Water and Energy Trade Sustain development in The Mediterranean

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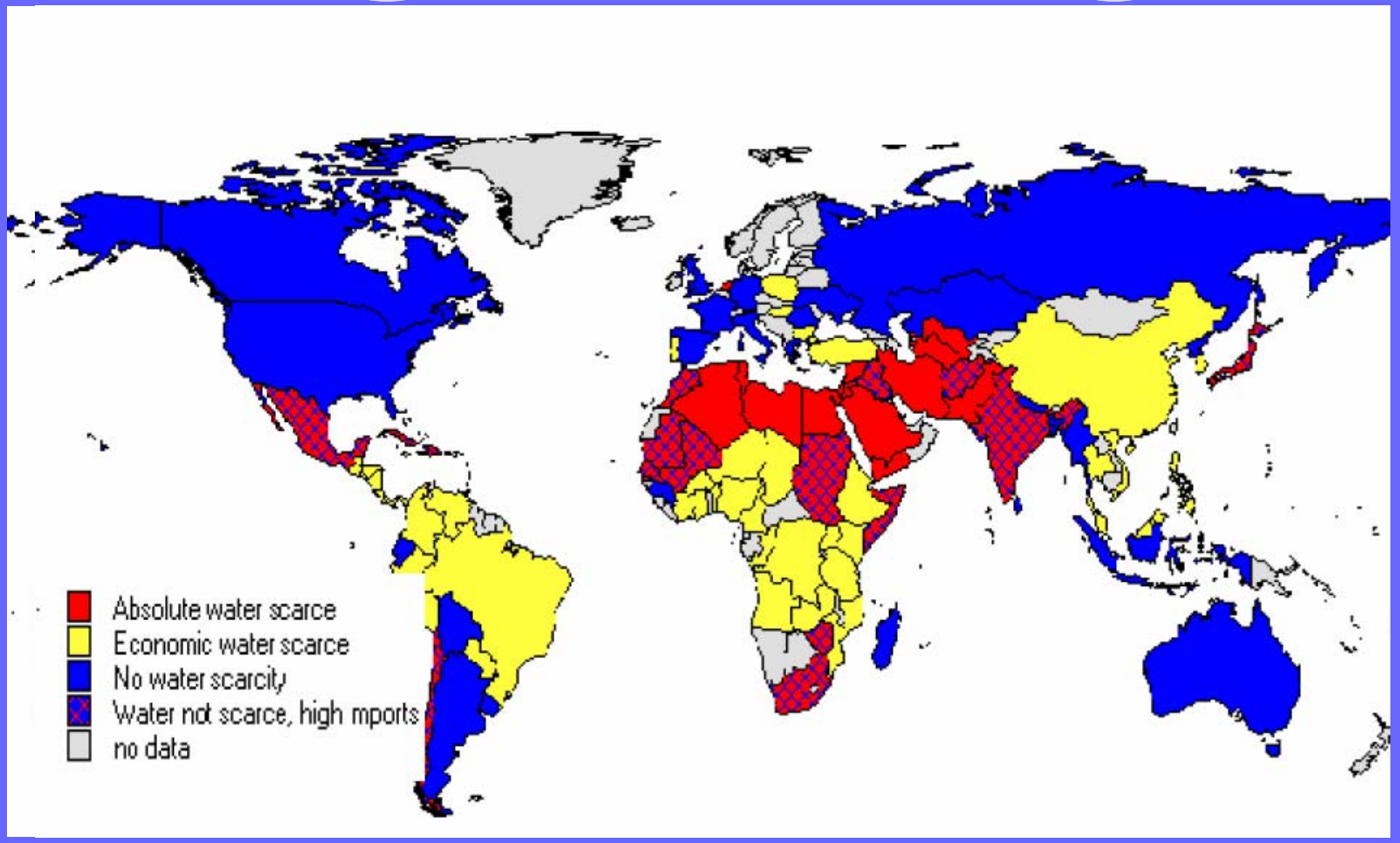
Water and Energy Shortage in the Glob

Water and energy 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 and energy will affect mostly the poor and it will undermine the economic, social, and environmental foundations of many countries especially the developing ones. Water and energy scarcity leads to the continual deterioration of water quality as well as quality of life. As we all know the usable freshwater and energy resources are finite, adding to the fragility of the global political and social system in the world. The scarcity of water and energy are great threat to the global sustainability of the water and energy supply and potentially to world development and peace.

