

[21] Ibid.

[22] Ibid.

[23] Ibid. and IMF (2014) http://www.imf.org/external/np/sta/ir/IRProcessWeb/data/egy/eng/curegy.htm

[24] Ibid.

[25] Ibid.

[26] WFP & IDSC, Egyptian Food Observatory, March 2013

[27] The Monthly Statistical Publication of The Ministry Of Finance, May 2013 and Financial Statement of State's General Budget for Fiscal year, 2012/2013

[28] Ibid.

[29] Herrera et al, Macroeconomic Shocks and Banking Sector Developments in Egypt, World Bank, January 2013

[30] The Monthly Statistical Publication of The Ministry Of Finance, May 2013 and Financial Statement of State's General Budget for Fiscal year, 2012/2013

[31] Ibid.

[32] Ibid.

[33] Ibid.

[34] Ibid.

[35] Ibid.

[36] Ibid.

[37] Doing Business Report, Egypt Profile, 2013

[38] Information presented in this environmental profile is based on expert consultations, author's input and international and local reports mentioned in the references.

[39] Egypt Country Profile, Concord International Investments, 2012

[40] Ibid.

[41] Adapted from FAO statistical database. Data also available at the EEAA website

[42] Dr Rifaat Abdel Wahaab, Wastewater Reuse in Egypt: Opportunities and Challenges, 2011

[43] Egypt Country Profile, Concord International Investments, 2012

[44] UNU-IHDP and UNEP (2012). Inclusive Wealth Report 2012.
Measuring progress toward sustainability. Cambridge: Cambridge University Press.

[45] A great deal of work has gone into the development of methodologies for green or environmental accounting or what is referred to by the United Nations Division of Economic and Social as the System of Environmental-Economic Accounting.

[46] World Development Indicators, 2014.

[47] Billion Cubic Meters.

[48] Average expert estimations.

[49] Dr Ahmed Moawad, Unconventional Water Resources in Egypt, 2011.

[50] Financial Statement of State's General Budget for Fiscal year, 2012/2013.

[51] Ibid.

[52] Global Hectares is the unit used to measure the ecological footprint

[53] Ecological footprint is a measure of human demand on the Earth's ecosystems.

[54] AFED, Survival Options: Ecological Footprint of Arab Countries, 2012.

[55] The supply of resources from a given area of biologically productive land or sea.

[56] Ibid.

[57] It has increased more than 1,176 per cent since 1960. See Figure 10.

58 IDSC, State of Pollution in Egypt Report,2012

[59] AFED, Survival Options: Ecological Footprint of Arab Countries, 2012

[60] Adapted from IDSC, State of Pollution in Egypt Report, 2012.

[61] African development Bank, Egypt 2012-2013 Interim Strategy Paper.

[62] Ibid.

[63] Adapted from IDSC, Public Spending Report, 2012

[64] Conservative estimates of Egypt Population Council

[65] WFP & IDSC, Egyptian Food Observatory, March 2013

[66] Expenditure of subsidized ration goods went from 1.44 billion EGP in 1990/91 to 1.2 billion EGP in 2000/01. However, under international increases in prices the government expenditure has increased in 2009/10 to 3.8 billion LE. See Ghoneim, Hebatallah (2013). Ration Cards in Egypt Targeting, Leakage, and Costs. Working Paper No. 36. Germany University in Cairo.

[67] Ibid.

[68] Adapted from IDSC, State of Public Expenditure Report, 2012

[69] Dr Ahmed Moawad, Achieving the MDGs for Water and Sanitation Sectors in Egypt, 2011. Considered as conservative estimates

[70] African development Bank, Egypt 2012-2013 Interim Strategy Paper

[71] IMF World Economic Outlook, April 2013

[72] Adapted from The Monthly Statistical Publication of The Ministry Of Finance, May 2013

[73] World Bank Statistical Database,2013 and African development Bank, Egypt 2012-2013 Interim Strategy Paper

[74] A measurement of the income distribution of a country's residents

[75] WFP & IDSC, Egyptian Food Observatory, March 2013

[76] Adapted from IDSC, Public Spending Report, 2012

[77] The Monthly Statistical Publication of The Ministry Of Finance, May 2013 and Financial Statement of State's General Budget for Fiscal year, 2012/2013

[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] Ibid. This pattern is in contrast with the evolution of GDP per capita (2011 PPP), which increase 20 per cent from 8,560 in 2005 to 10,685 in 2012. See World Development Indicators 2014.

