THE AMERICAN UNIVERSITY IN CAIRO | SCHOOL OF SCIENCES AND ENGINEERING

SUSTAINABILITY ISSUES IN EGYPT

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USFS – GLUE REGIONAL STUDY TOUR

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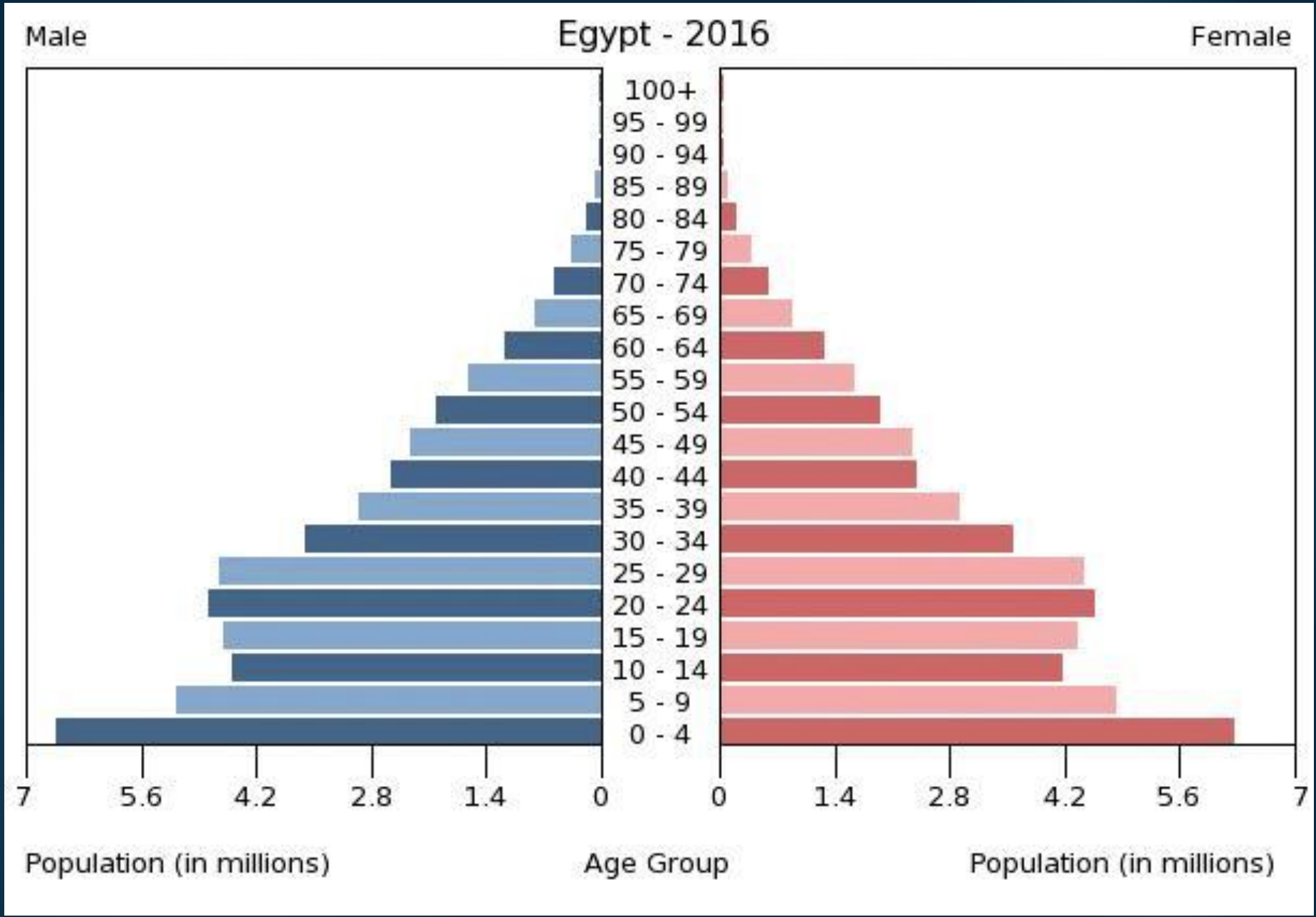
Egypt’s Sustainability Challenges

- Population growth
- Water scarcity
- Food security
- Pollution
- Urbanization, loss of agricultural land
- Climate change

