JOINT MANAGEMENT OF SHARED AQUIFERS

AN IMPLEMENTATION-ORIENTED AGENDA

FINAL REPORT OF PHASE II

MARWAN HADDAD,
ERAN FEITELSON,
SHAUL ARLOSOROFF,
TAHER NASSEREDIN

A Cooperative Research Project

The Palestine Consultancy Group (PCG)
East Jerusalem

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PREFACE

This report represents the outcome of the second phase of a five-year project on joint management structures for the aquifers shared by Israelis and Palestinians. It focuses on the steps necessary to implementing the joint management idea, taking into consideration the existing accords and agreements between the two sides. The project was conducted by a joint Israeli-Palestinian research team, whose members all participated in their private capacities. The recommendations made in this report thus represent the authors' personal views, and not any official positions.

Five years is a long time. We began this study in 1993, just before the Declaration of Principles was proclaimed in Oslo. Since then the peace process, and indeed life in general for both Palestinians and Israelis, have gone through many ups and downs. We felt this acutely in our work, often having to change meetings at the last minute – and in one case to postpone an international workshop – due to travel limitations. As a result, we have come to appreciate each other's commitment to the idea behind this study: that both sides have to manage their shared resources jointly for the benefit of future generations. If they don't, they will both lose in the long run. This appreciation has led to the development of trust between us. We may have started out on this journey as adversaries and strangers, but we quickly became colleagues and eventually friends. In this report we argue that a similar process has to occur on a wider scale if the two sides are to manage their scarce resources in an optimal manner. This process assumes that the parties will jointly manage, step by step, all the aspects related to their shared groundwater resources. But this will not happen by itself. Concrete calculated steps have to be undertaken to chart the way and facilitate the process. It is our hope that the present report will make a contribution toward this end.

This phase of the study, like the first, was funded by the International Development Research Centre (IDRC), Canada, and the Charles R. Bronfman (CRB) Foundation. We would especially like to thank Dr. David Brooks of IDRC and Dan Bitan, previously with the Truman Institute and currently with the CRB

Foundation, for their continuing personal interest, support and contributions to this study.

The research was carried out jointly by the Palestine Consultancy Group (PCG) and the Harry S. Truman Research Institute for the Advancement of Peace, of the Hebrew University of Jerusalem. At the PCG Dr. Issa Khater provided guidance and organizational and administrative support. At the Truman Institute Dr. Edy Kaufman offered support and continued interest. Idit Avidan facilitated all contacts and organized the workshops and meetings, often at short notice and overcoming tight schedules and the many security and political constraints.

Thanks are also due to the foreign and local experts who gave us the benefit of their time, experience and wisdom in the two workshops conducted as part of this phase of the study. Lisa Perlman prepared this report for publication, enhancing its presentation in the process.

Marwan Haddad
Eran Feitelson
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January 1999

EXECUTIVE SUMMARY

1. Israelis and Palestinians share several aquifers. These serve as long-term water storage to both sides. Given the high level of hydrological interdependence between the two sides and the susceptibility of the aquifers to pollution and salinization, there is a need to manage the shared aquifers in order to reach optimal results. As neither side can manage the aquifer on its own such management has to be done jointly. Following the treaties signed in the 1990s, if joint management is not institutionalized crucial storage capacity and quality levels may be lost, to the detriment of future generations of both Israelis and Palestinians. Therefore, the real choice the two sides face is between a lose-lose situation if they do not cooperate and a potential win-win situation if they do.
2. The sustainable management of a shared aquifer requires that many decisions be made jointly on a large number of issues. Therefore, joint management requires that an appropriate institutional structure be established. As there is only limited international experience in the joint management of shared aquifers Israelis and Palestinians would have to consider options that may not have been tried elsewhere. The study reported here advances an approach for identifying possible joint management structures. An Israeli-Palestinian team conducted it over a five-year period, with the contribution of a large number of international, Palestinian and Israeli experts (Appendix II).
3. As successful transboundary (mostly surface) water management institutions have usually developed gradually, the framework advanced suggests that joint groundwater management structures would also be developed over time. From a narrow basis and beginning from single orientations, tasks would be added as confidence in the joint management institutions grows, and as the lessons from early cooperation are ingrained.
4. Five initial strategies are advanced. These were re-analyzed over the last two years:

- *Aquifer protection* – with the focus on the long-term protection of the water quality in the aquifers;
- *Crisis management* – where the primary goal is to address such crises as droughts, pollution and over-pumping;
- *Efficient water use* – with the focus on assuring efficient water use by allowing for trade in water allocations, within environmental constraints;
- *Public sector involvement* – where the emphasis is on efficient water supply and wastewater treatment through the franchising of different elements of the water system;
- *Comprehensive-integrative management* – where the emphasis is on the sustainable management of the aquifer, including all facets of such management, from the outset.

5. The sequencing of tasks necessary to implement each strategy is described in this report. However, it is possible for decision-makers to shift from one strategy to another over time, or to expand the scope of the joint management structure. The framework therefore allows flexibility in accordance with shifts in policy priorities.
6. The principles for establishing joint management institutions are also discussed in the report. Essentially, these should not impinge on the authority of existing institutions; rather, they should focus on the tasks necessary for joint management of the aquifers. These structures are likely to evolve over time, as a function of added tasks and goals.
7. The implementation of the joint management framework would have to address several obstacles. These include the mistrust between Palestinians and Israelis, the level of participation in the joint management structure, the implications of management actions for the sectors within each society, the protection of the interests of future generations within the joint management framework, and the relationship between the joint management structures and other mechanisms that would be established as part of the permanent status negotiations and peace accords.
8. To address these issues an implementation agenda is proposed. It is essentially a series of steps that have to be taken before a joint management framework can be successfully instituted.

9. The success of any joint management institution depends largely on the confidence the parties have in the institution. In order to build the confidence of the technocratic strata that would be necessary to operate the joint management institutions, several steps are proposed. As one of the continuing sources for frustration on the Palestinian side is the dire water supply, a genuine effort to improve the reliability and coverage of domestic water supply to Palestinian population centers is a crucial step for establishing confidence in a joint management structure. Modifications must also be made in the operation of the existing coordination institutions, the Joint Water Committee (JWC) and Joint Supervision and Enforcement Teams (JSETs). Monitoring and creating a shared database can also help at this level.
10. An agreement on principles for allocation of water is a prerequisite for establishing a joint management framework. As within a single generation (25 years) virtually all the water pumped from the aquifer would be used for domestic use, a per-capita allocation principle is suggested. Yet, in making decisions on allocations, it is insufficient to look only at the water pumped from the aquifer. Rather, water has to be viewed as part of the water-cycle. The implications and advantages of such a view for the Israeli-Palestinian case are discussed in the report. In defining water rights or allocations, fluctuations in availability and the priority of domestic use must be addressed. Thus, a priority system has to be agreed upon.
11. As part of the permanent status negotiations the terms of reference for the joint management structures should be agreed upon. In particular, the strategy that would serve as the initial orientation for structuring the necessary institutions has to be identified. The institutional structure proposed has three levels. A policy-making board would determine the policies needed to implement the strategy agreed upon in the terms of reference. In this board a wide array of interests from both parties should be represented. A joint management authority would be responsible for the everyday tasks necessary to manage the aquifers. It would be composed of representatives of the Israeli Water Commissioner and the Palestinian Water Authority. To assist it in its tasks joint technical units may be set up. The tasks and

activities entrusted to such units are likely to change as the joint management structure evolves.