[82] Ibid.

[83] It is a comprehensive long term vision and strategy framework designed by the Government at the time for development and economic prosperity. African development Bank, Egypt 2012-2013 Interim Strategy Paper

[84] See Table 1 for more details about 'Vision 2022'

[85] African development Bank, Egypt 2012-2013 Interim Strategy Paper

[86] Ibid.

[89] Maxime Goualin, The Nuclear Debate: Nuclear Power energy vs. Renewable Energy Sources, March 24, 2011

[90] Justin McCurry, Japan earmarks 300m+for Fukushima cleanup, The Guardian 4 September 2013

[91] Central Bank of Egypt Statistical Bulletin 2013

[92] CIHEAM, Agricultural Observatory, 2013

[93] Information provided for this sector is based on expert consultations and reports and paper that discuss the discourse of the sector in addition to the author's own feedback

[94] Ibid.

[95] Ibid.

[96] Ibid.

[97] African development Bank, Egypt 2012-2013 Interim Strategy Paper

[98] WFP & IDSC, Egyptian Food Observatory, February 2012 100 Grains used for food, such as wheat, oats, or corn and grown as an agricultural crop

[100] WFP & IDSC, Egyptian Food Observatory, March 2013

[101] El-Ramady et.al, Sustainable Agriculture and Climate Change in Egypt, 2013

[102] FAO, Egypt Country Profile, 2013

[103] Expert estimations

[104] Expert estimations and projections

[105] "Climate Change Risk Management in Egypt" USAID project

[106] El Miniawy A., Gouell A. Food and agricultural policies in Egypt, CIHEAM Institute,1994

[107] Feddan is a unit of area used in Egypt, Sudan, and Syria. It is equivalent to 1.038 acres (0.42 ha)

[108] Shalaby et al, Threats and Challenges to Sustainable Agriculture and Rural Development In Egypt: Implications for Agricultural Extension, 2011

[109] Abdel Hakim T., Abou -Mandour M. Egyptian agriculture: Its characteristics, historical development and current challenges, CIHEAM Institute,1995

[110] El-Ramady et al., Sustainable Agriculture and Climate Change in Egypt, 2013

[111] Dr Abdel-Ghany M. El-Gindy, Sustainable Use of Agricultural Resources Programme, 2011

[112] Information in the section is based on expert consultations, study launching workshop and reports mentioned in the references section

[113] Information in this section is based on interviews, experts' feedback, expert presentations and consultations

[114] Helmy Abouleish, Organic agriculture and food Utilisation - "an Egyptian case study", 2011

[118] CIHEAM, Agricultural Observatory, 2013

[120] SNC, Second National Communication, 2011

[121] National Solid Waste Management Programme Egypt, Main Report, December 2011

[122] EGP 400 price per tonne of compost

[123] Helmy Abouleish, Organic agriculture and food Utilisation - "an Egyptian case study" 2011

[124] Ibid.

[125] Expert Estimations

[126] Billion Cubic Meter

[127] Doss et el., Water As An Economic Good: An Approach To The Egyptian Economy, 2011

[128] Arab Forum for Environment and Development, Green Economy: Sustainable Transition in a Changing Arab World, 2011

[129] The science of cultivating fruits, vegetables, flowers, or ornamental plants

[130] It is the sum of evaporation and plant transpiration from land surface to atmosphere.

[131] Per Cubic Meter of Water

[132] Professor Dr Ayman F. Abou–Hadid, High Value Products for Smallholder Markets in West Asia and North Africa – trends, opportunities and research priorities, 2006

[133] Ibid.

[134] Robert Goodland, The Urgent Transition to Environmental Sustainability, Libya, 2013

[135] Information adapted from Mr. Philipp Maximilian Abouleish-Boes sustainable development manager of SEKEM Holding

[136] H. K. Soussa, Effects of Drip Irrigation Water Amount on Crop Yield, Productivity and Efficiency of Water Use in Desert Regions in Egypt, 2010

[137] Ibid.

[138] Cubic Meter of Water per Feddan

[139] Ibid.

[140] Billion Cubic Meter.

[141] Expert Estimations.

