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Paving the way towards the creation of a Euro-Mediterranean Innovation Space

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Abstract. This article presents the rationale for including the innovation activities as part of the Euro-Med dialogue policy. It relies on an analysis focussed on the need to include innovation in the international cooperation schemes. It shows that policy can be largely upgraded to include not only simple measures aimed to promote international collaborations but more integrated joint initiatives targeted to encourage shared agendas and cooperative schemes. Finally the article indicates some general objectives for opening a dialogue process among Euro-Med science, technology and innovation stakeholders. The article gives the example of the conclusions of the MIRA forum on energy as a way to build this dialogue platform.

Keywords. Innovation – International cooperation – Euro-Med cooperation – Innovation adoption.

Préparer la voie pour la création d'un espace euro-méditerranéen de l'innovation

Résumé. *Cet article présente les raisons justifiant l'intégration des activités d'innovation dans le cadre du dialogue euro-méditerranéen. Il s'appuie sur la nécessité d'inclure l'innovation dans les schémas de coopération internationale. Il montre que la politique peut être améliorée pour passer de la réponse à des mesures de promotion de la collaboration internationale vers des initiatives conjointes qui permettent de promouvoir la définition commune des objectifs et des formes de coopération. Finalement l'article indique des objectifs généraux pour favoriser le processus de dialogue euro-méditerranéen entre les parties prenantes dans la communauté scientifique et technologique. L'article donne l'exemple des conclusions du forum MIRA sur l'énergie en tant que moyen pour construire cette plate-forme de dialogue.*

Mots-clés. *Innovation – Coopération internationale – Coopération euro-méditerranéenne – Adoption de l'innovation.*

I – Introduction

The geo-political stability of the Mediterranean region is of fundamental importance for Europe, given the strategic position of the region. It is recognized that economic growth and prosperity is one of the key drivers which can secure the strategic political stability of the Mediterranean countries, and the promotion of innovation is crucial towards achieving this aim. In this regard, the development of an innovation capacity throughout the region becomes of vital importance to the Euro-Med region as a whole. In this paper we argue that there is a need for concrete actions to stimulate a shift in the rationale and contexts of STI collaboration between EU and the Mediterranean countries. The creation of a Euro-Mediterranean Space (EMIS) could provide a framework to facilitate the exchange. In explaining this rationale, this paper will first give a brief overview of the current Euro-Med STI cooperation and subsequently provide a literature review of the rationales for international ST cooperation. In the third section the rationales are dealt with in further detail for Euro-Med STI cooperation. In conclusion, this paper provides some insights on the way forward in this regard.

II – The Euro-Med science, technology and innovation cooperation

Since the Barcelona Declaration in 1995, substantial effort has been made to support partnership at political, economic, social and cultural levels between the member states of the European Union (EU) and the Mediterranean Partner Countries (MPCs). Following the Barcelona process, Euro-Mediterranean association agreements have been signed with the partner countries in the context of the European Neighbourhood Policy (ENP). These agreements provide, among others, a framework for scientific, technical and technological cooperation. In this spirit, many activities have been accomplished in the EU to structure a Mediterranean policy on science and technology. New policy instruments have been designed: the creation of the Monitoring Committee on ST policy (also known as MoCo or ST Barcelona Committee), the introduction of science and technology in the Association Agreements between the EU and MPCs, the consolidation of the International Cooperation Division (INCO) in Brussels, the funding of policy-oriented projects, at the request of the MoCo, in order to draw a state of the art on science, technology and innovation systems in the region (ASBIMED and ESTIME, as well as other projects on forecasting and innovation in MPCs like INNFORMED), and the creation of a network of National Contact Points for EU-MPC scientific collaboration in the partner countries (EUROMEDANET1&2).

Other EU-MEDA funded initiatives include ANIMA (Network of Euro-Mediterranean investment agencies), Invest in Med and Medibtikar (a project aiming at developing innovation in business firms and building innovation systems in MEDA countries). This clearly shows that the process has already started but it is rather fragmented. What is urgently needed is to provide a mechanism for a more structured debate and trans-national learning on RTD and innovation policy.

