

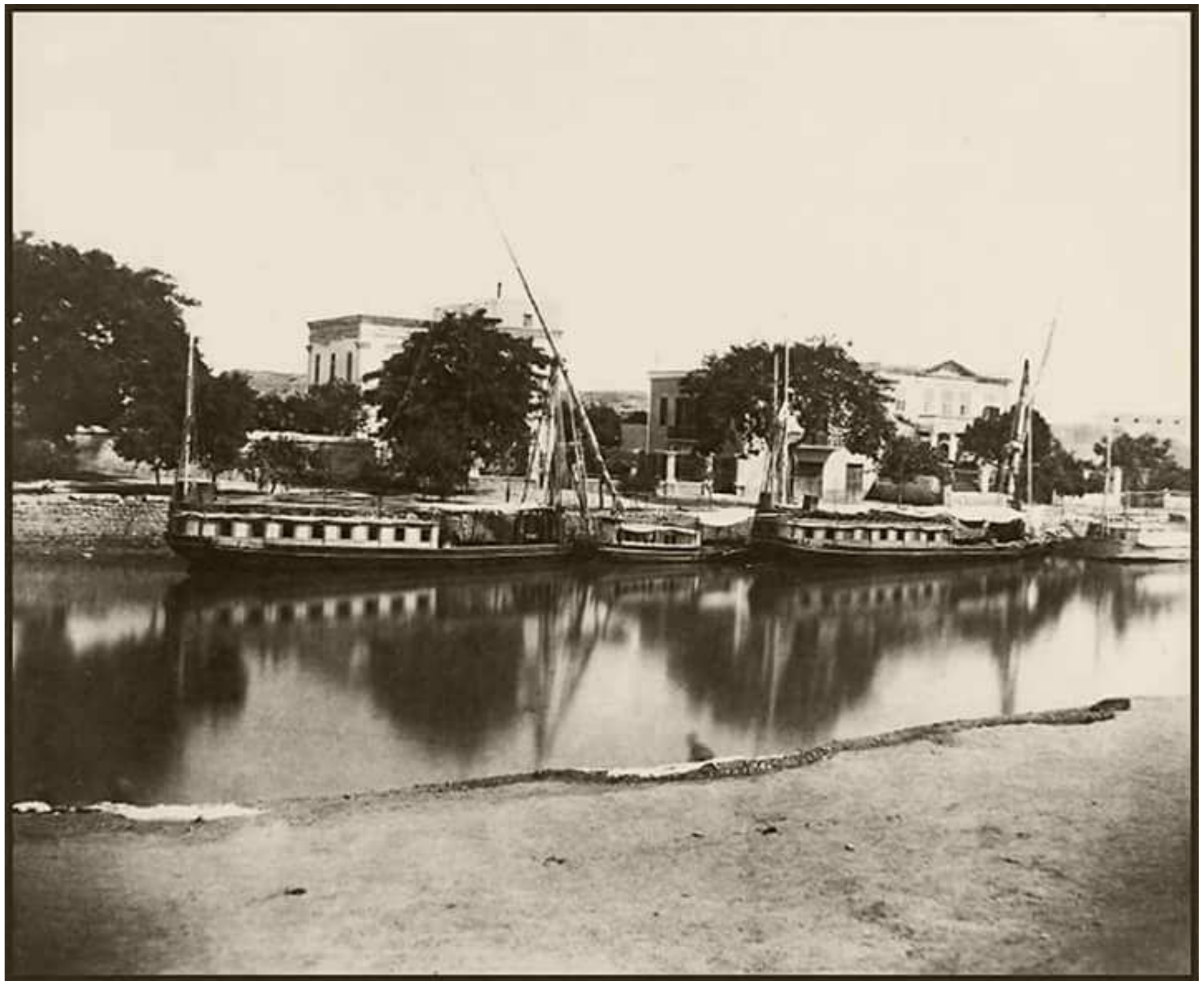
WATER AND SUSTAINABLE DEVELOPMENT

الماء والتنمية المستدامة









ترعة المحمودية في 1859

MEDITERRANEAN

SEA

MAP

OF

LOWER EGYPT

AS IN 1800 A.D.

Approx. Scale 1:500,000

Reproduced from Atlas of the French Expedition

خريطة
الوجه البحري

كانت سنة ميلادية

مقياس تقريبي

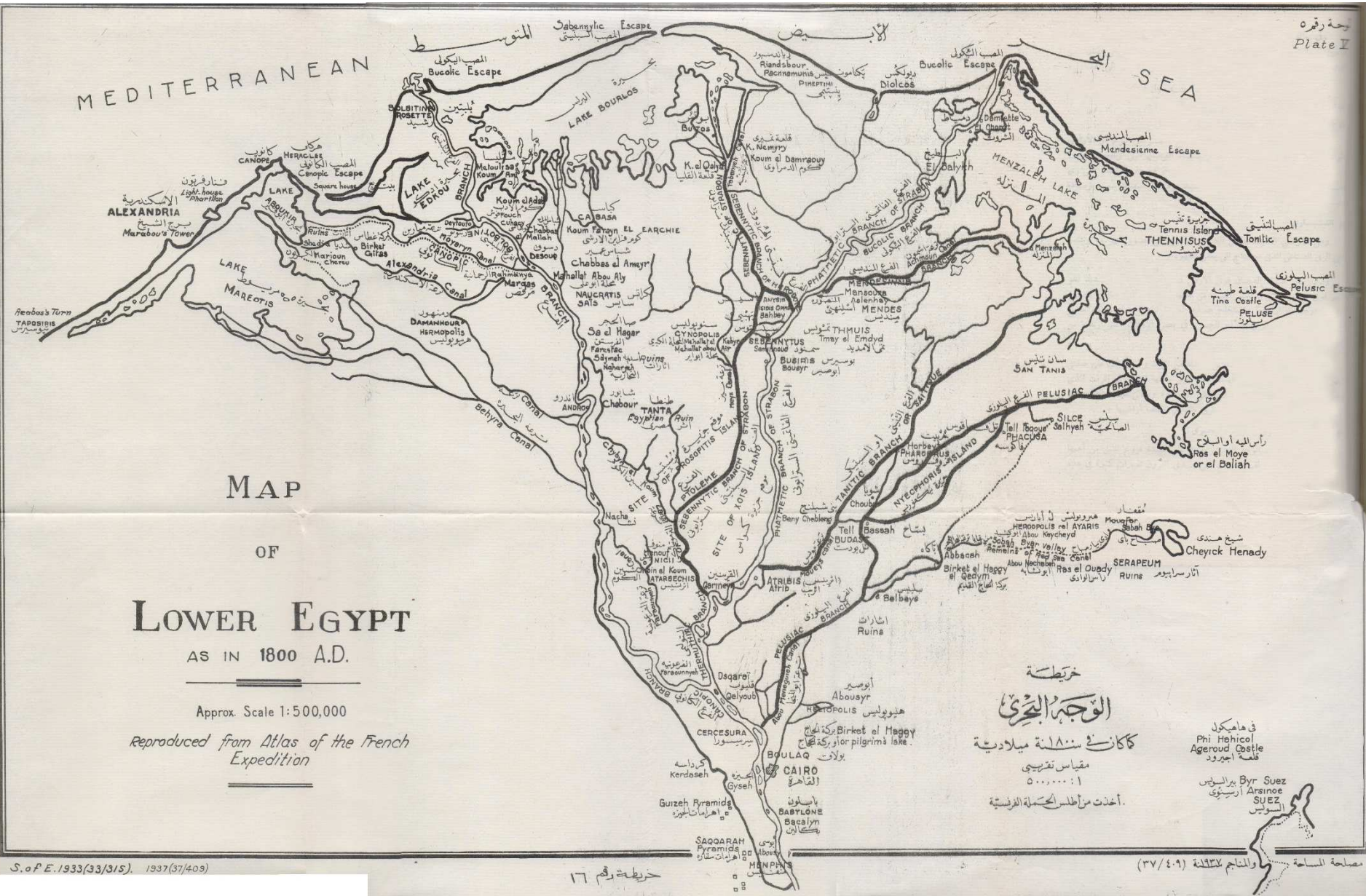
١:٥٠٠,٠٠٠

أخذت من أطلس الحملة الفرنسية

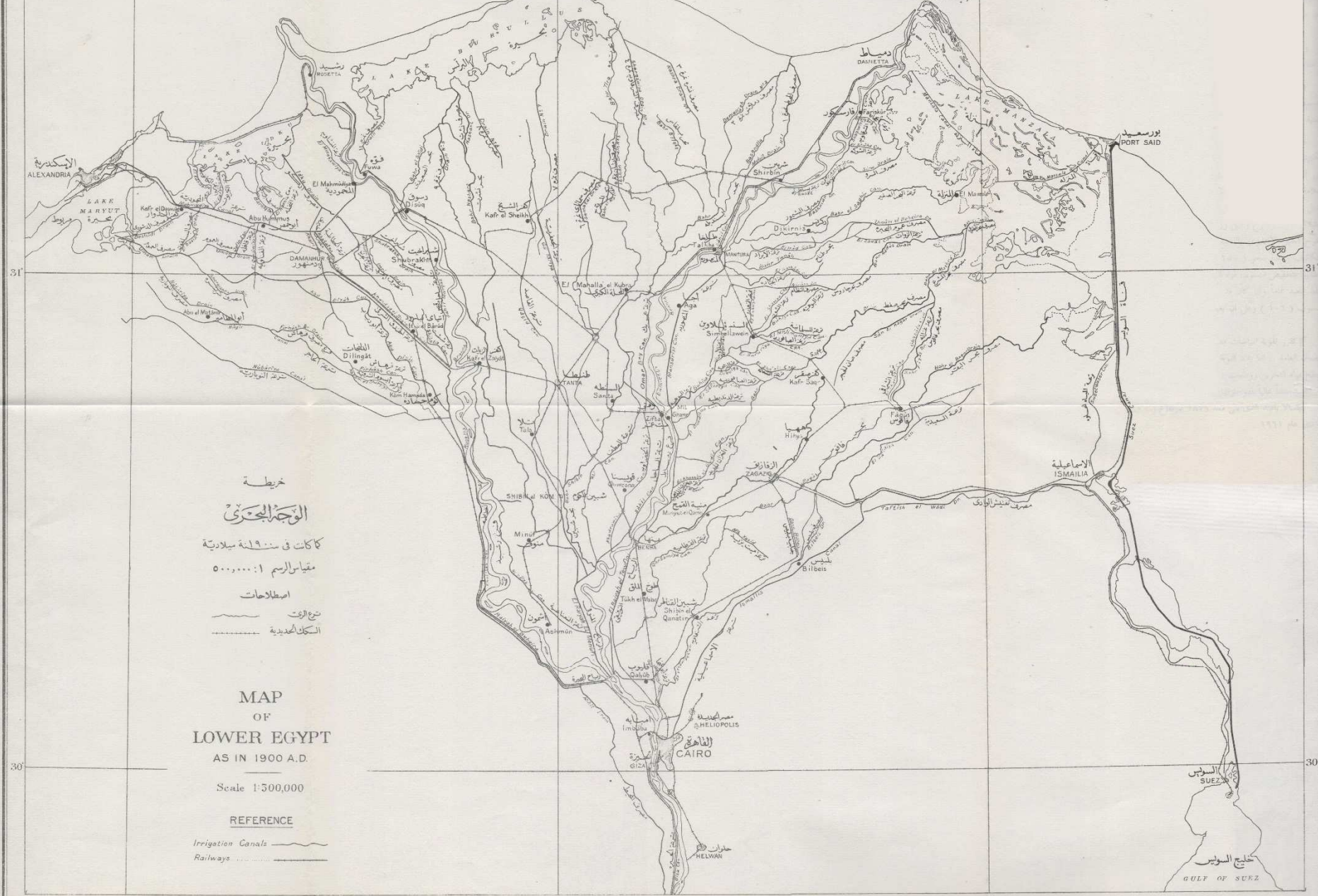
في هاهيكول
Phi Hahicoul
Ageroud Castle
قلعة اجيرود

Byr Suez
Arsinoe
السويس

مصلحة المساحة
والنظام لثلاثة (٤٩/٢٧)



M. E D I T E R R A N E A N
البحر الأبيض المتوسط



خريطة
الوجه البحري

كأكانت في سنة ١٩٠٠ ميلادية
مقياس الرسم ١:٥٠٠,٠٠٠

اصطلاحات
نوع القوت
السكك الحديدية

MAP
OF
LOWER EGYPT
AS IN 1900 A.D.