[142] Based on the average of international and national wheat production forecasts and annual consecutive

production. This average figure increases or decreases annually due to production conditions and seasonality

[143] Average Wheat production in Egypt is estimated at 15 erdab/ feddan. 1 erdab= 0.165 tonnes

[144] Estimated local price per erdab is 380 LE

[145] Egypt Independent, Farmers say Egypt's wheat crop hopes are 'a dream', September 2013

[146] Calculation is based on local government asking prices to purchase wheat from small holders mainly

[147] Ibid.

[148] UNEP, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, 2011

[149] World Bank Statistics Database 2013

[150] The Economist, 22nd September 2013

[151] Outcome is based on expert and author analysis and feedback

[152] Suggested sector specific enabling conditions are based on expert and author analysis and feedback

[153] Information and analysis mentioned in this section is based on expert consultations, study launching workshop, author's input in addition to international and local reports mentioned in the references section

[154] Dr Ahmed Moawad, Unconventional Water Resources in Egypt, 2011

[155] Shalaby et al., Threats And Challenges To Sustainable Agriculture And Rural Development In Egypt: Implications For Agricultural Extension,2010

[156] Ibid.

[157] Dr Ahmed Moawad, Unconventional Water Resources in Egypt, 2011

[158] Meter Cube of Water per Capita

[159] Ahmad WAGDY, Progress in Water Resources Management: Egypt, 2008

[160] Dr Abdel-Ghany .M. El-Gindy, Sustainable Use of Agricultural Resources Programme, 2011

[161] Dr Ahmed Moawad, Unconventional Water Resources in Egypt, 2011

[162] Tahani Abdel Hakim, Agricultural and Rural Development National Study Egypt, 2008

[163] Mohamed Nasr Allam, Water Resources In Egypt: Future Challenges and Opportunities, 2007

[164] Megawatts

[165] CEDARE, 2013

[166] Data and information mentioned in this section is based on expert consultations and feedback, in addition to international and local reports mentioned in the references section

[167] Estimates based on international studies and expert feedback

[168] Experts estimate the range of domestic water demand between 6 to 9 billion annually

[169] Based on current corn production supply, GAFI, 2012

[170] Ibid.

[171] Estimates based on international studies and expert feedback. 80 Billion m^3 is the annual estimated water demand for the country

[172] Dr Khaled Abu Zeid, Water and Green Economy, 2013

[173] Dr Rifaat Abdel Wahab, Wastewater Reuse In Egypt: Opportunities and Challenges, 2012

[174] Ibid.

[175] Expert Estimations

[176] Egyptian Pound per cubic meter of water

[177] Ibid.

[178] Dr Khaled AbuZeid, Water and Green Economy, 2013

[179] Doss at el, Water as an Economic Good: An approach to the Egyptian Economy,2001

[180] Expert estimations

[181] Dr Ahmed Moawad, Unconventional Water Resources in Egypt, 2011

[182] Ibid.

[183] Robert Goodland, The Urgent Transition to Environmental Sustainability, Libya, 2013

[184] Outcome is based on expert and author analysis and feedback

[185] Suggested sector specific enabling conditions are based on expert and author analysis and feedback

[186] Information and analysis mentioned in this section is based on expert consultations, study launching workshop, author's input in addition to international and local reports mentioned in the references section

[187] Dr Anhar Hegazi, Energy sector and Green Economy, 2013

[188] Expert estimations

[189] Dr Anhar Hegazi, Energy sector and Green Economy, 2013

[190] Eng. Ihab Farouk, Egyptian Renewable Energy

[191] IDSC, Public Spending, 2012

[192] Ibid.

[193] Ibid.

[194] Million tonnes of Oil Equivalent

[195] Energy Information Administration USA, Egypt Energy Data, 2011

[196] Barrels per day

[197] Ibid.

[198] Dr Anhar Hegazi, Energy Sector and Green Economy, 2013

[199] British Thermal Units

[200] Egypt Independent, 2012 & 2013

[201] Kilowatt hour

[202] NREA Annual Report, 2011/2012

[203] IDSC, State of Pollution in Egypt Report, 2012

[204] Ibid.

[205] Ibid.

[206] Kilowatt hour per meter square

[207] Mustafa Abdel Moneim, Integrated Solar Combined Cycle of Kuraymat, 2011

[208] Hour per day

[209] Ibid.

[210] Essam Hassan M. Ahmed, Renewable Energy for Sustainable Development, 2010

[211] Meter per second

[212] Megawatts

[213] Ibid.