The political coverage of all the aforementioned Euro-Mediterranean collaboration actions in science, technology and innovation has been provided by the Barcelona process since 1995 and would move in the near future under the Union for the Mediterranean.

“The Mediterranean Innovation and Research Coordination Action” (MIRA) is an FP7-funded INCO-Net coordination platform targeting MPCs. The project aims at creating a dialogue platform to improve the RTD and Innovation cooperation which includes linking up and facilitating the interaction between the fragmented RTD and Innovation cooperation initiatives already supported by the Member States, the European Commission and other political bodies. In this regard, the MIRA consortium acted to appoint an EU-MPC task force to kick-start the process of creating a Euro-Mediterranean Innovation Space (EMIS).

III – Rationales for the international collaboration in science, technology and innovation

Cooperation in science, technology and innovation (STI) used to be considered as a national or regional phenomenon (Georghiou, 1998), but since the 1980s international cooperation in R&D has experienced a substantial growth across continents and especially among developed countries. This trend is more visible today with several Countries using different methods to collaborate internationally.

Boekholt *et al*. (2009) have come up with a number of determinants, which trigger the policy debate on STI internationalization; these include:

- the emergence of BRIC countries as economies as well as STI powers
- increased pressure to address global challenges
- globalisation of R&D in the private sector as multinationals become more and more global, and researchers increasingly mobile
- competition towards STI talents between countries and companies.

Carlson (2006), while highlighting the growing literature body addressing internationalization of corporate R&D, contends that so far too little attention has been paid to the internationalization of national innovation systems. However, he concludes that there is sufficient evidence to support the claim that national innovation systems are becoming more internationalized, while admitting the existence of certain "barriers to internationalization inherent in innovative activity in the form of spatial boundaries of knowledge spillovers as well as certain features such as national specificities of intellectual property rights".

International cooperation depends on a number of elements according to the nature of the actors involved, the characteristics of the scientific fields of activity, the level of funding and the nature of the collaboration process - bottom up (impetus of scientists) versus top down (driven by government and other policy makers). Georghiou (1998) suggests four types of international collaboration in R&D:

1. informal collaboration
2. large-scale science cooperation between nations
3. formalized cooperation agreements
4. global collaborative programmes.

In order to analyze qualitatively and quantitatively international cooperation between ERA countries and BRICs, Gnamus (2010) developed the following twofold assessment approach:

Model 1 - Index Degree of Networking (Fig. 1): this model builds upon policy instruments for international ST cooperation implemented in ERA countries. According to this model, ST cooperation becomes more strategic and has a greater networking effect as we move from knowledge exchange schemes, such as Exchange of ST Information, Mobility & Exchange of Scientists, to knowledge clustering schemes, such as Joint Infrastructure Investments and Innovation / Knowledge Clusters.

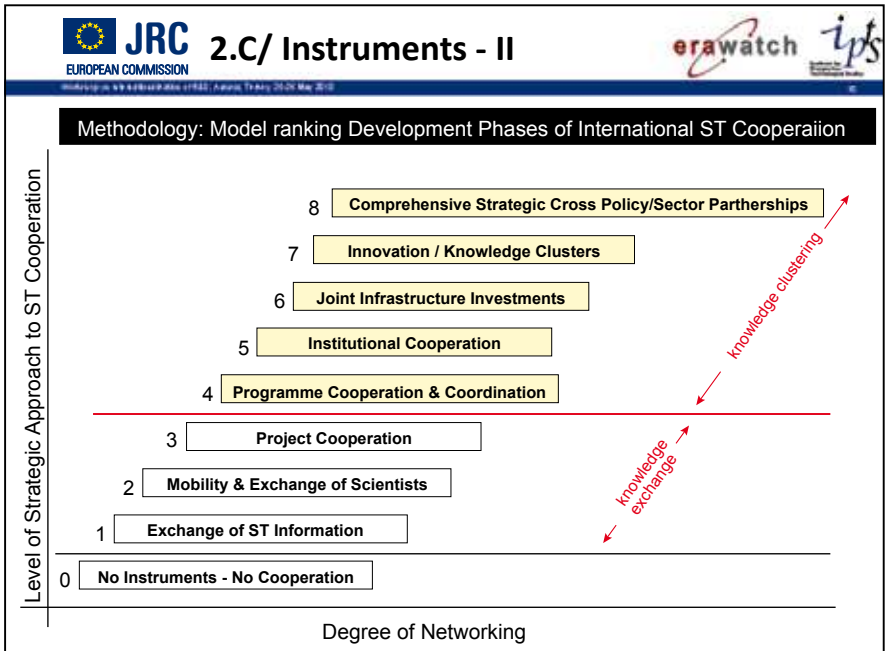

Figure 1. Model 1 ranking development phases of ST cooperation and networking.