Scale 1:500,000

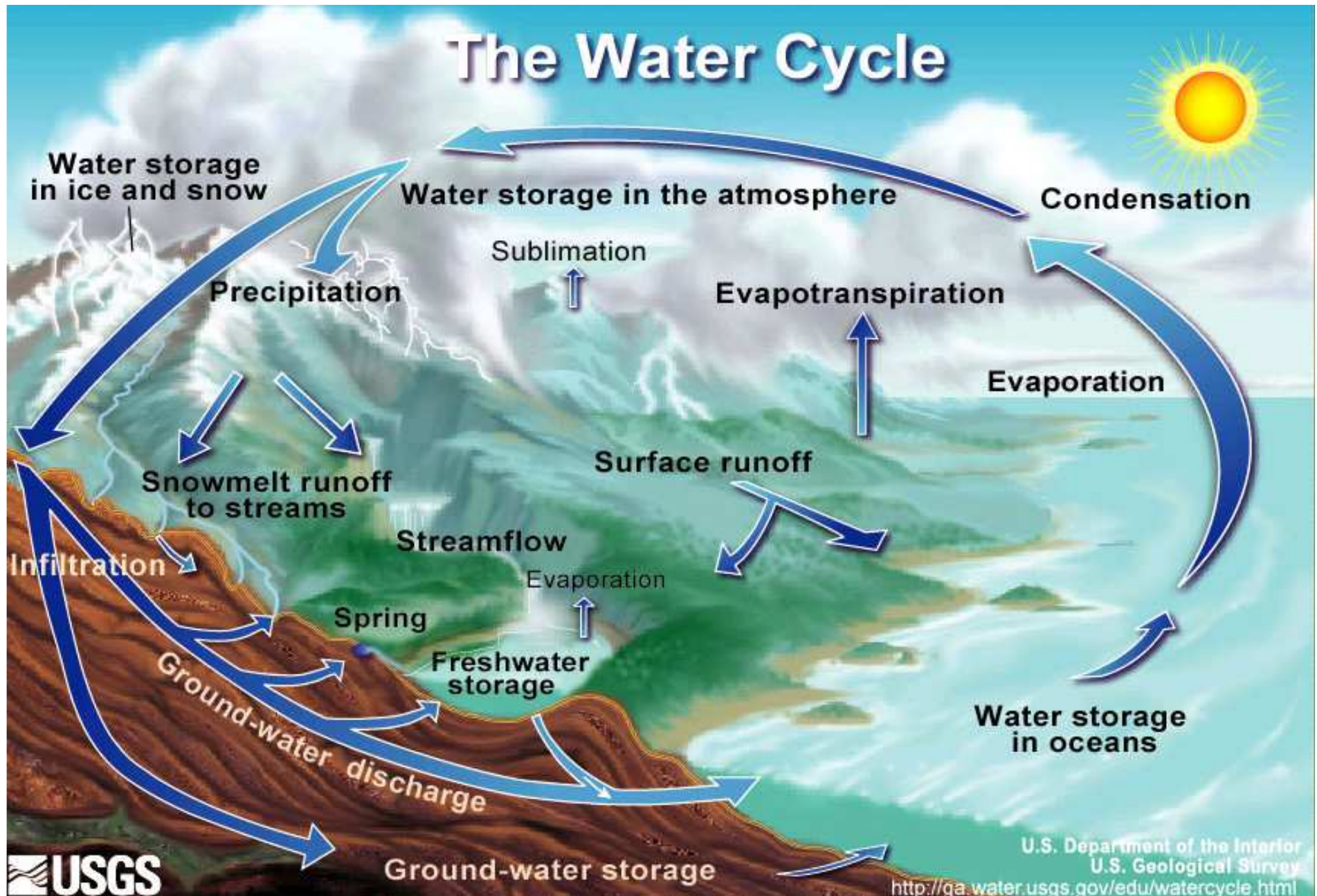
REFERENCE

Irrigation Canals
Railways

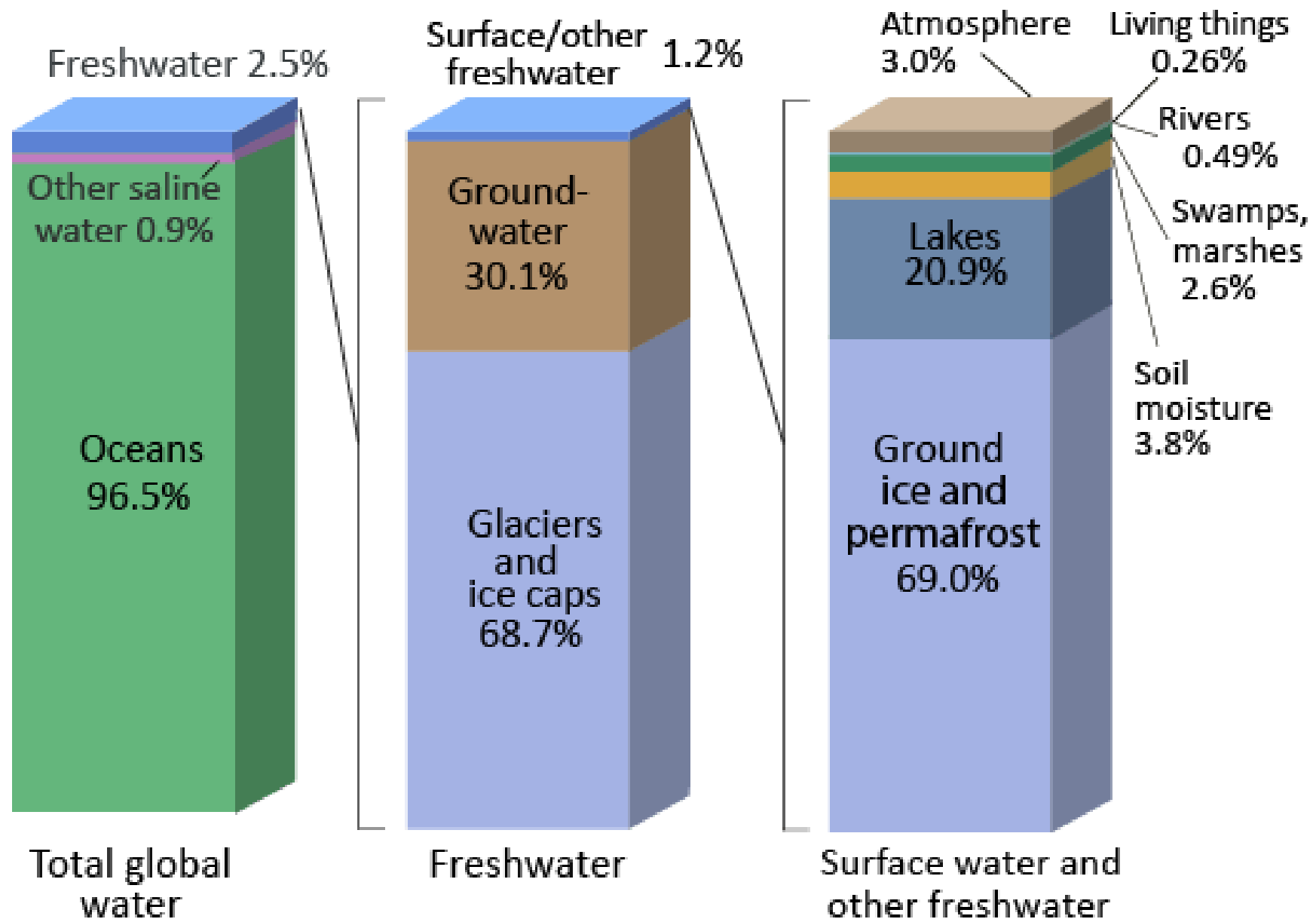
Rosetta 1818

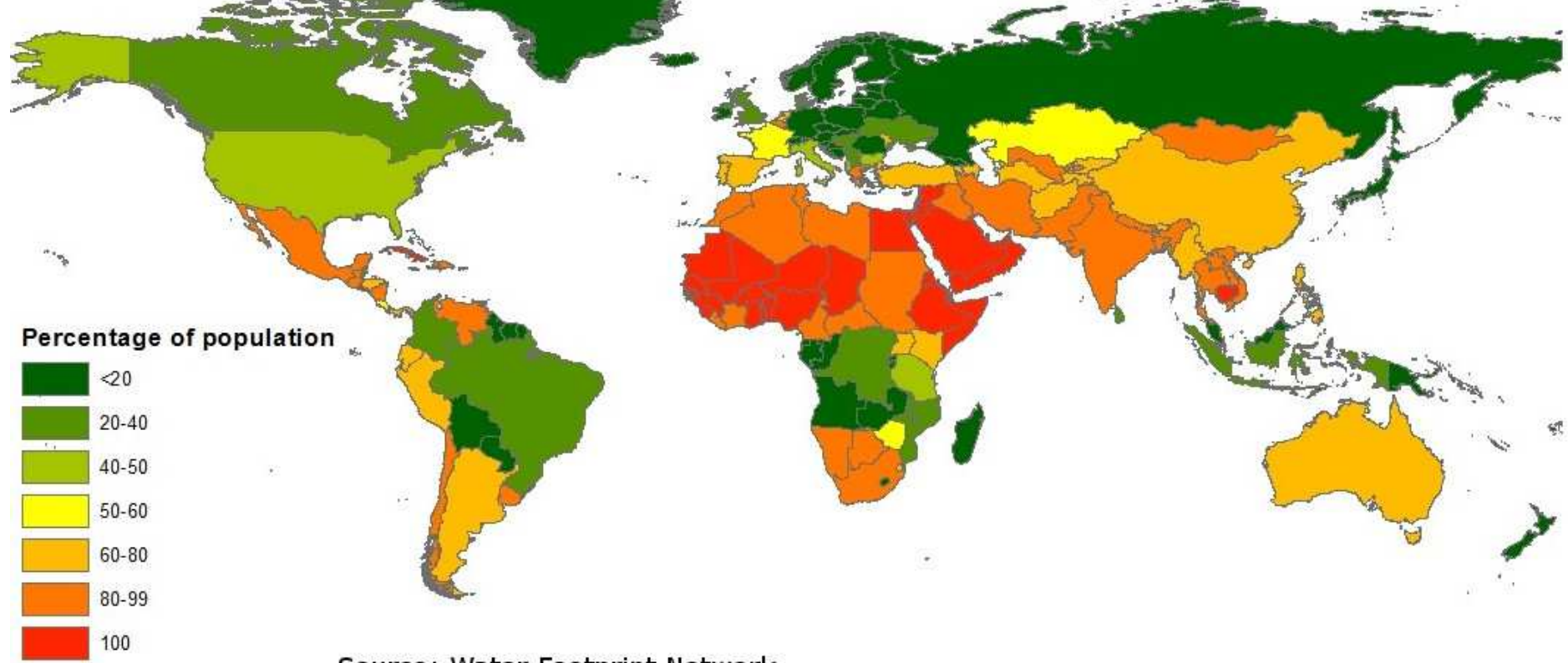


The Water Cycle



MACRO LEVEL

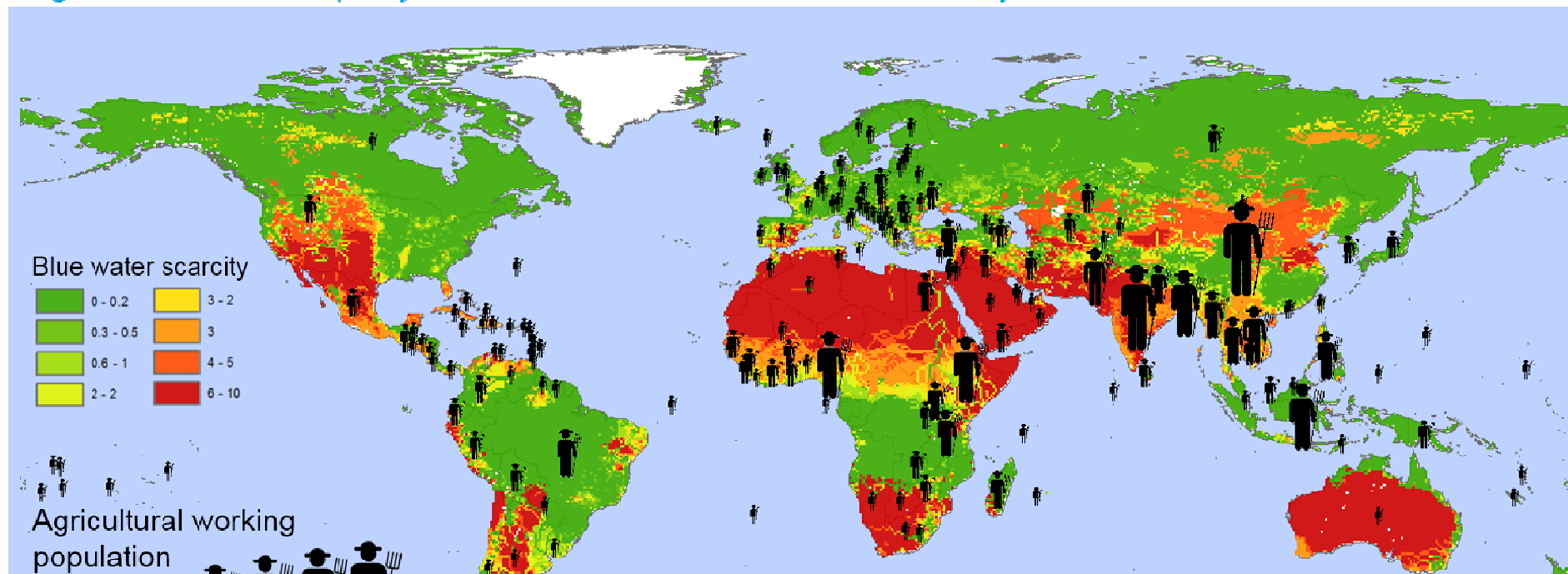




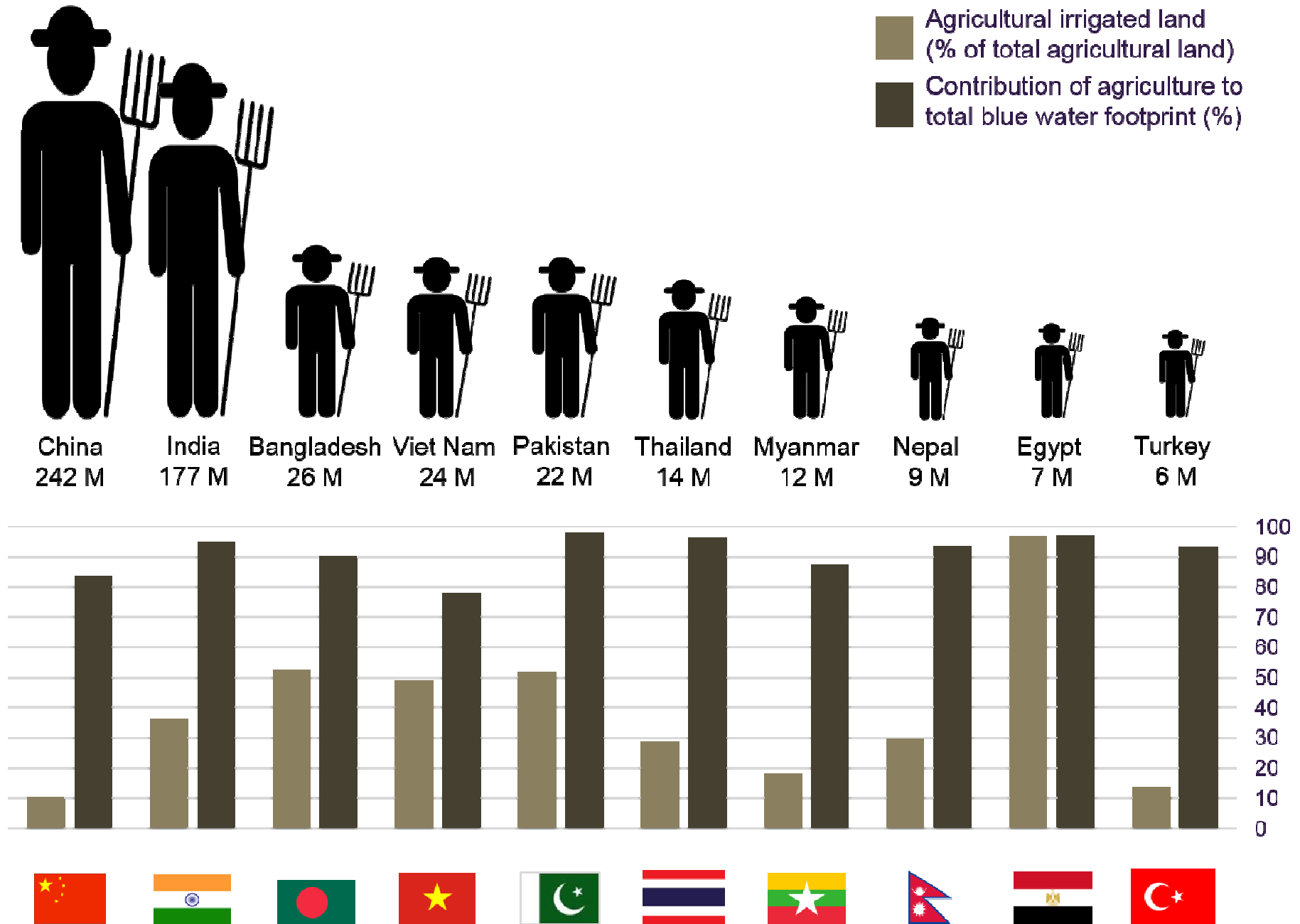
Source: Water Footprint Network

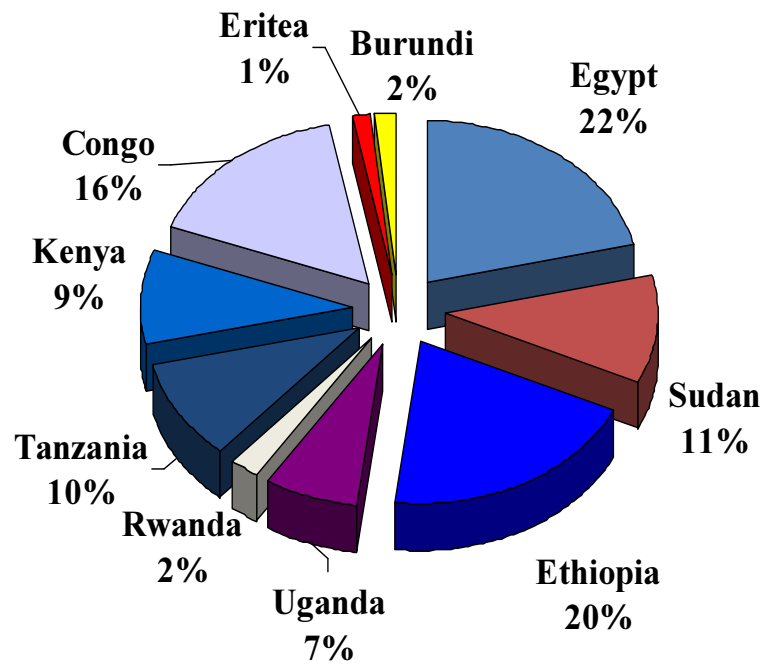
Data from M.M. Mekonnen & A.Y. Hoekstra, University of Twente

