

**Participative Approach in Water Resource Planning within Mediterranean Region:
the Case Study of Lower Litani Basin (Lebanon)**

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ABSTRACT

The EU 6thFP INCO-MPC project OPTIMA¹ (Optimisation for Sustainable Water Management) has the aim to support and test the implementation of the Water Frame Directive (WFD 2000-60-EC) in the Mediterranean region providing the on-line available Decision Support System WaterWare based on multicriteria analysis. It has been tested in seven pilot water basins respectively in Cyprus, Turkey, Tunisia, Morocco, Lebanon, Jordan and Israel/Palestine. The proposed methodology equally considers economic efficiency, environmental compatibility and social equity as the pillars of a sustainable implementation of water basin plans, by involving stakeholders in all the steps of the decision-making process.

Within OPTIMA framework, special care has been given by corridoio.zero to the adoption of a suitable participative decision-making procedure. According to the integrated assessment approach, challenging issues like including evaluation criteria and planning objectives related to local social and cultural framework are carried out. Two rounds of on-field participative workshops are realized in two of the seven case studies: the first round concerning the problem assessment and conceptualization, the second one concerning the evaluation phase and the final choice of best trade-off alternatives.

The proposed active-involvement methodology has the aim to explicit and manage structural conflicts among stakeholders, to improve the shared knowledge of the territory in order to make analysts (i.e., scientists, engineers and architects) able to build a reliable model of the system for the simulation of effects of different alternatives. Evaluation criteria, defined interactively with stakeholders, are the basis of the final negotiation, opportunely supported by facilitation tools.

The experience of the first round of the participative process carried out in the Lower Litani River Basin in Lebanon (September 2005) together with ELARD and NCRS, local OPTIMA partners² gave the opportunity to test and enhance the general methodological scheme. A critical analysis of this experience together with the developed guidelines for implementing participation in water basin planning will be introduced in this paper.

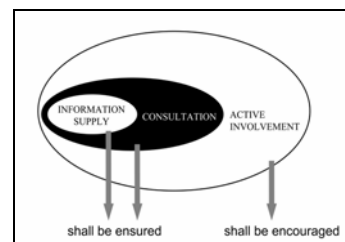
1. Introduction

Water is a key resource in the Mediterranean region, and efficient use and allocation are paramount to sustainable development, in particular in the coastal zone of the South and East, undergoing fast economic development, land use and demographic change; the overall aim of OPTIMA is to develop, implement, test, critically evaluate, and exploit an innovative, scientifically rigorous yet practical approach to water resources management, in close cooperation with local and regional stakeholders, intended to increase efficiencies and to reconcile conflicting demands based on the European Water Framework Directive (2000/60/EC). The approach equally considers economic efficiency, environmental compatibility, and social equity as the pillars of sustainable development. The project realises both the importance if not dominance of the socio-political and economic aspects, but also the importance of a reliable, consistent, and shared information basis for the policy and decision making process. Empowerment through scientifically based but policy relevant information is a key concept (AG 21, Chapter 40).

The proposed methodology will extend classical optimisation and mathematical programming methodology in several respects, also by:

- Developing the objectives, criteria and constraints in close cooperation with stakeholders and actors;
- Extending the set of objectives, criteria and constraints through expert systems technology to include difficult to quantify environmental and social dimensions;
- Putting specific emphasis on local acceptance and implementation through the inclusion of stakeholders in an interactive, participatory decision making process, using a discrete multi-criteria reference point methodology.

Stakeholders involvement realizes the general principle illustrated in Picture 1 and extensively explained in the "Guidance document n.° 8 - Public Participation in relation to the Water Framework Directive" as part of the "Common Implementation Strategy for the Water Framework Directive (2000/60/EC)".