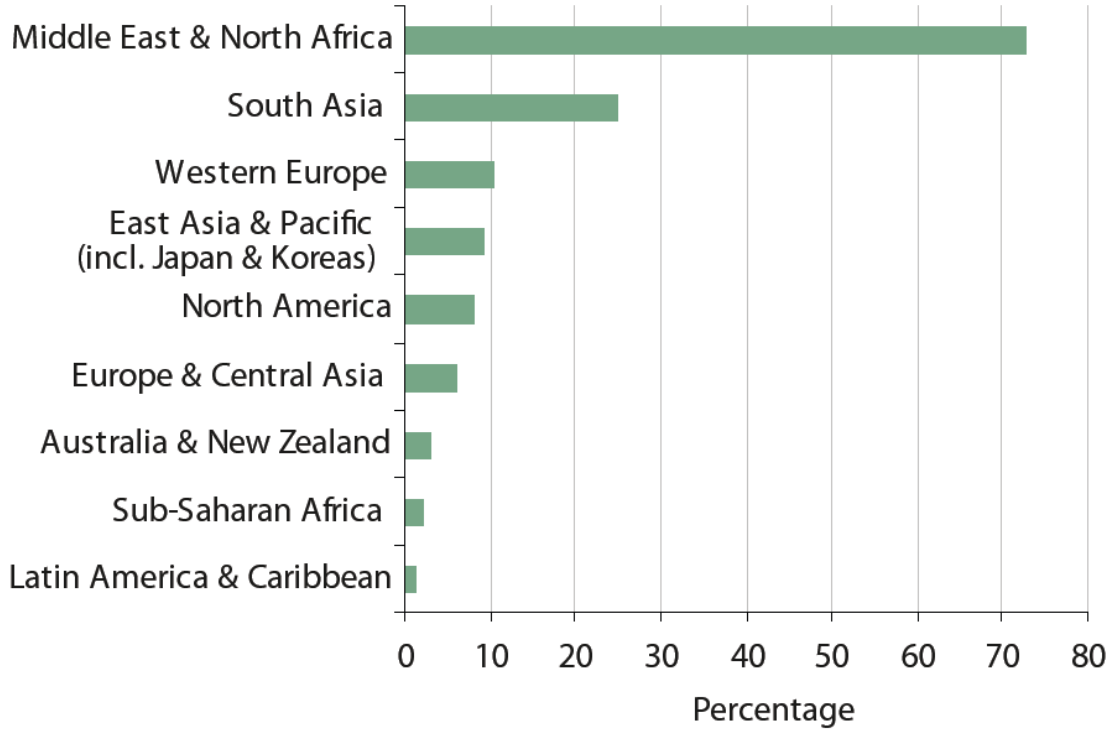
Water Shortage in the Glob



Source: "The Middle East Water Report", *The 4th World Water Forum 2006. Mexico City*

Water Shortage in the Glob

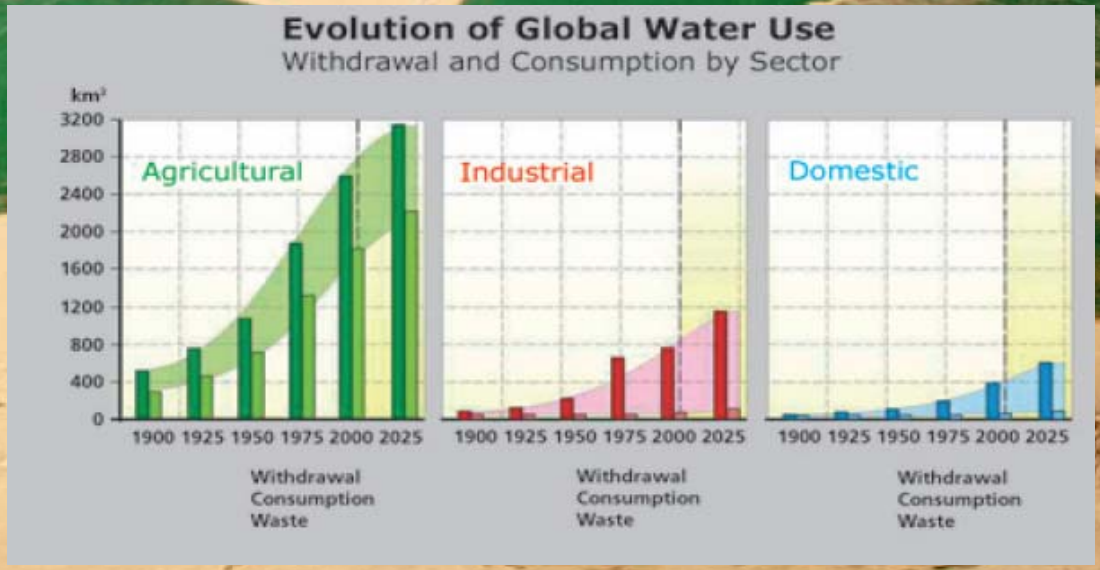
Percentage of Total Renewable Water Resources Withdrawn, by Region



Source: Environment Matters 2006 — The World Bank Group

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.