12. In choosing an initial strategy for the joint management efforts decision-makers should not consider only the advantages and disadvantages of each strategy independently. Rather, it is important to assess the possibilities for changing and adapting the structure to shifts in policy orientation and to changes in circumstances. These shifts are relatively smooth between crisis management and resource protection strategies, and can eventually be built up to a comprehensive-integrative structure. The choice of a water market strategy, and especially of a franchising orientation, may require more careful planning.
13. The implementation of a franchising concept involving international tenders and agreements would necessitate close cooperation between the two parties. This has the potential to change the focus of discussion toward service provision and legal, financial and verification issues, rather than two-sided political issues. But this orientation requires great care, as once an agreement with private sector and/or external firms has been signed it may be difficult to change the terms in response to changing policy focus or needs.
14. The agreement on joint management has to assure the parties they will be treated as partners in a fair and just way with respect to all water-related issues. It would have to establish the relations between the joint management institutions and local authorities, on the one hand, and national authorities, on the other. Given the complexity and novelty of the agreement it should include provisions that would clarify how misunderstandings and conflicts are to be resolved. One option for a conflict-resolution mechanism is advanced in this report.
15. In establishing the joint management structure it is necessary to address the funding of its operation, as well as of the capital projects needed to facilitate it. The funding options would be affected by the choice of strategy.

1. INTRODUCTION

1.1 Scope and Purpose of the Study

Israelis and Palestinians share several aquifers. These serve as the main long-term storage available to both sides. In semi-arid climates such storage capacity is the most crucial element of the water system, as it allows water to be stored from wet seasons to dry ones and from rainy years to years of drought. The shared aquifers are thus vital to both Israelis and Palestinians for ensuring long-term water supply to satisfy demand.

In contrast to surface water, it is very difficult to divide an aquifer physically. This is especially true in karstic aquifers, where water flows are relatively swift but their exact courses and directions are often unknown. Moreover, aquifers are susceptible to pollution from mismanaged human activities, and to salinization if they are over-pumped. In either case, once an aquifer is degraded its storage capacity is reduced. These factors create a high level of hydrological interdependence between Palestinians and Israelis.

Given this interdependence the option of "divorce" – a split operation whereby each side would exploit part of the resource and manage it as it sees fit – cannot succeed, and would inevitably lead to future conflicts. The possibility that one side would gain complete control of a shared aquifer is also unrealistic and unacceptable, as there is a need to address both land use and pumpage issues, requiring control of the recharge area, pumping and water usage. A demand for such control over the whole aquifer would severely constrain the ability to reach any agreement and would create a window for never-ending conflicts instead of a door for cooperation, mutual growth and peaceful relations.

Failure to manage an aquifer adequately might lead to its degradation and subsequent loss of water volumes and storage capacity, to the detriment of future generations of both Israelis and Palestinians. Thus, unless both sides cooperate and jointly manage the relevant aquifers, they both stand to lose

with regard to the long-term viability of their water systems. ***In other words, the real choice the two sides face is a lose-lose situation if they do not cooperate and a potential win-win situation if they do.***

Once the need for and potential gains from joint management have been realized the main question that needs to be answered is how to structure the joint management system, as such a system implies the need for joint decision-making on a multitude of issues. There are, in fact, numerous possible forms of joint management structures, varying in their goals, means and level of cooperation (Feitelson & Haddad, 1995). The purpose of this study is to identify structures that can be recommended for the joint management of aquifers shared by Israelis and Palestinians.

The issues raised in the study have relevance for other regions of the world, and experience elsewhere may provide some guidance for the Israeli-Palestinian case. However, the problematic nature of groundwater management has, until now, precluded widespread experiments on this subject. Furthermore, in many parts of the world the need for such management has only recently been recognized. It is not surprising, then, that the limited international experience with cross-boundary management of aquifers offers no relevant experience that Israelis and Palestinians can emulate. Thus, this study has had to identify new and innovative structures, some of which may have no precedent.

There are several principles for cooperation that are often mentioned in the literature: (a) the democracy principle in decision-making; (b) the voluntary principle of joining the cooperation arrangement; (c) the autonomy principle of self-sustainability of the cooperative arrangement; (d) the equity principle of participating and sharing the benefits stemming from the cooperation; and (e) the universality principle, of having a joint set of goals. While these principles may help evaluate the outcome of discussions on joint management agreements, they do not provide headway for reaching or identifying possible cooperative arrangements for managing an aquifer. Therefore, the approach taken in this study was open-ended.

The structures analyzed here focus on the administrative, institutional and legal mechanisms required to jointly manage these aquifers. The study does

not discuss the technical elements of aquifer management, such as pumpage regimes, water rights issues, or the division of water between the two parties.

