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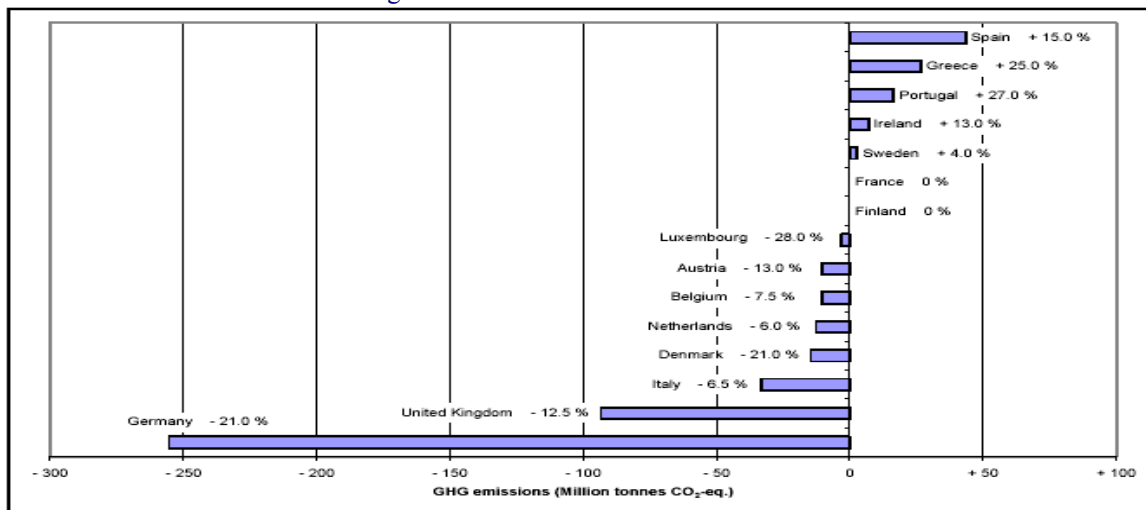
ENERGY AND CLIMATE CHANGE: SOME EU APPROACHES AND OPPORTUNITIES FOR THE SOUTHERN MEDITERRANEAN COUNTRIES

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1. Introduction

Fighting climate change is a high priority in the EU nowadays. In this regard the EU's Green Paper "Towards a European strategy for the security of energy supply" emphasizes respect for the environment and looks towards sustainable development. The Kyoto Protocol requires a 5% reduction from 1990 levels of developed countries of six greenhouse gas emissions² by 2008-2012. The EU, at the Kyoto conference of 1997, undertook to reduce greenhouse emissions by 8% between 2008-2012 compared with the figures of 1990. An agreement was also reached in 1992 for sharing the burden among the different member states, establishing the objectives for every country. On the 31 of May 2002 the member states of the EU ratified the Kyoto Protocol. The ten EU candidate countries also ratified the Protocol. They will be obliged to reduce emissions between 6 to 8% in the period 2008-2012. Beyond this year the average reduction of greenhouse emissions is expected to be 1% per year up to 2020. The target reduction is between 20% to 40% from 1990 levels.

Figure 1: Greenhouse gas emissions targets of the EU. Members States for 2008-12 relative to base year emissions under the EU burden sharing-decision.



Source: EEA, 2003a.

¹ Las opiniones expresadas en estos artículos son propias de sus autores. Estos artículos no reflejan necesariamente la opinión de UNISCI. The views expressed in these articles are those of the authors. These articles do not necessarily reflect the views of UNISCI

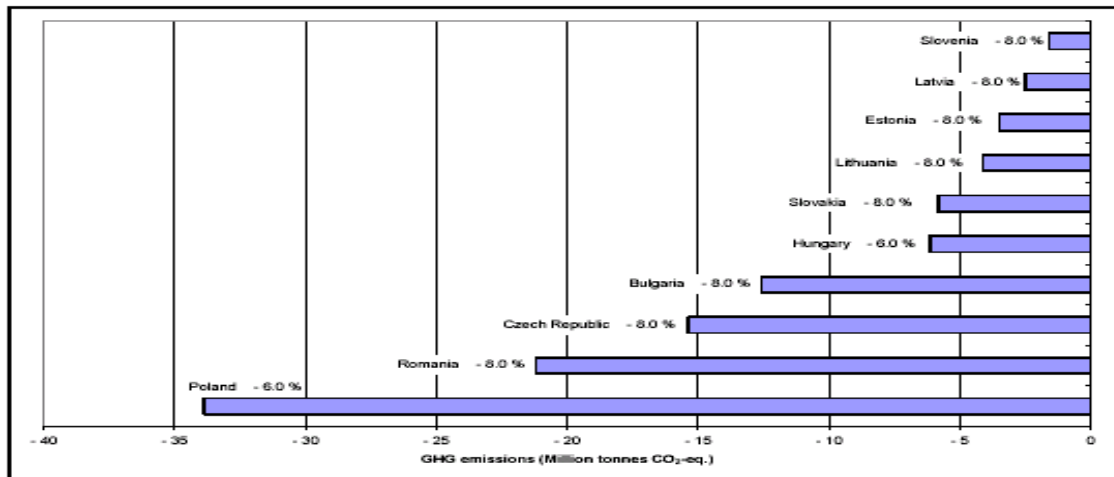
² These are: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).