Population Growth

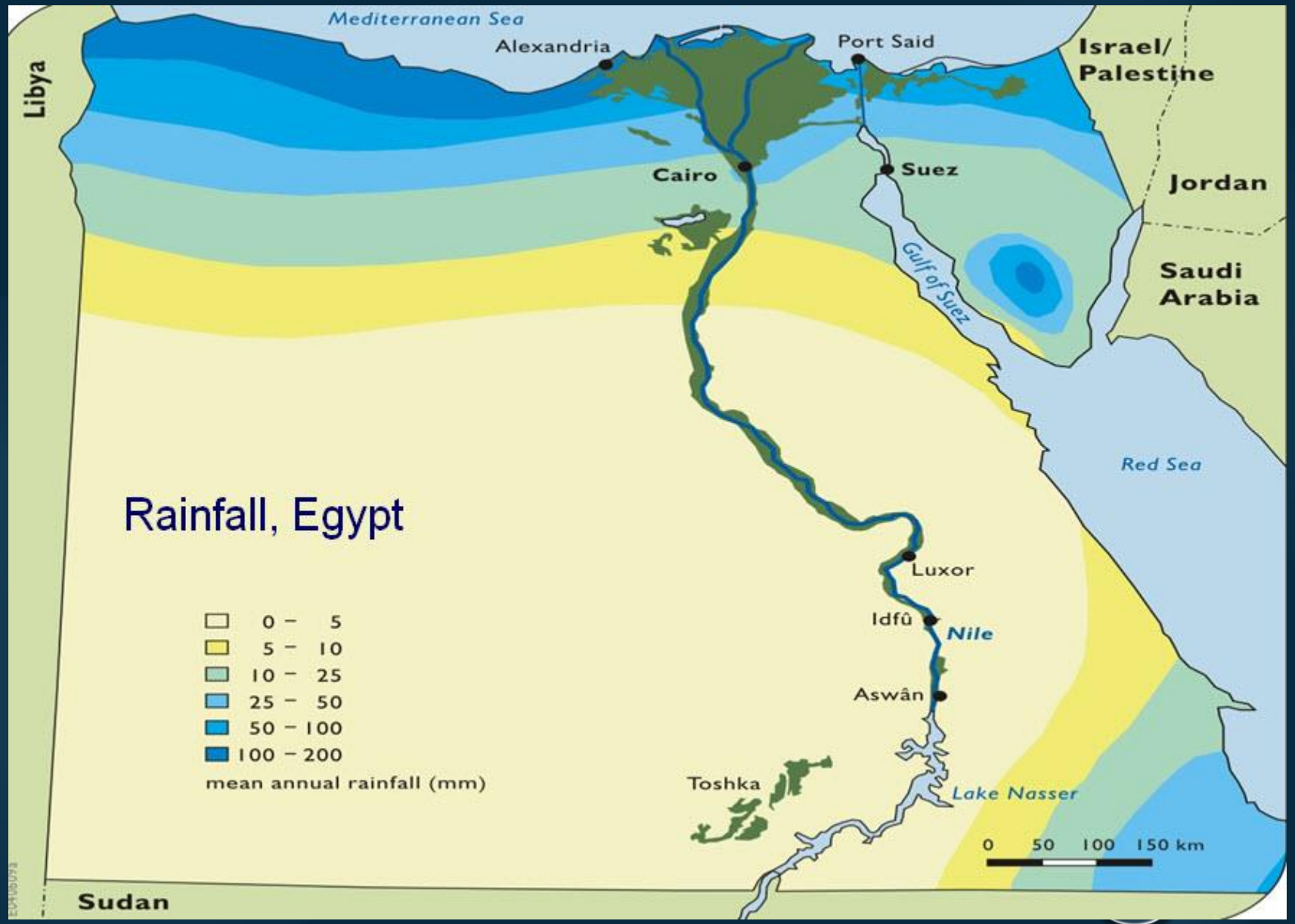

Egypt - 2016
Male
Female
100+
95 - 99
90 - 94
85 - 89
80 - 84
75 - 79
70 - 74
65 - 69
60 - 64
55 - 59
50 - 54
45 - 49
40 - 44
35 - 39
30 - 34
25 - 29
20 - 24
15 - 19
10 - 14
5 - 9
0 - 4
7
5.6
4.2
2.8
1.4
0
0
1.4
2.8
4.2
5.6
7
Population (in millions)
Age Group
Population (in millions)