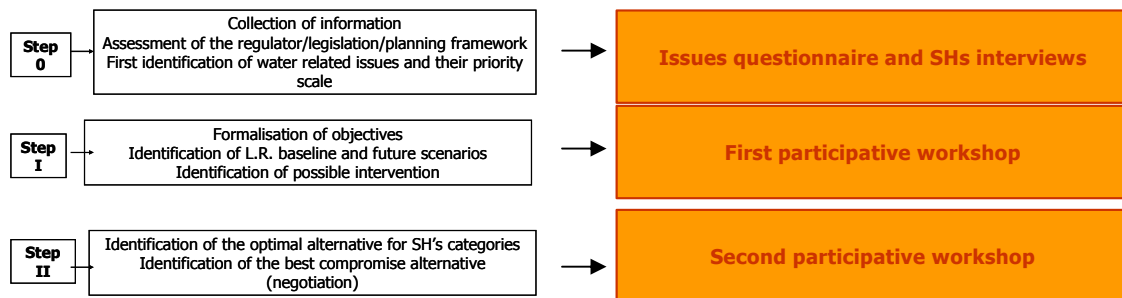
Picture 1. Participation in WFD.

2. Active Involvement in Participative Planning at Water Basin Scale

Methodology

The decision-making process adopted in OPTIMA is based on multicriteria analysis. Public participation is performed into three levels: *information, consultation and active involvement* (1).

Corridoio.zero proposal is focused on active involvement activities. The reference participative decision-making procedure (3) formally defines three roles of the involved actors: *analyst(s), stakeholders and decision maker(s)*. The organisation of two rounds of on-site workshops with local stakeholders in pilot OPTIMA Case Studies is the key issue of corridoio.zero tasks. Each workshop covers a set of methodological steps of the participative process and the workshop outcomes, opportunely post-processed by the analysts (the Case Study Partner), have to be used as inputs for the Decision Support System WaterWare (2).



Picture 2 A simplified scheme of stakeholders active involvement process adopted in OPTIMA.

The First Participative Workshop, as shown in Picture 2, covers all the activities concerning the following steps: **Problem Definition**. Outcome: understanding Case Study boundaries, constraints and macro-action, formalisation of objectives.

Identification of Criteria and Indicators. Outcome: formalisation of quantitative Indicators to evaluate the level of satisfaction of each Stakeholders category in correspondence of each possible scenario.

Model Identification – River Basin Modelisation. Outcome: defining a suitable model of the water system representing the Case Study.

The following modelisation and simulation phases foreseen by the decision-making procedure are carried out by the analysts. After the design of alternatives, the resolution of the optimization problem, the identification of Pareto-effective alternatives and the estimation of effects of each alternative (i.e. computation of the values that chosen indicators assume for each stakeholders' category as result of the alternatives being implemented), the Second Participative Workshop will be organised, covering the following activities:

Evaluation of Alternatives. Outcome: identification of the optimal alternative for each Stakeholders' category.

Comparison and Negotiation of Alternatives. Outcome: post optimal analysis and identification of the best compromise alternative.

Stakeholder and Framework Analysis

Any participative activity needs to be defined in details on a case-by-case basis, with a special care to the local context. Some key questions that can help in the definition of the local participative framework are related to:

The aim of the participative process and which are the "rules of the game" (i.e. potentialities and constraints):

- the local political and administrative framework and its level of stability,
- the decision structure related to water resources management and who will decide in the end,
- the role of the actor promoting the participative process,
- the actual acceptance level towards public participation processes in the country and in the local context,
- the demand for participation in the local context.

Stakeholder analysis and involvement (i.e., features of the target group, proper tools to reach stakeholders and communicate with them):

- dimension of the study area and scale of the problem ,
- number and representativeness of Stakeholders for the identification of the target group, with particular care to "hidden" or "weak" categories which, however, play a relevant role in water management,
- features of the territory in the study area (urban, mountain, rural, etc.) and of the basin boundaries (physical and political).

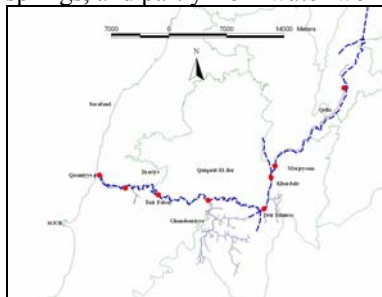
This paper will be focused on Step I of this process, showing a critical analysis of the pilot application carried out in September 2005 in the case study of the Lower Litani River basin, in Lebanon.