Source: www.yearofplanetearth.org

Water Shortage in the Glob

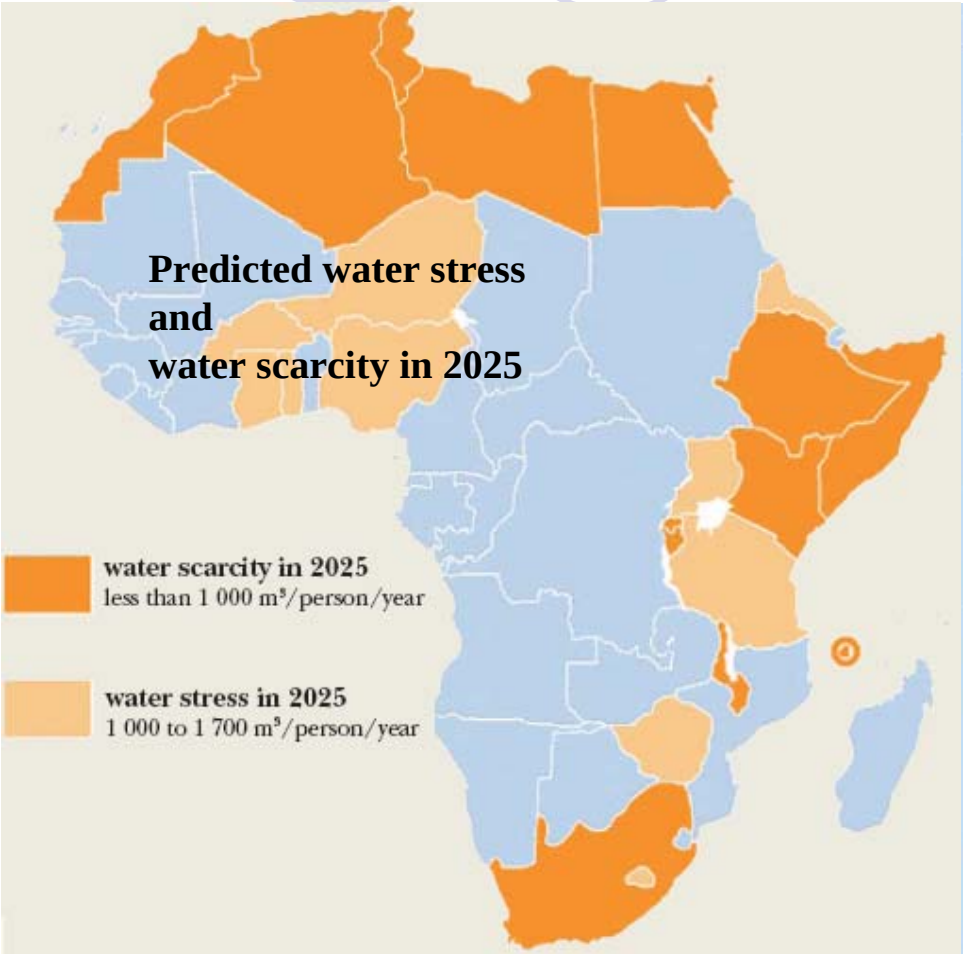
Renewable water potential per inhabitant at world level

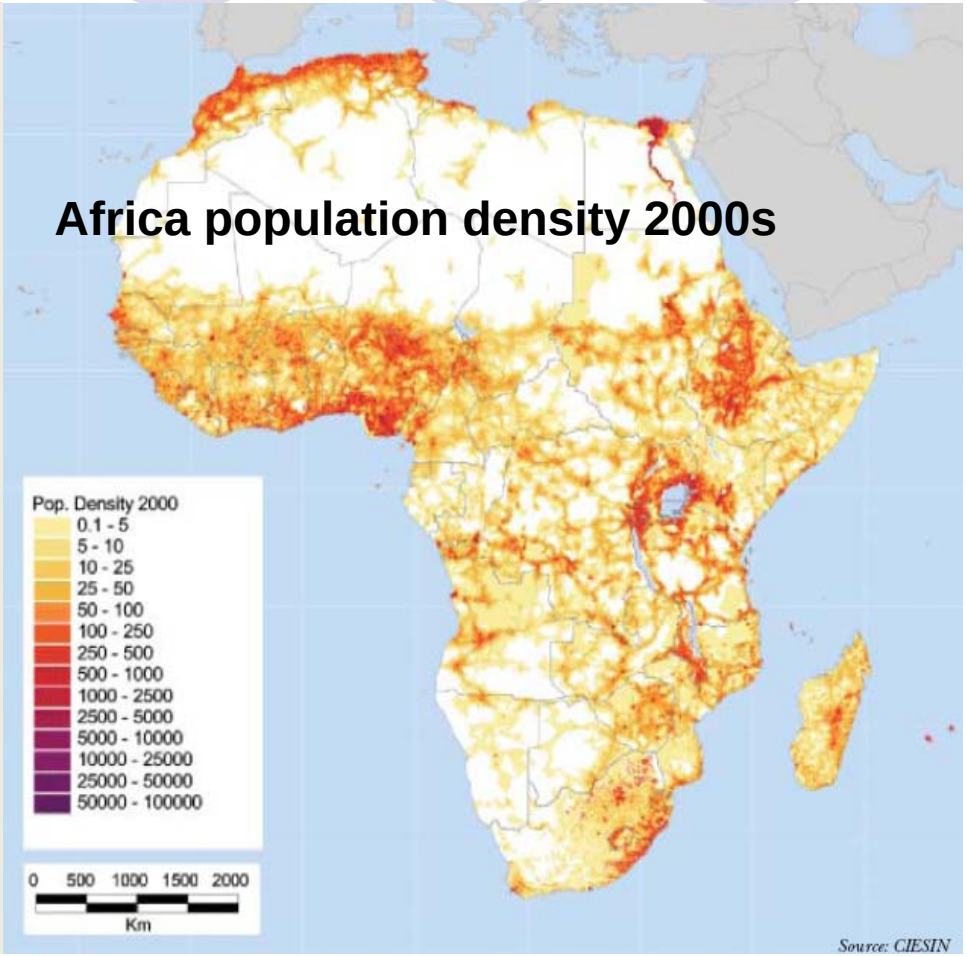
	Renewable water	Population	Potential/inhab/year
	milliards m3	millions	m3
Oceania	769	21	36619
Latin America	0776	466	23103
North America	579	287	18742
East Europe and Central Asia	7256	495	14659
Africa	4184	559	7485
West Europe	1985	383	5183
Asia	9985	3041	3283
MENA	355	284	1250

Source: United Nations Economic Commission For Africa 2005

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

In North Africa, agriculture accounts for higher percentage in national GDP that in other sub-regions. It ranges from 13% in Morocco to 17% in Egypt. Employment in the agricultural sector ranged in 1990 from 28 % in Tunisia to 45% in Morocco.