The present situation is worrying. Six member countries (United Kingdom, France, Germany, Sweden, Finland and Luxembourg) are on track but nine member countries (the Netherlands, Greece, Belgium, Italy, Denmark, Austria, Portugal, Spain and Ireland) are not on track mainly due to emission increases in transport, in particular in road transport.

Almost half of the reductions from energy industries were due to shifts in fuel, in particular from coal to natural gas. Other important reductions come from reductions in agriculture (nitrous oxide and methane), industry (CO₂, nitrous oxide), waste management and also household.

Figure 2: Greenhouse gas emissions targets of the acceding and candidate countries for 2008-12 relative to base year emissions under the EU. burden sharing-decision.

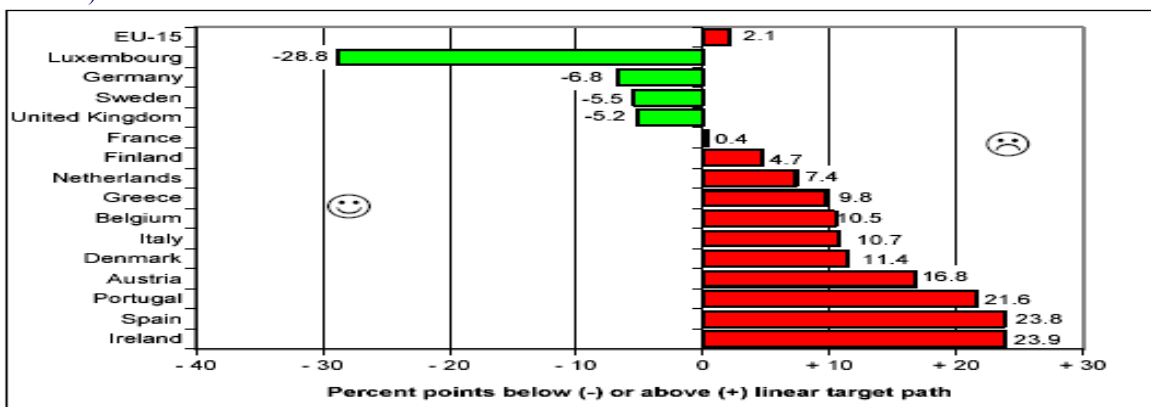


Note: Countries with base years other than 1990 are Bulgaria (1988), Hungary (average 1985–87), Poland (1988), Romania (1989) and Slovenia (1986). Cyprus and Malta have no targets and Turkey is not a Party to UNFCCC.

Source: EEA, 2003a.

Regarding the candidate countries, their emissions declined by 34% between 1990 and 1999, but taking into account the EU experience, where the cohesion countries (Greece, Ireland, Portugal and Spain) increased substantially their greenhouse emissions because of high economic growth and specifically from transport, important increases in greenhouse emissions are expected.

Figure 3: Distance to target (burden sharing-target) for EU. Member States in 2001 (with domestic policies and measures)



Notes: The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2001 from the (hypothetical) linear path between base-year emissions and the burden-sharing target for 2010. A positive value suggests an under-achievement and a negative value an over-achievement in 2001. The DTI gives an indication of progress towards the Kyoto and Member States' burden-sharing targets. It assumes that the Member States meet their target entirely on the basis of domestic measures. A preliminary analysis of the projected use of Kyoto mechanisms is presented separately in this report (Section 6).