Agricultural employment and blue water scarcity



Top 10 countries with large agricultural employment and blue water scarcity





Egypt

- 96% of population live in Nile Delta/Basin
- Entirely dependent on Nile waters – Only 4% from underground reserves
- Considered the most powerful riparian state in basin

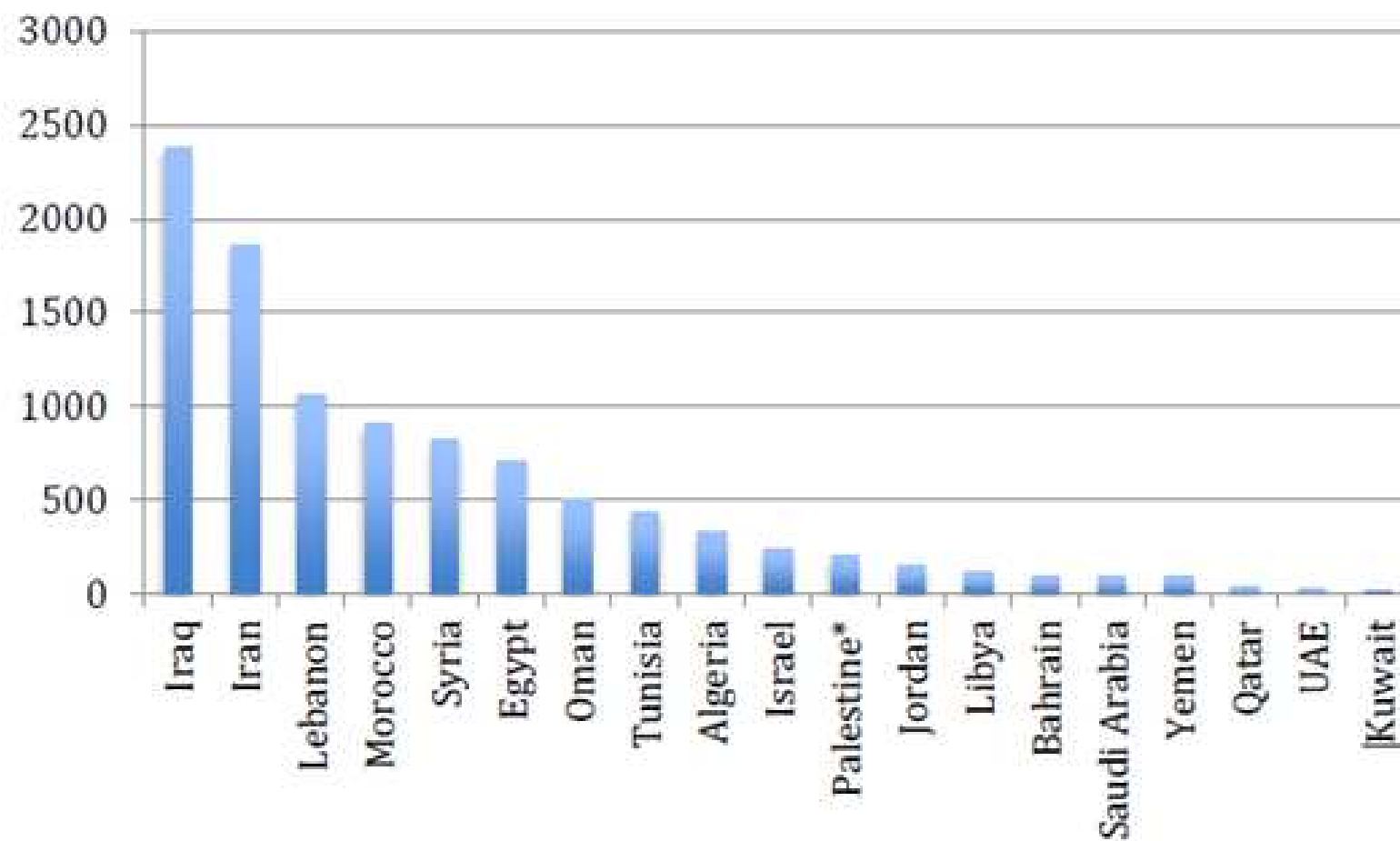
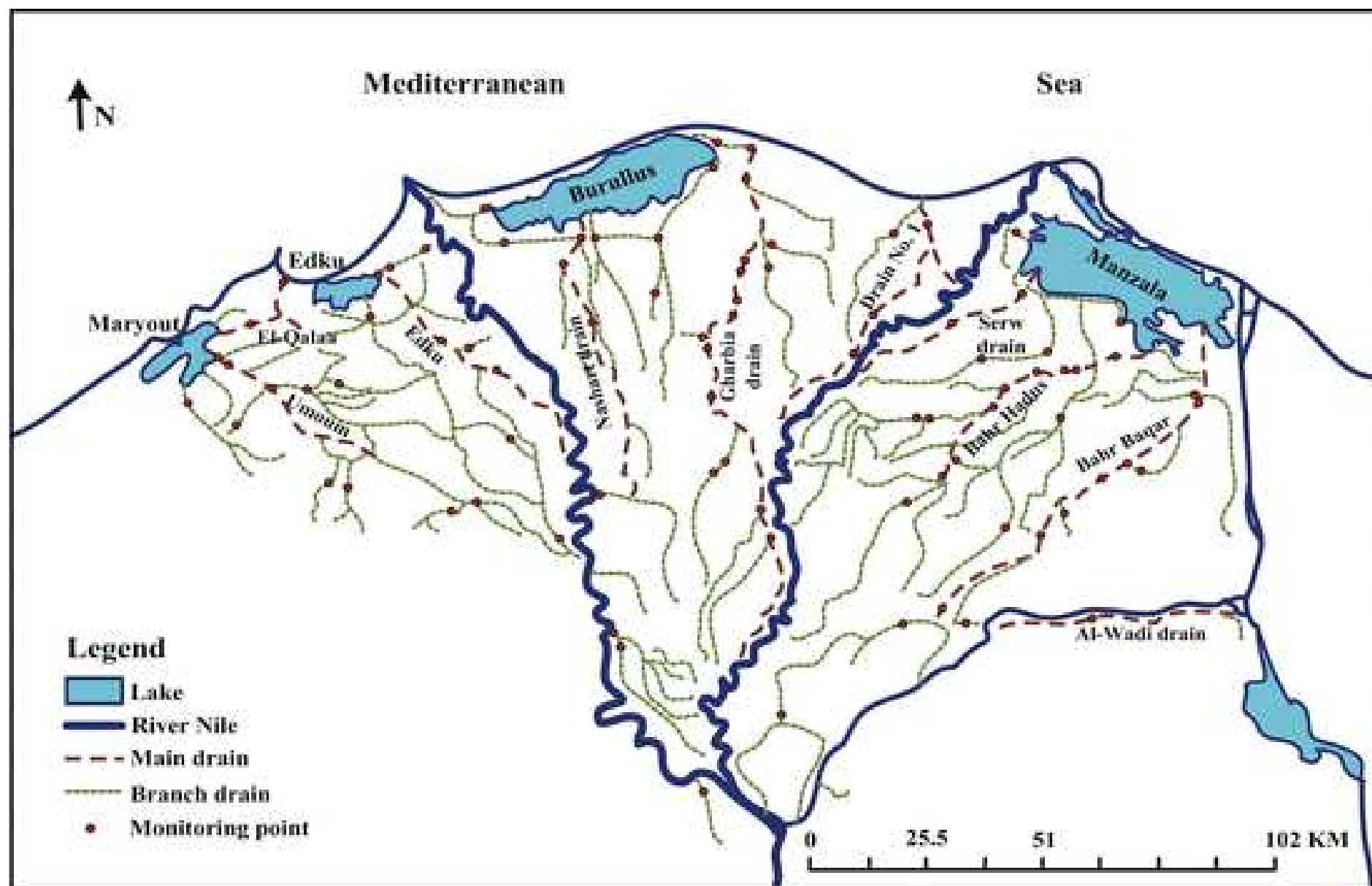
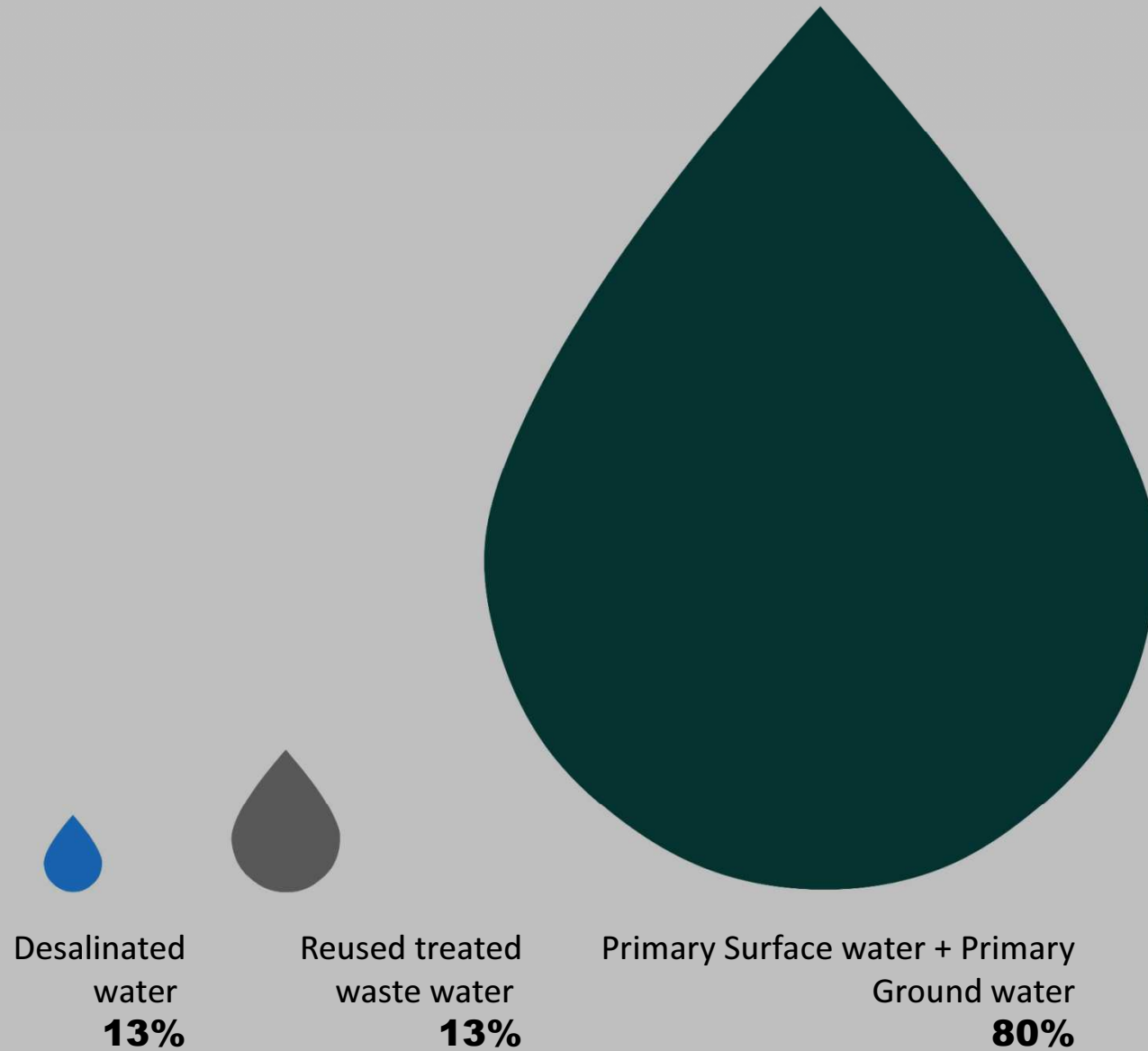


