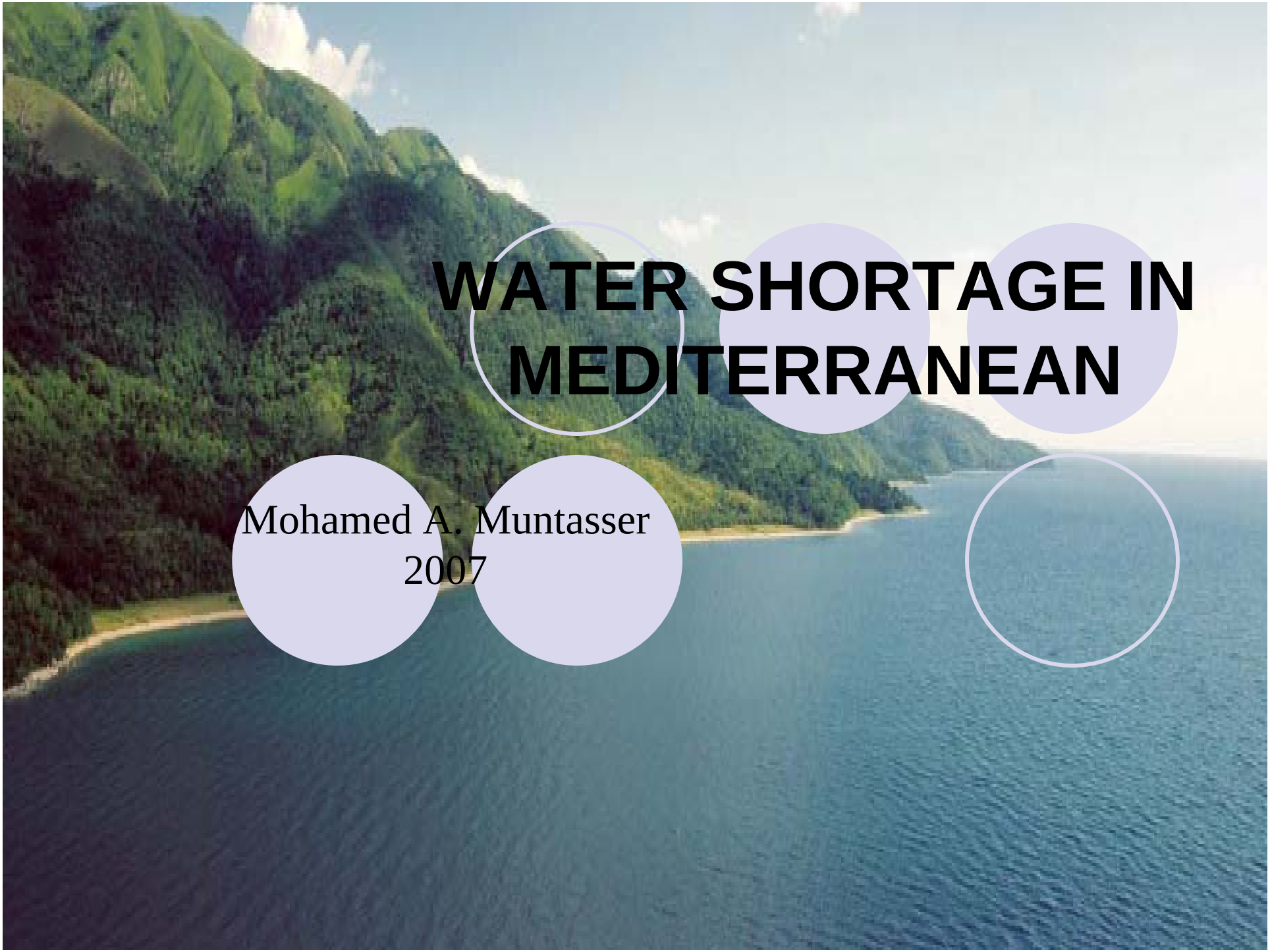


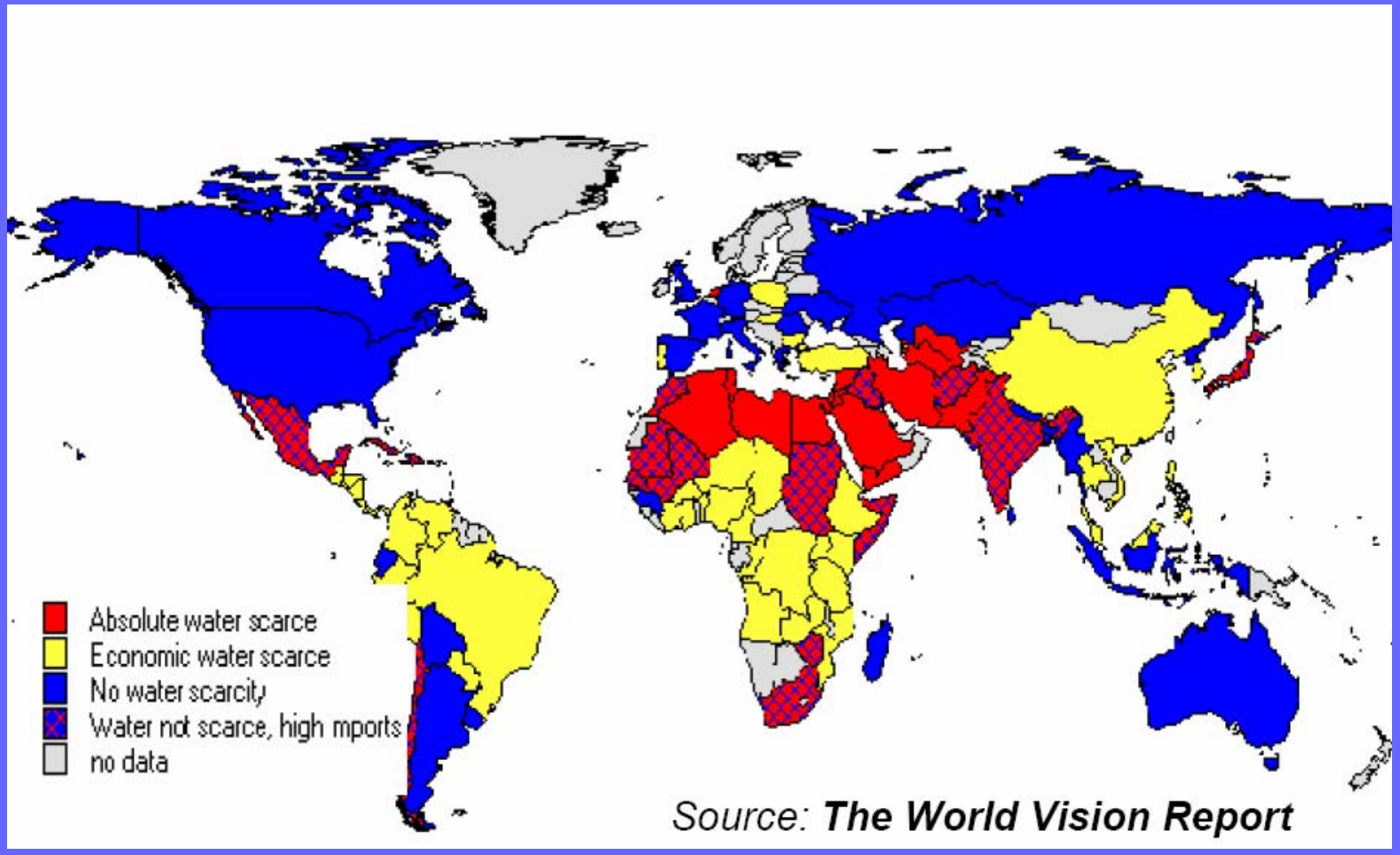
WATER SHORTAGE IN MEDITERRANEAN

Mohamed A. Muntasser
2007

Water Shortage in the Glob

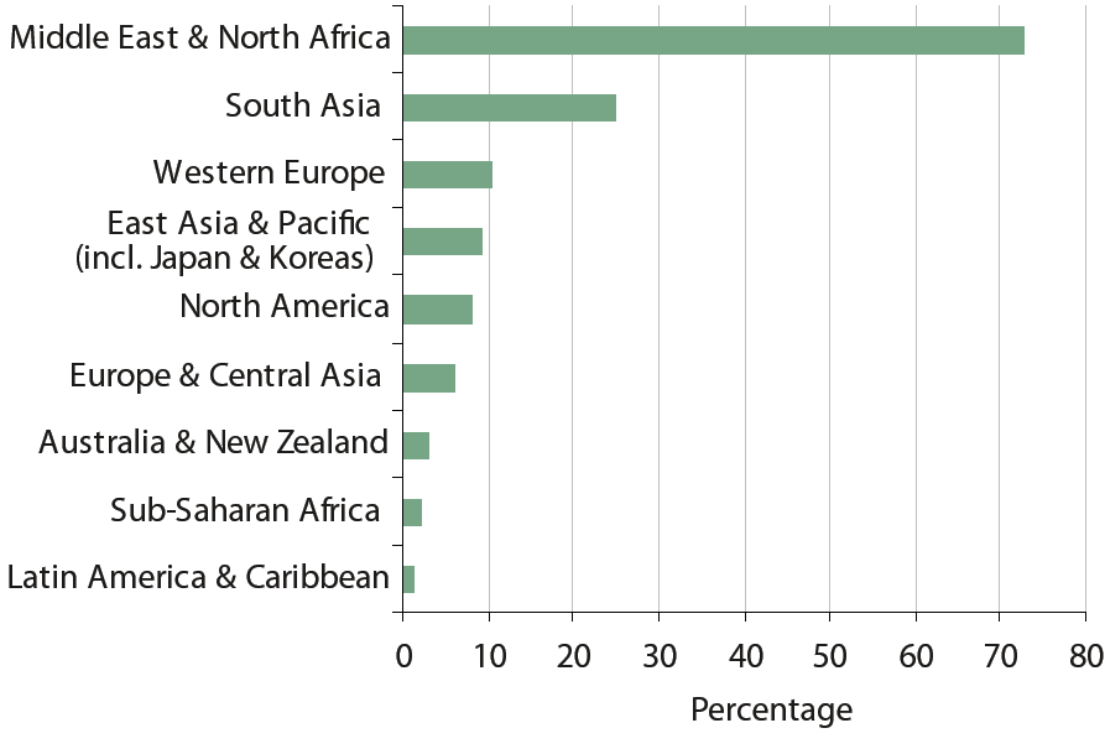
Water shortage and scarcity will be the main problem for future generations and it will have their effects in many parts of the world. The scarcity of water will affect mostly the poor and it will undermine the economic, social, and environmental foundations of many countries especially the developing ones. Water scarcity leads to the continual deterioration of water quality. As we all know the usable freshwater resources are finite, adding to the fragility of the global political and social system in the world. The scarcity of water is a great threat to the global sustainability of the water supply and potentially to world development and peace. [1]

