INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES
SEVILLE
W.T.C., Isla de la Cartuja, s/n,
E-41092 Sevilla

The Socio-Economic Impact of Renewable Energy Projects in Southern Mediterranean Countries

(Task 5- INTERSUDMED Project)

Executive Summary

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Work performed in partial fulfilment of the Joule contract no JOR-CT95-0066

Gro Waerras (EDF)

Juan C. Císcar-Martínez (IPTS)

Julián Leal (CIEMAT)

Miquel A. Aguado-Monsonet (IPTS)

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1. Introduction

The increasing demand for electricity in Southern Mediterranean countries and the willingness to preserve their hydrocarbon resources clearly address the need to further develop the use of renewable energies for electricity production in this area. Fully aware of this, the European Union is aiming at promoting initiatives to support the implementation of renewable energy technologies within the Mediterranean basin. In this respect, the APAS MEDENERGY project (1995-1996) elaborated an action plan for the development of renewable energies in those countries. Pre-feasibility studies of a set of renewable energy plants should provide strategic support for a major market deployment of renewable energy technologies in the Mediterranean basin and, therefore, assist regional development. National and local authorities, research, development and demonstration (RDD) institutions, manufacturers, utilities and users should participate in the subsequent project stages. In order to accomplish these objectives, the IPTS, together with other partners, has undertaken a JOULE project, named INTERSUDMED.

The project has been divided into several tasks. Each of these tasks has been co-ordinated by one of the partners. A close collaboration between Northern and Southern partners, especially regarding information and experience exchange, has played a key role during the project. The different tasks appear in the following table:

TASK	DESCRIPTION
1	Selection of appropriate sites and technologies given the local context
2	Analysis of the Southern Mediterranean institutional framework regarding electricity production
3	Basic engineering and techno-economic studies for renewable energy plants, including network integration.
4	Local industrial capabilities in each country for manufacturing plants, and technology transfer
5	Evaluation of the social and economic impacts
6	Evaluation of the environmental impact
7	Development of financial schemes

Table 1.-INTERSUDMED Tasks

The INTERSUDMED project is composed of thirteen renewable energy projects, with different renewable energy technologies. There are five photovoltaic projects, which are distributed across countries as follows: one in the south of Algeria, one in the North of Sinai (Egypt), one in the north of Morocco, one in the central region of Tunisia and another one in Palestine. Moreover, there are two wind farms, one located in the north of Tunisia and another one in the west of Turkey. Concerning solar thermal technology, there are two power plants to be set up in Egypt. There is a project of a desalination plant powered by photovoltaics in the south-west of Morocco. A demonstration project with photovoltaics is also to be performed in Israel. Finally, there are two biomass projects in the north region of Morocco.

The present report summarises the work carried out to analyse the socio-economic aspects of the integration of REs in the Southern Mediterranean area. Several institutions have performed this task. The IPTS (the task coordinator) and CIEMAT (the INTERSUDMED program co-ordinator) studied the electricity production projects from the point of view of the political decision makers, and not only from the perspective of a private investor. This is generally the fact for energy generation projects, as it is the State or a Utility related to the Government that are the institutions in charge of developing these kind of projects. EDF has also collaborated in this task, performing an analysis of the socio-economic impacts of photovoltaic systems in the local environment, as well as the analysis of the electrical needs of the local population.

Next table shows the set of subtasks performed under the socio-economic task of the INTERSUDMED project.

SUBTASK	*TITLE OF THE SUBTASK*	*MADE BY*
1	*The socio-economic impact of renewable energy projects in Southern Mediterranean Countries: Methodology*	IPTS
3	*Socio-economic characteristics of the INTERSUDMED sites*	IPTS
2	*Macro-economic impact of the renewable energy projects: Input-Output analysis*	IPTS
4	*Micro-economic impact of the renewable energy projects: The cost-benefit analysis*	CIEMAT
5	*Evaluation of the socio-economic impacts of renewable energies: Global survey to decision-makers*	IPTS
6	*Importance of the socio-economic impacts of renewable energies for the Southern-East Mediterranean decision-makers: Regional survey.*	IPTS
7	Local satisfaction and socio-economic impact surveys	EDF

Under the first subtask the analysis of the current methodologies to perform the socio-economic analysis has been done. Secondly, the description of the socio-economic characteristics of the sites selected by the INTERSUDMED projects has been done. This has been followed by evaluation of economic impacts from two perspectives. On the one hand, the Input-Output methodology has been used to quantify the impacts of the projects on variables such as employment, value-added and imports. On the other hand, the cost-benefit methodology has been applied in order to integrate under a common framework the costs and benefits of each project. Another subtask has consisted of the evaluation of the socio-economic impacts that renewable energy projects, already working around the world, have at the local, regional and national level. Another subtask has been the evaluation of the importance of the different socio-economic impacts for the decision makers of the southern Mediterranean countries. And last but not least, concerning the rural electrification projects, a local and comprehensive socio-economic analysis has been done in three countries, in order both to analyse the potential socio-economic impacts of the electrification and, the energy needs of the rural population.