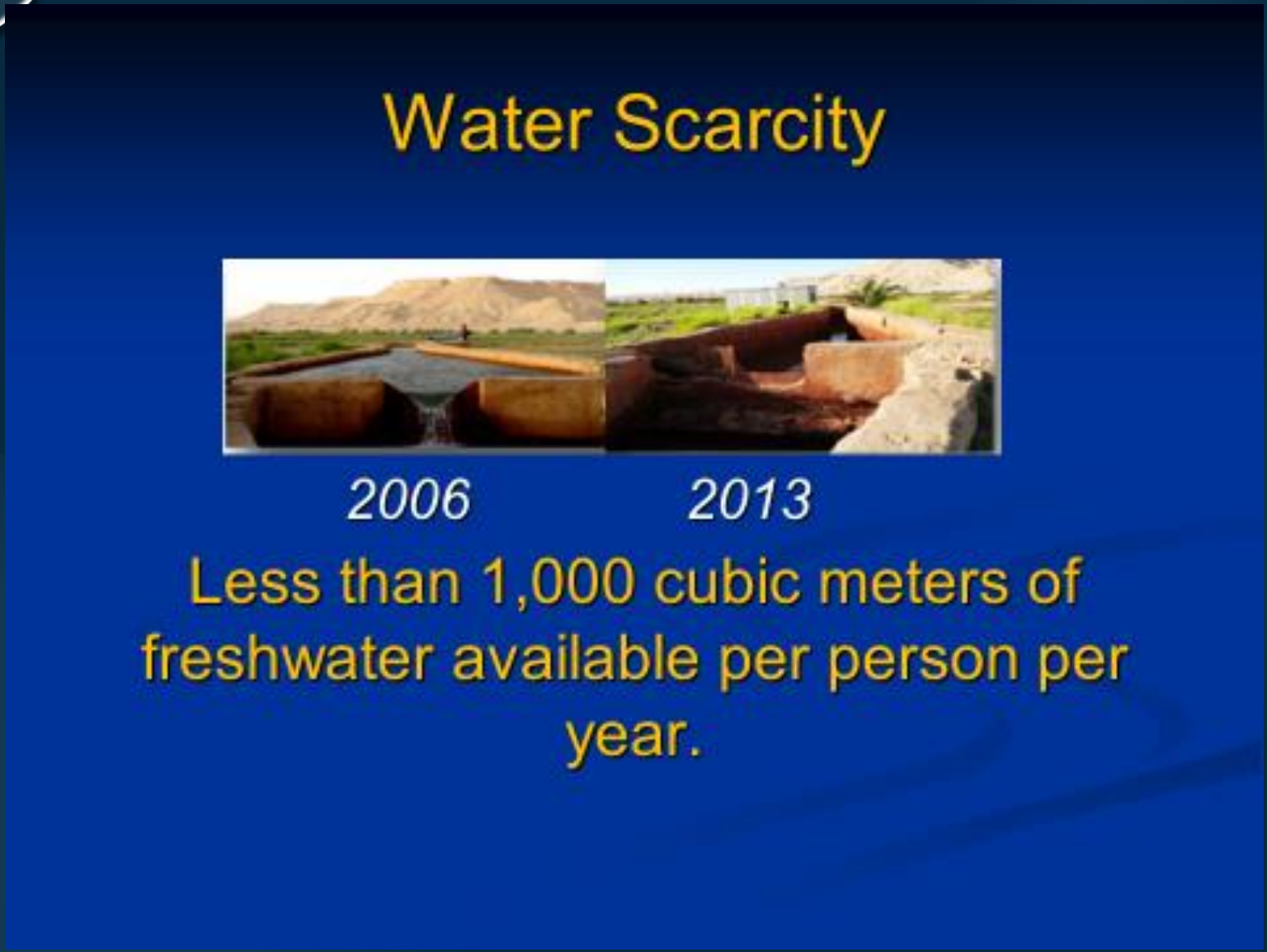
Egypt’s Predicament

- 98% of people on 4% of the land

Water

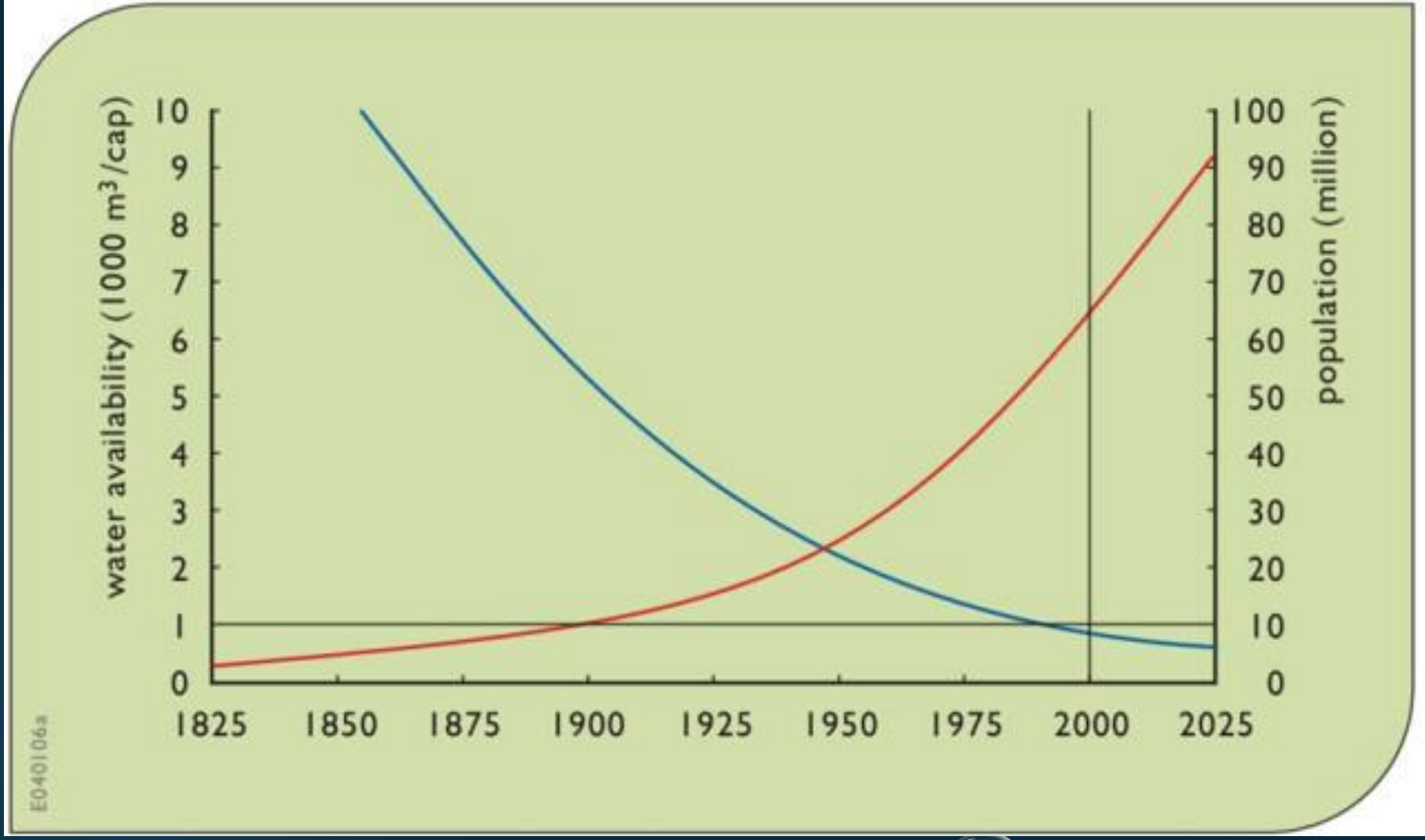
Rainfall


Mediterranean Sea
Alexandria
Port Said
Israel/
Palestine
Libya
Cairo
Suez
Jordan
Gulf of Suez
Saudi
Arabia
Red Sea
Rainfall, Egypt
Luxor
Idfû
Nile
Aswân
0 – 5
5 – 10
10 – 25
25 – 50
50 – 100
100 – 200
mean annual rainfall (mm)
Toshka
Lake Nasser
0 50 100 150 km
Sudan



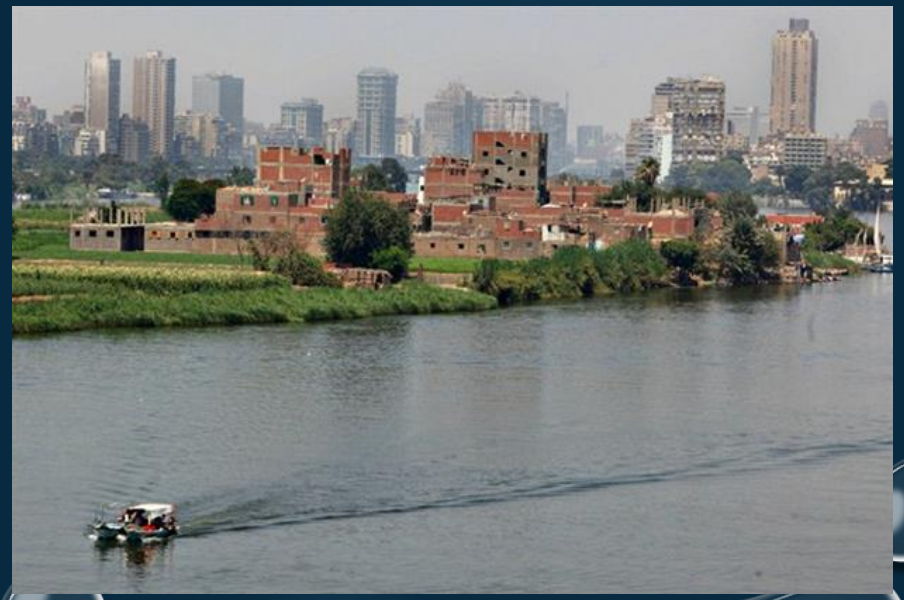
- Egypt is expected to head into Extreme water scarcity (500 cubic meters per person per year or Less) as soon as 2025