Source: EEA, 2003



Projections to 2010 for the EU based on existing policies and measures show that greenhouse emissions will be reduced slightly by 0.5 % between 1990 and 2010—a shortfall of 7.5 % to reach the Kyoto commitment—Policies and measures in transport and energy sector in theory would imply the majority of the total expected savings, (63% of savings from existing measures and 75% of savings from additional measures in the energy sector; and 18% of savings from existing measures and 16% of savings from additional policies and measures in the transport sector) but in practice, taking into account existing policies and measures, emissions from transport are projected to increase by 28% from 1990 levels by 2010; and emissions from energy supply and use will decrease by 16%.³

In this regard, environmental considerations will influence decisions on energy and transport in the future. Roughly, transport and electricity-steam production will mean each a third of the CO₂⁴ increase in emissions until 2020.

Table 1: CO₂ emissions by sector in EU-25:

	Mt CO ₂					Annual Growth Rate (%)			
	1990	2000	2010	2020	2030	90/00	00/10	10/20	20/30
Industry	724.6	606.1	538.1	529.0	527.5	-1.8	-1.2	-0.2	0.0
Tertiary	269.3	236.5	239.5	244.2	256.7	-1.3	0.1	0.2	0.5
Households	518.7	461.0	481.1	497.2	489.6	-1.2	0.4	0.3	-0.2
Transports	794.1	970.6	1114.8	1217.2	1261.0	2.0	1.4	0.9	0.4
Electricity-steam production	1250.8	1195.8	1206.2	1400.2	1630.8	-0.4	0.1	1.5	1.5
District heating	103.9	38.1	31.7	20.8	15.1	-9.6	-1.8	-4.1	-3.1
New fuels (Hydrogen etc) prod.	0.0	0.0	0.2	1.4	2.1	-	-	20.6	3.9
Energy branch	143.1	162.9	151.5	147.0	141.5	1.3	-0.7	-0.3	-0.4
Total	380.5	3671	3763	4057	4324	-0.4	0.2	0.8	0.6
Current EU	3082	3118	3205	3444	3669	0.1	0.3	0.7	0.6
Acceding countries	722	554	558	613	656	-2.6	0.1	0.9	0.7

Source: PRIMES, ACE

The question is what kind of policies and measures have to be implemented by the EU for achieving the objectives devised for the period 2012-2020, reducing emissions by an average of 1% per year up to 2020, thus achieving a global target of 20 to 40 % reduction.

³ See B. Guegle, B. Strobel, P. Taylor, “Greenhouse gas emission trends and projections in Europe”, Environmental issue Report n.33, and “Greenhouse gas emission trends and projections in Europe 2003” Environmental issue Report n.36. European Environmental Agency, 2002 and 2003.

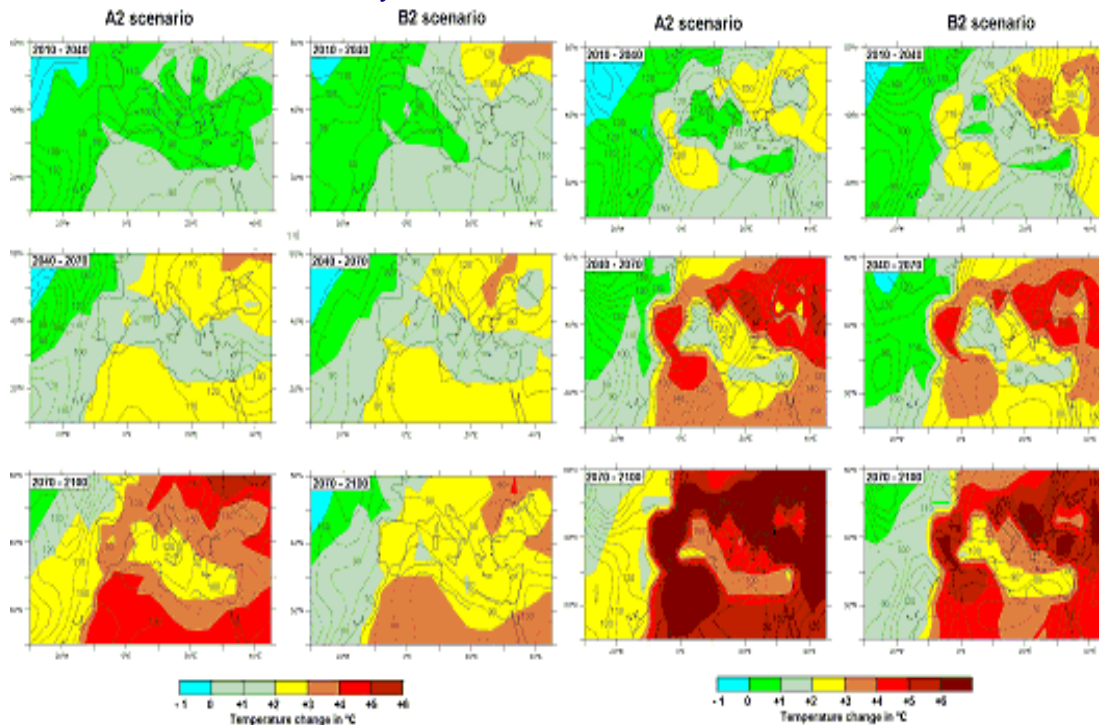
⁴ CO₂ is by far the most significant greenhouse gas, accounting for 52% of total greenhouse gas emissions in the EU