Water Shortage in the Glob



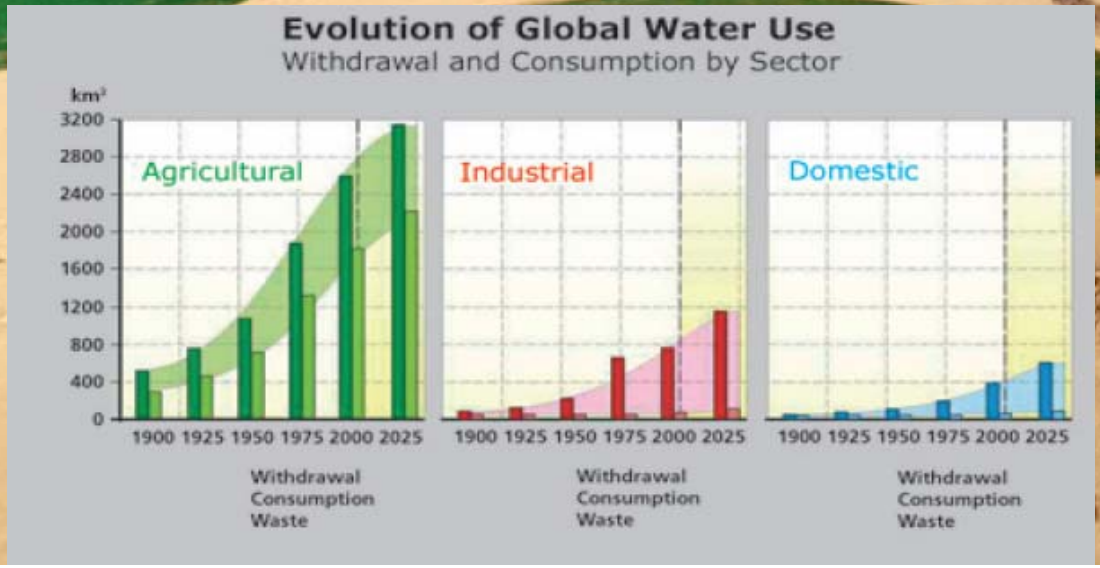
Water Shortage in the Glob

Percentage of Total Renewable Water Resources Withdrawn, by Region



Water Shortage in the Glob

Agriculture is the greatest single worldwide consumer of water (70%), followed by industry (20%) and homes (10%). Considerable efforts have been made to reduce consumption in industry and homes; but much remains to be done in improving the efficiency of irrigation. The increasing use of nonrenewed groundwater for irrigating of marginal farmland in arid zones is of particular concern. The proportion of water used in these three sectors varies region to region, and between levels of economic development. In Europe and North America, water is used primarily by industry. In Asia and Africa, agricultural irrigation is the primary consumer. Thus in many semi-arid and arid regions about 30% of groundwater is extracted for irrigation, and the trend is increasing.



