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for Environmental Affairs
Egyptian Environmental
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Egypt Second National

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**Global Climate Change
Egypt Faces the Challenge**

Contents

- Introduction
- **Key outcomes**
 - GHG inventory
 - Vulnerability and Adaptation
 - Mitigation
 - Crosscutting Issues
- **Key challenges**
- **Lessons learnt and best practices**
- **Next steps**



Introduction: National Circumstances

Egypt Profile

- **Location:** Northern Africa
- **Climate:** desert; hot, dry summers with moderate winters.
- **Population:** 78,882,586 (August 2010 est.)
- **Real growth rate:** 4.5% (2009 est.)
- **Human Development Report 2009:** HDI rankings (123)
- **Poverty gap index was 2.97%,** implying an average poverty deficit of the poor of L.E. 248.



Total Egypt GHG Emissions

- In year 2000 193.267 MtCO₂e
- In year 1990 116.61 MtCO₂e.
- Annual Average increase 5.1%
- Estimated 2008 287.73 MtCO₂e.



Emissions by Gas, year 2000

Gas	CO2e, million ton/year	Percentage Global Warming
CO2	128.22	66%
CH4	39.44	20%
N2O	24.36	13%
PFC	1.08	1%
SF6	0.12	0.06%
Total	193.27	100%

GHG emissions by sector for the year 2000

Sector	Emissions (Mt CO ₂ e)	Emissions (%)
Fuel Combustion	105.5	55%
Fugitive Fuel Emissions	10.8	6%
Agriculture	31.7	16%
Industrial Processes	27.8	14%
Waste	17.5	9%
TOTAL	193.3	100%

Emissions per Capita year 2000 compared with 1990

Year	population, million	emissions, Million ton CO2e	Emissions ton CO2e per Capita	Emissions per capita Ratio (2000/ 1990)%
1990	52.6	116.61	2.22	100%
2000	63.3	193.27	3.05	137%

Emissions per 1000 US\$ year 2000 compared with 1990

Year	GDP Market price, Billion US\$	emissions, Million ton CO2e	Emissions ton CO2e per 1000 US\$	Specific Emission Ratio (2000/ 1990)%
1990	35.16	116.61	3.32	100%
2000	97.47	193.27	1.98	60%

Summary of year 2000 emissions with respect to 1990

- Total GHG emissions **increased by** **65%**
- Population increased by **20%**
- Emissions per capita increased by **37%**
- GDP, US\$ is **increased by** **177%**
- Emissions per 1000 US\$ is **reduced by** **40%**

which implies that more efficient production technologies with less GHG emissions are used



Comparison with World GHG Emissions

- World Emissions in 1990:

29,910 Mt CO₂e

- Egypt share in World Emissions:

0.4%

- World Emissions in 2000:

33,017 Mt CO₂e

- Egypt share in World Emissions:

0.58%



Vulnerability and Adaptation

- Egypt's large and dense packed population makes the country extremely vulnerable to climate change impacts. Egypt does not produce enough food to feed its current population. Its water resources also are rather limited. Moreover, The studies have indicated that the following areas are the most vulnerable in order of severity and certainty of results: coastal zones, agriculture, aqua-culture and fisheries, water resources, human habitat and settlements, and human health.