2. Climate change in the Mediterranean

According to the IPCC, if strong policies are not adopted, the average world temperature will increase between 1.4° and 5.8° C in the period 1990-2100. The consequences will be extremely important for agriculture, ecosystems, biodiversity, health and sea level rising

Focusing on the Mediterranean, the IPCC emission scenarios discussed in a recent ARW workshop⁵ show that the highest warming simulated in two emission scenarios may reach values above 6°C or above 5° throughout most of the inland Mediterranean areas for the last third of the 21st century in summertime. In the winter season the projected temperature rise will be only 1°-2°C. The maximum warming in the winter season is projected for the southern Mediterranean region, while in the summer it is generally localised in the European Mediterranean countries.

Figure 4. (Left) Average winter season temperature changes for A2 and B2 SRES emissions scenarios in three periods through 21th century relative to 1960-1990. Isolines indicate the ratio (in %) between future and current interannual variability. (Right) Average summer season temperature changes for A2 and B2 SRES emissions scenarios in three periods through 21th century relative to 1960-1990. Isolines indicate the ratio (in %) between future and current interannual variability



Source: de Castro, Manuel "Regional IPCC Projections until 2100 in the Mediterranean Area" in Marquina, A. *Environmental Challenges in the Mediterranean 2000-2050*, Kluwer, Dordrecht 2004.

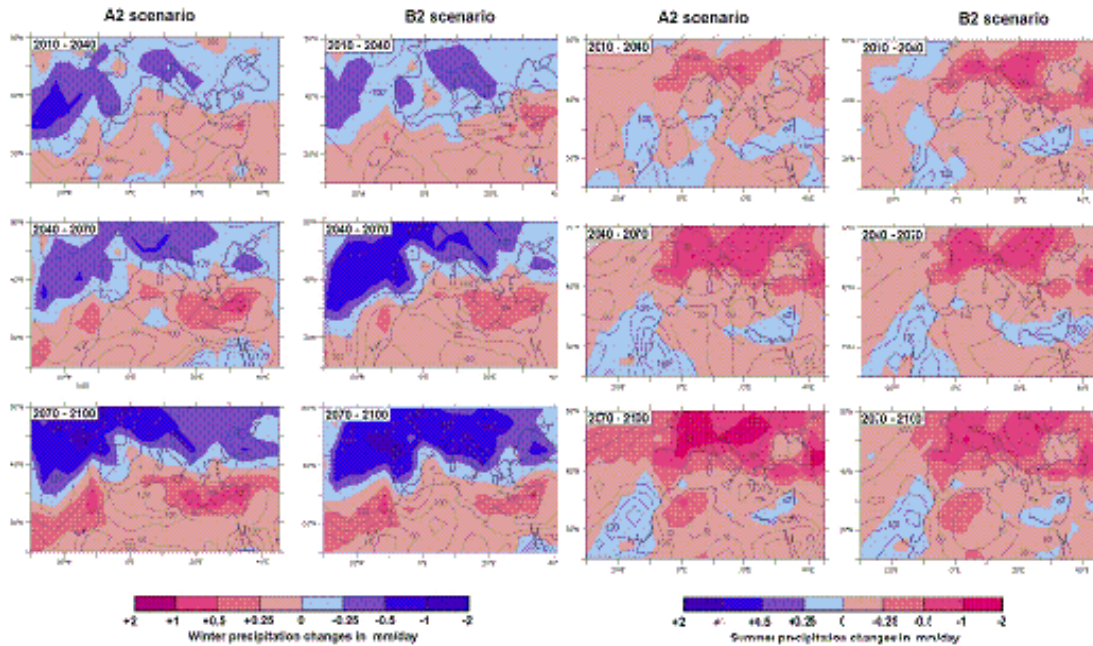
Projected seasonal precipitation changes will depend on the season and the Mediterranean area under observation. The amount of winter precipitation is projected to increase in the western and northern Mediterranean region in both scenarios, while there will be a decrease in the southern and eastern Mediterranean areas. But the changes projected for the other seasons show a uniform decrease all over the Mediterranean, more remarkable in the