[214] Gigawatt

[215] Karen Ellis, Green Growth Opportunities and Requirements in Egypt GIZ, 2012

[216] Robert Goodland, The Urgent Transition to Environmental Sustainability, Libya, 2013

[217] Ibid.

[218] Data and information mentioned in this section is based on expert consultations and feedback, in addition to international and local reports mentioned in the references section

[219] Elsewedy for Wind Energy Generation – SWEG, TERNA Expert Dialogue, 2009

[220] Mr Albrecht Kaupp, DESERTEC – Energy from the Desert Opportunities for Egypt, 2012

[221] Mustafa Abdel Moneim, Integrated Solar Combined Cycle of Kuraymat, 2011

[222] Gigawatt Hour

[223] Tonnes of Oil Equivalent

[224] Rainer Sünnen, Clean Development Mechanism in Egypt Project, Example Zafarana, 2010

[225] Price per Megawatt per hour

[226] Rainer Sünnen, Clean Development Mechanism in Egypt Project, Example Zafarana, 2010

[227] Certified Emissions Reductions

[228] The ratio of the amount of input energy contributed by a solar energy system to the total input energy required for a specific application.

[229] Samir S. Ayad, Solar Energy in Egypt Advantages and Obstacles

[230] Ibid.

[231] Dr Anhar Hegazi & Dr Ibrahim Yassin, Towards a More Sustainable Energy Economy, 2013

[232] Ibid.

[233] Calculation based on Egypt's total emissions due to oil reached 89.5 million tonnes of CO_2 in 2010. CO_2 Emissions from Fuel Combustion, IEA report, 2012

[234] Calculation based on IMF findings that phasing out energy subsidies globally could lead to an average 13 per cent decreased of emissions. Energy Subsidy Reform: Lessons and Implications, IMF, 2013

[235] Skills and Occupational Needs in Renewable Energy, ILO 2011

[236] Green Economy, UNEP. 2011

[237] Outcome is based on expert and author analysis and feedback

[238] Suggested sector specific enabling conditions are based on expert and author analysis and feedback

[239] Information and analysis mentioned in this section is based on expert consultations, study launching workshop, author's input in addition to international and local reports mentioned in references

[240] IDSC, State of Waste in Egypt, 2012

[241] SWEEP Net, Country Profile on the Solid Waste Management Situation in Egypt, 2010

[242] Samuela Bassi, Egypt Country Report, 2011

[243] SWEEP Net, Country Profile on the Solid Waste Management Situation in Egypt, 2010

[244] Expert estimations

[245] SWEEP Net, Country Profile on the Solid Waste Management Situation in Egypt, 2010

[246] Ibid.

[247] SWEEP Net, Country Profile on the Solid Waste Management Situation in Egypt, 2010

[248] Ibid.

[249] IDSC, State of Waste in Egypt,2012

[250] SWEEP Net, Country Profile on the Solid Waste Management Situation in Egypt, 2010

[251] Data and information mentioned in this section is based on expert consultations and feedback, in addition to international and local reports mentioned in the references section

[252] Dr Ahmed Gaber, Green Municipal Solid Waste Management, 2011

[253] Ibid.

[254] Expert Estimations

[255] Adapted from Expert estimations

[256] Ibid.

[257] Ibid.

[258] Egyptian Pound per tonne

[259] Expert Estimations

[260] Ibid.

[261] Tonne per day

[262] Calculations are based on expert feedback

[263] Kilo Calorie

[264] Based on Experts field work and related conducted study

[265]UNEP, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication,2011

[266] Outcome is based on expert and author analysis and feedback

[267] Suggested sector specific enabling conditions are based on expert and author analysis and feedback

[268] Information of case study is adapted from a presentation by Dr Hafez A. El-Salmawy, Status of Energy Efficiency in Egypt and Its Regulatory Framework, 2010

[269] Information adapted from The Egyptian Green Building Council. 2011. The Green Pyramid Rating System. Ministry of Housing, Utilities and Urban Development in addition to a presentation by Dr Hend Farouh, A Greener Cairo - Visions & Realities. Cairo Climate Talks, 2012

[270] China have been a pioneering country in integrating the circular economy concept to ensure that transitioning to a Green Economy is equitable across sectors and gradually change the country's consumption patterns.

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