3. The case study

The study area is part of coastal southern Lebanon along the eastern Mediterranean, that was until recently occupied by Israel. It is bordering the ancient city of Tyr (Sour), covering the coastal part of the Litani river watershed making round 600 km². It stretches from seashore to about 600 m elevation starting with gentle plains through slopes and inner plateau into steeper slopes inland. The average annual precipitation is about 700 mm, mostly torrential, with temperature range between 12 to 30 degrees Celsius. There is a major river (Litani) with other minor water courses, over a 100 springs and an increasing number of water wells indicating further reliance on groundwater. The major city is Sour with about 140,000 inhabitants and density of 12,000 per km². The rest of the area has around 120 towns and villages with total population of around 250,000 people at a growth rate roughly 4%. They are occupied mostly with agriculture, light industries and handicraft, now tourism is gaining a new stand with construction expansion. The major land-use is agricultural, with main products being citrus, olives, vegetables, tobacco and fruits. The chaotic urban expansion is growing at the expense of prime land. Agriculture is the main user taking up around 70%, mostly from surface water of rivers and springs, and partly from water wells.



Picture 3 Map of Lebanon and the study area.



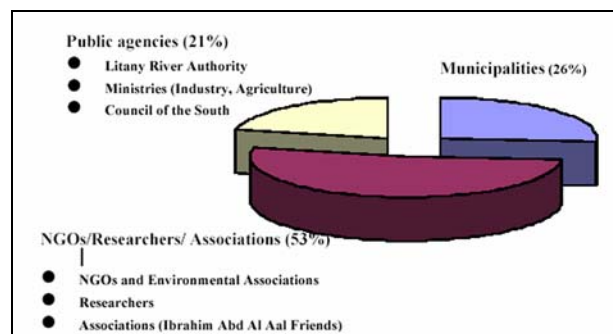
Picture 4 Map of Litani River Basin.

The average is about 6,000 cubic m per hectare while the general per capita water use is around 120-150 l/d, with drinking water making 20-25% and the rest goes to industry plus other uses. The major problem is due to water mismanagement, inefficient networks, weak quality control, small land property (waste in irrigation practice), plus lack of control of groundwater exploitation. The long dry season whose frequency is increasing, and the increased population accompanied with development expansion, is stressing the water sector tremendously. The major players are the Ministry of water with its South Lebanon Water Authority, the local municipalities, Ministry of agriculture plus farmers' syndicate, other players are major urban centres, NGOs especially important for public awareness and participatory approaches.

End users and beneficiaries are always looking for improvement of the water sector which will make them then more involved.

The key stakeholders who were identified at the early stage of the project belong to different types of public or private organizations. The major public and private organizations that contributed directly and indirectly to the workshop are:

1. Local Municipalities in South Lebanon;
2. Ministries (Agriculture, Energy and Water);
3. Water authorities (Litani River Authority, Water and Wastewater Establishment of the South);
4. Council of the South, National Council for Scientific Research;
5. Non-Governmental Organizations (USAID, Mercy Corps);
6. Local Associations and farmers;
7. Researchers.



Picture 5 Composition of participants to the workshop

A total of 42 persons attended the workshop representing the different categories of stakeholders. Picture 5 shows the distribution of the participants according to the type of institution they represent. The workshop language was Arabic and simultaneous translation in English was available; participants were selected with the aim of building a representative and balanced sample of overall set of stakeholders; the overall composition of the group permitted the management of discussion both in plenary meetings during the workshop and in small groups. Geographical provenience, as professional and institutional characteristics of participants was decided in order to permit balanced and fruitful working sessions in the spirit of active involvement, as showed below in detail in the workshop agenda.

4. The First Participative workshop

Why a Workshop?

The development of on-site active involvement activities in the starting steps of an Integrated Water Planning process (4) is supported by several motivations:

- to implement a decision making process which is open, transparent, inclusive and to give commitment and support to simulation model outcomes (essential for the negotiation phase),
- to promote social and community learning and to gain a sense of belonging to the territory,
- to make use of knowledge and experience of the different stakeholders to improve the quality of the mathematical description of the water basin system (shared baseline and vision scenarios, scoping of the problem),
- to identify proper criteria (and then from criteria building up the indicators) starting from Stakeholders problems and perception of the strength and weakness of the area, eventually starting from water issues previously collected by means of questionnaires),
- to identify actions (structural, allocation, regulatory, demand, educational, etc.) needed to build a set of planning alternatives to be simulated and then evaluated in order to reach the identified objectives.