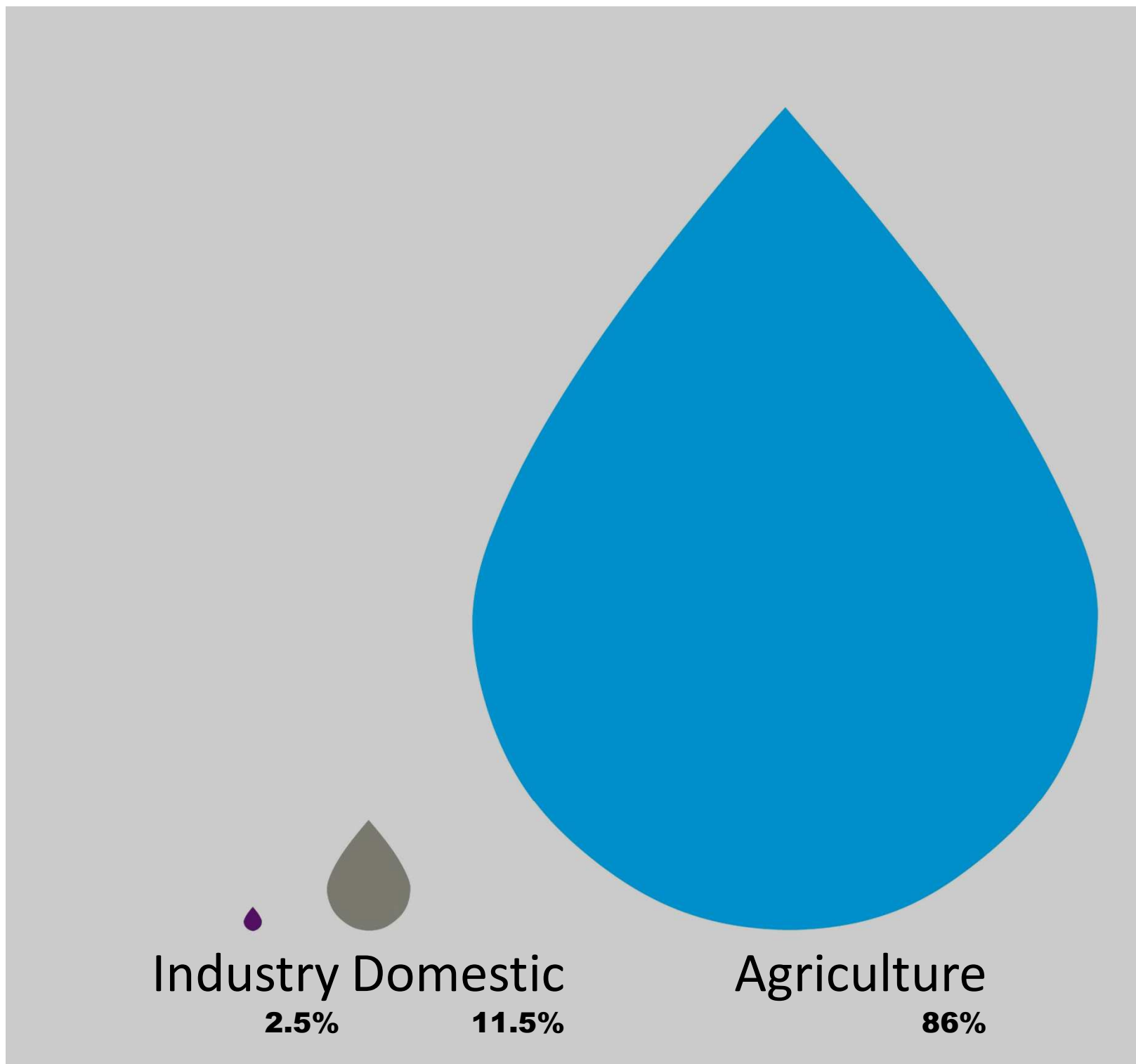
Figure 1.1 Total Renewable Water Resources per year per capita (m³) reported to FAO. (Source: Aquastat, 2012; for Palestine source is UNDP <http://www.arabstats.org/>. All dates are 2010)

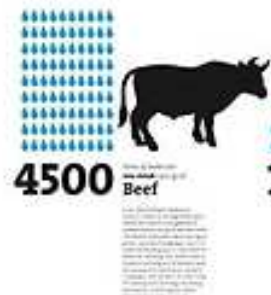
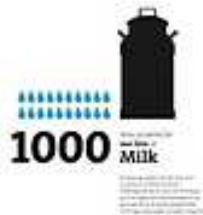
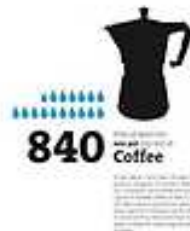
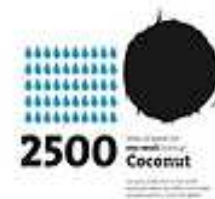


Water withdrawal by source



Water use by sector



[illegible]