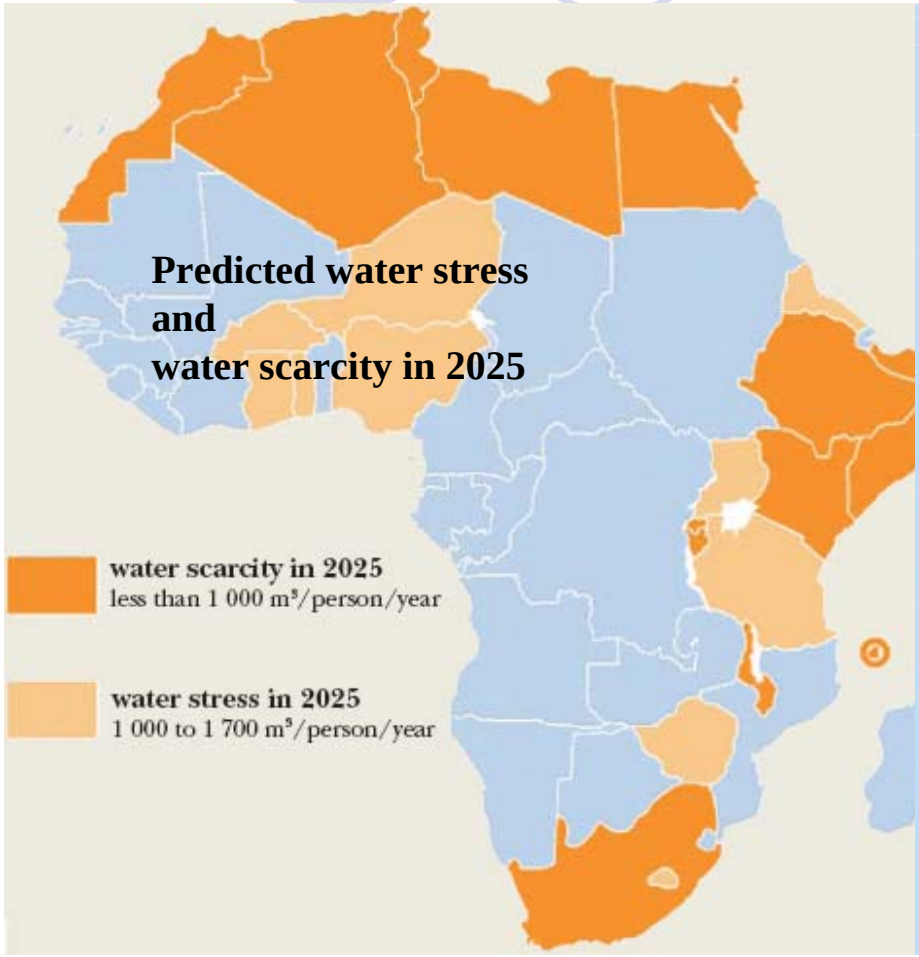
Water Shortage in the Glob

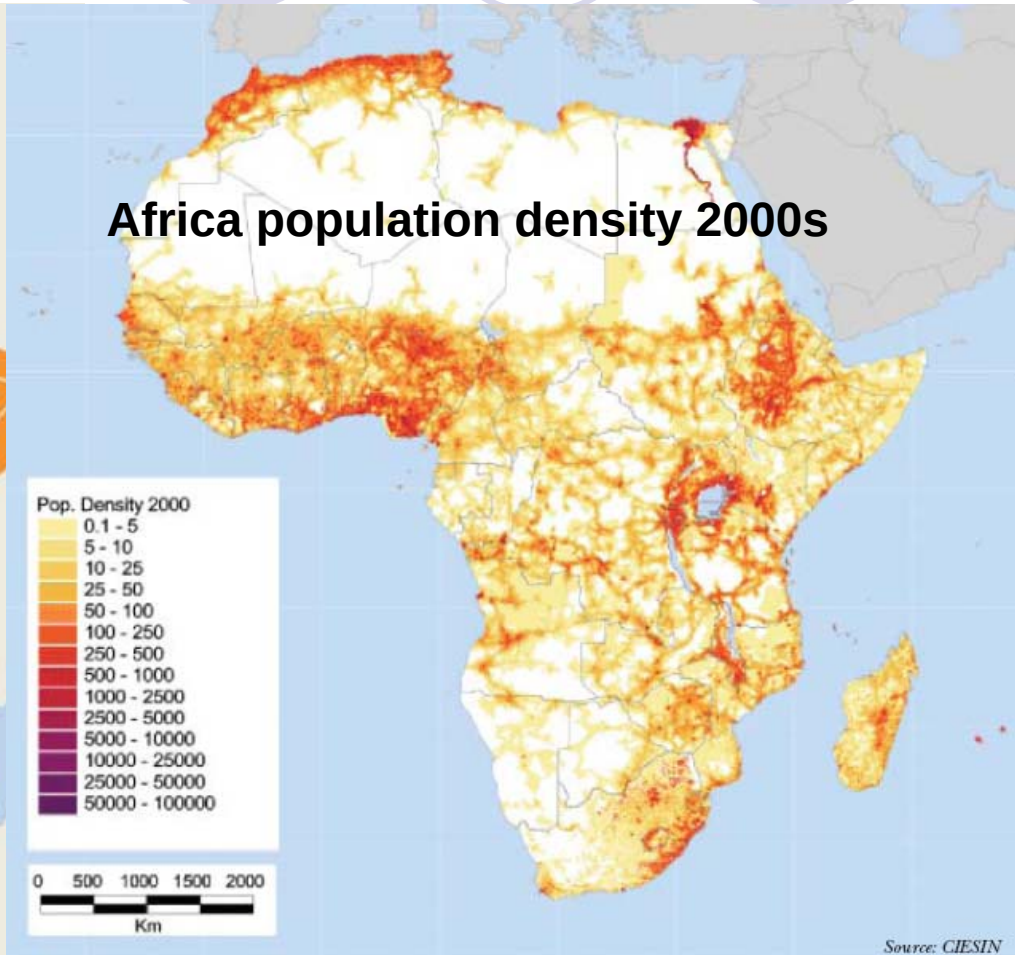
Table n° 12: Renewable water potential per inhabitant at world level

	Renewable water	Population	Potential/inhab/year
	milliards m3	millions	m3
Oceania	769	21	36619
Latin America	0776	466	23103
North America	579	287	18742
East Europe and Central Asia	7256	495	14659
Africa	4184	559	7485
West Europe	1985	383	5183
Asia	9985	3041	3283
MENA	355	284	1250

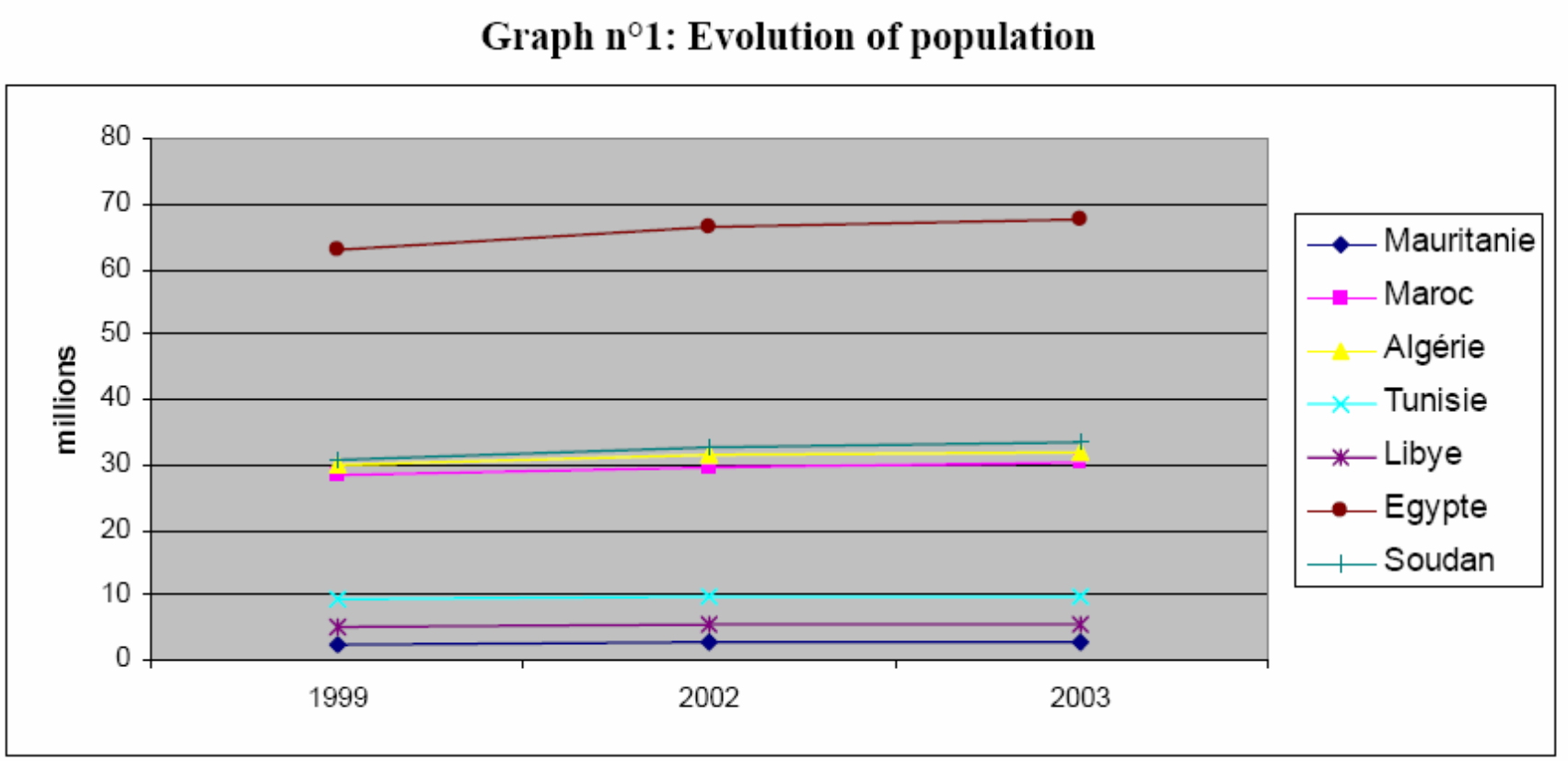
The countries concerned with the MENA region (Middle-East and North Africa) whose water resources are the lowest on a worldwide scale. By using the ratio **[volume of renewable water resources/population]** one notes that MENA region has only 1250 m3/hab/an, which is the lowest water potential worldwide, representing the third of the potential per capita of the second lowest water potential zone, which is Asia (3280m3/hab), and almost twentieth of Latin America potential (23000 m3/hab).