⁵ See A. Marquina (2004) *Environmental Challenges in the Mediterranean 2000-2050*, Dordrecht, Kluwer.



summer season.⁶ For the Mediterranean, an important and increasing water deficit can be expected.⁷

Figure 5. (Left) Average winter seasonal precipitation changes (in mm/day) for A2 and B2 SRES emission scenarios in three periods through 21st century relative to 1960-1990. Isolines indicate the ratio (in %) between future and current interannual variability. (Right) Average summer seasonal precipitation changes (in mm/day) for A2 and B2 SRES emissions scenarios in three periods through 21st century relative to 1960-1990. Isolines indicate the ratio (in %) between future and current interannual variability



Source: de Castro, Manuel "Regional IPCC Projections until 2100 in the Mediterranean Area" in Marquina, A. *Environmental Challenges in the Mediterranean 2000-2050*, Kluwer, Dordrecht 2004.

To this, an increase of extraordinary events can be expected, not only in the mean climatology, but also at the extremes such as droughts, floods and wind storms that generally have greater impacts on human activities than changes in the mean climate⁸. A very large increase in the occurrence of days with high temperature is also projected.

All these phenomena are occurring faster and in larger proportions than originally expected. *Probably the projections for 2010-2015 are still with us.*

3. Significant efforts and policies are needed

After the hot and torrid summer of 2003, the European Parliament adopted a resolution in September 2003 in which it

1.-Urged the EU Commission and each member state to implement ambitious initiatives for the rapid phase-in of renewable energy.

⁶ See M. de Castro, C. Gallardo and S. Calabria (2004) Regional Projections until 2100 in the Mediterranean Area in Antonio Maquina, *Environmental Challenges in the Mediterranean 2000-2050*, Dordrecht, Kluwer.

⁷ For the Maghreb, see for instance Faouzi Senhadji and Mohamed Senouci, *Les changements climatiques dans les pays du Maghreb*, Medenergie, Décembre 2003, Numéro hors-série p.81.

⁸ J.P. Palutikof and T. Holt (2004) "Climate Change and the occurrence of extremes: some implications for the Mediterranean basin" in A. Marquina, *Environmental challenges in the Mediterranean 2000-2050*. op. cit in note 4.



- 2.-Called on the Commission to give priority to of rail, water and combined transport infrastructures projects.
- 3.-Considered that the EU needs more binding target values for ozone in ambient air.
- 4.-Interpreted the recent extreme weather conditions as further evidence of the negative effects of climate change
- 5.-Called on the Commission to take initiatives to ensure respect for the Kyoto commitments and develop research into connections between pollution and climate change⁹.

A month later, in order to minimise the economic costs of the Kyoto commitment, the EU published on the Official Journal of the European Union on the 25 of October the directive 2003/87/EC of the European Parliament and of the Council of the 13 of October 2003, establishing a scheme for greenhouse gas emission allowance trading within the Community and the amendment of Council Directive 96/61/EC. Different regulations on greenhouse emission permits, allocation and issue of allowances, guidelines for monitoring and reporting of emissions, verification, penalties(for every tonne that is not covered in an allowance: 40 euro in 2005 to 2007 and 100 euro thereafter), agreements with third countries which have ratified the Kyoto Protocol are included.

With this, the EU has set up, inter alia, a trading scheme for greenhouse gas allowances which will allow around 10.000 EU companies to buy and sell permits to emit greenhouse gases from 1 January 2005 onwards. This can benefit the Southern Mediterranean countries which have ratified the Kyoto Protocol. To this has to be added the promotion of transfer of environmentally sound technologies to third countries set off against issue of Certificates of emission reduction¹⁰.

In this paper I will not focus on the implications of these measures in the Southern Mediterranean countries that, without a doubt, may benefit from these regulations, given the penalties and taxes that may affect several industrial sectors.