In the East Mediterranean countries, agriculture is the principal user of water. In Syria, agriculture is the most water intensive user accounts for 28.5% of GDP, 33% of labor force and 94% of water withdrawal. In other countries agriculture plays a relatively small to moderate economic role, as shown in the following table.

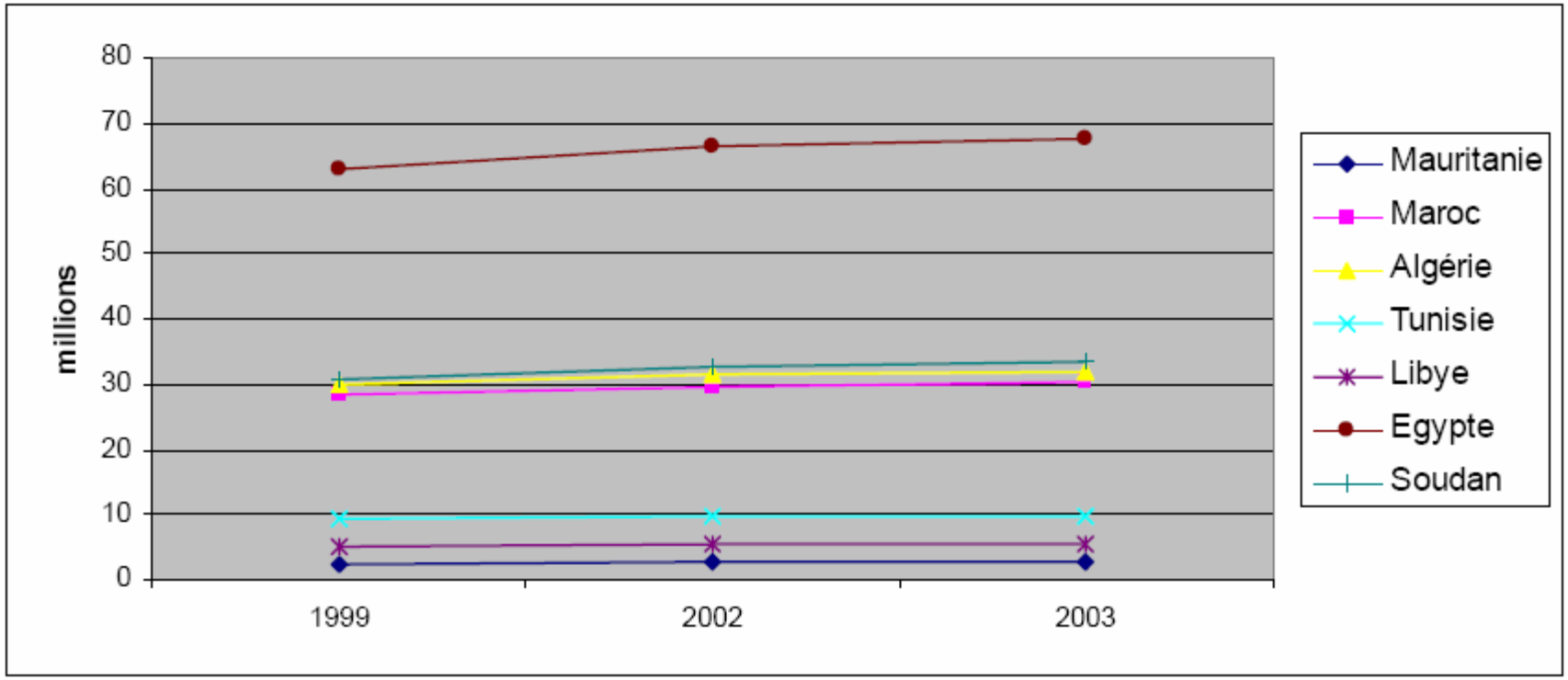
Water Shortage in Mediterranean

Country	GDP from Agriculture (%)	National Water Withdrawal from agriculture (%)	Employment distribution in Agriculture (%)
	1999	2001	1990
Portugal	3,0	48	N.A
Spain	3,8	62	12
France	2,8	15	5
Monaco	N.A	N.A	0
Italy	2,8	59	9
Malta	2,7	12	3
Slovenia	3,7	0	6
Croatia	8,6	0	16
Bosnia	15,5	N.A	11
Yugoslavia	N.A	N.A	30
Albania	52,6	76	55
Greece	6,7	63	23
Turkey	15,8	72	53
Syria	28,5 (1990)	94	33
Jordan	2,4	75	2,6
Lebanon	12,4 (1995)	68	7
Palestinian Authority	33	64	13
Cyprus	3,4	74	14
Egypt	17,4	86	40
Libya	3,2	87	11
Tunisia	N.A	89	28
Algeria	11,4	60	26
Morocco	14,8	92	45

Source: Handbook on Freshwater in the Mediterranean, 2003

Water Shortage in Mediterranean

Evolution of population



Source: United Nations Economic Commission For Africa 2005

Water Shortage in Mediterranean

North Africa 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

Population in North Africa

	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: United Nations Economic Commission For Africa 2005