To obtain those results, there are different kind of active involvement activities that could be organised; choosing a workshop has some “hidden reasons” that make it more effective than other participative tools:

- each others legitimacy grows up and the decision making process is more creative (i.e., new approaches and ways of solution may emerge),
- the stakeholders network can be enforced
- facilitators can start working on conflict management and transformation (which is very important for the future negotiation phase of the final planning alternative).

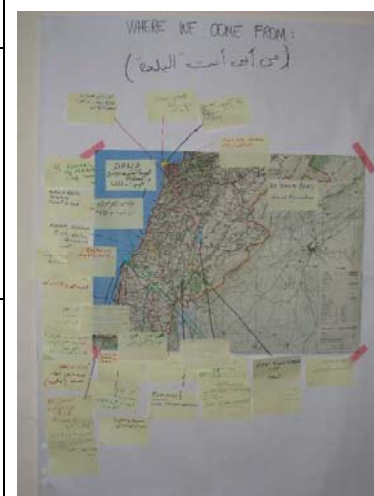
Building the Agenda

The organisation of a stakeholders workshop implies the presence of *facilitators*. They do not have to be necessary involved in all the decision making process and they should not belong to one of the three categories of actors identified in the procedure (i.e. the technical staff of the analysts, the stakeholders, the decision- or policy - maker(s)). Facilitator’s task is to provide proper tools to the working group in order to improve the interaction among participants and to make the elaboration and decision processes more effective and equal. Facilitators are involved also in the preliminary work of the technical staff supporting them in building the workshop agenda. The first step is to build up the *rough agenda* of the activities (see Table I). Then, the detailed agenda is built, focusing on the choice of proper tools and logistics (see par. *Working Sessions*). The composition of the working groups, sessions for sharing results and breaks are key issues: they guarantee a well balanced process and support consensus building.

In the Lebanese pilot project it has been decided to organise a one-day workshop, structured in a first plenary reported speech session, followed by 3 parallel working sessions in small, interactive groups.

What	Details	How	Duration
Check - up preliminary steps with SHs	Attribution of SH – DM – Experts labels	Welcome activities	Waiting for WS beginning
	Aggregation in categories		
Share the understanding of the “framework”	The OPTIMA project: brief introduction	Reported speech	15’ each intervention
	Case study description (water basin map, boundaries, actors, ...)		
	The optimization process: method, techniques & aim of modelisation		
	The participative process: aims, rules, opportunities & limits		
Participants active involvement in Case Study activities	Collection of needs, wishes, expectation, objectives and Water Issues priorities	Interactive activities (thematic round table, brainstorming, focus groups, visioning, action planning, creative sessions)	45’/60’ each activity
	Proposal of evaluation Criteria and their hierarchical structure		
	Sharing of the mental model of the system		
	Identification of actions		

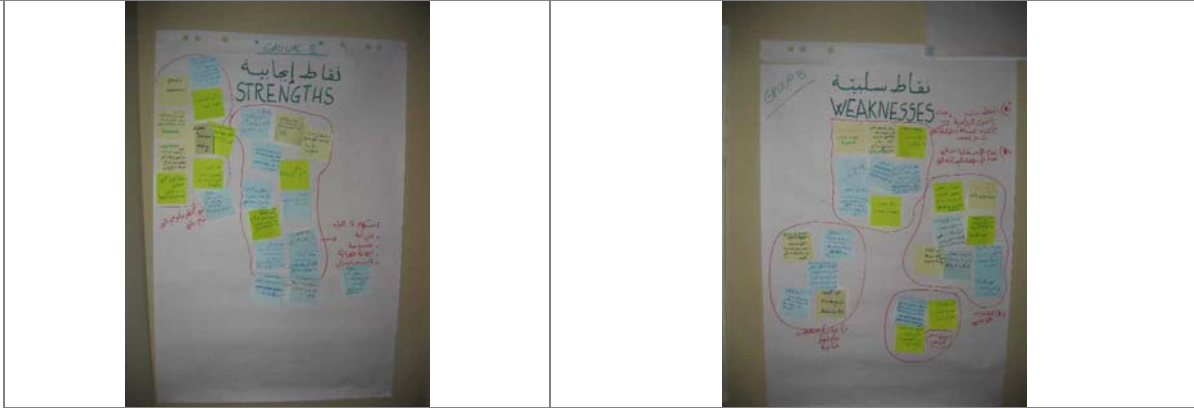
Table I Example of rough agenda (Lower Litani River Basin – Lebanon), built up with local OPTIMA partners



Picture 6. The outcome of the Welcome activity.