4 Natural Gas and Renewals

Related to energy supply and consumption, several possibilities and options are on the table Putting aside the increase of nuclear energy, something that is still on the table in some countries, apparently more efficiency, more natural gas and more renewables (limited, with the sole exception of solar) is considered the best option for the EU in the sort -medium term.

Choosing the following emission factors¹¹:

- 1.-Oil 260g CO₂/kWh.
- 2.-Natural Gas 195g CO₂/kWh.
- 3.-Coal 330g CO₂/kWh.

It is obvious that natural gas will be preferred in the future energy options of the EU and member states.

⁹ "Effects of the summer heatwave. European Parliament resolution on the effects of the summer heat wave". P5_TA-PROV(2003)0373.

¹⁰ See also "Green Paper on greenhouse gas emissions trading within the European Union" COM(2000)87 final. Brussels 8.3.2000.

¹¹ Wermer Zittel and Manfred Treber : "Analysis of BP Statistical Review of World Energy with respect to CO₂ emissions" German Watch, 14 July 2003.



Table 2: Fuel use for electricity generation EU.25

	Mtoe					Annual Growth Rate (%)			
	1995	2000	2010	2020	2030	90/00	00/10	10/20	20/30
Hard coal	139.9	132.7	103.1	133.2	195.9	-1.1	-2.5	2.6	3.9
Lignite	80.7	77.5	67.3	57.8	45.8	-0.8	-1.4	-1.5	-2.3
Oil products	53.9	41.8	24.7	18.8	20.8	-0.5	-5.1	-2.7	1.0
Gas	70.1	112.1	186.3	243.5	255.3	9.8	5.2	2.7	0.5
Biomass	6.2	8.0	11.6	13.0	15.1	5.3	3.7	1.2	1.5
Waste	7.5	9.7	13.8	15.2	14.5	5.2	3.6	1.0	-0.5
Nuclear energy	215.5	237.8	245.4	213.7	185.2	2.0	0.3	-1.4	-1.4
Geothermal Heat	2.1	3.0	3.4	3.6	3.9	6.6	1.4	0.7	0.8
Total	576	623	656	699	736	1.6	0.5	0.6	0.5
Current EU	496	541	568	596	625	1.7	0.5	0.5	0.5
Acceding Countries	80	81	87	103	112	0.4	0.7	1.7	0.8

Source: PRIMES, ACE

Regarding renewables, it is obvious that the EU not only has to increase its imports of natural gas but also it has to increase the production and imports of renewables in order to achieve the short and medium term objectives in the reduction of greenhouse emissions. The EU proposed indicative targets for member states. The overall indicative target agreed of 22.1% contribution of renewable energy sources to gross electricity consumption is unlikely to be met in 2010¹².

Renewals have a significant characteristic: they produce very little pollution but they are not yet profitable. In this regard they need tax incentives, fixed prices, different aids for research and development, priority rights to access to electricity networks, subsidies for development and operation, compulsory standards, etc. It is clear that they are quite far from replacing other resources.

However, in the non-distant future these kinds of energies, in particular solar energy, can be brought to the market. The production costs are falling fast. This is a window of opportunity for the Southern Mediterranean countries.

5. Hydrogen and Fuel cells

Hydrogen is considered by many as a clear alternative to oil. It is a clean energy. However critics emphasize the energy-intensive cost of producing hydrogen. Hydrogen is not a primary energy, it is mainly a more efficient or cleaner energy carrier. But it has attracted the attention

¹² According to the report "Greenhouse emissions trends and projections in Europe 2003", op. cit. in note 2, "The use of Kyoto mechanisms for achieving the EU Kyoto target is so far limited to about 21 million tones CO₂ equivalent, per year, in the commitment period (by the Netherlands and Portugal) and only a few counties have allocated resources" Regarding carbon sinks " Eight member states intended to use carbon sinks options under the Kyoto protocol. So far CO₂ sequestration of 10 and 3 million tones of CO₂ has been quantified according to article 3.3 and 3.4 respectively of the Kyoto Protocol".



of EU policy makers and industrialists as a possible energy alternative able to address at the same time environmental concerns and the EU dependence on foreign energy supply.

In this regard the High Level Group on Hydrogen and Fuel cells was created in Brussels on the 10th of October 2002. Its aim was the formulation of an integrated vision on the possible role that hydrogen and fuel cells could make to the realisation of sustainable energy systems in the future.