Model 2 - Index Cooperation Status (Fig. 2): “a composite indicator summing up information on ERA countries” ST cooperation policy, institutional capacity and related policy measures, and practical implementation of ST cooperation policies, while describing the overall ST cooperation policy implementation framework for internationalization of ST with BRICs”.

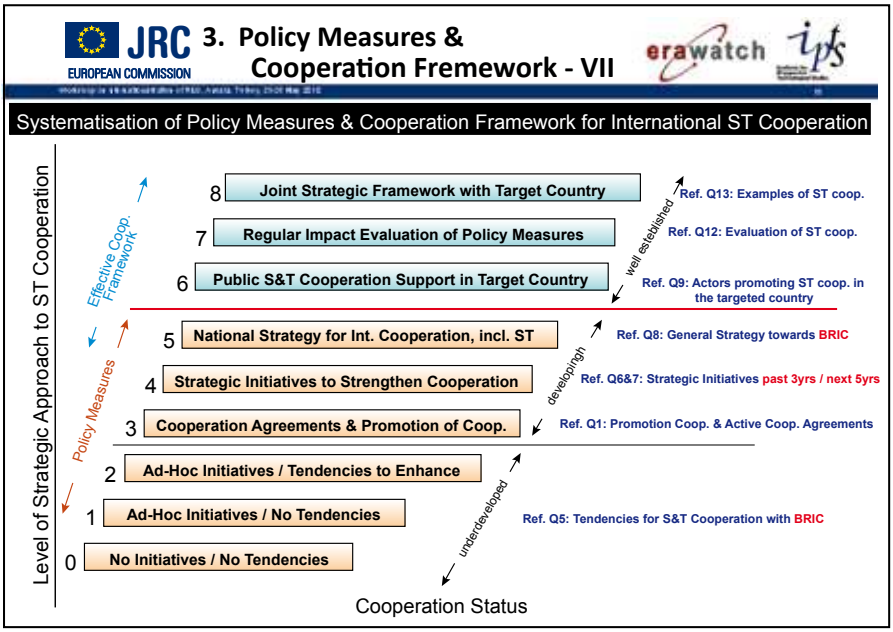

Figure 2. Model 2 ranking types of cooperation.

While analysing the drivers for international cooperation in R&D, Boekholt *et al.* (2009) distinguished between two sets of paradigms underpinning international collaboration in STI:

- The “Narrow STI Paradigm”: the drivers here take roots in the scientific community and are related to scientific ST objectives then translated in science and policy instruments establishing linkages between national and foreign resources and knowledge (both material and human). Among the objectives we might find access to complementary assets, scientific excellence, sharing costs and risks (Georghiou, 1998).
- The “Broad STI Paradigm”: it describes a situation where international STI cooperation is driven by objectives (political, economical, cultural, historical) that are external to science and technology, such as:
  - enhancing national economic competitiveness;
  - supporting developing countries to build their STI capabilities;
  - addressing global challenges (climate change, low carbon economy, migration, etc.);
  - building trust and promoting political dialogue between countries.

IV – Rationales for the Euro-Med STI cooperation

1. Innovation is a must

First of all, it is widely acknowledged among scholars that innovation has become one of the pillars in modern economies and is gaining a growing importance in today's increasingly global and knowledge-based economy. Competitiveness depends, to a far larger extent today than in the past, on the ability of businesses to meet fast-changing market needs through the application of new technologies. This offers new opportunities and poses new challenges for both the EU and MPCs. While the northern bank of the Mediterranean Sea seems to have the knowledge, skills and resources to respond to such a great challenge, the southern one is moving at a slower pace in responding to such a challenge, thus placing the region in a competitiveness disadvantage. MPCs need to be equipped with the appropriate tools to improve their innovation capacity for competing internationally. This needs to be done through the introduction of specific measures such as the enhancement of resources in the field of education, science, research and technological development, and the strengthening of institutions to ensure the right framework through which businesses can operate. In a nutshell, their innovation systems have to be enhanced, improved, and created, where necessary.