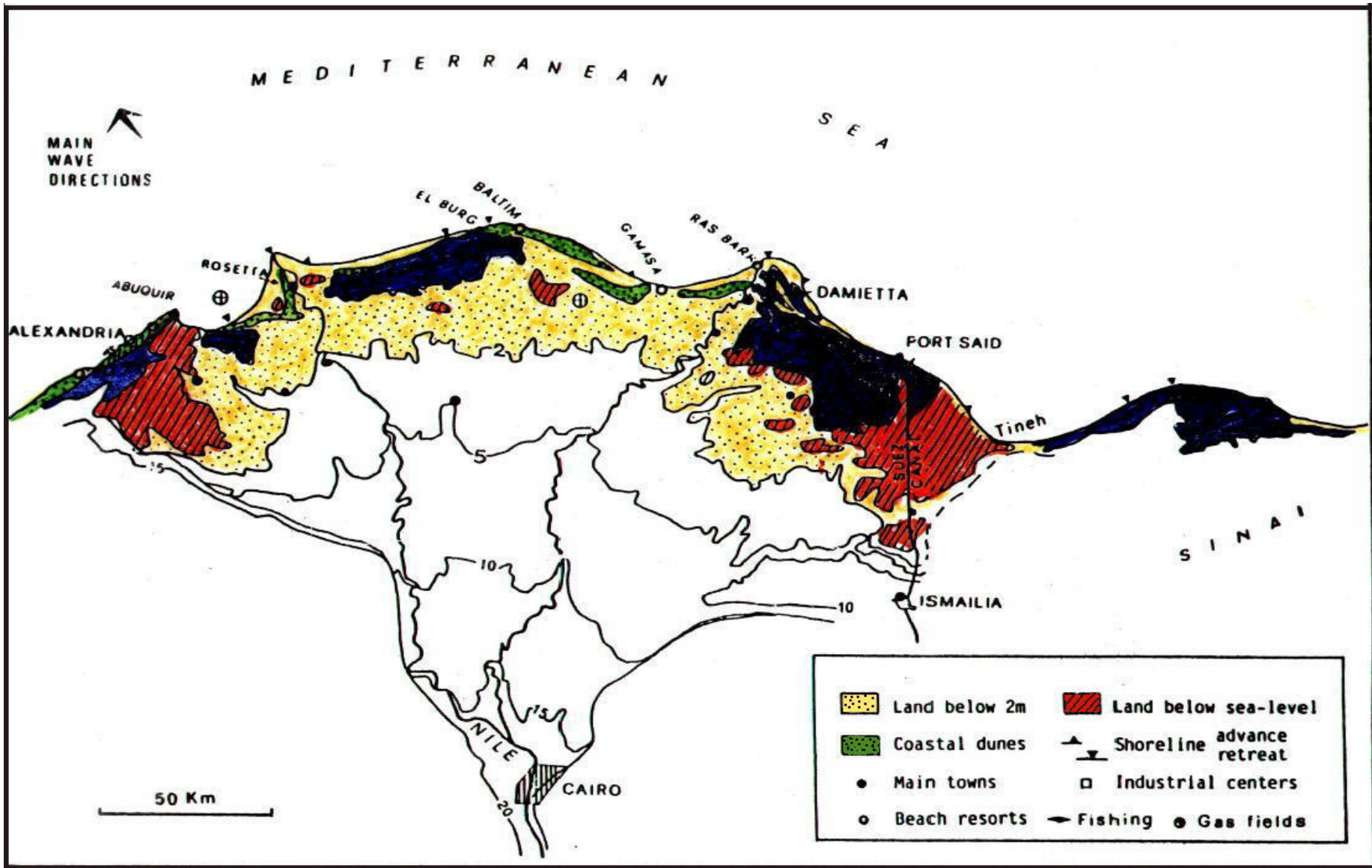


Sea Level Impacts

- Nile Delta region is the **most fertile** land of the country and hosts **most** of the **agricultural productivity** and the **largest** part of the **population** of the country.
- Its **shoreline** has relatively **low elevation** areas. In addition the Delta suffers from **land subsidence** .
- The Nile Delta region is **presently** subject to changes, including **shoreline changes**, due to erosion and accretion, **subsidence** and **sea level rise**



Vulnerability of northern coastal zones due to sea level rise



Aquaculture and Fisheries

- The Egyptian coastal lakes are among the most productive natural systems in Egypt, and they are internationally renowned for their abundant bird life. Moreover, over 25% of all Mediterranean wetlands are situated along the Mediterranean coast of Egypt. The most important coastal lakes are: Lake Mariout, Lake Manzala, Lake Edku, Lake Bourollos, and Lake Bardaweel. Thus, the Egyptian lakes and wetlands serve both as an economic resource for the country, providing it with nearly 65% of its total fish production, and also on an international level, they are valued as being numerous wetlands attractive to migrating birds.