Two years later, on the 20th of January 2004, the Commission has launched the European Hydrogen and Fuel Cell Technology Platform for promoting and smoothing the EU transition from a fossil fuel based economy to a “hydrogen economy”.

The Commission has also included hydrogen and fuel cells among the priorities of the 6th research and development framework program. The European Commission plans to spend 2.1 billion euros on hydrogen related research over the next four years.

This is a strategic choice of the EU for reducing the energy dependence from foreign countries and it will be the key to achieving the objective of replacing 20% of vehicle fuels with alternative fuels by 2020. But the transition to a fully integrated hydrogen economy would take 20-30 years.

The main problems to be faced are the following:

- 1.- Production is too expensive
- 2.- Storage, distribution and transportation infrastructure and problems have to be solved
- 3.- The integration of renewables into hydrogen fuel.
- 4.- Devising an efficient hydrogen-fuel power generator to replace the internal combustion engine.
- 5.-The price of the fuel cell system.
- 6.- The environmental and socio-economic impact of hydrogen technologies.
- 7.- The technology for the capture and storage of CO₂ released in the transformation of hydrocarbons to hydrogen up-stream from the end-user.¹³

In fact there is a clear debate between NGO's and the EU Commission. The NGO's believe that hydrogen has the potential for a significant contribution to a sustainable energy future but this can only be achieved—in opposition to heavy industry and commercial interests, and governments such as US and Australia—if hydrogen is produced from renewables¹⁴, The focus on hydrocarbon transformation has generated deep suspicion in some circles.

¹³ Some countries look to bury carbon dioxide in depleted oil and gas wells. The Bush Administration is planning pumping carbon dioxide into underground reservoirs as the most promising way to counter the greenhouse effect. The gas will be pressurized and injected as a liquid into the reservoirs through a pipeline. When a reservoir becomes full, the pipeline will be taken out and the hole sealed up. But the storage is expensive. Some estimates put it as high as 100 US dollars per tonne. (Globally the different countries are releasing 7 billion tonnes of carbon per year). Some important critics have speculated that “US interests envision the eventual inclusion of CO₂ sequestration in the Kyoto framework, thereby offering the prospect of eventual US adhesion. Moreover, cynics would contend that the multi-decade time horizon for the arrival of the hydrogen economy suits at least some of its proponents just fine”. See BSKH Insight: *The hydrogen economy...What's real?*, Brussels, July 2003.

¹⁴ CAN Europe, Greenpeace, Transport and Environment : *Hydrogen for a cleaner Europe? Only if it's green!* Brussels, 16-17 June 2003. They emphasise renewables and improving energy efficiency. That is also the position of the Greens at the European Parliament Claude Turmes, speaking after the European Commission made its policy towards hydrogen and fuel cells public, said “...We need to boost technological development—



At this time the EU Commission considers that in the medium term, hydrogen from natural gas is likely to be the most cost-effective (partial oxidation), but it will have to be much cheaper to produce. And the drawbacks of CO₂ emissions will be addressed by CO₂ capture and underground storage. Steam methane reforming is the cheapest option but taking into account the CO₂ emissions, it is not included in the possible options¹⁵.

There is no doubt that the Southern Mediterranean countries can exploit this initiative in the medium term, taking into account the EU needs of renewables that they have to import in order to achieve the goals of reducing greenhouse emissions, the importance of gas in the hydrogen production and also renewables that the Southern Mediterranean countries can produce, in particular solar energy.

6. The EU priorities in the Mediterranean

If we move to the priorities established by the Commission for the Mediterranean in the energy sector, we can see that in the objectives of the 4th EUROMED Energy Forum for 2003-2006 the protection of the environment is included, plus security of supply and competitiveness of the energy industry.

The priorities are the following:

1.- Infrastructure projects of common interest.

- Construction of a fully integrated and interconnected Euro-Mediterranean electricity, oil and natural gas market.
- Improving the security and safety of infrastructure.
- Reducing the risk associated with the carriage of oil and gas by sea in the Mediterranean.

2.-Energy policy activities of a regional nature:

- Cooperation on gradual reform in the energy sector
- Promotion of the regional electricity and gas market
- Promoting security of supply and the safety of hydrocarbons carried by sea.
- Support for the development of energy efficiency policies.
- Promotion of renewable energy and new technologies on the southern shore of the Mediterranean.
- Enhanced Euro-Mediterranean cooperation within the international institutions.

3- Regional Economic activities¹⁶.