Water Shortage in Mediterranean

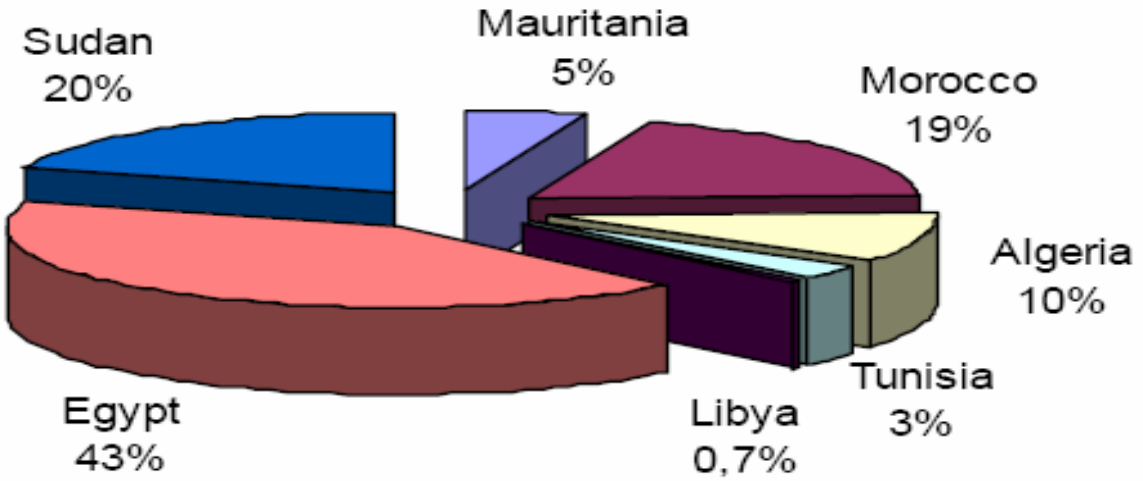
Water Potential per Inhabitant

	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**

Source: United Nations Economic Commission For Africa 2005

Water Shortage in Mediterranean

Partition of renewable water resources



Source: United Nations Economic Commission For Africa 2005

Water Shortage in Mediterranean:

Water from outside a country's borders: Water is a contested resource in the Middle East region and the water dependency is rather high for many countries, for example Egypt the dependency ratio runs as high as 97% on water sources outside its boarder, as it is shown in the following table:

Water Shortage in Mediterranean:

Country	Water Dependency Ratio (percent)
Egypt	97
Syria	80
Tunisia	9
Algeria	4
Morocco	0
Malta	0
Libya	0

Source: Human Development Report 2006 - Water for Human Development

It should be noted that the water dependency ratio in the this 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 m^3 per annum [Source: United Nations Economic Commission For Africa 2005.]

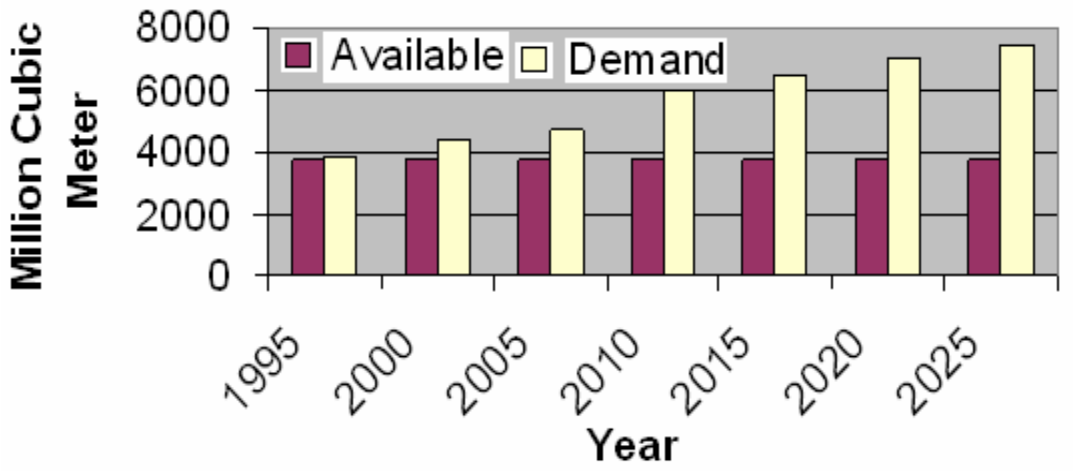
Libya, which has very limited water resources, has for a long time been in a situation of imbalance between water resources and water needs. To offset this imbalance, Libya has recourse to non-conventional water and to mining as a means of exploiting its underground water resources, which, we may recall,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

Water balance in Libya



Source:" WATER SHORTAGE IN MEDITERRANEAN" Mohamed A. Muntasser 14-16 /10/2004 Palazzo Dogana Cumunita delle Universita FOGGIA, ITALY

- Figure shows the water balance 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 has doubled 3.6 Mm3 per day in the year 2005.