Egypt Water Per Capita - More than one sign



The Nile

- Egypt receives up to 97% of its freshwater from the River Nile
- The Nile does not originate in Egypt and receives its water from the rains in upstream countries, e.g. Ethiopia
- Egypt needs to negotiate its share of the Nile with other countries
- Climate change might reduce the amount of rain in Ethiopia and thus decrease the amount of water in the Nile
- The water quality is worst downstream
- 80% of fresh water in Egypt for agriculture



Nubian sandstone Aquifer

The Nubian Sandstone Aquifer System is one of the largest aquifer systems in the world, composed of non-renewable groundwater. It extends over 2,000,000 km^2 and contains about 540,000 km^3 of water, out of which 15,340 km^3 is believed to be exploitable.
Most water is 200,000 years, some water up to 1 million years old.
Sources: International Water Law; Mueller et al.

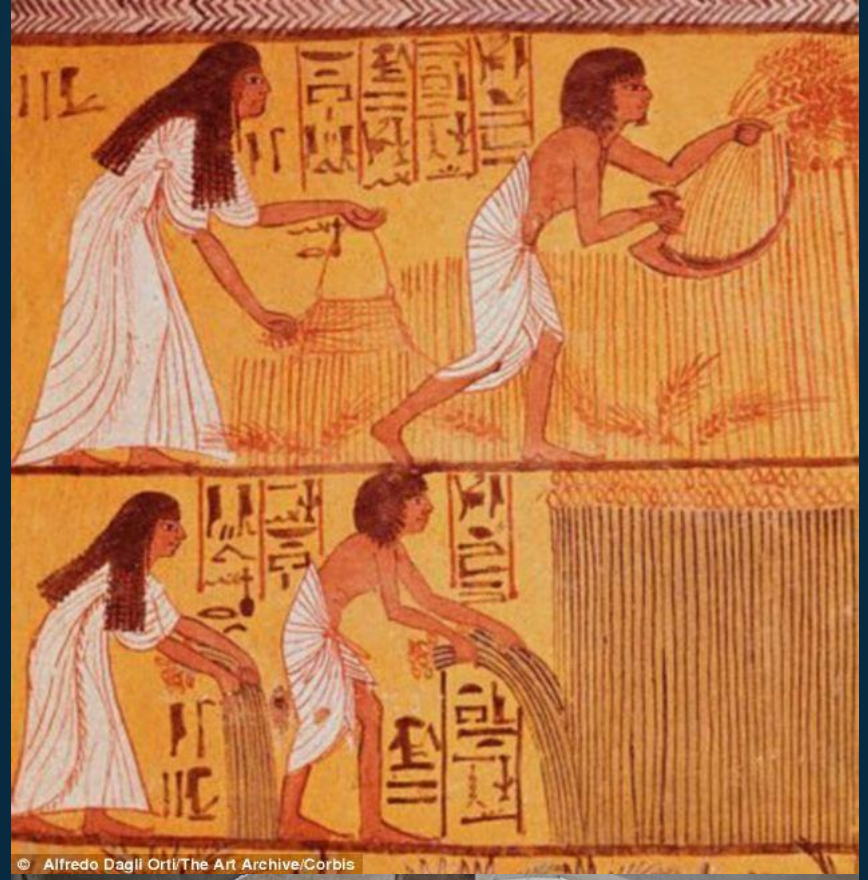
Greening the Desert

Food Security

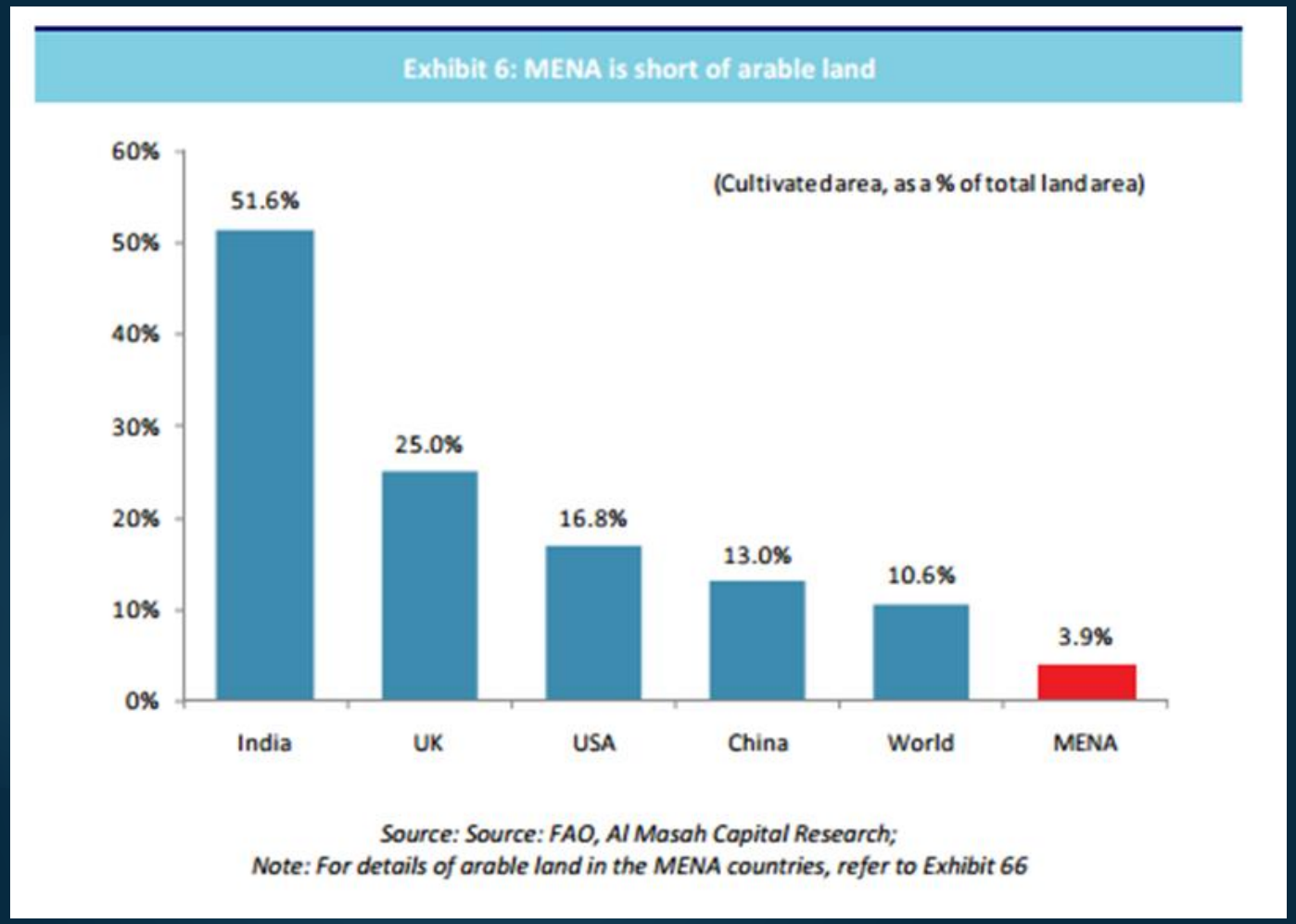
- Egypt used to be the corn chamber of the Roman Empire,