These priority axes and projects for investment are included in the new TEN-Energy document¹⁷. The cost is incredible. At least, it can be said that the EU has a clearer and better

especially in renewable fuel cells where Europe is severely lagging behind US and Japan... We can not allow public funds to be diverted away from developing the renewable energy economy and improving energy efficiency and spent instead on promoting a hydrogen economy built on unsustainable foundations... The Commission must therefore promote renewable energy first, and hydrogen second..." The Greens/EFA in the European Parliament, Brussels 10 September 2003.

¹⁵ Other methods mentioned are: electrolysis mainly in Greenland and Iceland, and nuclear power. Energy Research. Research and development needed for hydrogen <www.europa.eu.int/comm/research/energynn/nn_rt_hy3_en.htm>. See also Geoff Dutton: *Hydrogen Energy Technology*, Tyndall Centre for Climate Change Research. Working Paper 17, April 2002.

¹⁶ Communication from the Euro-Mediterranean Energy Forum to the 2003 Ministerial Energy Conference in Athens, Brussels, 29 April 2003. EUROMED Report, n. 58, 23 May 2003.



strategy than in the 90's (see table and MAPS). It is obvious that there are important opportunities for the Southern Mediterranean countries in the energy domain, taking into account EU policies and needs¹⁸.

Table: Envisaged investment along the Priority Axes of TEN-Energy for the Period up to 2013

PRIORITY AXIS		ADDITIONAL CAPACITY INSIDE/TO THE EU	INVESTMENT INSIDE THE EU	INVESTMENT OUTSIDE THE EU
EL 1	FR-BE-NI-DE	2500	300	-
EL 2	Borders Italy	4000	600	-
EL 3	Fr-Es-Po	3000	400	-
EL 4	Gr-Balkans-UCTE	2000	100	300
EL 5	UK-Continental Europe	2000	1100	100
EL 6	Ir-UK	500	300	-
EL 7	Baltic Ring	3000	700	100
EL 8	Central Europe	3000	500	-
EL 9	Mediterranean Ring	3000	1000	500
TOTAL PRIORITY PROJECTS EL		23000 Mega Watts	5000 Millions Euro	1000 Millions Euro
NG 1	Russia-NL-DE-UK	10	4000	1500
NG 2	Algeria-EU	20	4500	1500
NG 3	Casp. MO-EU	10	1000	1500
NG 4	Terminals LNG	20	2500	-
NG 5	Underground stock	-	2000	-
NG 6	East Med. Ring	10	1000	2500
TOTAL PRIORITY PROJECTS GN		70 Billions m³/year	15000 Millions Euro	7000 Millions Euro
PE 1	Russia-EU		800	1500
PE 2	Black Sea-EU		200	1500
PE 3	Oil pipelines incide EU		2000	-
PE 4	Africa/Middle East-EU		1000	2000
PE 5	Oil Ports		2000	1000
TOTAL PRIORITY PROJECTS PE		Millions tonnes/year	6000 Millions Euro	6000 Millions Euro
OVERALL TOTAL			26000 Millions Euro	14000 Millions Euro
Source: Estimates of the European Commission Services (DG TREN/B2)			40000 Millions Euro	

¹⁷ The EU Commission presented a communication " On the development of energy policy for the enlarged European Union, its neighbours and partners countries" COM(2003) 262 final/2, Brussels, 26,5,2003. The objectives of the policy set out in this Communication are to:

- Enhance the security of energy supplies of the European continent.
- Strengthen the Internal Energy Market of the enlarged EU.
- Support the modernisation of energy systems in our partner countries.
- And facilitate the realisation of major new energy infrastructure projects.

¹⁸ See also " Ministerial Declaration by the Euro-Mediterranean Energy Forum" Rome 1-2 December 2003. EUROMED Report, n.72, 8 December 2003. The ministers stress their interest in the Commission's Communication "Shaping support for private Sector Development in the Mediterranean" and reaffirm the importance of the funding of projects of common interest included in the priorities for 2003-2006 under existing instruments, in particular MEDA and FEMIP. They noted that, as a priority, projects will be financed in those countries which are carrying out reforms to liberalise their energy sector.



Maps see: <http://europa.eu.int/comm/energy/ten-e/en/external.html>

Map 1: Projects of Pan European Interests (Priority axes for electricity interconnections)

Map 2: Projects of Pan European Interest (Priority axes for natural gas)

Map 3: Projects of Pan European Interest (Priority axes for crude oil pipelines)