Water Shortage in Libya

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

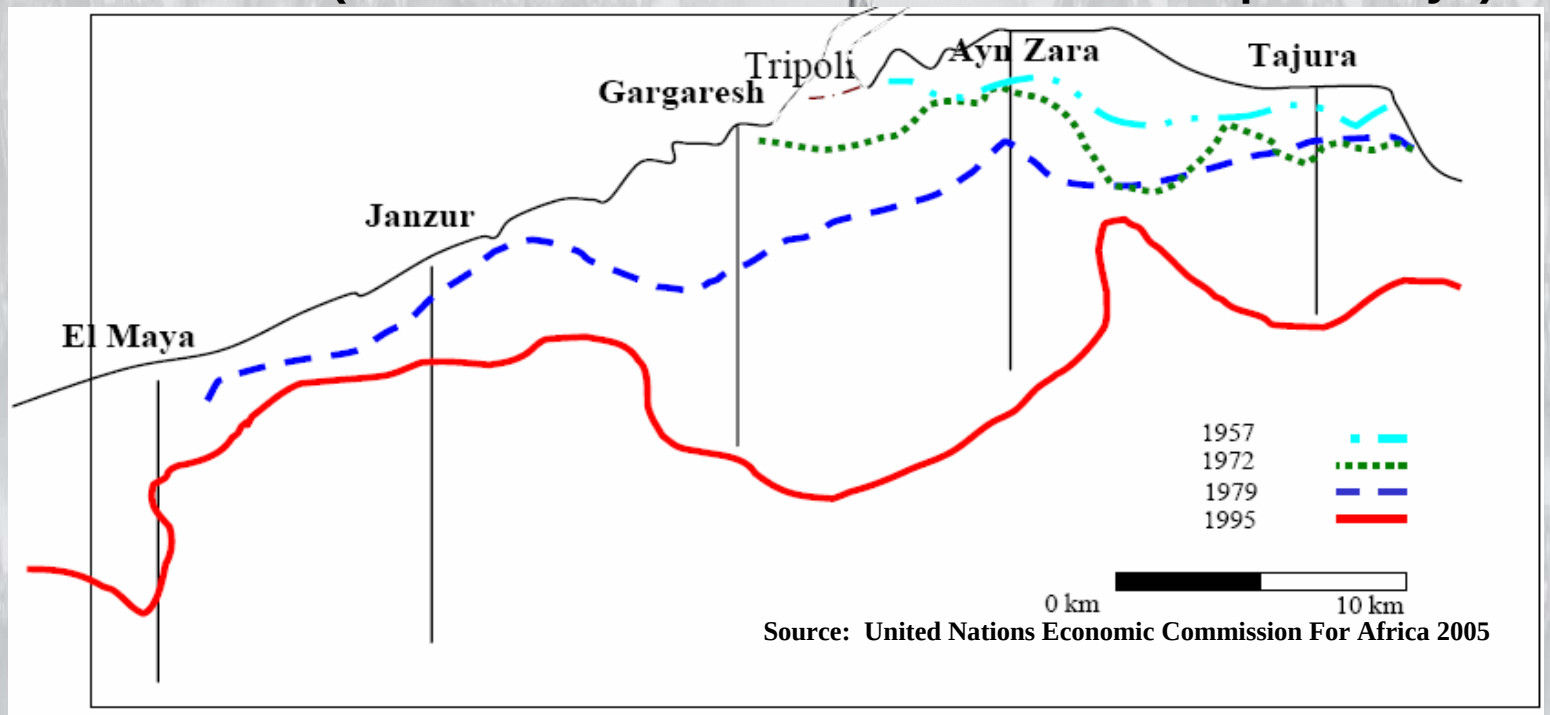
Source: United Nations Economic Commission For Africa 2005

- 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 Fig, where the sea water intrusion in the zone of Tripoli in Libya is progressing year by year.

(Intrusion of sea water in the zone of Tripoli- Libya)



Source: United Nations Economic Commission For Africa 2005

MENA

Management Policy

- **The main elements of 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.
- Recycled water.

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.

(Re-used water after treatment)

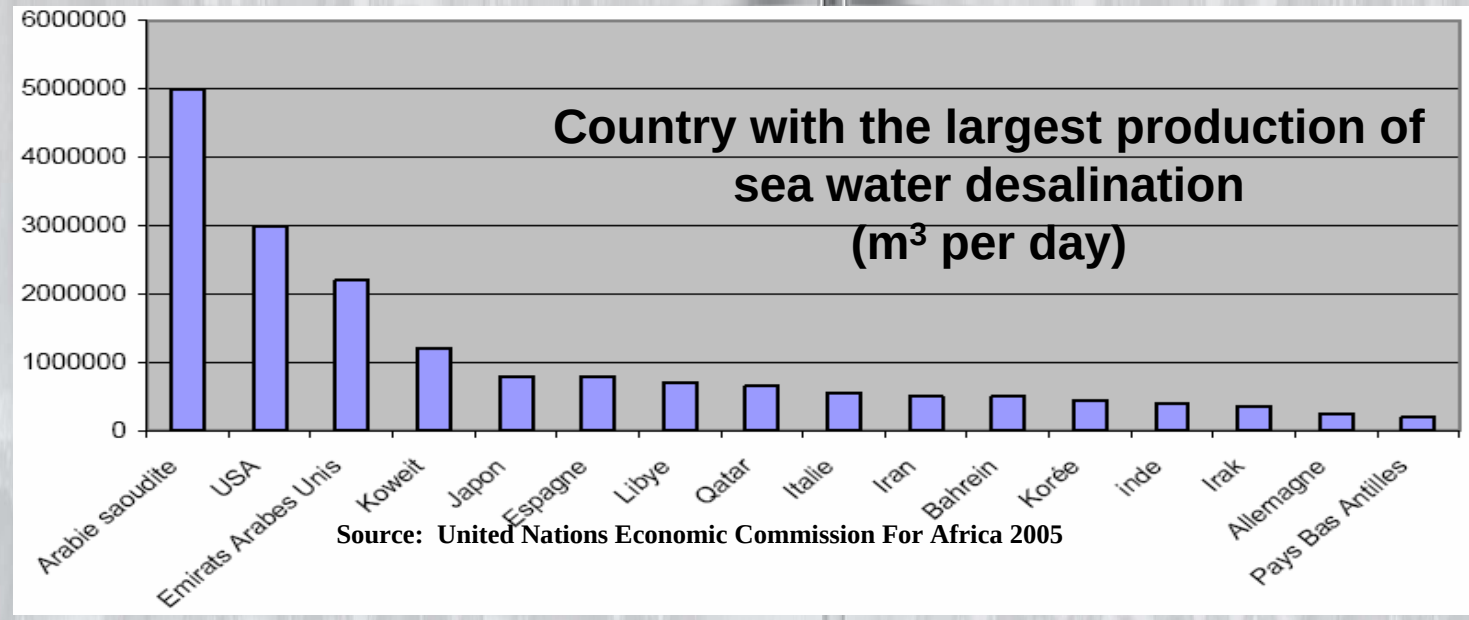
	Mauritania	Morocco	Algeria	Tunisia	Libya	Egypt	Sudan	Total
Capacity of production (Mm3)	0	70	(70)	30	100	700	1	971
%	0	7	7	3	10	72	0.1	100