While the technical issues should be discussed within the joint management structures, resolution of the contention over water rights and allocations is a prerequisite for establishing any joint management structure. ***However, this study argues that the final status negotiations should not be limited to questions of water rights and division of water; rather, they should be expanded to include the choice and definition of appropriate structures for the joint management of shared aquifers.*** In other words, this study analyzes the institutional aspects of joint management structures, so as to facilitate and assist the discussions by decision-makers.

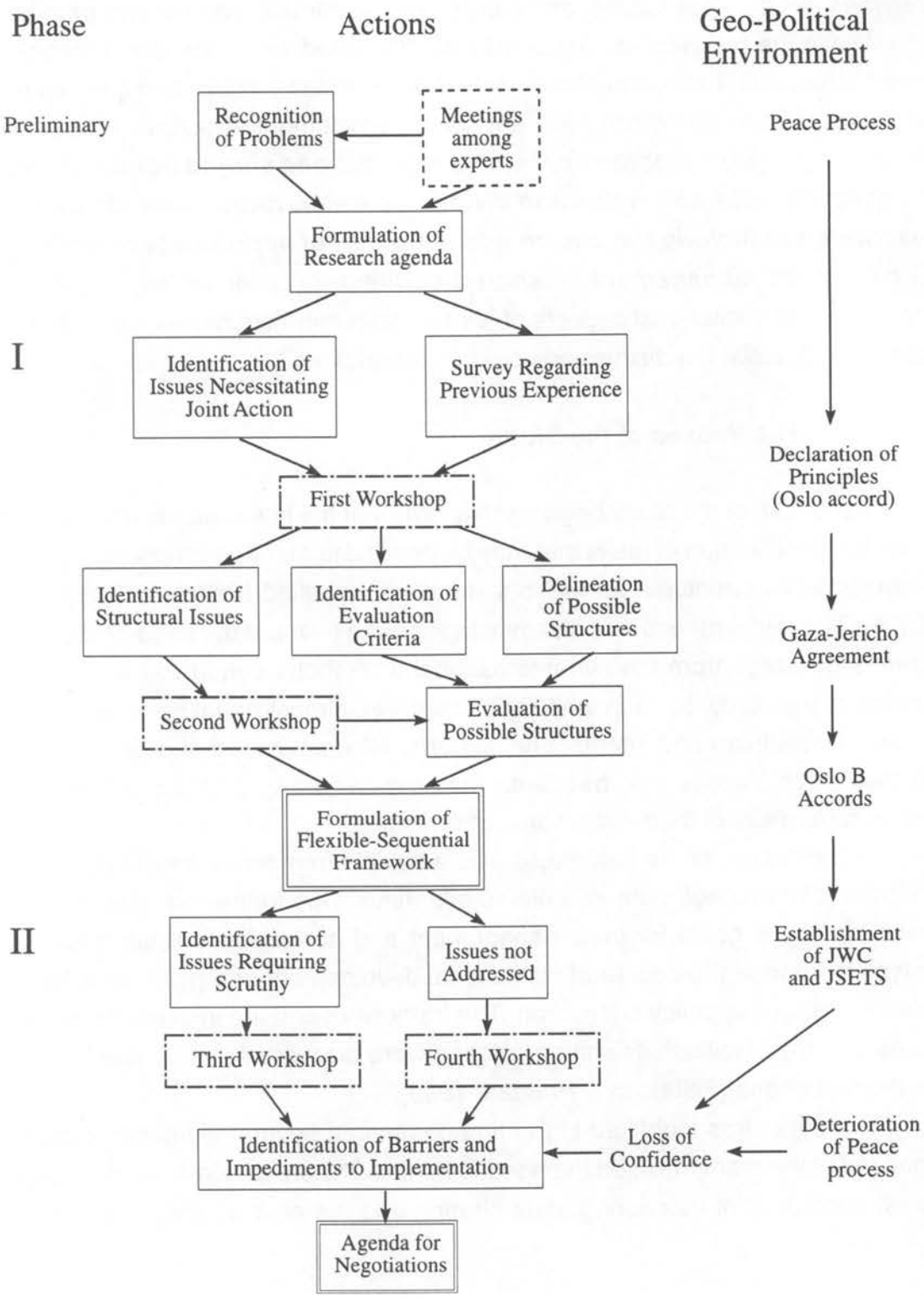
1.2 The Phases of the Study

The first phase of the study began with a review of the international experience and the identification of tasks that may be needed to manage an aquifer. Then, administrative structures for these tasks were identified (Feitelson & Sylvan, 1995). Their advantages and disadvantages were evaluated, based on a set of criteria garnered from the two international workshops conducted in the first phase of the study. In each workshop there was almost equal participation of Israeli, Palestinian and international experts. All were invited and participated in their private capacities, based on their expertise and professional experience, regardless of their institutional affiliation.

The outcome of the first phase was a flexible framework for the development of joint management institutions over time. This framework advances a set of possible goals for joint management and allows for multiple decision points to change the course of institutional development and goals as a function of changes in policy orientation. The framework and the institutional structures that may facilitate its implementation were discussed in the Final Report of the first phase (Feitelson & Haddad, 1995).

The structures identified in the first phase had several elements in common. All of them emphasized the need to begin with confidence-building measures, such as joint monitoring, data sharing and the establishment of conflict

Figure 1: The Work Process



Coordinated or Joint Management?

Following the Oslo B accords a coordinated management structure was established between Israel and the Palestinian Authority. In this study we propose to supplant it with a joint management structure. In a coordinated management structure each party has its own institutions which coordinate some of their activities. In a joint management structure the activities are carried out by joint institutions to which the parties delegate authority. A coordinated management strategy is suitable for situations in which the degree of interdependence is limited, there are no glaring asymmetries among the parties, the overall atmosphere is cordial and all parties agree that water should be protected for the welfare of future generations. None of these conditions hold for the Israeli-Palestinian case. The degree of