2. The worrying situation on the southern shore

With the exception of Israel and to some extent Turkey (considered as an emerging economy or "catch-up" country), the reality in the MPCs is rather bleak according to the findings of the ESTIME project (Evaluation of Scientific, Technology and Innovation capabilities in Mediterranean countries) (Arvanitis, 2007). The final report includes a list of areas where MPCs lag behind: poor innovation policies, investment in R&D ranging from 0.3% to 1%, poor R&D infrastructure, low R&D performance in terms of number of researchers, publications and patents, lack of coordination in policy making, difficult access to funding, poor innovation and entrepreneurship culture etc. The report highlights the differences between countries, particularly the recognition that MPCs have varying profiles of governance in managing their ST and innovation systems. This situation casts serious doubts on the future of the whole Euro-Mediterranean region as an area of sustainable development and shared prosperity (as envisaged in the Barcelona Declaration and wished for by the Union for the Mediterranean).

3. Why the EU-MPC cooperation on innovation?

Science, technology and innovation were not explicitly mentioned as an objective of the Barcelona Process which focussed on three large directions (i. e. political and security dialogue, economic and financial partnership, social, cultural and human partnership). Nonetheless, science was instrumentally taken into account by the EU with the creation of the Monitoring Committee on ST policy (also known as MoCo). The targets were political and economic: the creation of a zone of peace and stability based on shared fundamental values, particularly the respect of human rights and democracy, and the construction of a region of shared prosperity through the gradual establishment of a free trade area by 2010.

The MEDA programme was put in place as a financial instrument to achieve these goals. As regards science and technology, the main instruments for collaboration included the framework programmes (FPs) and, more specifically, the calls targeting the so-called third countries, including the Mediterranean regions within the successive FPs. The rationale behind science and technology collaboration belongs mainly to the broad paradigm driven by security and political dialogue between the two shores, in addition to the capacity building from the southern Mediterranean perspective. Although it is widely recognised among scholars that innovation is the driver of growth and prosperity and hence the key to achieving Barcelona process targets, science,

technology and innovation were not a priority at that time. By the end of the MEDA programme in 2006, the European Commission recognised the importance of regional programmes to promote innovation, and it launched a three-year pilot project for Euro-Med Innovation and Technology Programme (Medibtikar). The main aim of the programme was to ascertain the state of the art in MPCs; however it became clear that the project was too small in scope and budget to face the enormous challenge and the diversity of situations in Mediterranean countries. Bilateral association agreements (including ST agreements) were signed between most of the Mediterranean countries and the European Union[1]. But the turning point in the policy context at regional level was marked by the signing of the inter-ministerial agreement called Cairo Declaration between the EU and MPCs "Towards a Euro-Mediterranean Higher Education & Research Area" (June 2007)[2]. At the same time there was the announcement of the Union for the Mediterranean (UfM) which gathers 27 European Union member countries and all the Mediterranean countries. This provided further momentum to the Euro-Med partnership at political level. The UfM developed the following concrete "core initiatives":

1. Depollution of the Mediterranean ("Horizon 2020 Initiative");
2. Replacement energies (Mediterranean Solar Plan);
3. Sea highways and road highways;
4. Business development (including vocational training);
5. Education and research, Euro-Mediterranean university;
6. Civil protection (fight against climate change…);
7. Sustainable water management in the Mediterranean;
8. Agriculture and food security;
9. Sustainable cities and urban transport.

These political evolutions clearly show that there is the willingness to move towards an effective framework to assist MPCs to actively respond to the global common challenges (solar plan, de-pollution of the Mediterranean sea, etc.). An increased participation of MPC scientists in FP programmes can certainly contribute to the capacity building of their research skills to produce knowledge in the frontier of science. However, if MPCs are to meet the challenges and objectives outlined in the Cairo declaration or addressed by the UfM, there is the need to go further in developing complementary skills, competences, institutions and structures to enable the diffusion and use of knowledge in the socio-economic sphere (Hall, 2005).