Timm Kekeritz

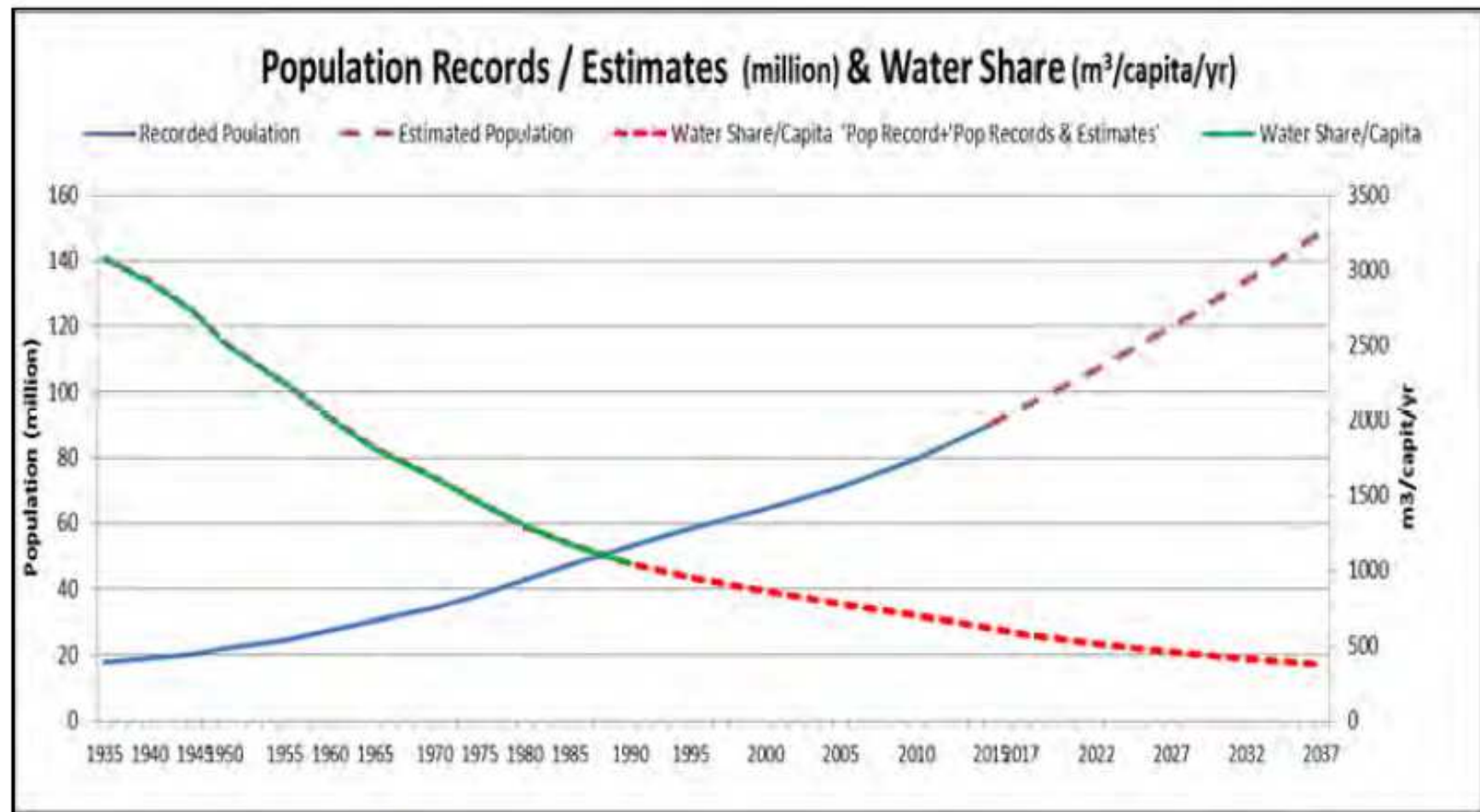
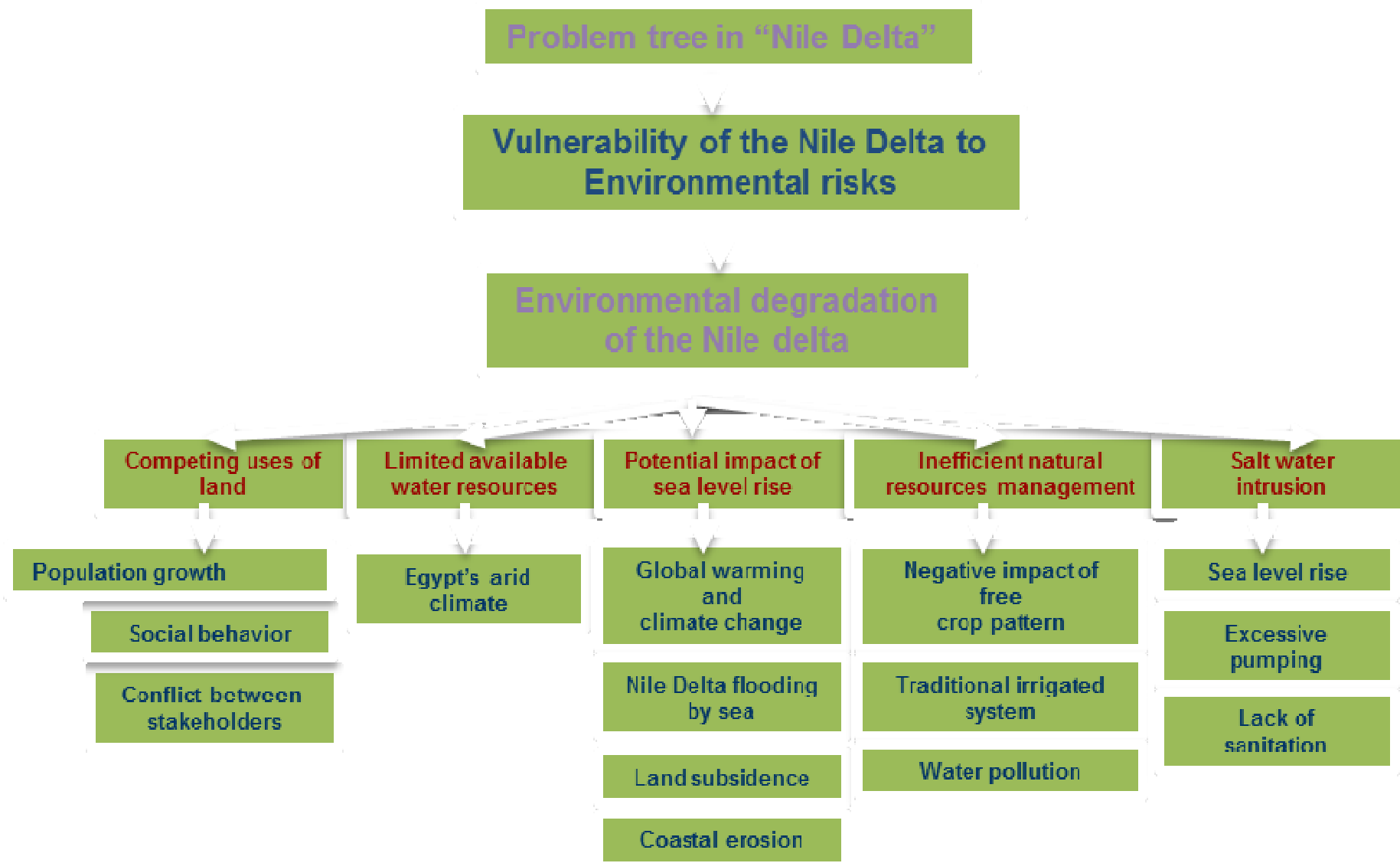
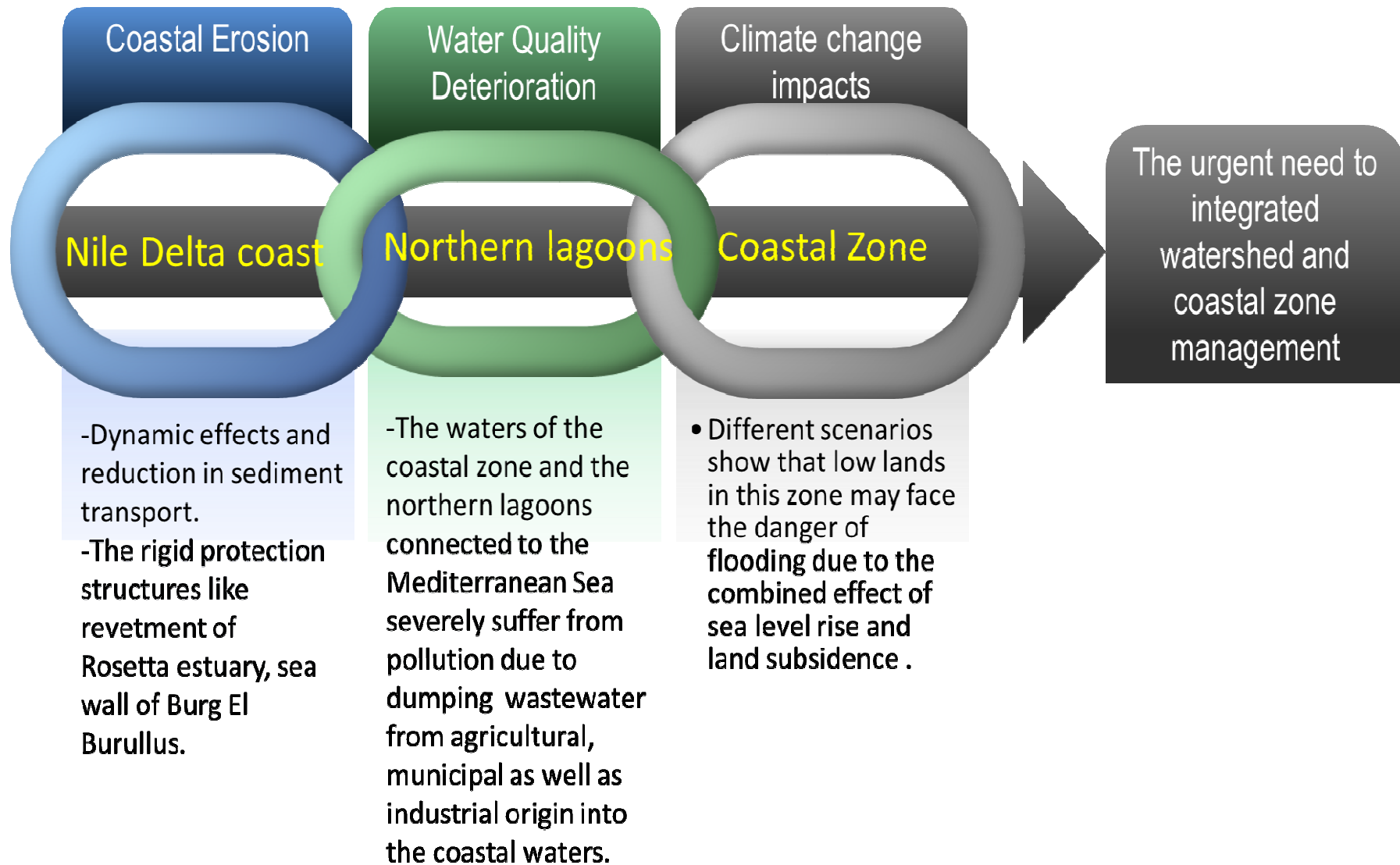


Figure (1): Population growth vs. estimated water share per capita



- Egypt depends mainly on single water resources .
- The natural NILE cycle of flow and sediment discharge has been disrupted.
- The NILE DELTA is threaten by sea level rise erosion, sanitization, and pollution.
- There is a marked decline in agricultural productivity and loss of land and coastal lagoons at a time when the population is expanding exponentially.

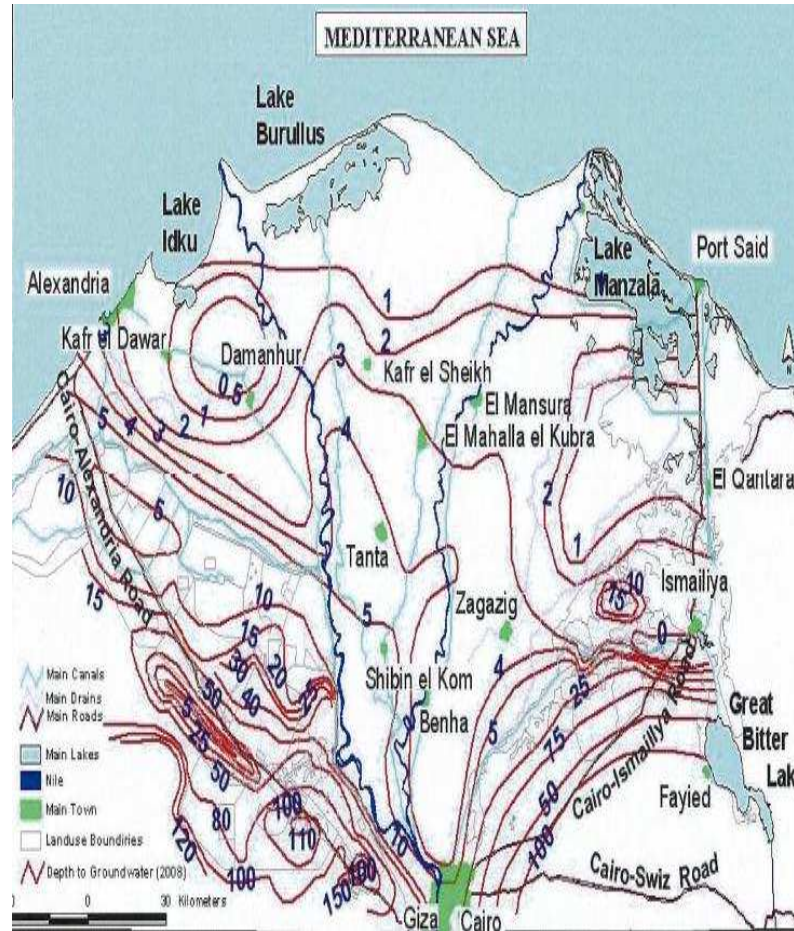
Major problems facing delta region



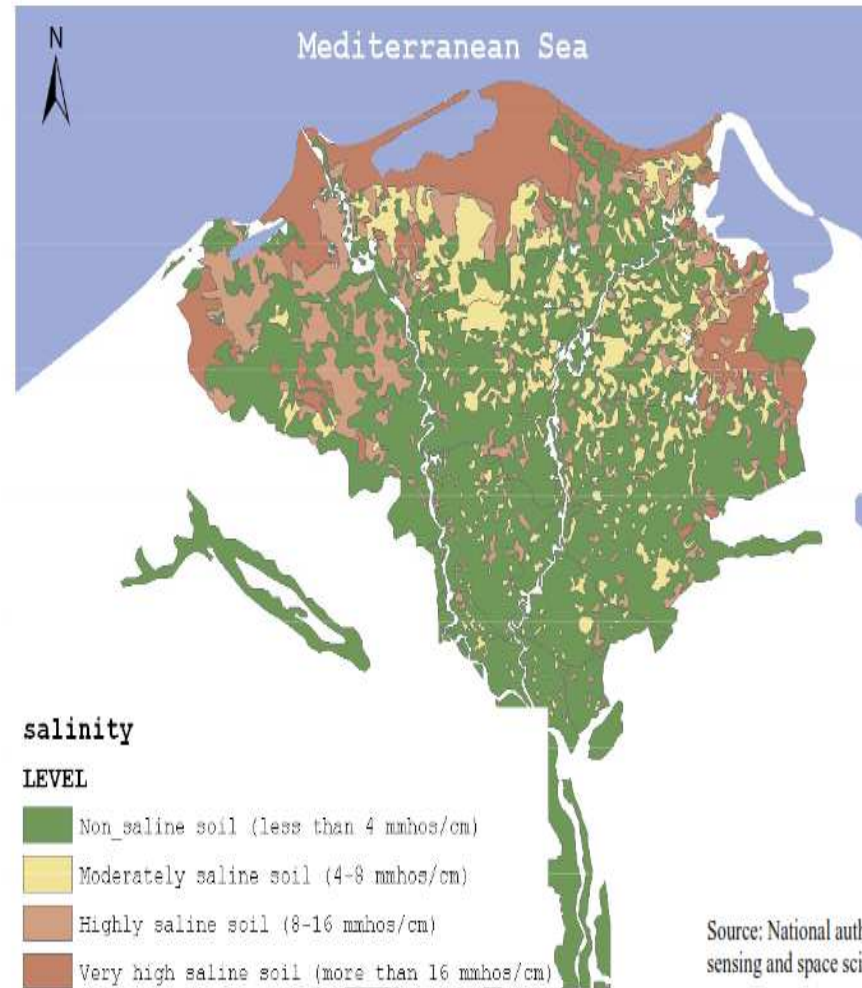
Other problems facing Nile Delta region

Rapid population growth, Salt-Water Intrusion, Soil salinization ...etc.

Salt Water intrusion



Average depth to groundwater in the Quaternary aquifer recorded in 2008 (Morsy, 2009).

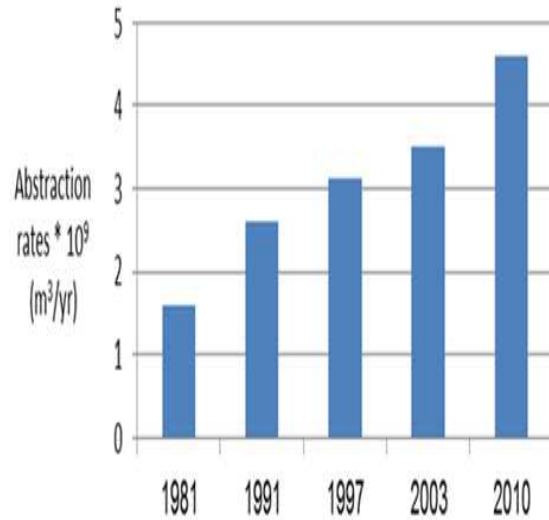


Source: National authority of remote sensing and space science, 1998

Salinity Level in the delta

Source: Land-use change and adaptation in the Nile Delta region (medany el al)

Salt Water intrusion



Abstraction rates versus time in Nile Delta (RIGW, 1980, 1992b, 1999, 2003, and 2010).