Water Shortage in Mediterranean





Water Shortage in Mediterranean



Water Shortage in Mediterranean

The sub region is relatively low populated taking into account the vast space on which it extends: the density of population is almost 19 inhabitants per km^2

Table n°2 : Population

	Mauritania	Morocco	Algéria	Tunisia	Libya	Egypt	Sudan	Total
Population (million)	2,7	30	32	10	5,6	68	33,5	181,8
% of total	1,49	16,50	17,60	5,50	3,08	37,40	18,43	100
Area (1000km2)	1000	711	2400	163	1800	1000	2500	9574
Density/km2	2,7	42,19	13,33	61,35	3,11	68,00	13,40	19,20

Source: national reports (2004)

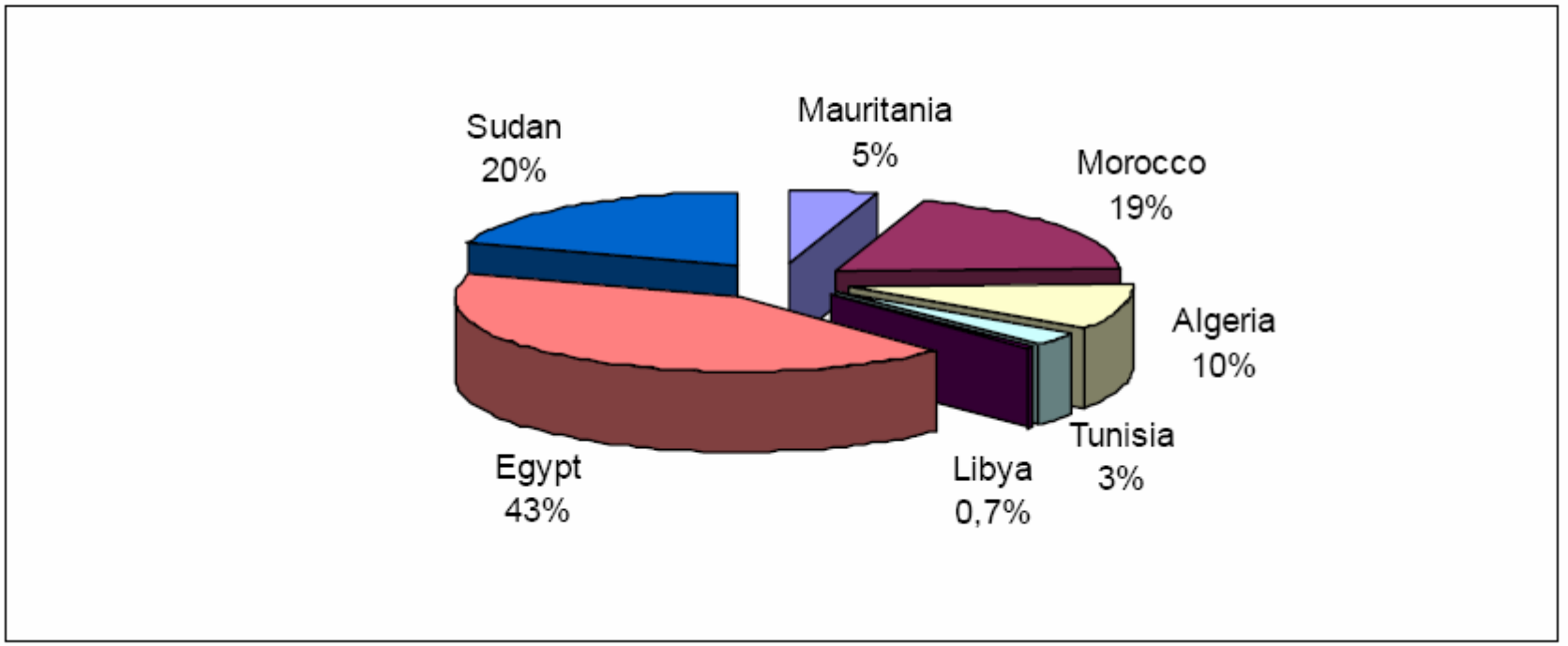
Water Shortage in Mediterranean

Table n°13 : Water potentiel per inhabitant

	Mauritania	Morocco	Algeria	Tunisia	Libya	Egypt	Sudan	Total
Renewable water resources (Mm3)	7400	29000	15150	4560	600	63000	30000	145010
Potent/inhab (m3/year)	**2741**	**967**	**473**	**456**	**107**	**926**	**896**	**825**
Population 2003 (1000)	2600	2700	32000	10000	5600	68000	33500	181800
Pop increase (%)	2.2	1.6	1.6	1.1	2.0	1.8	2.3	1,69
Population 2025	4287	42624	45072	12603	8516	100065	55333	268500
Water potentiel 2025(m3/year	**1726**	**680**	**316**	**362**	**70**	**629**	**542**	**557**

Water Shortage in Mediterranean

Graph n°7: Repartition of renewable water resources



Water Shortage in Mediterranean: (Water dependency ratio)

Water is a contested resource in the Middle East region and the water dependency – water from outside a country's borders – is rather high for many countries (see Table 3). For example Kuwait relies entirely on water sources outside its borders and the dependency ratio also runs high in countries like Egypt, Syria, Palestine, Israel and Iraq.