Adaptation Measures and Policies

Beach nourishment and groins: Beach nourishment strategies include depositing sand onto the open beach and beach scraping, building artificial dunes as storm buffers and beach sand reservoirs, and laying pipes underneath the beach to suck in the water and trap sand. Groins trap sand, which covers the beach. This strategy is very cheap compared to other strategies.

Breakwaters: Break-waters are hard structures used to reduce the wave energy reaching the shoreline. This strategy is relatively very expensive. The net benefit of this strategy is only along the coastline, not on the social community or ecosystem. The environmental impact of this strategy is fair, but it is considered to be the best available tool for protection of lowland areas.

Legal Development Regulation: Through taking legal or regulatory actions to restrict development or prohibit development in a hazard-prone area.



Adaptation Measures

Integrated Coastal Zone Management (ICZM): Redirecting growth away from sensitive lands and towards less vulnerable areas is one option to reduce the risks associated with a sea level rise, and also to reduce vulnerability to other problems of the coastal zones. ICZM involves the best possible use of resources under multi-criteria analysis. For example, the ICZM Action Plan for the Egyptian Red Sea sets out a process for determining options and priorities for the use and management of coastal and marine resources along the Egyptian Red Sea coast over the next 5-10 years. The plan provides guidelines and proposes what actions are needed to put tourism and other human uses of the Egyptian Red Sea coast onto a more ecologically and economically sustainable basis.

Land Use Change: The option of change of land use in vulnerable lands is still an open one. The objective is to change to a less vulnerable land use, or to another land use which makes better use of the lowland, such as aquaculture. A slight or moderate SLR may be quite beneficial for development of aquaculture on the coastal areas.



Agriculture

- Decrease in crop productivity due to :
 - Temperature increase
 - Water shortage
 - Land degradation



Proposed Adaptation Measures

Agriculture:

- Developing new cultivars that are more adapted to higher temperatures and Modification of cropping patterns
- Changing certain agricultural practices
- Reducing the area under cultivation with crops (i.e. rice and sugar cane) which consume large amounts of water.
- **Water Management:** Here the first imperative is to improve both the technical water application efficiency and the agronomic water use efficiency.
- **Land Management:** A further set of adaptation measures involves the management of low lying lands on the northern fringe of the Delta.



Water Resources

Vulnerability

- More than 95% of the water budget of Egypt is generated outside its territory. Thus, our priorities for water resources lie in the rainfall changes outside Egypt.
- Several studies indicated that impacts of climate change on River Nile between -3 to +7 %, so that any decrease in the total supply of water, coupled with an expected increase in consumption due to the high population growth rates and the rise in the standards of living, will have drastic impacts.



Water Resources

- We couldn't yet predict the impact of climate change on the Nile Basin, but that there are indications that the impacts will be significant and severe.



Adaptation Measures:

- Adaptation of Supply

- Improvement of Rain Harvesting Techniques
- Increased Abstraction of Groundwater
- Recycling of Water
- Desalination of Water
- Transportation of Water
- Rationalization of Water Use



Adaptation of Demand

- Increase of water use efficiency by utilizing modern systems
- Land leveling
- Enhancing the contribution of shallow underground water abstraction
- Introduction of drought and salt tolerant crops that consume less quantities of irrigation water of low quality
- Raising short age varieties of different crops like wheat, maize, rice and cotton.
- Under severe water shortage conditions the whole cropping pattern can be changed in order to cope with the prevailing circumstances.