now it is the biggest wheat importer in the world.

Egypt imports 60% of wheat consumed in the country



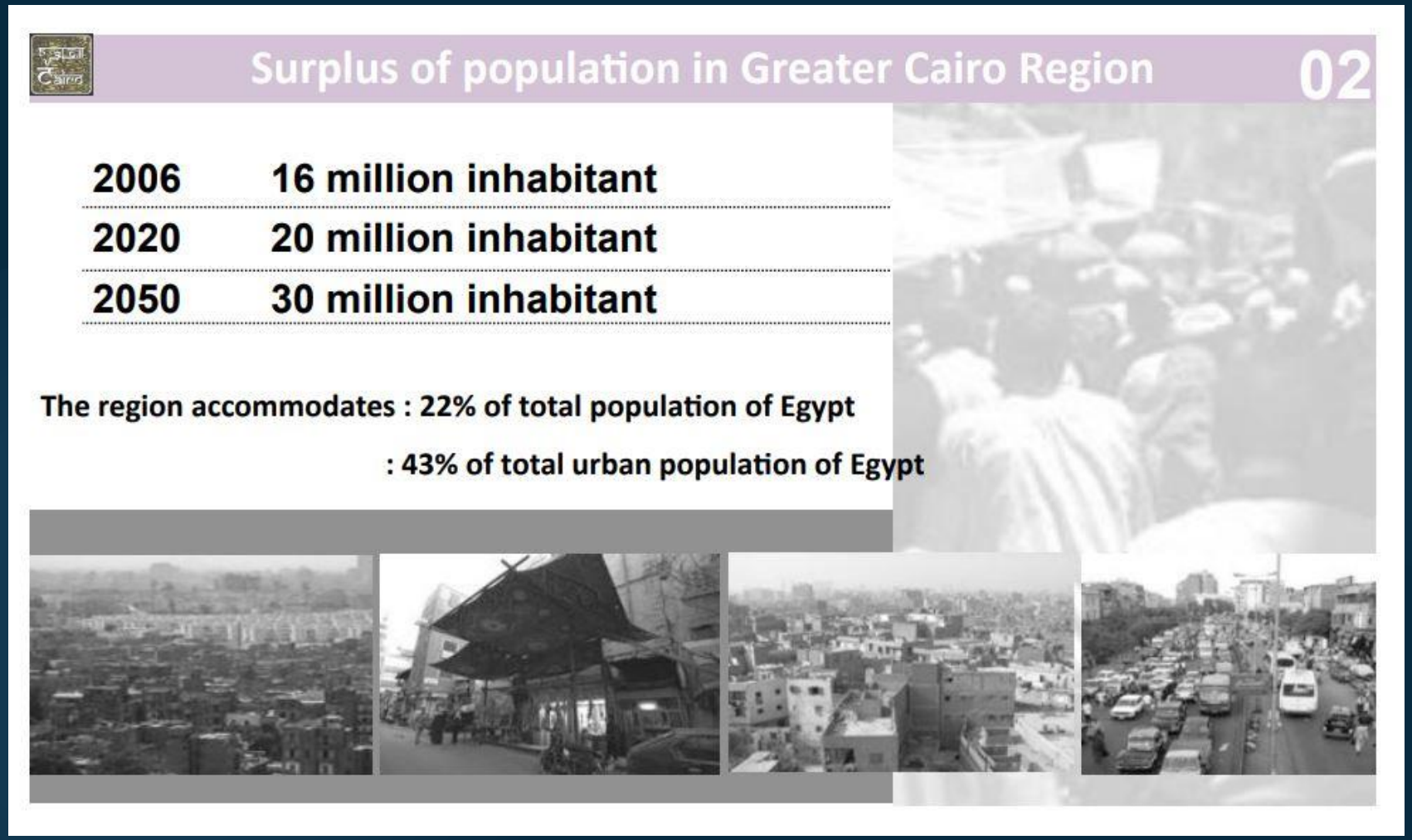
Arable land in MENA



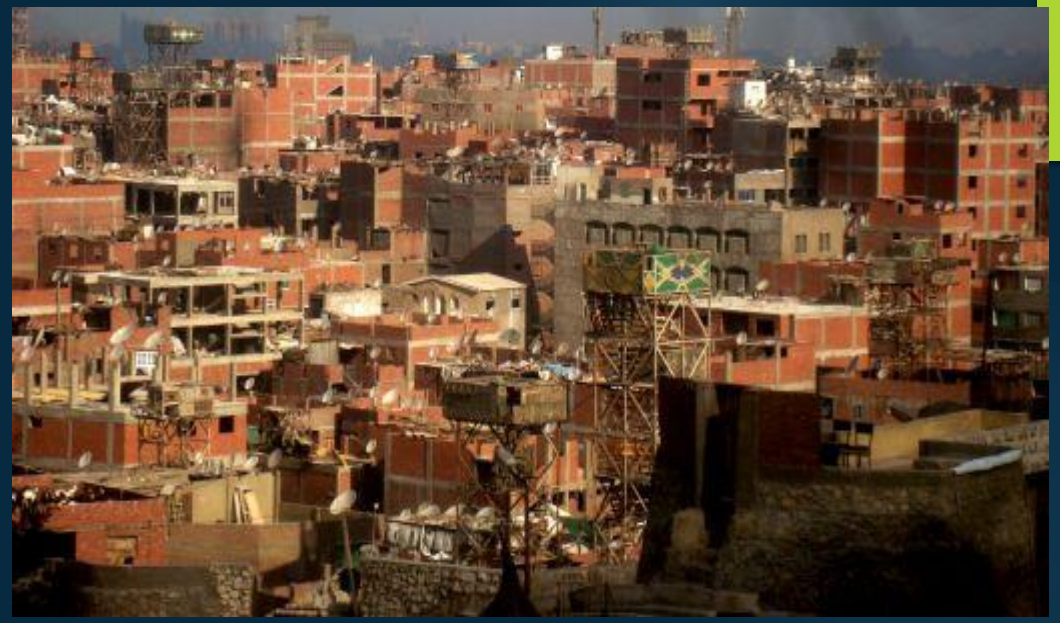
- Al Masah: MENA Food Security: Are We Doing Enough to Feed the Population?