Water Shortage in Mediterranean: (Water dependency ratio)

Country	Water Dependency ratio (percent)
Kuwait	100
Egypt	97
Bahrain	97
Syria	80
Palestine	75
Israel	55
Iraq	53
Jordan	23
Tunisia	9
Iran	7
Lebanon	7
Algeria	4
Qatar	4
Morocco	0
Djibouti	0
Oman	0
Yemen	0
Malta	0
Saudi Arabia	0
Libya	0
United Arab Emirates	0

Source: World Water Development Report 2003 and Phillips et al. 2005.

It should be noted that the water dependency ratio in the above table does not include shared groundwater aquifers. In fact, countries like Libya, Tunisia and Algeria are sharing vast amounts of groundwater.

Water Shortage in Mediterranean

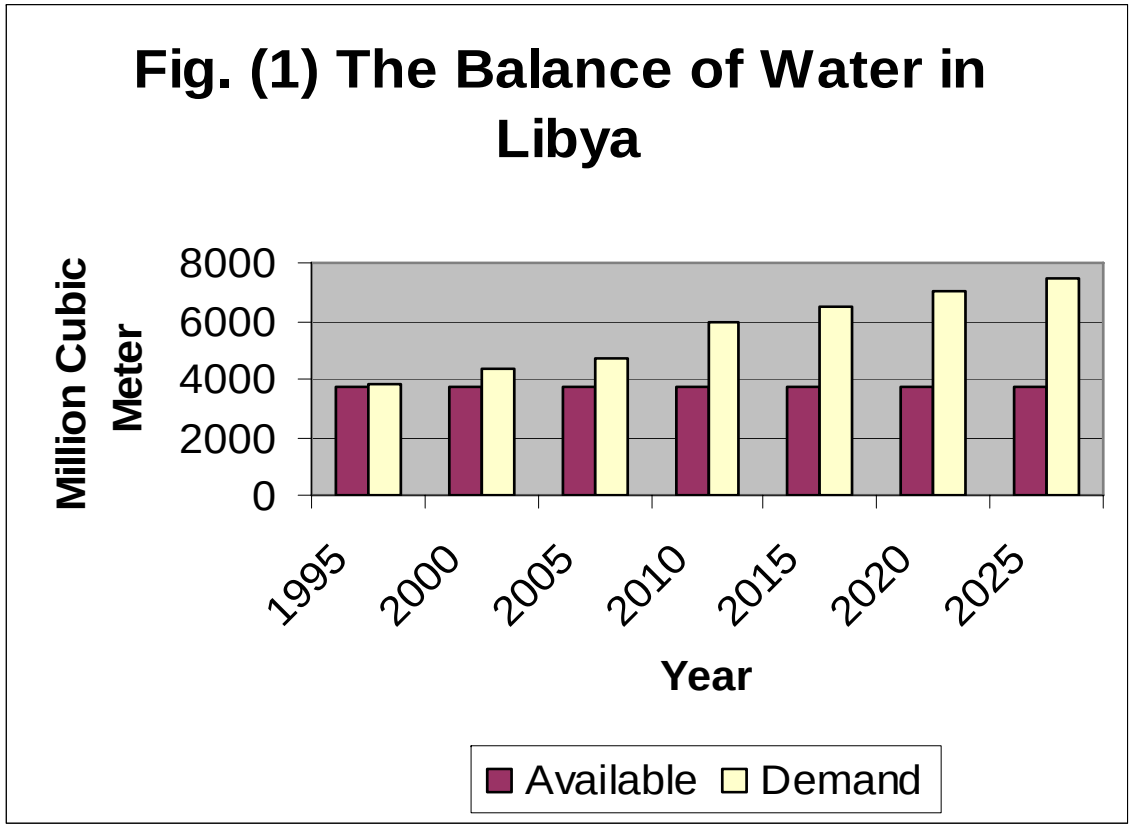
Algeria, Tunisia and Libya share the exploitation of the groundwater of the North Sahara Aquifer System (SASS), which over recent decades have seen their exploitation increase from 0.6 to 2.2 billion m3 per annum.

Libya, which has very limited water resources, has for a long time been in a situation of imbalance between water resources and water needs. To offset this imbalance, Libya has recourse to non-conventional water and to mining as a means of exploiting its underground water resources, which, we may recall, are non-renewable.

Water Shortage in Libya

- According to the reports published by the water resources institute, nine countries on the Globe are considered that there are in water crisis where these countries using consuming water more than it can be replaced. Libya is the one of this country [2].
- In Libya rainfall(56mm) generates an annual average of flow evaluated to 98,000 Mm3, but only small proportion of this rainfall is transformed into renewable water resources, globally evaluated to 1075 Mm3, with 200 Mm3 for surface water, and 875 Mm3 for ground water.
- The underground water sheets whose water is renewable are located at the north of Libya:
- - Sheet of Jifarah (200 mm3, with an annual taking away of 1200 mm3)
- - Sheet of Jabal Lakhdar (200 mm3 with a taking away of 600Mm3)
- - Sheet of Hamada (475 mm3 with a taking away of 150 mm3)
- Three other sheets (Murzuk, Sarir, and Kufra) contain an important water potential, but it is non renewable.