Working Sessions

<p>Working Session I <i>Understanding the Real Water System</i></p>	<p>CONTENTS: discussion on key issues, relevant problems and perception, sharing of any water-related and other information on the Case Study</p> <p>ACTIVITIES:</p> <p>Introduction: 1 “Local language staff” introduce the activity, 1 “participative process expert” distribute adhesive labels (colors related to SHs category) and felt pens, 1 “Local language staff” write down questions and hang down them on the wall</p> <p>Individual work: each person answers the questions on his/her own. Write down one item on one adhesive label</p> <p>Work in group: 1 “Local language staff” invite persons (one at a time) to put their adhesive labels on the STRENGTHS & WEAKNESSES poster. They read it and go back. After the first one, “Local language staff” starts clustering adhesive labels and, on his input, people is invited to do the same when their turn. The other “Local language staff” verbalizes</p> <p>Work in group: organization of results (see outcomes)</p>
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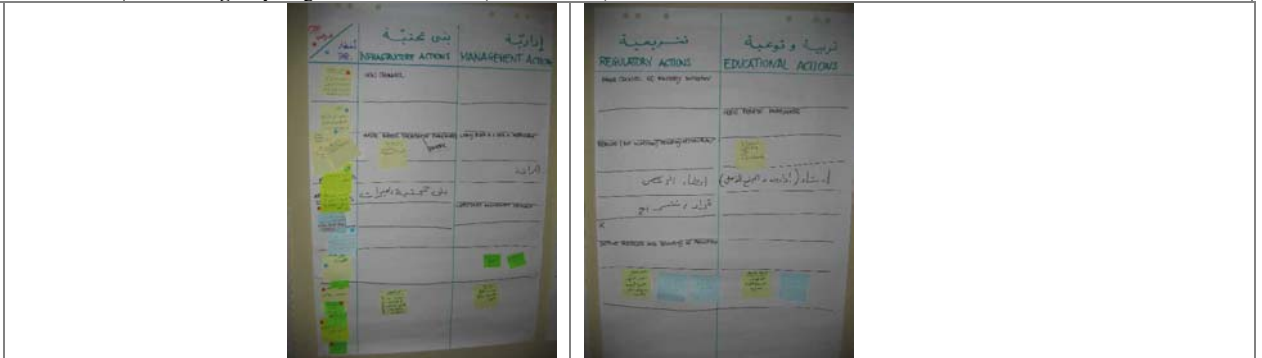


Picture 7. Output of working session I: STRENGTHS. Picture 8. Output of working session I: WEAKNESSES.

<p>Working Session II <i>Model of the System and Baseline Scenario</i></p>	<p>CONTENTS: From the real basin to the model of the system: the actual scenario.</p> <ul style="list-style-type: none"> - introduction of the WaterWare model: graph connecting water components - sharing the mental model: possibility to modify the graph adding or erasing components - description of new components or other key issues (based on the results of session I) <p>ACTIVITIES:</p> <p>Introduction: 1 “Local language staff” introduce the activity, 1 “participative process expert” distribute material</p> <p>Model description: Case Study Partner explanation of the model, focusing on meanings and features of components</p> <p>Work in group: people work together starting from the printed network and define their baseline scenario. 2 “Local language staff” support people in choosing, describing and allocating components, and write down reasons of any choice on a poster</p> <p>Work in group: organization of results (see outcomes)</p>	
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Picture 9 Output of working session II: building consensus on the model of the water system baseline scenario.