The following table summarises the relationship between the different subtasks of task 5 and the INTERSUDMED projects.

PV: photovoltaic

DESALIN: Desalination-PV
ST: Solar Thermal
BM: Biomass

	COUNTRY SUBTASK TECHNOLOGY	ALGERIA-PV	EGYPT PV	EGYPT ST	ISRAEL PV	MOROCCO BM- CROPS	MOROCCO BM-WASTE	MOROCCO DESALIN	MOROCCO PV	PALESTINE PV	TUNISIA PV	TUNISIA WIND	TURKEY WIND
1	The socio-economic impact of renewable energy projects in Southern Mediterranean Countries: Methodology												
2	**Error! Reference source not found.**												
3	**Error! Reference source not found.**												
4	**Error! Reference source not found.**												
5	**Error! Reference source not found.**												
6	**Error! Reference source not found.**												
7	**Error! Reference source not found.**												

In the following sections there are summaries of each of the subtasks performed under the socio-economic impact analysis and, finally, a list of the publications made under the socio-economic task of the INTERSUDMED project.

2. The socio-economic impact of renewable energy projects in Southern Mediterranean Countries: Methodology

In this JOULE project, the IPTS is carrying out the *ex-ante* socio-economic evaluation of the renewable energy plants, paying special attention to the quantification of the socio-economic benefits. The socio-economic analysis intends to focus on two key issues. Firstly, estimation of the impact of the projects on *development*. Here the aim is to assess to what extent the projects stimulate the living standards of the populations concerned. Most experts usually point out some positive effects although their quantification is rather difficult. Secondly, the focus is also on the estimated impacts concerning the generation or modification of the *migration flows* within the zone. The main point concerns rural exodus to urban areas, but these flows may be considered as a preliminary step to the transboundary migration from the Southern Mediterranean Countries to the European Union. In fact, most of the INTERSUDMED projects are set up in rural areas. By supplying their population with electricity, people could improve their living standards and then their willingness to migrate to urban areas or to foreign countries could diminish.

The aim of this subtask has been to review the different available methodologies for carrying out the *ex-ante* socio-economic evaluation of renewable energy projects before applying them to the INTERSUDMED plants. Both quantitative and qualitative methods are taken into account, although the primary interest is to quantify as much as possible the socio-economic impacts. Depending on the size of the direct impact area, two general kinds of projects have been identified: decentralised rural electrification projects and grid-connected electrification projects. The analytical schemes that would be adequate to deal with these projects largely depend not only on the technical characteristics of the RE technology concerned, but also on the socio-economic

characteristics of the housing site. The main methodological propositions of this document are the following:

- For all the projects: to evaluate the *economic* impacts on income, industrial structure, employment and imports through input-output analysis, depending on the availability of the structural data describing the concerned economies at the macroeconomic level. In some selected cases, and depending on the specific characteristics of each project, this analysis may be complemented by a cost-benefit evaluation of the project, in order to provide a microeconomic focus.
- For the rural electrification projects: to carry out the social evaluation through the use of questionnaires. These questionnaires are addressed first to obtain information on similar electrification projects that have been carried out in the past in other sites. The results obtained from these questionnaires will subsequently be applied to the specific RE projects that have been considered within the INTERSUDMED project.

3. Socio-economic characteristics of the INTERSUDMED sites

In this subtask, the main socio-economic characteristics of the INTERSUDMED countries have been analysed. The main features of each one are summarised in the following paragraphs.

ALGERIA:

Algeria is a country where the national electrical network is very much extended among the population. But the national electrical network has not arrived to the southern part of the country. In that location, diesel systems that provide electricity to local networks have been installed. The two places analysed to place photovoltaic plants are very sunny (average global radiation over 5.5 kWh/m2/day) and they are quite far from the oil supply. Trucks have to drive distances over 1,200 Km to bring the gasoil to the diesel generators. The local people have low income and their main economic activity is the agriculture.