North Delta

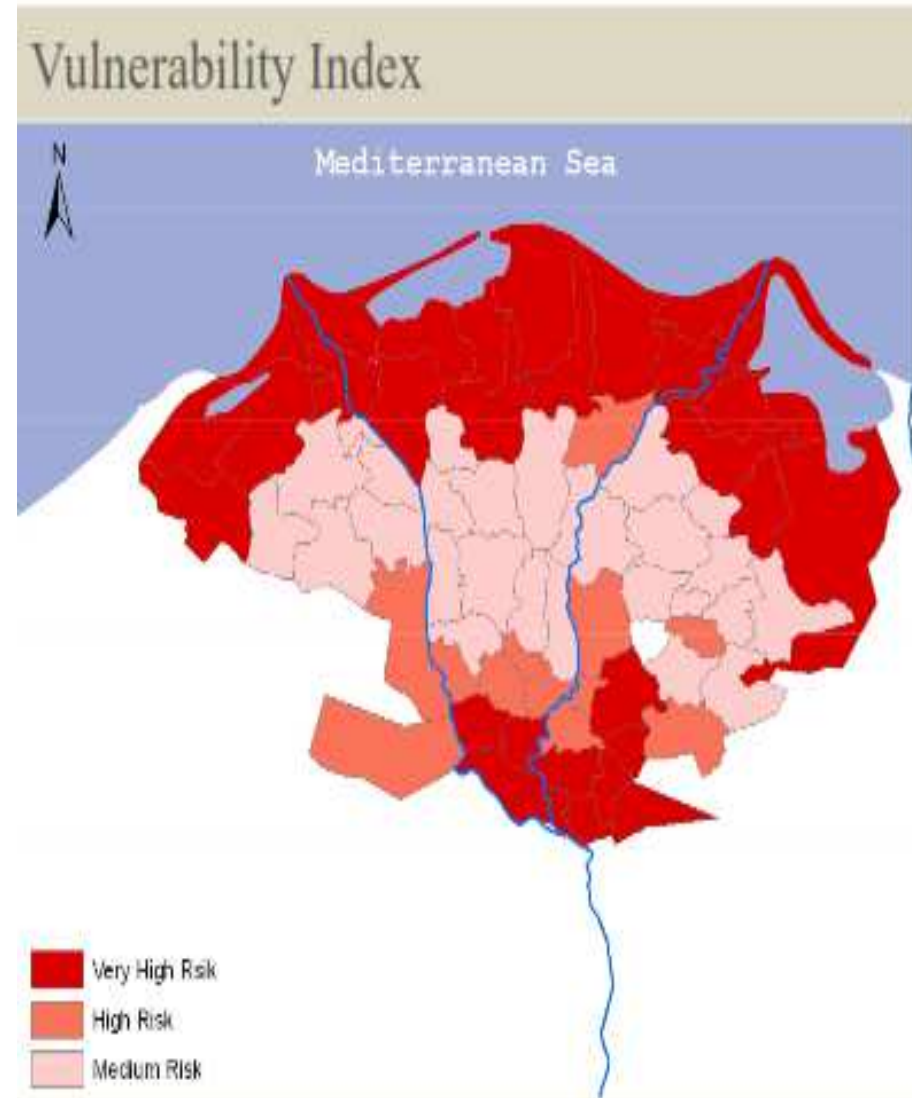
Land degradation due to soil salinity and continues increase in water table and continues increase in water table

Middle Delta

High water table
Limited and inflexible crop pattern Limited and inflexible crop pattern

South Delta

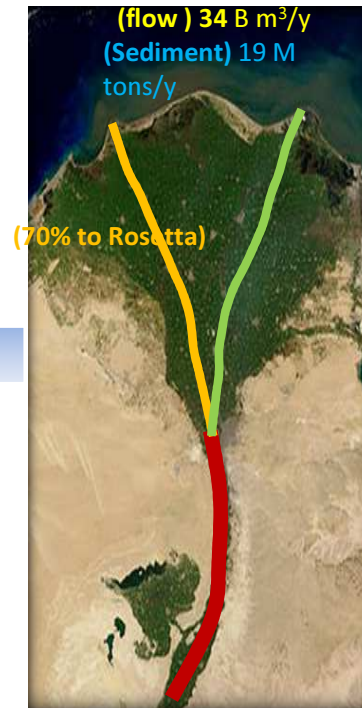
Land degradation due to urbanization



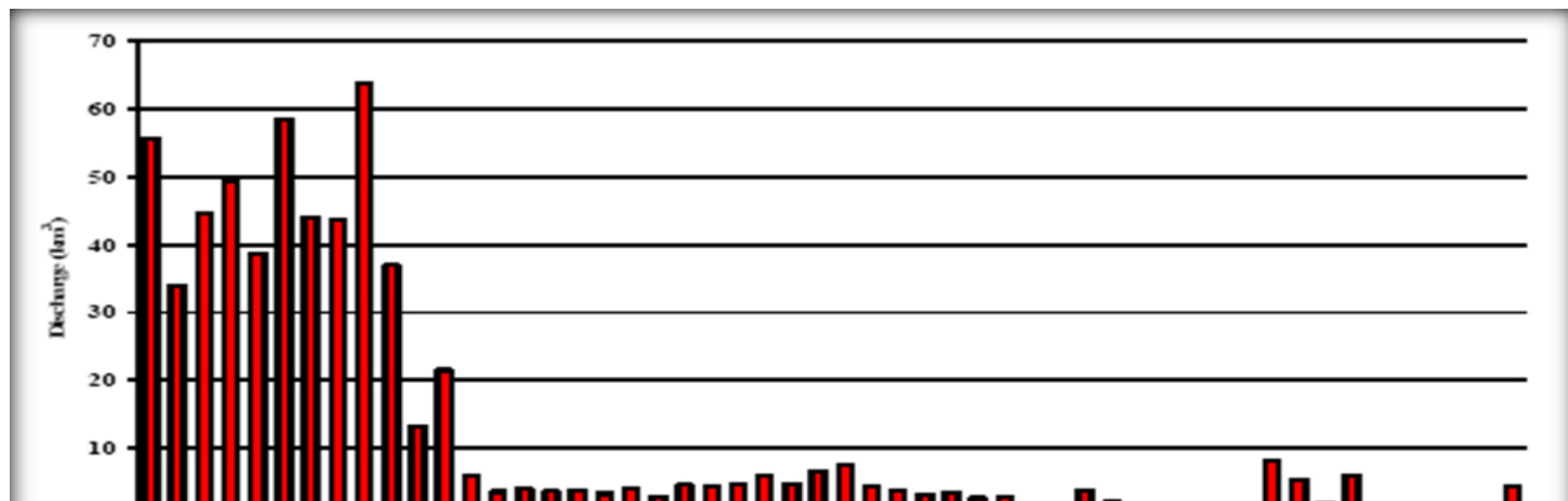
Source: ADAPTATION OF AGRICULTURE IN EUROPEAN REGIONS AT ENVIRONMENTAL RISK UNDER CLIMATE