Water Shortage in Libya



- This Figure shows the balance of water in Libya for the years 1995 to 2025 where the shortage of water has exists starting from the year 2000. Equivalent to 1.8 million meter cube per day and this will rise to 3.6 million meter cube per day in the year 2005

Water Shortage in Libya

Table n° 25: Indicators of irrigated agriculture

	Mauritanie	Morocco	Algeria	Tunisia	Libya	Egypt	Sudan
Irr area (100ha)	40	1100	450	400	350	5800	1880
Ha per 1000 inhab	15	36	14	40	62	85	56

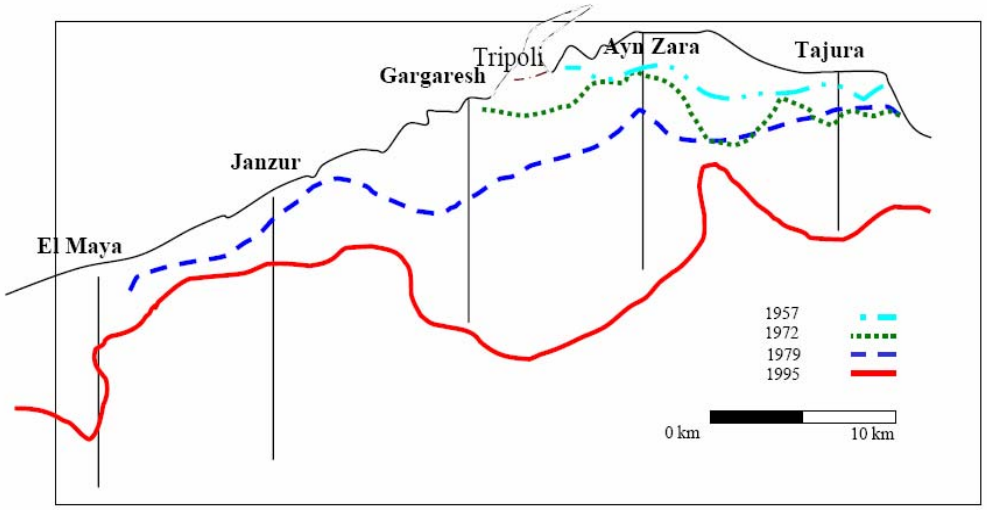
- In Libya, agriculture consumes nearly 87% of mobilized water. It takes part for 7.8% in the GDP and employs nearly 12% of the employment. This contribution would decrease because of water scarcity which characterizes Libya, but the Libyan government counts on the project of the Large artificial River for at least "preserving the areas which are irrigated at the moment, and, perhaps, extend them"
- Water demand for irrigation is estimated at a volume of 4300Mm3 in 2005, which is necessary to irrigate 450,000ha. This volume would increase to 6300 Mm3 (650,000ha) by 2025
- Industry uses 4% of the Libyan water resources. Today the volume of water used by industries rises to 214 Mm3, but an increase in demand, with a rate of 4% is forecast, which increases water demand for industry to 470 Mm3 in 2025.

Water Shortage in Libya (Intrusion of Seawater)

Excessive extraction in ground water sheets causes intrusion of salted bevels when these sheets are situated on coast. It is a phenomenon which becomes extensive in the majority of the coastal sheets of the countries in the sub region, as illustrated in the following graph, which illustrate the progression of the sea water intrusion in the zone of Tripoli in Libya.

MENA

Graph n°13 : Intrusion of sea water in the zone of Tripoli- Libya



Source national report -Libya(2005)

Management Policy

- The main elements of sound policies for water resources management involve:

  Reduce water consumption for agriculture sector; Water tariffs linked to the increase in consumption; Customer sensitivity awareness to the real value of quality of water; Maintenance of water and sewage pipe line net works; Long term sustainability of development; Tourism water needs carefully balanced; Optimum use of water desalination

MENA

Management Policy: (The re-use of the waste water)

The re-use of the waste water after treatment is not yet developed by the countries of the sub region, in spite of the scarcity of water, and the environmental imperatives which force to have recourse to it.

Table n°16 : Re-used water after treatment

	Mauritania	Morocco	Algeria	Tunisia	Libya	Egypt	Sudan	Total
Capacity of production (Mm3)	0	70	(70)	30	100	700	1	971
%	0	7	7	3	10	72	0.1	100

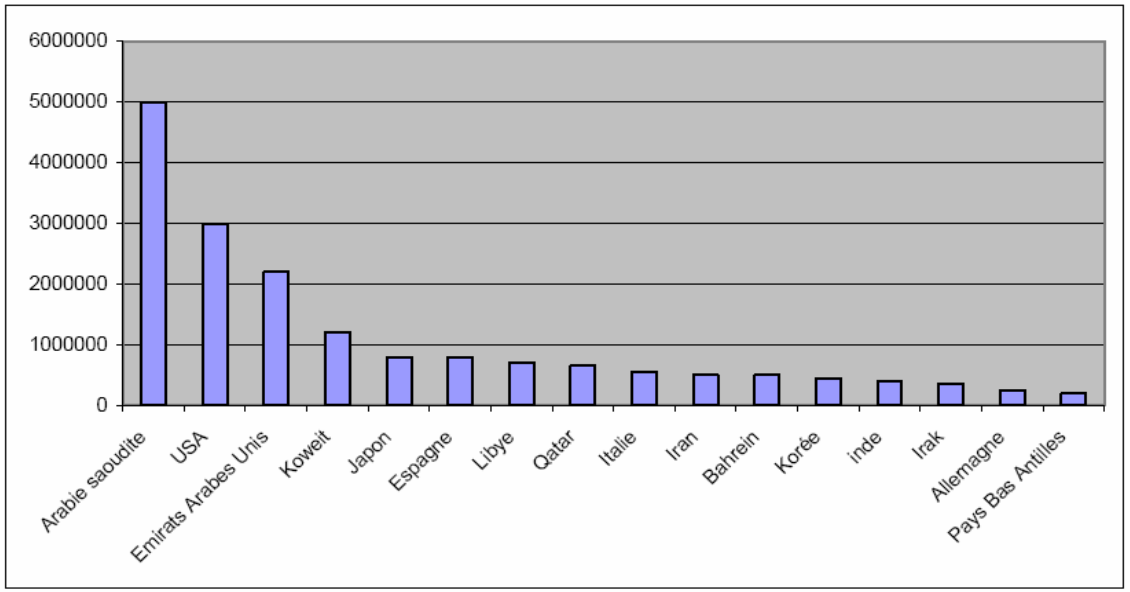
MENA

Management Policy: (Desalinated water)

Counting brackish water and sea water, the sub region has at its disposal a desalination capacity of about 1,410,000 m3 per day. The production of fresh water through desalination is still very expensive, and for this reason it is not much used except in the Middle East, where this water resource is often the only alternative, and also because of low energy costs and the wealth of the countries which use it. In terms of the production of water by desalination, the Middle East has a production capacity equivalent to three times the production of all the other parts of the world.