EGYPT

Egypt is a country where the national electrical network covers almost all the population. The reason for that is that the population is concentrated around the Nile valley. But some small villages in isolated areas, far from the Nile valley remain to be electrified. The towns selected for the photovoltaic projects are small towns in the north of the Sinai. The main economic activities are subsistence agriculture and livestock raising.

MOROCCO

The North region of Morocco is a rural region, poor and with lack of electrical infrastructure. The main reason for that is the mountainous character of the region as well as the dispersion of the population. Those factors increase dramatically the cost of the extension of the electrical network. Some parts of the North region of Morocco are devoted to olive agriculture. This was reason to include a biomass project that uses the biomass solid waste.

TUNISIA

Tunisia is a country where the electrical network serves almost all the population. Only isolated houses need to be electrified. The Kairouan region is one of the regions where many isolated houses need to be electrified.

TURKEY

Turkey is the most developed countries of the INTERSUDMED project and a wind farm is planned to be placed in Barbaros village, near Izmir. That small town is located in a very windy place and it is quite close to a tourist area. The average income of the population around Izmir is quite high compared to that in the other areas of the INTERSUDMED project.

4. Macro-economic impact of the renewable energy projects: Input-Output analysis

The input-output methodology is used to quantify the effects of a set of renewable energy plants in southern Mediterranean countries on key socio-economic variables. Input-output tables from Turkey, Tunisia and Morocco are employed. In particular, the effects on employment, imports and value-added are computed, as well as their sectoral structure. The main results are the following.

1 - The generated *employment* (in jobs-year), by every million ECU (Mecu) of total costs, is approximately twice higher in the wind and biomass projects than in the PV project. This is due to the fact that the PV project requires very high imports, which amount to half of the total costs. Thus, it is estimated that the Turkish wind farm and the Moroccan PV rural electrification project create 91.2 and 46 jobs-year for every Mecu, respectively. The Tunisian wind farm generates 95 jobs-year for every Mecu of total investment and the photovoltaic project 54 jobs-year. The Moroccan biomass plants generate 93 jobs-year by every Mecu of total investment.

2 - The industrial *imports* required to build the renewable energy projects are rather large. Direct imports are almost half of the total investment in the PV rural electrification projects. This proportion is a third in the wind project and a fourth in the biomass plants. Furthermore, for the case of the wind farm in Turkey, the indirect imports raise the total imports to half of the total costs. For the other countries, there are no data for measuring the indirect imports.

3 - Concerning the *sectoral structure* of the domestic costs of the renewable energy plants, all the projects have a clear bias towards industrial sectors, being the PV project being the one with the strongest bias, with 91% of the total domestic expenditure. The wind project allocates 72% of domestic costs to the industry and 18% to the building sector. The remaining 9% is absorbed by the services. For the case of the biomass plants, which have the most sectorally diversified structure, half of the domestic expenditure is absorbed by the industry and the rest is allocated on an equal basis to the building and services sectors.

4 - The *sectoral structure of the generated value-added* is mainly concentrated in the industrial sector in the three kinds of renewable energy plants (around 63% in wind, 70% in photovoltaics and 46% in biomass). The services sector is the second one in importance (around 23% in wind, 20% in photovoltaics and 31% in biomass). Moreover, the sectoral structure of the value-added is different from that of the domestic expenditure because there is a diffusion process from the industry to the services sector due to the interlinkages between the sectors of the economy. If the sectoral structure of the value-added is compared to that of the domestic expenditure, in the wind and biomass projects the industrial and building sectors diminish their participation, while the mining sector and the services experience a rise in their participation rates. The PV rural electrification has a similar diffusion process from the industry to the mining and services sectors.

5 - The previously noted bias in the generated value-added is maintained in the *sectoral distribution of the generated employment*. The PV and wind projects have a strong bias towards the industrial sector, creating there around 60% of total jobs. The service sector also absorbs 18 to 26% of the employment. The rest is mainly allocated to the building sector in the case of the wind farm and to the mining sector in the PV project. For the biomass plant, the industry, building and services absorb similar proportions of the total employment (27, 33 and 28% respectively). The agricultural sector does not register any significant impact in job creation when building the renewable energy plants analysed.

5. Micro-economic impact of the renewable energy projects: The cost-benefit analysis

The cost-benefit analysis tries to guide the decision makers among different possible actions by calculating the difference between costs and benefits of each alternative over a period of time. In this part of the project, a cost-benefit analysis of two power plants was made considering both the social and the private aspects. The first case where this methodology has been applied is located in El Hajeb (Morocco), where a biomass power plant of 10 MW would be installed. The second case is located in Djanet (Algeria), where a PV plant of 600 kW would be set up.