interdependence between the parties (in hydrological, economic and water supply terms) is extraordinary, the parties are highly unequal and the relations between them have been marked by mistrust at all levels. It is not surprising, therefore, that the coordinated management mechanism established in the Oslo B accords has not met expectations. Moreover, as the intricacy and severity of the problems increase it is doubtful whether such a mechanism would suffice in the future. A joint management structure, in contrast, has the potential to evolve over time, as detailed in this report (and in the Final Report of the first phase of this study) and thus address increasingly complex issues.

resolution mechanisms. But many facets of these issues were not discussed in the first phase, nor were the issues of water rights and allocations, as they were seen as sensitive issues that would need to be resolved by decision-makers. At the same time, some of the joint management structures may have a bearing on the definition of water rights, and none of the proposals is likely to be implemented before these issues are addressed.

During the course of this study important geopolitical changes took place. In September 1995 the Oslo B accords were signed, establishing a coordination mechanism composed of a Joint Water Commission (JWC) and Joint Supervision and Enforcement Teams (JSETs). These accords addressed the issues of monitoring and data sharing, and recognized the existence of Palestinian water rights. However, the experience with the coordinating institutions and the changing climate in the peace process since 1995 have not been positive. This report advances an alternative approach, whereby the aquifers are managed jointly by the two parties, rather than just coordinating actions that pertain to the aquifer. Such an approach may help address the main problems and prevent others.

To address the lacunae identified above and the implications of the developments since the first phase report was published, a second phase took place (see Figure 1) during which two additional workshops were held. One focused on the more technical issues, such as monitoring and data sharing, while the second focused on the definition of water rights and the principles of allocations. On the basis of these workshops modifications were made in the original framework, and a set of issues was identified that needs to be addressed before a joint management framework is implemented.

This report presents the outcome of the two phases. In the next section the revised flexible-sequential framework is presented. Then we identify the main issues that need to be addressed before a joint management structure is implemented. In Section 4 a sequence of actions necessary to implementing a joint management framework is advanced. ***It is our belief that unless this sequence is followed the water supply to future generations of Israelis and Palestinians may be threatened.***

What If Joint Management Is Not Instituted?