Urbanization

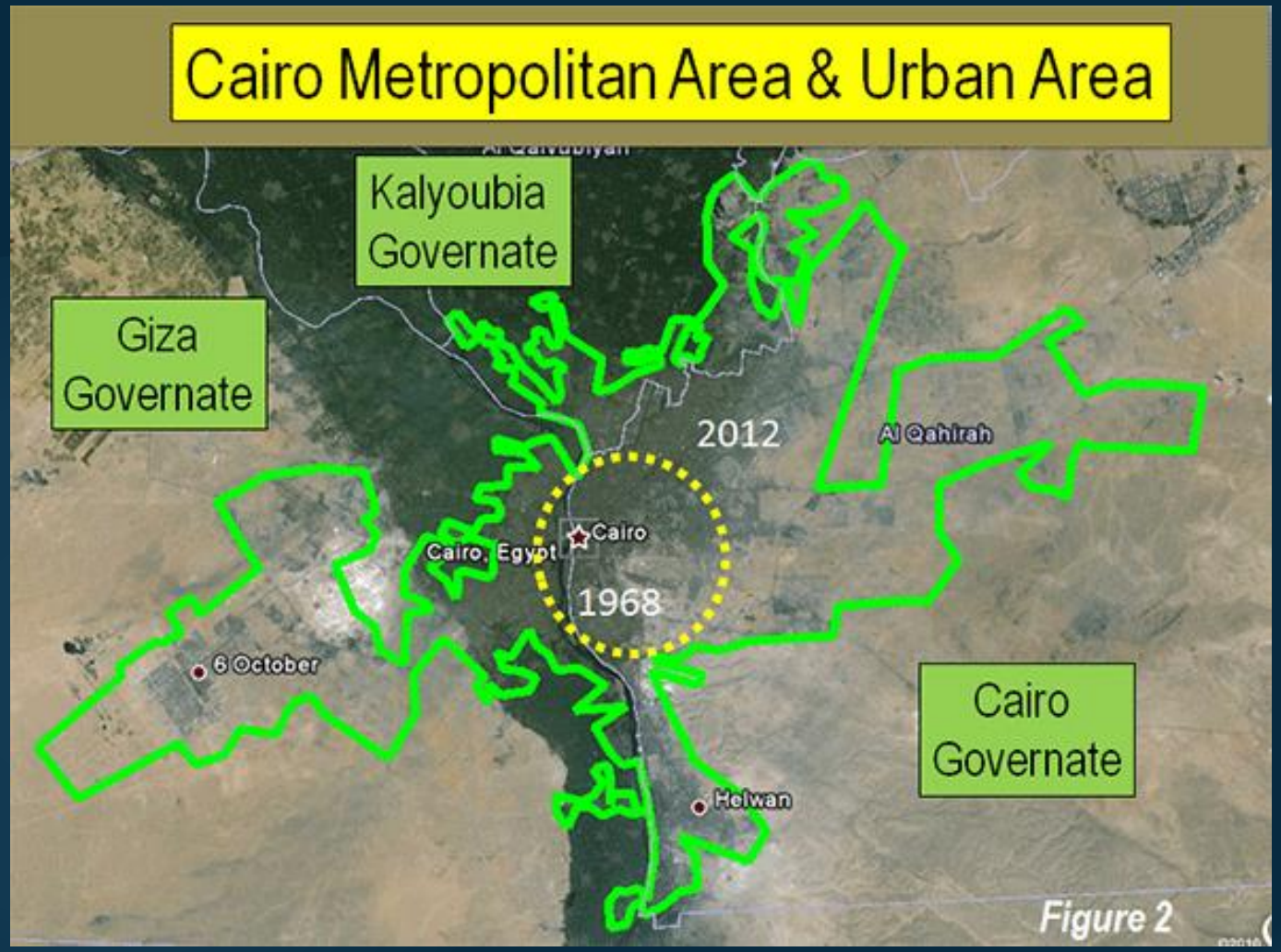
Cairo 2050



- GOPP 2009



Urbanization and Urban Expansion

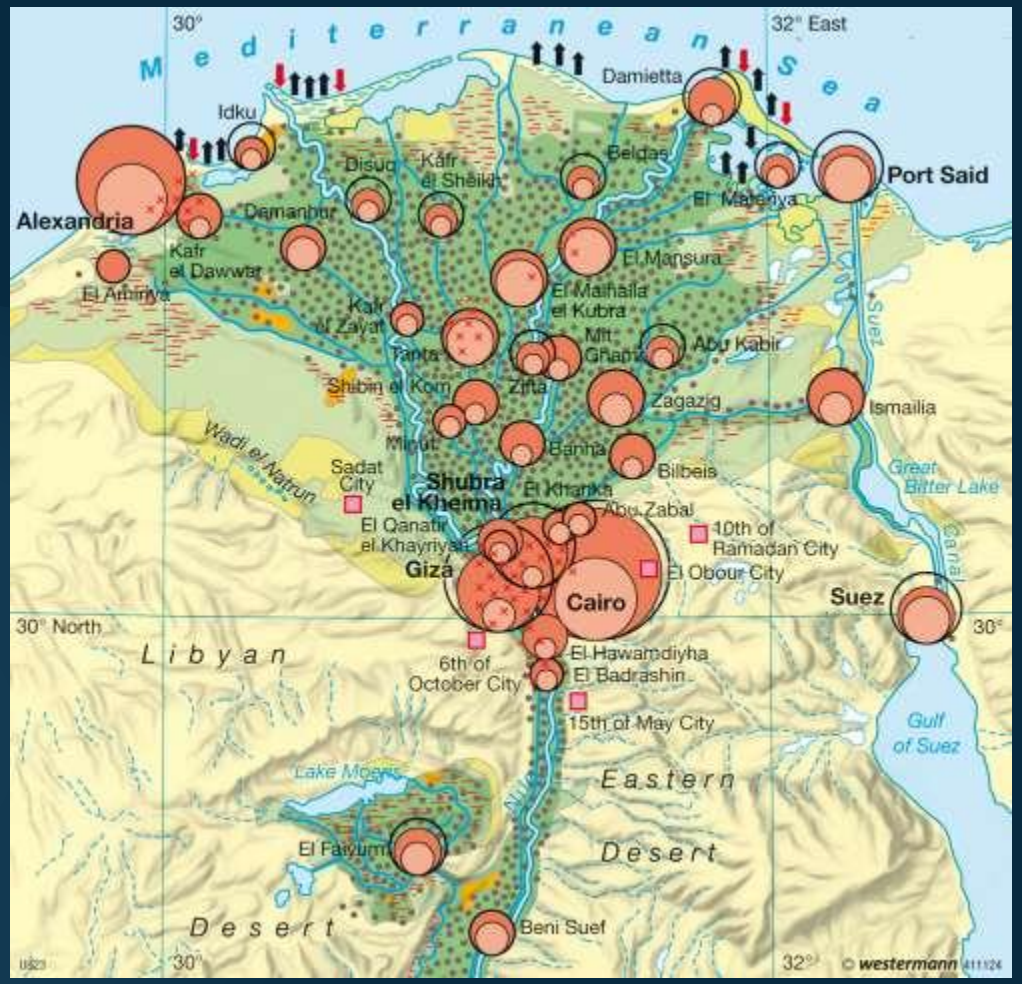


- Source: World Cultures

RURAL DEVELOPMENT

- DELTA VILLAGES

Urbanization Delta



- Source: Diercke International Atlas.

Challenges

- Villages are turning into urbanized areas
- Resemble informal areas in Cairo
- Limited water access
- Polluted canals and waterways