Moroccan case:

The biomass power plant would be located in the north of Morocco, El Hajeb, where the following costs and benefits have been calculated:

Costs	Benefits
Private	
Fuel costs: **Fc** = 1,683,575 $/year	Sale of Electricity: **Elb** = 6,750,000 $/year
Investment costs: **Ic** = 23,520,000 $	
Operation and maintenance costs: **OMc** = 1,162,500 $/year	
Training costs: **Trc** = 10,725 $/year during the first 3 years	
Social	
Environmental costs: **ENVc** = 21,937.5 $/year	Direct and indirect employment **EMPb** = 296,106 $/year
	Energy security: **Esb** = 570,000 $/year

After the calculation of all the costs and benefits, the study has determined the value of the following economic indicators:

Economic indicators	Private analysis	Social analysis
NPV	$7,987,327	$ 20,914,202
IRR	2.2%	5.3%
B/C	1.30	1.50

It can be seen that the social analysis produce better results than the private one, these results show the way to a successful integration of RE projects from the social point of view.

Algerian case:

The PV solar plant of 600 kW will be located in the Southern part of the country, in the Djanet province. The estimated costs and benefits appear in the following table:

Costs	Benefits
Private	
Investment costs. **Ic** = 3,580,000 $	Saving of fuel consumption: **BFCb** = 75,240 $
Operation and maintenance costs: **OMc**= 71,604 $/year	
Training costs: **TRc** = 2860 $	
Social	
Environmental costs: **ENVc** = 2,805 $	Environmental benefits (Not calculated)
	Direct and indirect employment **EMPb** = 750 employments created (not calculated)

In this case and due to the impossibility to estimate in monetary terms the social benefits, the economic indicators have not been calculated.

6. Evaluation of the socio-economic impacts of renewable energies: Global survey to decision-makers

The construction of any energy power supply system involves the impact at different levels of the society. For instance it creates impacts on the technical development, to the environment, to the local population and to the national economy. It is clear that some of those impacts are very difficult to evaluate but nevertheless one should try to quantify or at least to identify the possible impacts that a certain energy plant will have. Of course those impacts can be qualified as positive impacts under some point of views or negatives under other point of views. In other words, an impact can be seen by some actors as a positive impact and by others as negative impacts. Some actors may not consider that impact as such and choose simply to ignore it. For instance, normally a renewable energy developer does not consider the impact of such renewable energy plants on the national economy, or how it affects to the different sectors of the economy.

This study represents a first attempt to evaluate the socio-economic impacts that the renewable energies have at national, regional and local level in the Southern Mediterranean region. The following social impacts have been considered:

1. The impact on social welfare
2. The impact on migration flows
3. The impact on technology status
4. The impact on culture
5. The impact on the security of energy supply
6. The impact on environment

Once the impacts have been defined the second step is to try to quantify as much as possible the impacts that each renewable technology has on the socio-economic environment. To accomplish this aim, a questionnaire was prepared were several questions where introduced for each impact in order to evaluate the global impact.

The idea of the questionnaire was to analyse "ex-post" a battery of renewable energy projects already working around the world. The evaluation of the impacts has been done by directors or managers of the renewable energy plants. The questionnaire is intended to help them to systematically identify the renewable energy plant performance and possible impacts. The main socio-economic impacts identified have been the following:

1. Wind technology is the renewable energy technology that is constructed in countries with higher industrial capabilities. Biomass projects are the most high-tech systems, and only 50 % of the developing countries have the capability to construct this kind of plants.

2. Photovoltaic technology is a technology that has less impact in the industrial development of the country where it is constructed. That impact is much lower in the case of developing countries compared to industrialise countries.

3. Although national population have worked in the construction of all renewable energy plants, wind technology is the one that employs less local people.

Those rates of employment are much lower in the case of developing countries.

4. Although local people are usually quite satisfied with renewable energy plants, it is in developed countries where the local population are more likely to object the construction of those renewable energy plants.

5. Wind farms are the technology that induce the more the diffusion of the technology within the country. In other words, they are better able to transfer technology. That process of diffusion is lower in developing countries.

The main socio-economic impacts that the renewable energy projects have had in the rural areas are :

1. Photovoltaic systems are placed in locations where there are more needs for of electricity. That percentage is higher in the case of developing countries.