As Georghiou (2001) said in proposing a new framework for European collaboration in science and technology, "the fact that innovation policies are often better delivered locally does not mean that they would not benefit from co-ordination at a higher level". Arvanitis *et al.* (2009) contends that instead of calling for a specific policy oriented towards innovation it would be more appropriate to launch a strategy to create a Euro-Mediterranean Innovation Space (EMIS) to support several of the broad objectives, such as the harmonization of standards, facilitating the emergence of a knowledge-based economy, developing technological and productive clusters, which will ultimately help develop the innovation capacity to meet these challenges.

This strategy of a Euro-Mediterranean Innovation Space (EMIS) could be part of the action of the EU involving an Innovation Policy for Europe. Such a structure should be closely linked to the Union for the Mediterranean and in line with its priorities shown above. Pasimeni *et al.* (2007) argued in favour of "the creation of a Euro-Mediterranean Innovation Space (and not a Mediterranean system of innovation) because international relations are still limited by frontiers and political criteria, but scientific relations, business links and technological cooperation and learning are less likely to be brindled by political constraints". EMIS would bring Euro-Med innovation stakeholders

in a common framework and act as a mutually beneficial partnership to develop a more intelligent and competitive Euro-Med space.

4. Building indigenous innovation capabilities in MPCs: relevant issues to consider

So far, policy discussions addressing technology transfer at international level, including our Euro-Med region, have had a strong tendency to focus on providing developing countries with access to existing technology on the basis of consuming technological hardware (equipment) rather than producing it[3]. This attitude fails to recognise the vital importance of building innovation capabilities (absorptive capacity) to promote both the diffusion of innovation within developing countries and sustainable economic development, based on the adoption, adaptation and development of environmentally sound technologies that fit the conditions faced by developing countries. This calls for a deeper analysis and understanding of:

- what should be the essence of a Euro-Med STI cooperation in the field of renewable energies that might allow knowledge and innovation clustering?
- what kind of knowledge flow would ease rapid and sustained uptake of innovations in renewable energies in the Euro-Med region?

To answer these questions it is important, particularly in the context of developing MPCs, to clearly define two concepts : technology and innovation.

"Technology" as defined by innovation scholars encompasses both material elements (physical equipment) with knowledge and processes. Knowledge can be explicit and codified knowledge (e.g. engineering and manufacturing process) as well as implicit and tacit knowledge (i.e. embodied knowledge acquired by doing, applied engineering, system integration skills). The centrality of tacit knowledge and experience of working with the technology is often overlooked. The development of innovation capabilities in MPCs is not only about importing new hardware or the creation of new production capabilities but includes also promoting the capacity to absorb the technology, to adapt it to local changing needs, to replicate it, enhance it and enable the countries to become innovators in their own right.

"Innovation" can be characterised using the OECD Oslo Manual (OECD, 2005) under the following typologies:

I. Innovations 'new to the world': where a firm is the first to introduce innovation for all markets & industries, domestic and international.

II. Innovations 'new to the market': where a firm is the first to introduce innovation in its particular market.

III. Innovations 'new to the firm': where a firm introduces a product, process or method new to that firm, or significantly improved by it, even if it has already been implemented by other firms.

"Type I" innovation (new to the world) is the main interest of policy discussions within Euro-Med STI cooperation level. This type of innovation is more likely to be associated with more radical innovations that are the results of deliberate R&D, and it requires the existence of a strong knowledge base. However, in the context of developing countries (such as MPCs), where rapid adoption and diffusion is a central concern, incremental and adaptive innovations that are often underpinned by "type II" (new to the market) and "type III" (new to the firm) are often more relevant and important.