How AHD affect discharges of flow and sediment

Before



After

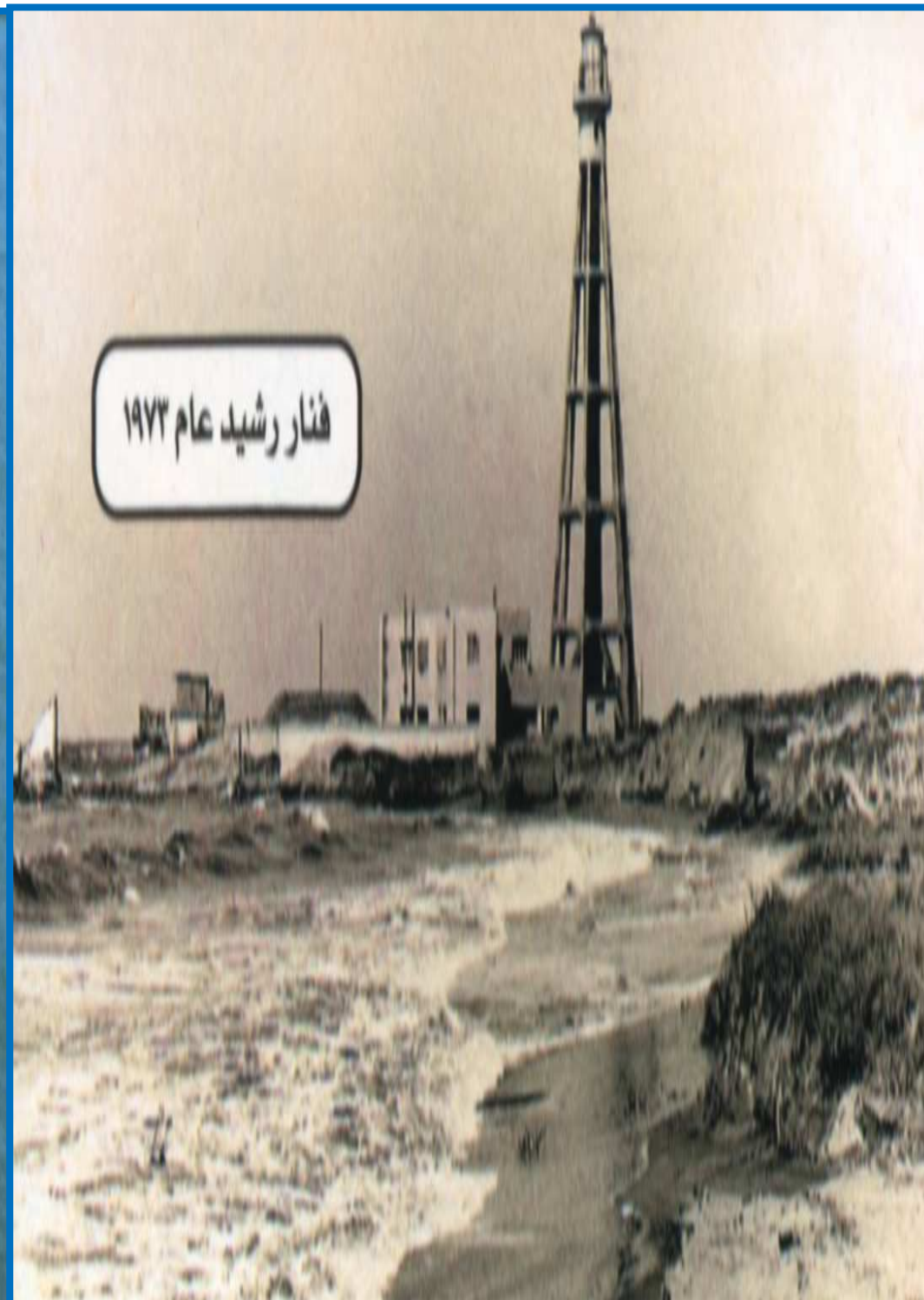




Rosetta lighthouse by Chafik



فنار رشید عام ۱۹۹۰
وعمق المياه حوله ۸-۶ متر
منطقة فنار رشید



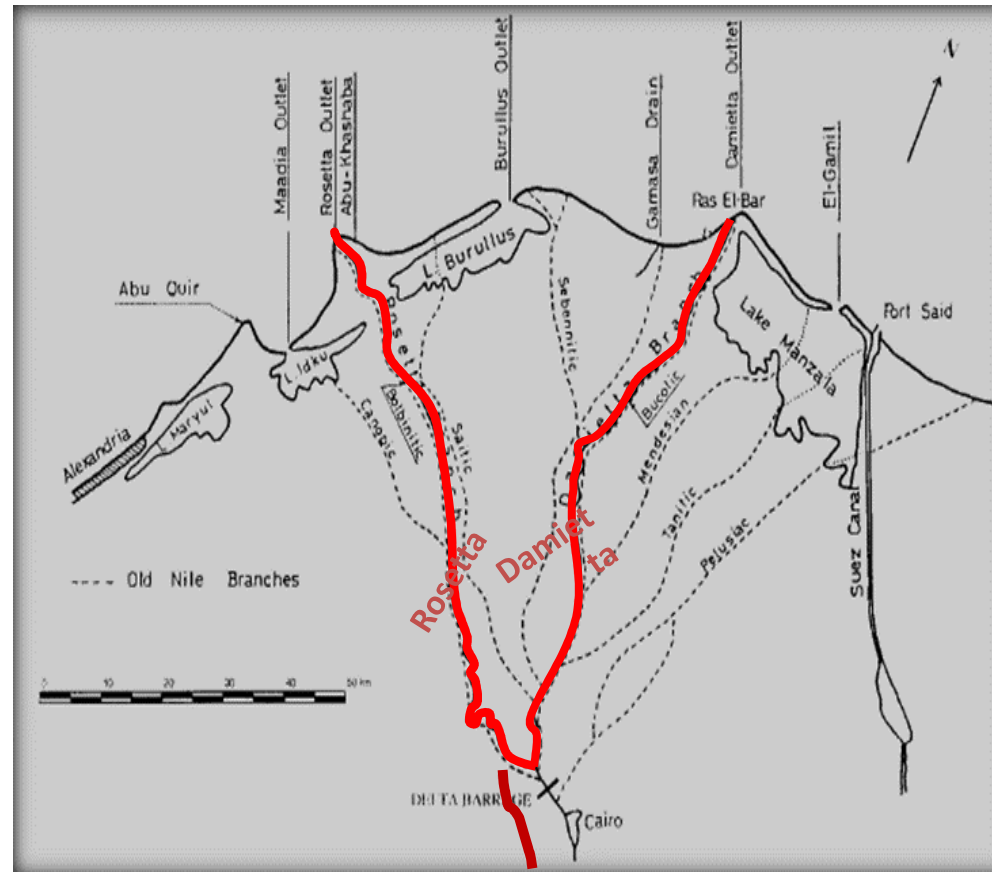
فنار رشید عام ۱۹۷۳



Nile flood by Chafik

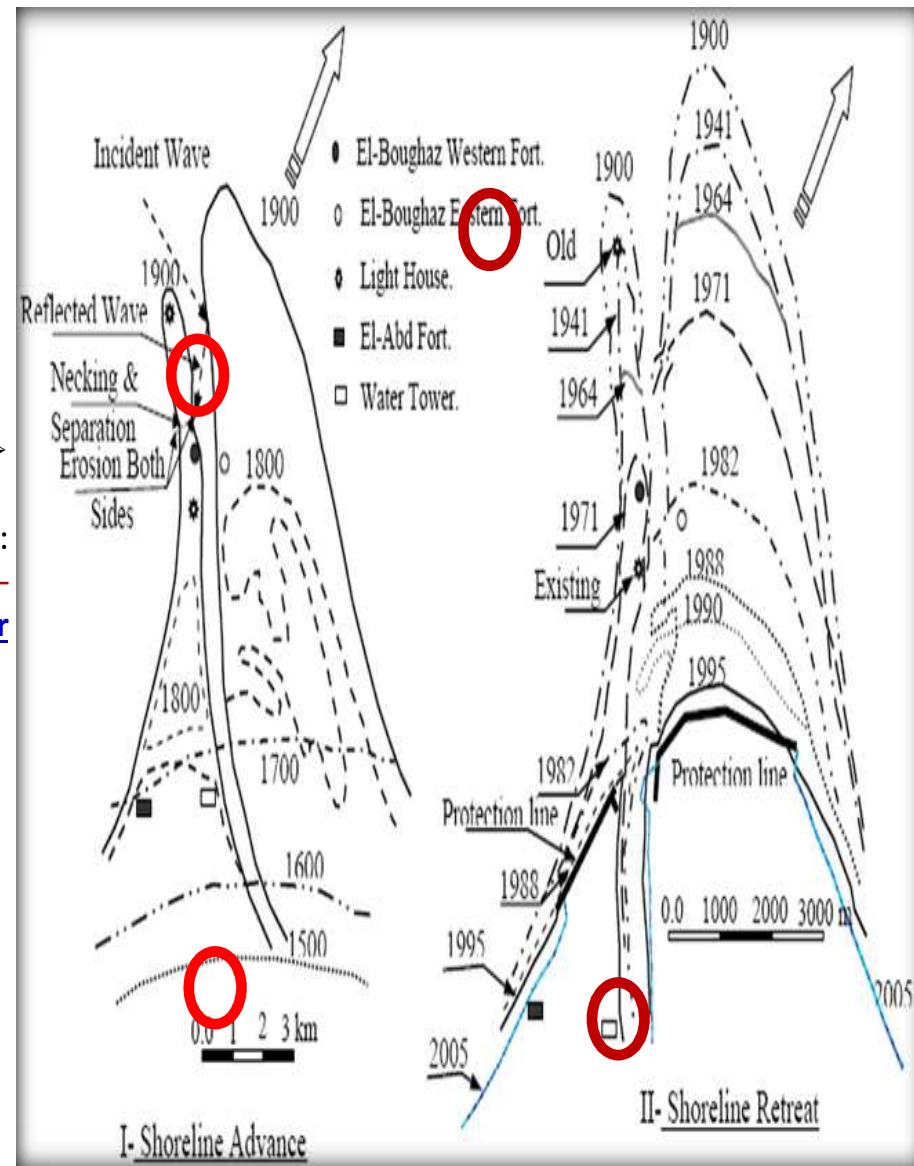
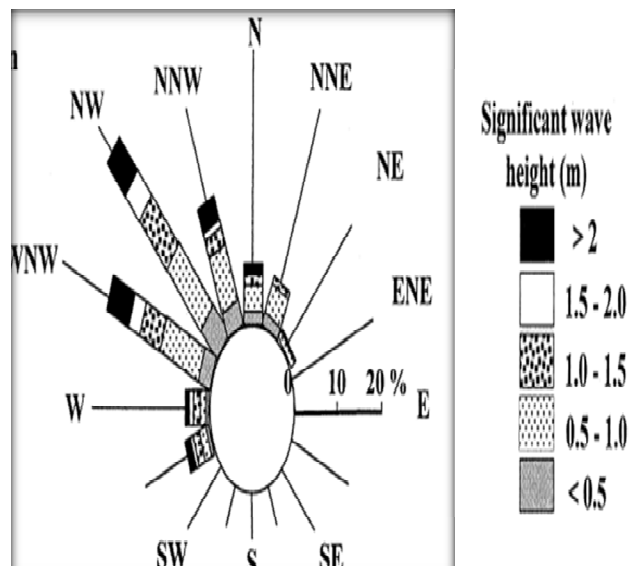


- The Nile Delta was built during many thousands of years by sediment transported through Nile River to the **coastal area before** constructing Aswan High Dam (**AHD**), Stanley and Warne (1994)



Began about 1900 after ➤
construction
the **Aswan Low Dam**:
Erosion rate(1900 –
1964): 20 m/yr

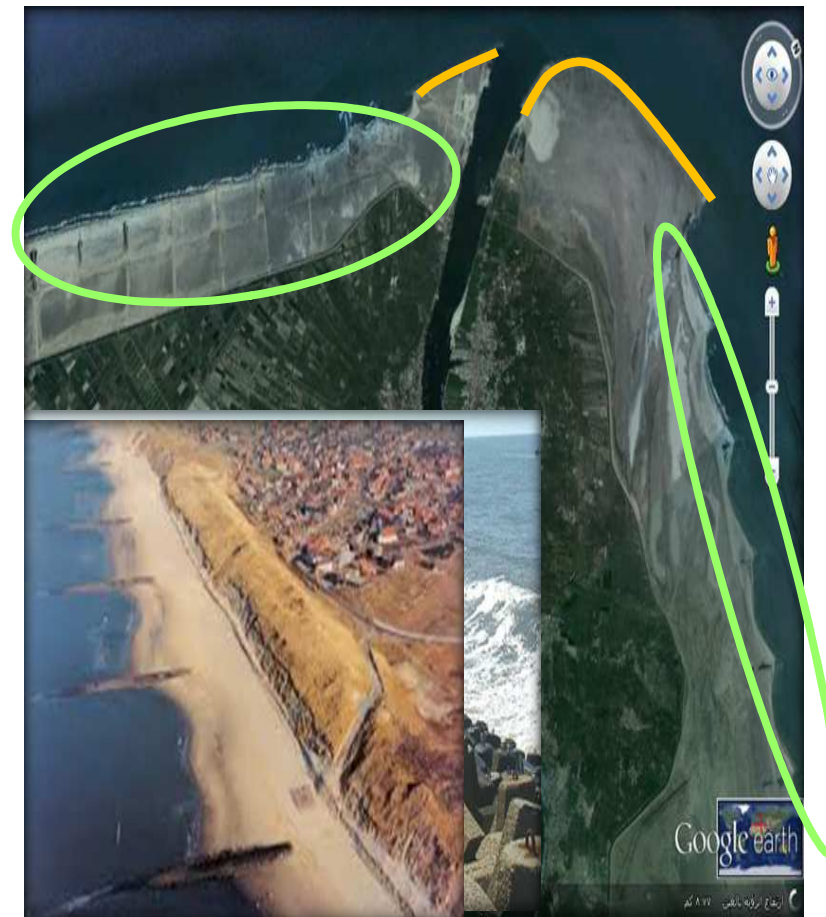
After **High Aswan Dam**, ➤
it **increased** the erosion
rate between 1964-2006
to 95.3 and 124.8 m/yr



Shoreline Advance & Retreat along Rosetta Promontory, (1500-2005) El Sayed et al. 2007).

- Total cost = seawall (250, 000,000 LE)+ 5 groins(50,000,000 LE)+ 9 groins(100,000,000 = **400,000,000 LE =55,967,200 \$**
(AT THAT TIME)

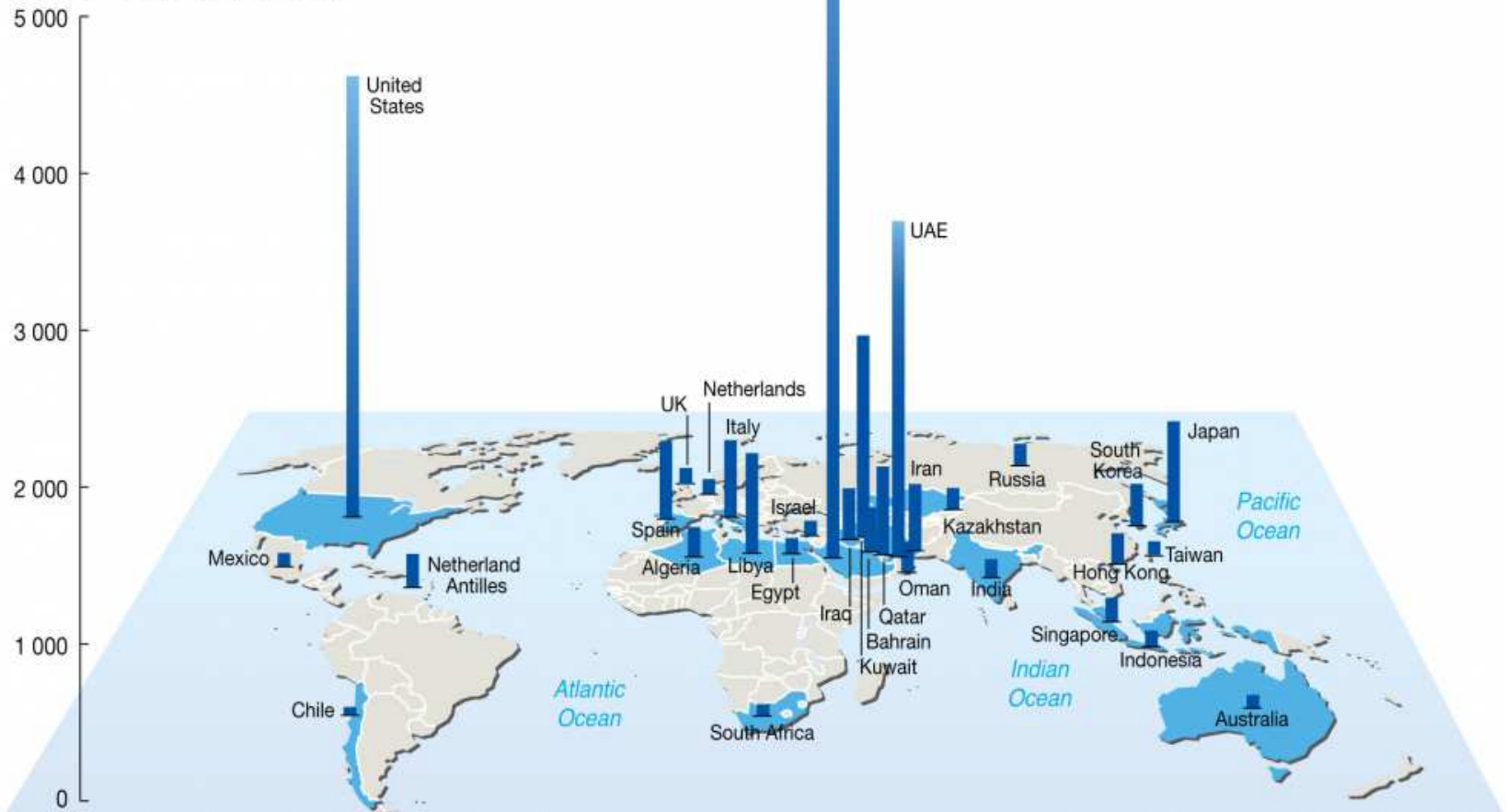
➤ Although, many hard structures were built up, The situation still unstable