2. Photovoltaic technology is the one that has more impact on the local life style. That impact is higher in the case of developing countries.

3. Photovoltaic technology is as well the technology that has more impact on the domestic activities. That percentage is much higher in the case of developing countries.

4. Biomass systems and wind farms are the technologies that avoid local out-migration.

5. In the case of developing countries, photovoltaic systems are the systems that stimulate more the appearance of productive activities in those countries where it is constructed. In the case of developed countries, it is the wind technology the most stimulating technology of productive activities.

6. Biomass systems are the systems that stimulate the more the appearance of new local infrastructure in both developed and developing countries' rural areas.

7. Importance of the socio-economic impacts of renewable energies for the Southern-East Mediterranean decision-makers: Regional survey.

Once the socio-economic impacts of the different renewable energy technologies have been identified, it is necessary to create a framework to integrate those impacts. In order to create that unified accounting framework and evaluate a global socio-economic impact, a questionnaire was addressed to decision makers of the Southern-Mediterranean countries. The aim of that questionnaire was to evaluate the most important impacts that the decision makers from the Southern-Mediterranean countries expect when an energy plant is constructed. In this way, it is possible to evaluate the importance of each impact and to evaluate which are the most suitable renewable energy plants that should be constructed in the perspective of the decision maker. Renewable energy plants that gives the maximum satisfaction in terms of desirable impacts are the ones that should be promoted.

This study represents the responses of responses made by the decision makers of the Southern Mediterranean countries regarding the importance of the impacts that the renewable energies have in the socio-economic environment. The ranking of the impacts of energy projects based on the average answers of the decision makers of the Southern Mediterranean countries is the following one:

Position	Impact on ...
1	the technology transfer
2	the community welfare
3	the environment
4	the income
5	the security of supply
6	the household welfare
7	the industrial production
8	the employment
9	the migration
10	the local culture

The study also includes the analysis by type of dec ision maker. The conclusions extracted from the analysis of the data are:

1. The technology transfer issues are considered by decision makers of ministries much more important than decision makers from utilities.
2. Decision makers in ministries give much more importance to the industrial production than utilities.
3. Security of supply and the impact in the income are impacts more important for decision makers in utilities than in the ministries.

The analysis per country give the following conclusions:

1. Tunisian decision makers consider environmental issues an important issue, whereas Egyptians and Moroccans do not.
2. Moroccan decision makers consider that household welfare is very important, whereas Egyptians and Tunisians consider it as a medium impact and Turkish as small.
3. Community welfare is more important than household welfare, maybe because more people may take advantages of that.
4. Security of supply is an important issue, being for Turkish decision makers the most important one.
5. Employment issues are not considered so important for all the Southern-Mediterranean countries's decision makers.

8. Local satisfaction and socio-economic impact surveys

One of the aims of the INTERSUDMED project is to look for new and innovative ways of adapting renewable energies into the socio-economic conditions of the different regions. In that perspective, the study of the target population's energy needs and the corresponding budgets is essential. Furthermore, an evaluation of the local forms of operation and management and

the socio-economic impact of the systems is indispensable for a better integration of renewable technologies.

In this perspective, socio-economic field surveys have been conducted in the pilot[1] regions for photovoltaic technology in Morocco, Tunisia and Egypt. Random sampling was used in the three countries, and data were collected through similar questionnaires by representatives of respectively CDER/ONE, STEG and NREA. An average of 20-25 % of the households were interviewed in 14 different villages or attachments.

Electrification has led to a wider and more intensive[2] **use of electric appliances**, especially radio and TV. However, it should be noted that the basic service provided by decentralized services, namely lighting, does not function in a satisfactory way for more than 75% of the households, who declare they experience regular energy failures (the rate is as high as 100 % for Egypt). The main reasons for this are lack of capacity - especially in Tunisia, and Morocco, where the households interviewed were equipped with 50 W stand alone systems - and absence of O&M service systems (Egypt[3] and Morocco). The population in the three countries have different solutions to these problems : in Egypt, the 75% would like to replace the diesel plant by PV, in Morocco, the majority recommend an extension of the existing (50 W) systems ; whereas the Tunisians would prefer getting connected to the grid.

The main **priorities** today as expressed by the households without electricity are above all household lighting (Tunisia, Morocco, Egypt), electrification of the mosque (Morocco) and television (Egypt). The willingness to pay for PV services is equivalent to the traditional energy budget. For electrified households, the main need is a refrigerator (Morocco, Tunisia) or a television (Egypt).