Source: United Nations Economic Commission For Africa 2005

Management Policy: (Desalinated water)

Counting brackish water and sea water, the North Africa has at its disposal a desalination capacity of about 1,410,000 m3 per day. The water desalination production 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 fresh water by desalination, Middle East has a water desalination production capacity equivalent to three times the production of all other parts of the world.

MENA



Source: United Nations Economic Commission For Africa 2005

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. 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

(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

Source: United Nations Economic Commission For Africa 2005

Sharing Policy for
sustainability development

The long term sustainable development between the South and the North of the Mediterranean can be enhanced by sharing together all their natural resources such as crude oil, natural gas, on addition the plenty of renewable water resource discharged to the Mediterranean sea. The later natural resources such as the water flowing out from the River of Rhone in France, and River Ebro in Spain. The total amount of discharged renewable water is about 2226 m^3/s, details in the following tables:

MENA

Ebro River in Spain

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

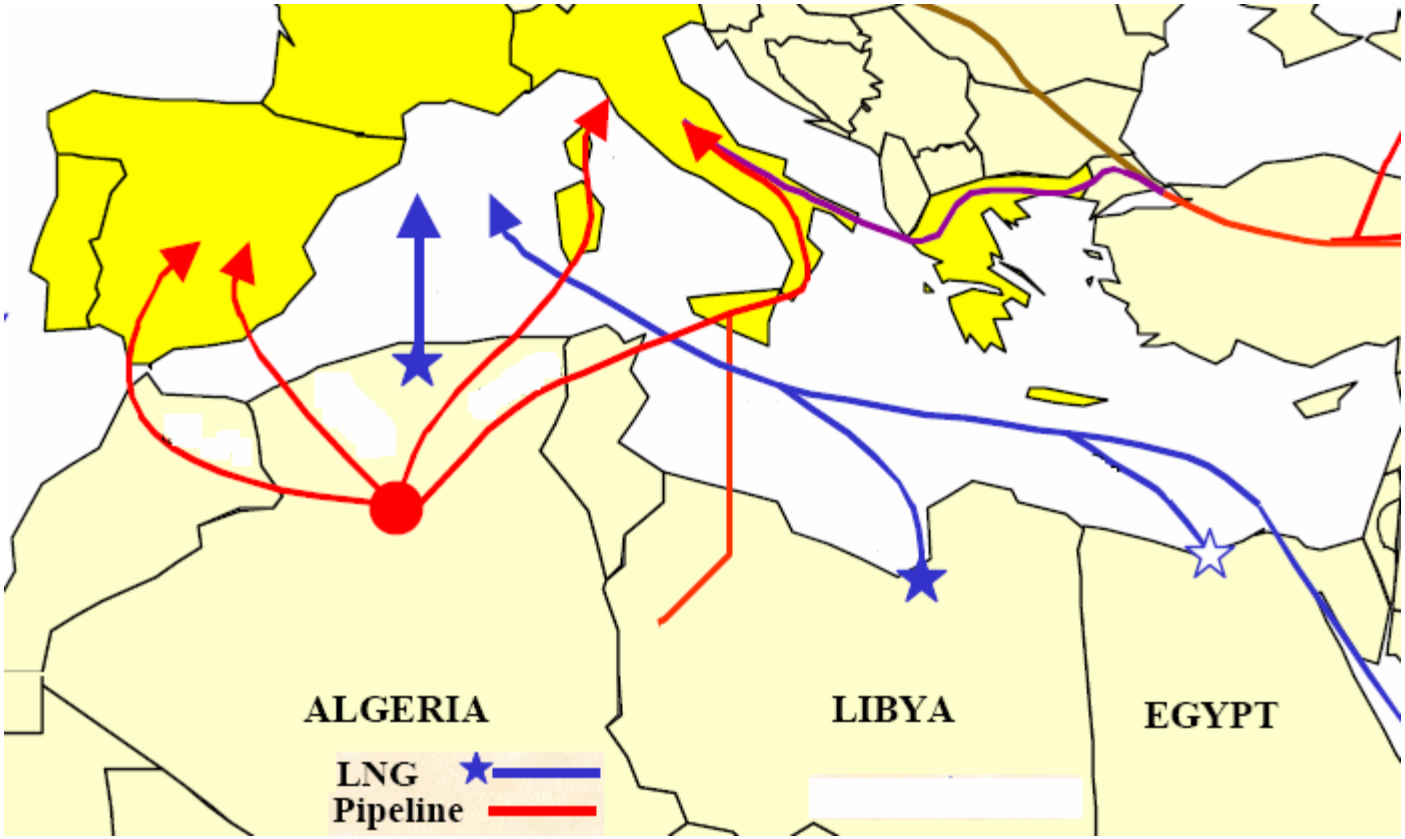
River Rhone in France

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

Energy Supply and Demand

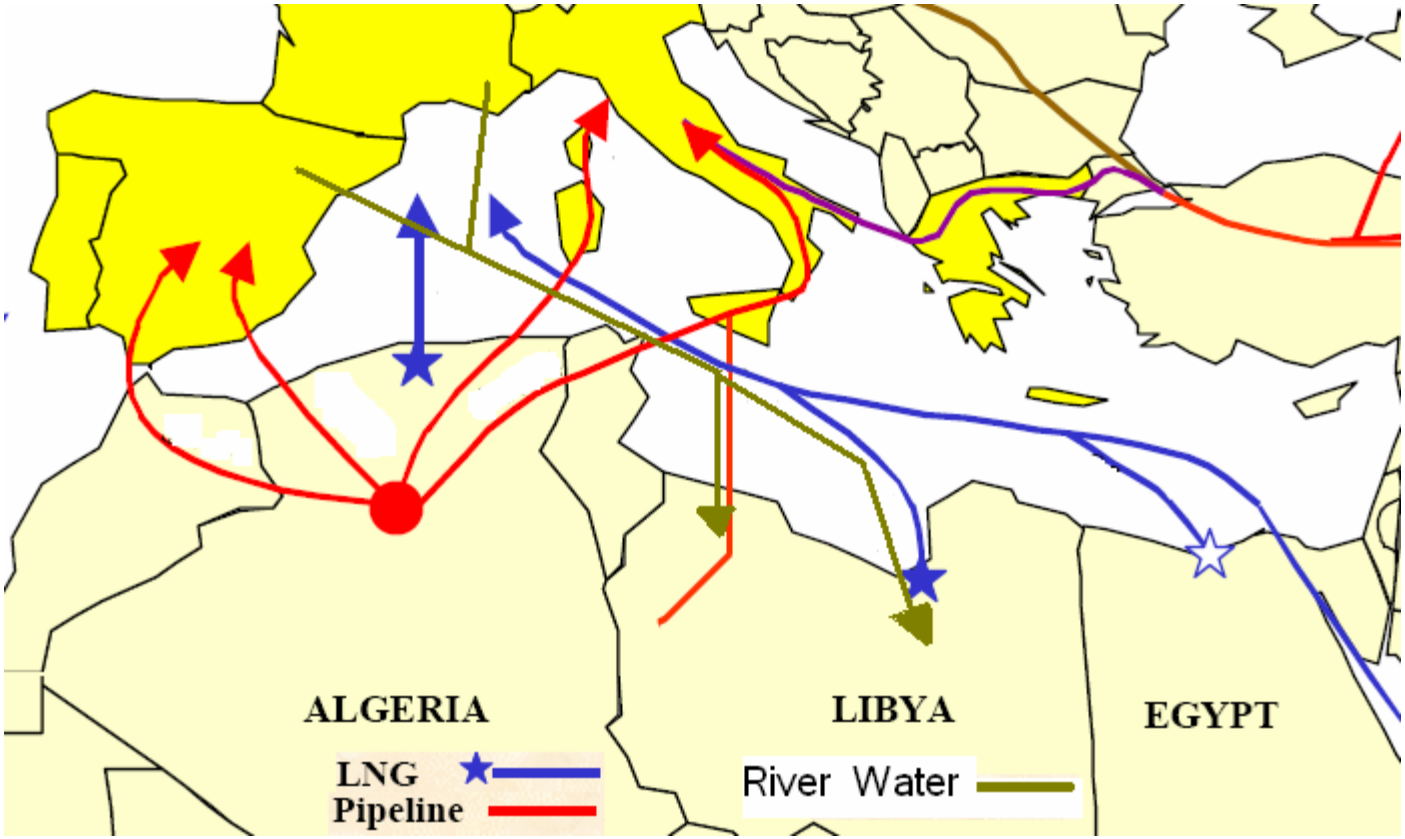