Incremental innovations are seen as occurring more or less continuously, as economic agents strive to improve quality, design and performance. The emphasis is on learning by searching, using and doing and on the interaction between suppliers and users of technology (Lundvall,

1988; Freeman, 1992). Incremental innovation plays also a critical role in instances of assumed technology "leapfrogging" in developing countries, where countries have moved towards, and then surpassed, the international technological frontier. Ockwell *et al.* (2010) mention, for example, that the most successful latecomers into the wind energy market (e.g. Spain and China) took the first steps in developing their industry through joint partnerships technology transfer via licensing agreements and associated royalty fees with manufacturers in Germany and Denmark.

Gallagher (2006) cites the case of the Korean steel industry, which eventually emerged as international technology leader as a result of the adoption of internationally established technology followed by a continuing process of incremental improvements. Walz (2010) finds that the relationship between scientific publications, patenting activities and trade share in sustainability-related technologies is positive but not linear among emerging economies (Taiwan, Korea, Malaysia, Brazil, etc…). Zhao and Arvanitis (2010) also reported the technological capabilities of Chinese firms to be related with foreign clients, relayed by local industrial policies. The possibility to develop the industrial capabilities and export capacity is thus not only related to the kind of innovation but to a combination of enterprise's capabilities and public policies (Bironneau, 2012).

Other analyses in 2010 reported that it is tempting for policymakers to operate on the basis of a simple model of innovation and growth, where investment in science is seen not only as a necessary but also as a sufficient condition for innovation-based growth. It is striking that the most important European innovation policy measure to implement the Lisbon Agenda has been the Barcelona 2%+1% objective for, respectively, private and public R&D to GDP ratios. There are inherent risks in exaggerating the expectations regarding the direct impact of science on innovation and underestimating other sources of innovation such as experience-based learning within industry. Among policymakers this has resulted in disappointments and in what they consider as 'paradoxes': domestic strength in science not being reflected in innovation-based economic growth. To overcome these paradoxes, policymakers look for solutions that aim at a commercialisation of science, thus transforming universities into "patent producers" neglecting their fundamental role, while serving industry and society with well-trained and critically minded graduates.

V – The way forward

Within this context, if we are to hope for a substantial change in the foreseeable future of the technological and innovation profile of MPCs enabling them to contribute with European countries to address those common trans-national challenges, substance needs to be given to the Cairo Declaration and UfM declaration as well as to their objectives. Opening a process of dialogue among Euro-Med science, technology and innovation stakeholders (businesses, policy makers, researchers, programme managers, financers) through an EMIS discussion platform will be important for the identification, selection of relevant activities and collaboration opportunities to outline the best course of actions to meet EMIS objectives. Using the above mentioned Model 1 (degree of Networking) and Model 2 (cooperation Status), the EMIS discussion platform should play a key role in:

- upgrading the strategic level of cooperation from less complex knowledge exchange schemes towards knowledge clustering schemes (see fig. 1 above),
- moving the status of cooperation from the response to policy measures towards a joint framework of Euro-Med Cooperation in science, technology and innovation,
- improving the communication channels among MPCs,
- working towards the linking up of regional programming among MPCs,
- and, last but not least, contributing effectively to building science, technology and innovation

capabilities in MPCs.

VI – Conclusions

Indeed, the Mediterranean region has been in a political turmoil recently. The economic difficulties faced by the populations have partly caused this situation. This process, although fragile and lengthy, is more likely to lead to more freedom and better governance, values that are common with the northern neighbours of these countries. However, to promote significantly the odds of success of this political transition the process needs consolidation to bring about the economic success expected by the population. The EU is a vital entity which could play an important role to provide the required support for this purpose.

Supporting the innovation capacity of these countries through a commensurate framework, namely the Euro-Mediterranean Innovation Space, could provide the right conditions towards enhancing the STI capacity of the southern STI countries to become more competitive. The Arab spring that has brought about a wave of change in the region, with new people with fresh ideas at the helm of key countries such as Libya, Tunisia, and Egypt, may provide an opportunity to develop academic and industrial partnerships that will enable these countries to create wealth, provide jobs and ensure stability. EMIS is trying to contribute in this sense in the fields of water and energy.

Notes

[1] See a list of these agreements in the article by Arvanitis *et al*., in this volume.

[2] This section draws heavily on the OECD report by Ockwell *et al*. (2010), Enhancing developing country access to eco-innovation.