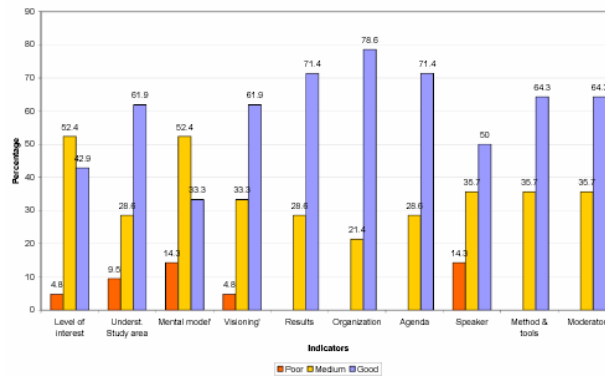
<p>Working Session III <i>Visioning Scenario and Actions</i></p>	<p>CONTENTS: sharing future scenario (visioning) and definition of possible interventions to reach it</p> <p>ACTIVITIES:</p> <p>Introduction: 1 “Local language staff” introduce the activity, 1 “participative process expert” distribute adhesive labels and felt pens (colors related to SHs type), 1 “Local language staff” write down questions and hang them on the wall</p> <p>Individual work: each person answers the questions on his/her own. Write down one item on one adhesive label</p> <p>Work in group: 1 “Local language staff” invite persons (one at a time) to put their adhesive label in OPPORTUNITIES & THREATS poster (row-opportunities/threats; columns: actions) and their new elements on the map. They read/describe it and go back. People is invited to do the same when their turn, and after the first one, if the “opportunities & threats” scenario is the same, they put actions on the same row. The other “Local language staff” verbalizes</p> <p>Work in group: organization of results (see outcomes)</p>
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Picture 10. Output of working session III: actions and future scenarios.

5. Conclusions

A Workshop Evaluation form was proposed to the participants and filled by 15 of them, focusing on topics related to the case study, the organization of the workshop, the quality of the speakers and moderators, the methods and tools used during the working sessions, the results and the level of interest of the workshop and the general project. The results, see Picture 11, show that most of the criteria were generally rated as significantly good whereas about 52% of the attendees regarded the seminars as only moderately interesting and about 52% were moderately impressed with the building of the mental model of the basin; the evaluation also included some bivariate analysis according to stakeholders' profession or type of organization.



Picture 11 Results of Workshop Evaluation form. Elaboration by ELARD.

Discussions held over the three working sessions, in addition to the stakeholders' feedback, secured:

- the stakeholders' understanding of project's objectives, an increased ownership thanks to the offered forum for interaction, the building-up of a strong SHs network and the growth of a special interest for the case study area from some of the main planning stakeholders in the country;
- the validation of the preliminary project results, the updating and correction of the preliminary topology model, the acquisition and discussion of new information.

Some more post-processing activities have been carried on after the workshop to ensure his effectiveness:

- a complete Workshop Report has been prepared and distributed to the group of involved stakeholders, "returning" to people all the contents and results of the participative working groups;
- the local Partner has worked on workshop results to derive from participative activities some key information for the river basin modelisation: evaluation Criteria for every SHs' category and quantitative leaf-criteria (indicators) that put in relation the WaterWare output with each sector's point of view³ have been extracted from the perceived strengths & weaknesses of the basin; some modelisation alternatives (in terms of technologies or options to be used as input in the model and on which build up future scenarios) have been designed starting from the qualitative information about future opportunities & threats and possible intervention associated with by stakeholders.

Future steps will be the model run of scenarios and computing the cost for their implementation and associated benefits. A second participatory workshop will be organised to select with stakeholders the most appropriate.

6. Bibliography

- (1) Common Implementation Strategy for the Water Framework Directive (2000/60/EC), *Guidance document n. 8 - Public Participation in relation to the WFD*.
- (2) Decision Support System *WaterWare*, credits: <http://www.ess.co.at>.
- (3) Castelletti, A., Soncini Sessa, R., *PIP: A Participatory And Integrated Planning Procedure For Decision Making In Water Resource Systems*, in Proceedings of Workshop on Modeling and Control for Participatory Planning and Managing Water Systems, September 29th-October 1st 2004, Venice, Italy.
- (4) *corridoio.zero - Laboratorio multidisciplinare di scambi con i Balcani e il Mediterraneo, First Participative Workshop: aim, methodology and tools. Practical guidelines for OPTIMA Case Study Partners*, November 2005.

¹ <http://www.ess.co.at/OPTIMA>

² Ricardo Khoury, Joanna Doummar, Alain Doummit, ELARD sarl Earth Link and Advanced Resources Development, Beirut, Lebanon and Mohamad Khawlie, NCRS – National Centre for Remote Sensing, Lebanon.

³ After the model run, such Indicators will be used to measure the effect of each alternative upon each SHs' sector, and will then be useful in the negotiation phase.