Human Health

- Climate change is expected to have both **direct** and **indirect adverse impacts on human health**.
- **Direct impacts** of climate change on human health are perceived to include **physiological disorders**, **skin cancer**, **eye cataracts**, damage to public health infrastructure, **deaths** and injuries, **heat strokes** and heat related phenomena, etc.
- **indirect impacts** are perceived to include factors like demographic dislocations, socio-economic disruptions, ecological system impacts, and **air pollution impacts**.



Human Habitat and Settlements

- As a result of the SLR, there is likely to be a migration of at least two million people from the Delta coastal areas due to the inundation and loss of fertile land. This migration will have its impact on the human habitats and settlements.
- socio-economic impact of this migration in other areas of Egypt need Careful assessment to determine the costs of resettlement, finding new jobs, new habitats, etc.





Strategies, Programs and Policies Containing Measures for Mitigating GHGs Emissions by Key Sectors

CONTENTS

- **Energy Sector**
- **Industrial Sector**
- **Transport Sector**
- **Agriculture Sector**
- **Waste sector**



ENERGY SECTOR

Scenario (1): the Base Case (BAU)

Scenario (2): Mitigation Measures integrated in the Strategy include 5000 MWe Nuclear and 20% Renewables

Scenario (3): Mitigation Measures integrated in the Strategy include 5000 MWe Nuclear, 20% Renewables, in addition to 20% Reduction due to Energy Efficiency Improvement Program



ENERGY SECTOR (Contd.)

Further reductions of GHG emissions up to the year 2027, are **considered**; provided that Technical Assistance for Technology Transfer and funding are available. These actions can include:

- 1.using of lower carbon fuels; (bio-diesel, ...etc.)
- 2.controlling the emissions of GHGs at various sources;
- 3.creating offsets through investment in GHGs emission sinks
- 4.use of the market-based economic instruments



Table-4
Selected Examples of Measures to
abate GHGs Emissions in the **Industrial Sector**

Technical Options	Climate and Other Environmental Effects
New Technologies and Processes	Climate Benefits Savings of CO ₂ emissions / yr Other Additional Effects Reduction in air pollution from coke
Process Improvements	Climate Benefits -Savings of CO ₂ - equivalent/yr Other Effects -N ₂ O and HCFC reduction will protect ozone layer



Selected Examples of Measures to abate GHGs Emissions **in the Industrial Sector**

Technical Options	Climate and Other Environmental Effects
Material Substitution	Climate Benefits -Has to be determined on case by case basis. Other Effects -Reduction in air pollution
Material Recycling/Reuse	Climate Benefits -Savings of carbon emissions proportional to the increase in Recycling percentage. Other Effects -Less solid waste and lower resource use



Transport Sector Opportunities for Mitigation Options

No.	Mitigation / Adaptation Option	Size
1.	Automotive Transport	• Shift to diesel (including bio-diesel) engines. • Introduction of the hybrid car, including the plug-in hybrid electric vehicle (PHEV).
2.	Rail Transport	• Development of urban transport in the cities of & in the form of metros and tramways, and combinations of “light” and “heavy” rail passenger transport.
3.	Freight Transport	• barge freight transport • Rail freight transport (container inland ports).



Transport Sector Opportunities for Mitigation Options (contd.)

No .	Mitigation / Adaptation Option	Size
4.	Power Train Technologies	Power train technologies available today include ICE Petrol (further development of the ICE can improve the fuel efficiency of petrol vehicles by 30% and that of diesel vehicles by around 20%.); ICE Diesel; Compressed Natural Gas (CNG); and Hybrids.
5.	Shifting from Diesel to Electrified Railways	<u>Potential Shifts:</u> •Electrification of – Line around 2020. •Electrification of – Upper Egypt Line (to Assiut then to) around 2030.
6.	Fuel Cells Technology	• Vehicles utilizing fuel cells is anticipated to grow as their economics improve. • Hydrogen generated as by-product in many industry will be used. • More hydrogen could be generated via electrolysis of water using free carbon energy as solar photovoltaics (or wind energy).