- No sewage system – sewage ends up in irrigation canals
- Encroachment on agricultural areas
- Access to services: Health / education

Pollution

Pollution in Cairo

- Air
- Light
- Noise
- Water
- Solid Waste

Image sources: World Bank (Kim Eun Yeul), Arabstoday

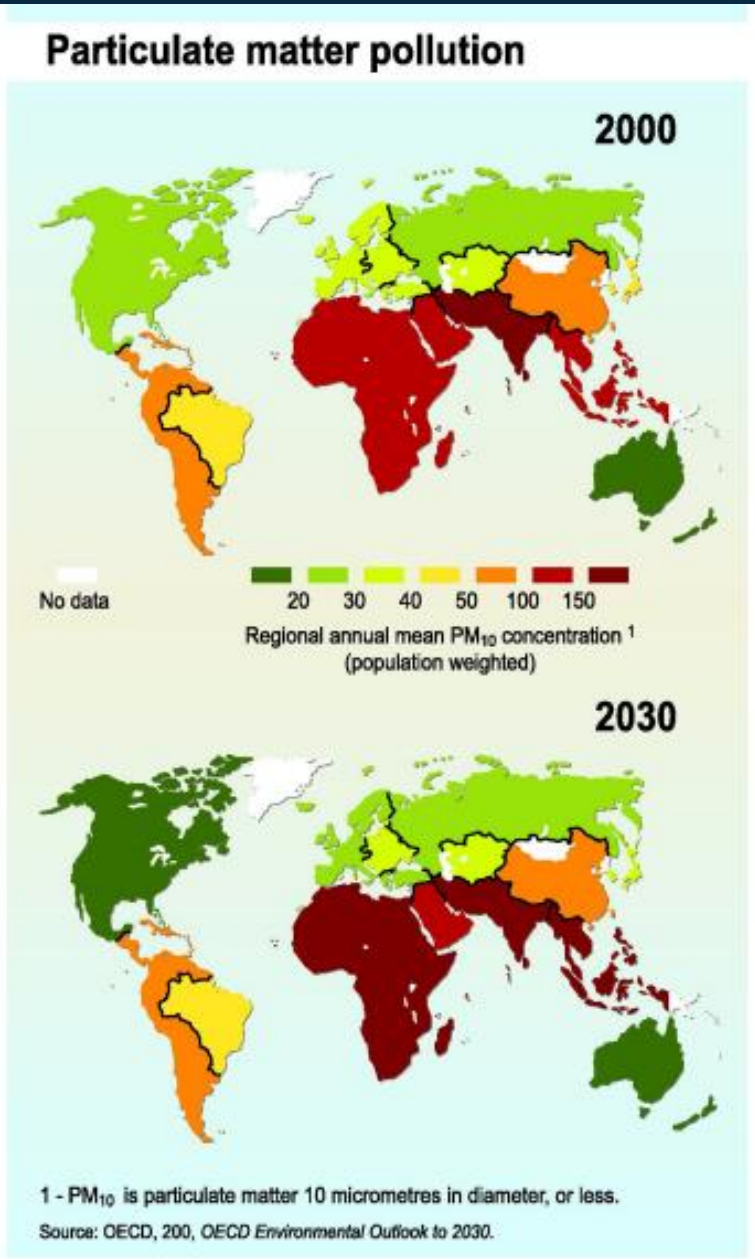


Figure 2.8. Worldwide comparison of annual average PM_{10} in 2000 and projection for 2030

- World Bank, 2013.