[1] In Tunisia, since no PV electrification had taken place in the pilot region (Kairouan), the study concerning electrified households was made in the Kef region. In Egypt, the absence of residential PV at all led us to study villages electrified by diesel plants.
[2] In Tunisia and Morocco, electric appliances were already present before electrification. They were used thanks to batteries.
[3] Bad availability of fuel also plays a role in Egypt.

The **social impact of electrification** is very positive, especially on education, security and migration. The economic impact is less clear-cut : at the household level, energy budgets have diminished by 20 % to 44 %, but at the community level, no direct economic impact can be measured in Tunisia and Morocco. On the contrary, it is perceived as being important in Egypt : the respondents mention several types of activities which have taken advantage of (diesel) electrification, especially within the trade and handicraft sectors. The lack of micro-level economic impact for PV plants is certainly due to the small size of the projects ; 50 W_p per household is far from enough to stimulate economic activity.

Three main conclusions can be drawn from this study :

- In order to avoid frustrations, the systems should always be adapted to the financial capacities of the households. An evaluation of their needs and budgets should therefore be done prior to dimensioning ;
- Future electrification projects should not only propose technical systems, but also prepare O&M service systems to provide operational sustainability and better the satisfaction of the consumers ;
- a significant socio-economic impact can only take place if an identification of projects and activities likely to use electricity is done at forehand. Furthermore, the capacity of the systems must exceed a certain minimum.

9. List of reports and material produced under the socio-economic task

Reports

- "The socio-economic impact of renewable energy projects in Southern Mediterranean Countries: Methodology", Miquel A. Aguado-Monsonet & Juan C. Císcar-Martínez, IPTS, April 1997, EUR-17688 EN
- "Socio-economic characteristics of the INTERSUDMED sites", Miquel A. Aguado-Monsonet, IPTS, January 1998
- "Quantification of the socio-economic effects of renewable energy projects in Southern Mediterranean Countries: an Input-Output analysis", Juan C. Císcar-Martínez, IPTS, January 1998
- " Micro-economic impact of the renewable energy projects: The cost-benefit analysis", CIEMAT, January 1998
- "Evaluation of the socio-economic impacts of renewable energies: Global survey to decision-makers", Miquel A. Aguado-Monsonet, IPTS, January 1998
- "Importance of the socio-economic impacts of renewable energies for the Southern-East Mediterranean decision-makers: Regional survey. ", Miquel A. Aguado-Monsonet, IPTS, January 1998
- "Enquête d'évaluation sociologique en Tunisie, au Maroc et en Egypte", EDF, January 1998

Publications

- "Methodologies for assessing the social and economic impacts of rural electrification projects through photovoltaics in developing countries", Miquel A. Aguado-Monsonet and Juan Carlos Císcar-Martínez , Proceedings of the 14th European Photovoltaic solar energy conference and exhibition, Barcelona (Spain), July 1997

- "Photovoltaic Technology and Rural Electrification in Developing Countries: the Socio-economic Dimension" Císcar-Martínez, J. C. The IPTS Report, issue 19, November 1997, pp. 12-19

Presentations to conferences and meetings

- "Defining the socio-economic impact task in the Intersudmed project", Miquel A. Aguado-Monsonet, Intersudmed meeting, Cairo (Egypt), May 1996
- "What and how it is going to be done the socio-economic analysis of renewable energy projects in the Southern Mediterranean countries", Miquel A. Aguado-Monsonet, Intersudmed meeting, Rome (Italy), November 1996
- "Evaluation of the socio-economic impact of the renewable energies", Miquel A. Aguado-Monsonet, Intersudmed meeting, Sevilla (Spain), April 1997
- "Literature Review: Socio-Economic issues of Rural Electrification in Developing Countries", Juan C. Císcar-Martínez, Intersudmed meeting, Sevilla (Spain), April 1997
- "Input-Output Evaluation: the Energy Crop Biomass Plant in Saïs (Morocco)", Juan C. Císcar-Martínez, Intersudmed meeting, Sevilla (Spain), April 1997
- "Methodologies for assessing the social and economic impacts of rural electrification projects through photovoltaics in developing countries", Miquel A. Aguado-Monsonet and Juan Carlos Císcar-Martínez , 14th European Photovoltaic solar energy conference and exhibition, Barcelona (Spain), July 1997
- "Advance of the results obtained in the socio-economic task", Miquel A. Aguado-Monsonet, Intersudmed meeting, Marrakech (Morocco), November 1997