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Annex 1 - The EMIS Forum: the example of the Energy Forum

The energy forum is an example of an initiative to promote common understanding in a specific technological area. The whole Mediterranean region and the European Union (EU) will both face major energy and climate challenges in the coming decades. Energy demand is projected to rise significantly, while fossil fuel prices will most likely continue to follow an unstable and rising trend. To address these challenges, the EU countries and the other member countries of the Union for the Mediterranean need to intensify their efforts to develop adequate policies in the field of energy efficiency and energy savings, renewable energies and reduction of greenhouse gas emissions (Solar Plan, 2010).

The neighbouring Southern Mediterranean Partner Countries (MPCs) have vast solar power resources which could tackle Europe's most pressing issues and add at the same time complementary issues in the Mediterranean region, such as energy poverty, socioeconomic development and efficiency. In the Med region the growth of population and economy will lead to a rising demand. The energy demand may increase by 65% before 2025, as a result of the influence of population growth and rising demand associated with economic development.

Against this background, several ambitious initiatives bringing together stakeholders around the Mediterranean have been launched such as the Mediterranean Solar Plan and Desertec. The challenge now is to establish a policy that encourages the rapid uptake and use of technology to avoid the catastrophic social, economic and environmental impacts of the current non sustainable development model at the global scale.

A policy approach that aims to promote renewable energy in the Euro-Med region is likely to be successful if tailored to respond simultaneously to the interests of developed EU Countries as well as developing Southern Mediterranean Countries. The EU has an interest in speeding up the uptake of sustainable technologies to mitigate the global environmental problems. European firms are expected to gain from the new market opportunities in MPCs. This might apply particularly where MPC engagement at local level leads to adaptive innovations opening up new set of technologies, which are specifically applicable within countries with similar context. MPC incentives to promote renewable energies are twofold. Firstly, MPCs are expected to be among the most vulnerable to the environmental impacts. Secondly, and maybe most importantly in terms of economic development, the prospects of revenues coming from export of clean energy to EU and access to new technologies are key determinants of the future socioeconomic development level of MPCs. In regard to the latter, the access of MPCs to new sustainable technologies opens up the potential of technological change, broadening the industrial base with associated employment benefits, profits, and public income through taxes. Renewable energy is a key area where MPCs can access new technologies and build their indigenous innovation capabilities with the support of a targeted European Neighbourhood Policy.

The EMIS Forum on renewable energy was particularly focused on building an indigenous innovation capability in MPCs. The objective of the Forum was to target the key players for innovation, i.e. industry, academia and the public sector in the Mediterranean and European countries in order to build-up a dialogue between these participants, create a mutual understanding of innovation by identifying intermediate structures and initiatives dealing with innovation (IPR experts, Technological Parks' administrators, service providers, etc.), discover cooperation and funding opportunities. The Forum was intended to identify possible partners for setting consortia on research and innovation, which are topics of mutual interest covered by the available funding instruments. Finally, the Forum aimed at developing recommendations for policy makers to foster innovation in the field of Renewable Energy and Energy Efficiency.

Taking into consideration the previous activities of MIRA, the Forum was mainly focused on solar energy and energy efficiency in the Euro-Med region. During the thematic workshop in the field of energy research, the MIRA project identified the following research priorities:

- Photovoltaic
  - advancement of PV system components including cells, storage devices, inverters;
  - controllers for micro-grid applications;
  - integration of PV/CPV systems in industrial grid connected applications;
  - development of operation and maintenance training programs to support deployment of PV technology;
  - policy research, legislation development and awareness building for integration of PV technology application in energy management and resource planning.
- Concentrating Solar Power
  - local manufacturing of components;
  - advanced materials and surfaces;
  - improved weather forecasting models for direct normal irradiation;
  - new joint test facilities for CSP in the MENA region collocated to pilot power plants;
  - CSP Dissemination and Education Program “Educate the Educators”;
  - evaluation of Hybrid Concepts.
- Energy Efficiency
  - energy efficiency road map (prospects and challenges);
  - develop optimized energy efficient buildings for the region;
  - increasing efficiency and reliability of solar collectors through developing new materials, specific coating materials & cleaning techniques;
  - large energy-intensive industries: energy intensity improvements through energy efficiency.