MENA

Graph n° 11: Country with the largest production of sea water desalination (m3 per day)



Source :Water Vision for the Twenty-first Century in the Arab World

Management Policy: (Desalinated water)

Due to the water shortage in Libya, a National Committee has been formed to find the possible ways and recommendations to concentrate on the water desalination [3]. The first water desalination plant has been installed in 1964. Now more than 75 desalination plants has been installed using different technologies (MSF) (RO) and others.

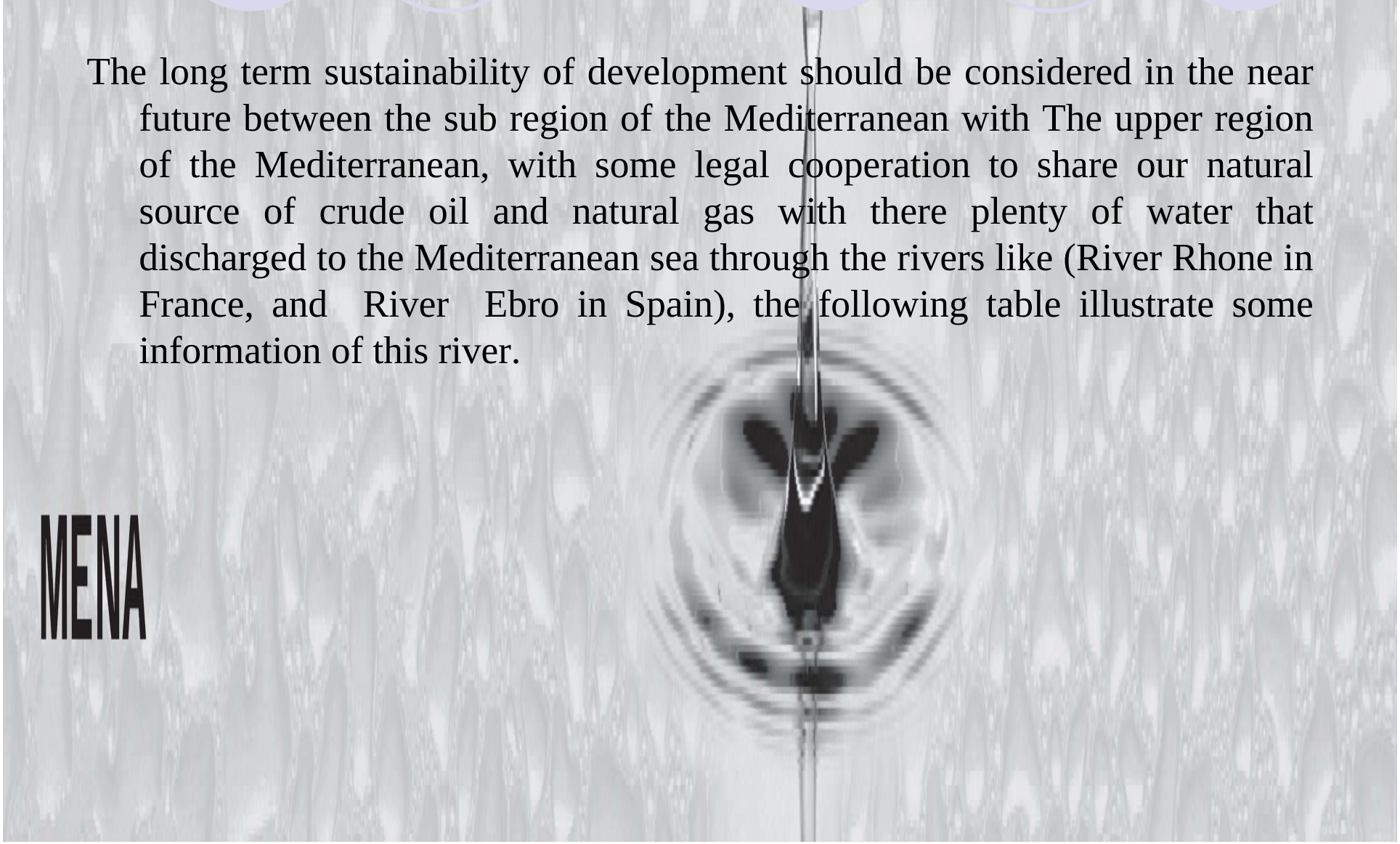
The production capacity of Africa is at an intermediate level, at around one tenth the capacity of the Middle East. The sub region provides 70% of this capacity, which is largely contributed by Libya

Table 3
Desalination capacity by country

	Mauritania	Morocco	Algeria	Tunisia	Libya	Egypt	Sudan	Total
Production Capacity (m3/day)	0	100,000	340,000	70,000	700,000	200,000	0	1,410,000
%	0	7	24	5	50	14	0	100

Management Policy: Long term sustainability of development

The long term sustainability of development should be considered in the near future between the sub region of the Mediterranean with The upper region of the Mediterranean, with some legal cooperation to share our natural source of crude oil and natural gas with there plenty of water that discharged to the Mediterranean sea through the rivers like (River Rhone in France, and River Ebro in Spain), the following table illustrate some information of this river.



MENA

Ebro river in Spain

Country	Spain
Length	910 km
Average Discharge	426 m^3/s

River Rhone in France

Origin	Rhône Glacier
Mouth	Mediterranean Sea
Basin countries	France ,Switzerland
avg .discharge	1,800 m³/s

- THANK YOU FOR YOUR ATTENTION