- Algeria, Libya and Egypt have the big advantages of the a proximity to the south of Europe.
- They can supply the Europe needs, (50 bcm), year 2010) of energy by pipelines and LNG.
- The energy supply from North Africa is of the lowest production cost.

schematic map for LNG & Pipeline



Source: OME 2001

Purposed water pipeline



Conclusion

- The need for water and energy trade policy to enhance the sustainable development in the Mediterranean.
- Pipelines and LNG from North Africa can meet the energy demand of the South Europe.
- Water pipelines from the South of Europe can meet a partial water needs of the North African countries.
- Water pipelines can reduce the deficit in trade as well as reduce the unemployment.
- The water trade in the Mediterranean can reduce the waste of the renewable water, the most precious natural resource.
- Water trade can sustain agreements on energy.
- Building in parallel the two pipelines for energy and water will reduce the construction cost and it is also improve the eco- environment of the operating conditions of all energy facilities in both sides of the Mediterranean.

- Northern Water pipeline will need a water treatment facilities before transporting water to the south of the Mediterranean.
- Water receiving facilities will be erected at the south of the Mediterranean with a proper hygienic storage and distribution.
- Capacity building programs need to be prepared to secure enough human resources required to construct, operate and maintain such huge water pipeline and facilities.

- Acknowledgement:
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- THANK YOU FOR YOUR ATTENTION