Water desalination

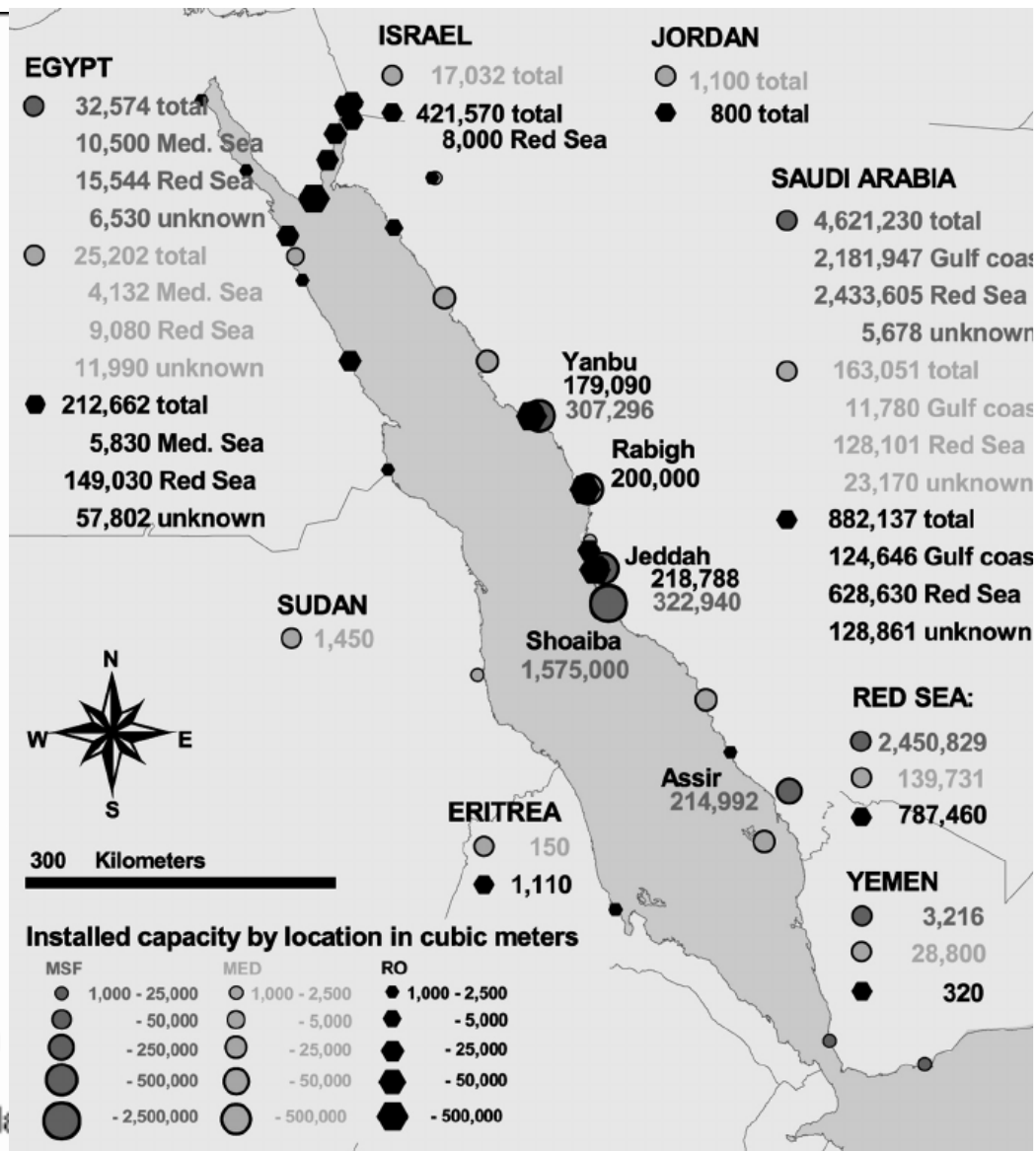
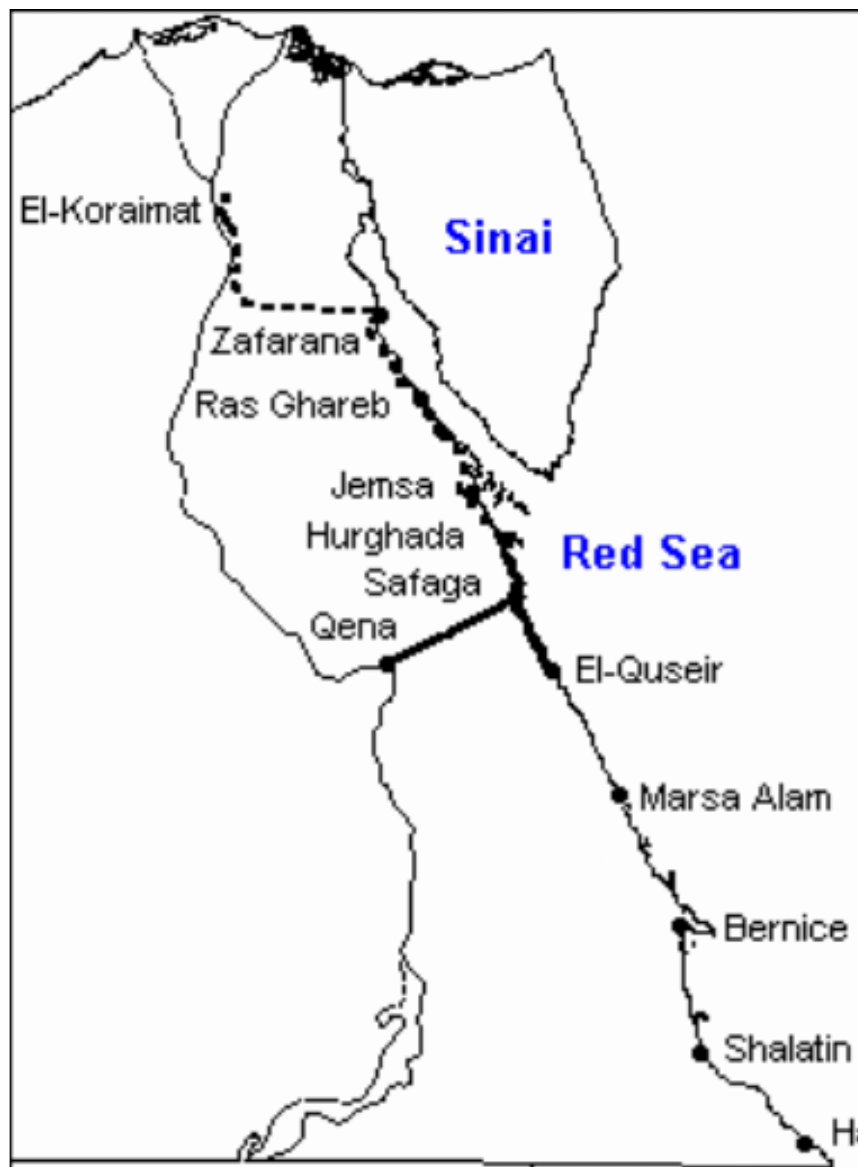
Desalination capacity

Thousand of cubic metres per day



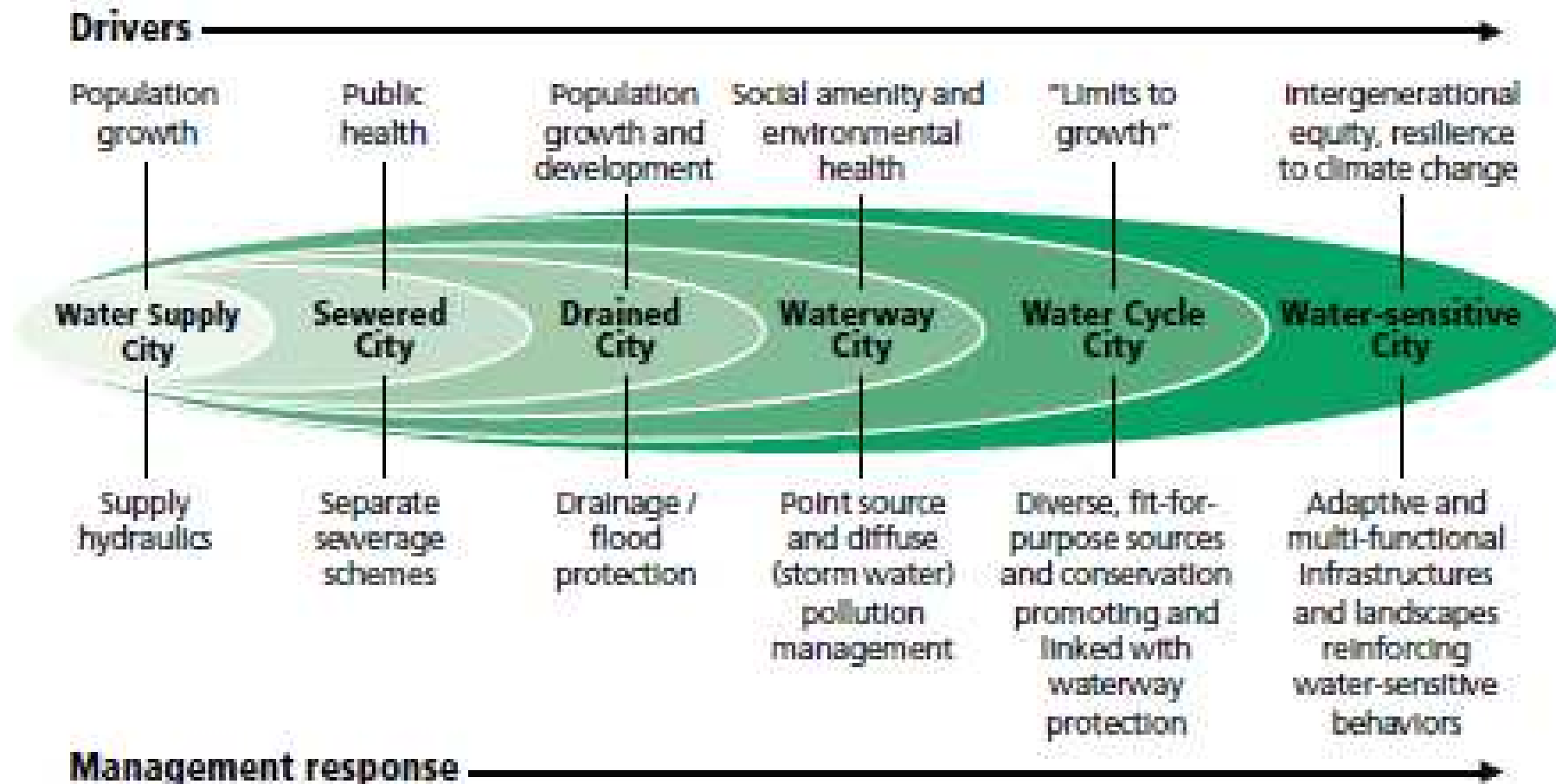
Note: only countries with more than 70 000 cubic metres per day are shown.

Sources: Pacific Institute, The World's Water, 2009.

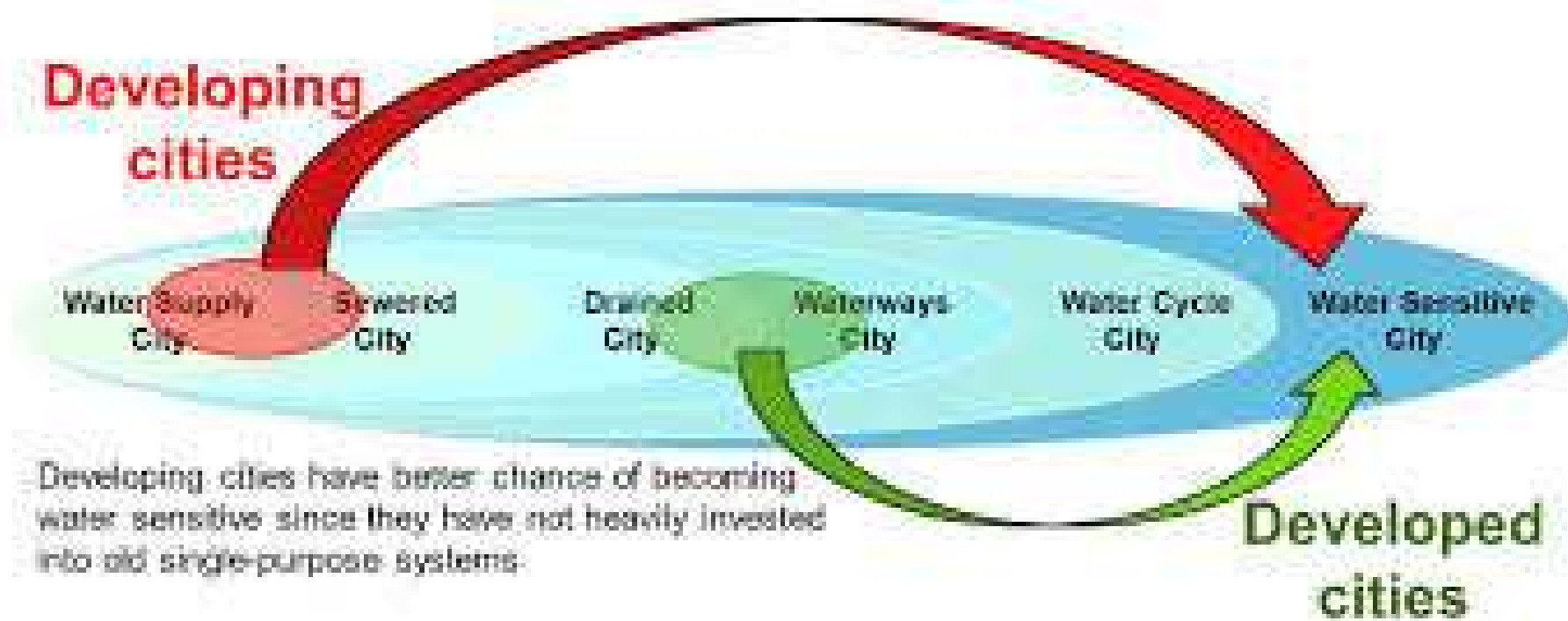


Water-Sensitive Cities Framework

Urban water transition phases



Source: Based on T. Wong and R. R. Brown. 2009. *The Water Sensitive City: Principles for Practice*. *Water Science and Technology* 60(3):673–682.



Economic vs Biological

Three fundamental differences

- 1) the economic resource definition is human-centered while the biological definition is nature-centered
- 2) the economic view includes desire along with necessity, whereas the biological view is about basic biological needs;
- 3) economic systems are based on markets of currency exchanged for goods and services, whereas biological systems are based on natural processes of growth, maintenance, and reproduction.