AGRICULTURAL SECTOR

Research studies, national and international projects & programs have been implemented :-

a. **Mitigation of GHGs Emissions from Livestock**

b. **Mitigation of CH₄ from Rice Cultivation**

d. **Mainstreaming Mitigation in the National Policies**



Solid Waste and Wastewater Sector

<i>No.</i>	<i>Mitigation Measure</i>	<i>Emission reduction potential (tCO₂e/t MSW)</i>	<i>Investment cost (\$/t MSW)</i>
Solid Waste			
1.	<i>Composting and recycling facilities</i>	0.38	0.92
2.	Refuse Derived Fuel (RDF) with electricity generation only, composting, and recycling	< 0.3	2.07
3.	Refuse Derived Fuel (RDF) with substitution in cement kiln, composting, and recycling facilities	< 0.3	1.97
4.	<i>Anaerobic Digestion with recycling (flaring biogas)</i>	0.342	12.16
5.	<i>Anaerobic Digestion with recycling facilities (with electricity generation)</i>	0.547	16.16



Solid Waste and Wastewater Sector

<i>No.</i>	<i>Mitigation Measure</i>	<i>Emission reduction potential (tCO₂e/t MSW)</i>	<i>Investment cost (\$/t MSW)</i>
	Wastewater		
1.	Wastewater prevention, minimization, and improved collection	0.5	< 0.04
2.	Wastewater reuse and recycle	0.5	< 0.04



Cross cutting issues to address Egypt needs

- Research needs in different sectors
- Modeling needs
- Capacity needs , institutional and to individuals
- Technology transfer for adaptation and mitigation
- Public awareness, educationetc.



Key challenges

- Difficulty to access data and information
- Lack of institutional coordination
- Long period between INC and SNC
- Low number of national experts & institutions

Lessons learnt and best practices:

- Importance of accurate, updated data flow
- Need to continuous training in GHG invent. and V&A
- Adding new areas and updated methodologies in TNC



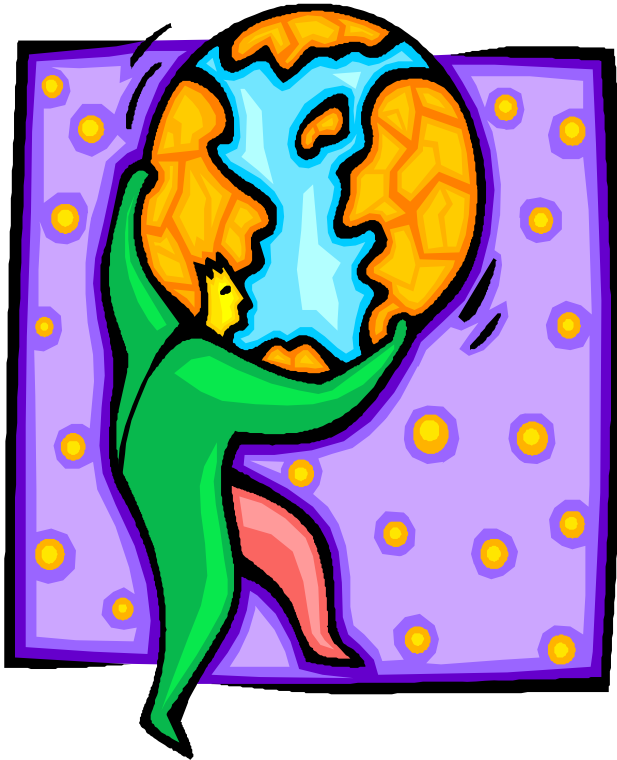
Next steps

- Egypt started TNC in Aug.2011
- Establishing CC data base including NIS
- Conducting Nat.&Int. training programs in NCs
- Being well prepared to eliminate gap between NC
- Increasing ownership of the civil society and stakeholders in preparing TNC& mainstreaming of its results into National Plans



Thank You

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Let's save our planet...