Solid Waste

- Cairo generates over 14,000 tons of trash per day
- Failed aid project to fund trash trucks in Egypt
- Zabaleen recycling efficiency 80%

Noise Pollution

Noise pollution averages 90 decibels (dB) and never drops under 70 dB – this is equivalent to continuously living inside a factory.

Effects:

Stress Hypertension
Aggression Hearing loss
Sleep disturbances

Source: Reader's Digest.

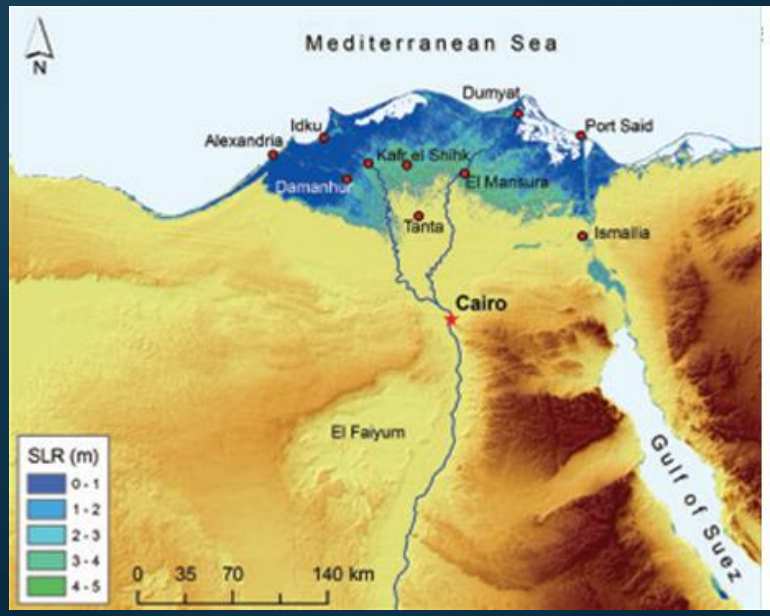
Climate Change

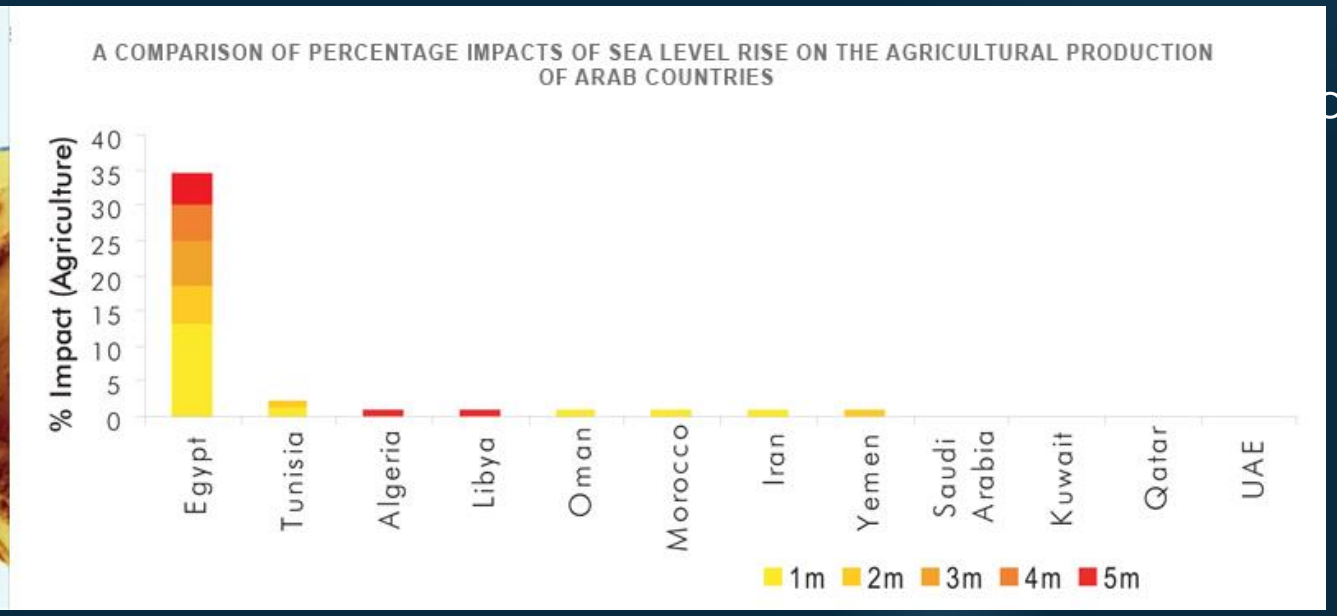
Climate Change in Egypt

1. Temperature Rise

2. Sea Level Rise and Land Subsidence

3. Water Availability





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Displaced population: 3,800 000
Lost cropland: 1,800 km²

Displaced population: 6,100 000
Lost cropland: 4,500 km²

Figure 4: Potential Impact of Sea Level Rise: Egypt's Nile Delta.
Source: Sermonett et al., 2005.

Saltwater Intrusion

Coastal governorates threatened by three major environmental processes:

- Inundation from sea level rise and subsidence
- Coastal erosion
- Soil and water salinity

Significant saltwater intrusion into the Delta's groundwater, already increased salinity levels in Delta soils and groundwater wells.

https://www.youtube.com/watch?v=zGjce6uc1v0

Temperature Rise: EGYPT

- Lower water availability for crops
- Increase levels of evapotranspiration
- Higher water demand
- Potential decrease in agricultural productivity
- Decrease in organic matter and soil quality

Year	Degrees Temperature Increase
2025	1.0°C-1.3°C
2050	1.9°C-2.6°C
2100	2.2°C-4.9°C

Source: IDSC, 2013.