If a joint management structure is not established, the current coordination mechanism is likely to continue operating, at least for some time. This structure would have to coordinate increasingly complex activities, some of which pertain to sensitive issues such as the funding of protection measures or growth controls over recharge areas. Consequently, differences of opinion between the parties are likely to arise. In addition, crises are likely to erupt over time. But the coordination mechanism is not geared to address such crises, or to prevent them. As a result, unless the coordination mechanism is upgraded, tension between the parties may intensify. This is especially likely if the stronger party (Israel) uses its power to force the weaker side (Palestinians) in the coordinating bodies to accept steps or measures they see as contrary to their interests. As there is no conflict-resolution mechanism embedded in the structure the disagreements would be raised to decision-making echelons. This may lead to a realization of the need to upgrade the existing structure. Alternatively, it may lead to the eventual disintegration of the coordination mechanism amidst acrimony. In this case it is likely that the inequality in water supply between the parties would worsen (especially during drought periods, when the Palestinians would have no supplemental sources). Moreover, "red lines" are likely to be breached and pollution prevention efforts hindered, making for a bleak water future. With the anticipated population growth the density of activities will swell. Consequently, domestic demand will increase leading to over-pumping of the aquifers, more effluents will be generated though they may not be treated adequately, and pollution sources over the recharge areas will multiply. In such a case conflicts may become increasingly frequent, making water indeed a source of tension rather than cooperation.

2. A FLEXIBLE-SEQUENTIAL FRAMEWORK FOR JOINT MANAGEMENT

2.1 The Principles

The management of shared aquifers should be based on the concept of sustainable development. This implies that the management of an aquifer should ensure that water extractions for the current generation do not create social, environmental or economic problems for future generations, that equity between people, including in water use, be fostered, and that further economic development, especially of weaker strata, be encouraged. These goals are somewhat incompatible, and therefore require that value-laden decisions be made in order to balance them.

The management of an aquifer involves a host of activities. These include operational actions like monitoring the levels and quality of water in the aquifer, regulating and monitoring water withdrawals from the aquifers and their use, research, regulating and monitoring activities over the recharge areas, setting withdrawal limits to prevent damage to the aquifer (such as salinization), formulation and enforcement of policies for drought situations, pollution prevention and coordination of artificial recharge and extraction points. In addition, a management strategy needs to address issues such as water transfers between aquifer basins, wastewater treatment and re-use guidelines and the establishment of financial mechanisms to sustain all these activities. A mechanism for addressing disagreements over any facet of the joint management strategy should also be included.

The need to make decisions and value-judgments pertaining to such a wide array of issues requires that joint institutional structures with sufficient expertise and authority be established. In practice, however, successful institutions for managing cross-boundary water have generally developed gradually over time.[1] They usually began with limited authority over a single issue. Gradu-

[1] Examples of such gradual evolution of management structures include the Rhine River, the Danube basin, the Nile River, the Murray-Darling basin in Australia and others for rivers or surface flows, and the cross-jurisdiction management institutions for groundwater in southern California.

ally, as confidence in their ability and usefulness grew, they were vested with additional tasks and authority. For a shared aquifer to be managed successfully it may be necessary, therefore, to establish an initial, limited focus. From this narrow base it is possible to chart different courses of institutional development over time. This is the approach advanced in this study. The need for such a gradual approach is strengthened in the Israeli-Palestinian case by the socio-economic differences between the two parties and the history of mutual hostilities.

Based on an evaluation of 19 initial structures (examining tasks that may be included in an aquifer management framework) four objectives, or directions for institutional development, were initially identified:

- *Aquifer protection* – whereby the institutional focus is on joint long-term protection of the water quality in the aquifers;
- *Crisis management* – whereby the focal point is on structures that are needed to formulate and implement joint responses to both rapidly developing crises, such as accidental spills of contaminants, and evolving crises, most notably droughts.
- *Efficiency* – whereby the main goal would be to supply and use water from the aquifer in the most efficient manner. Actually, this goal can be sub-divided into two. The first sub-goal is to promote *efficient water use* and minimize wasteful use. That is, water transfers from less efficient use to more efficient sectors would be facilitated, and wasteful use within sectors minimized. To this end, structures whose primary purpose is to reduce transaction costs that would otherwise impede water trading would need to be identified and demand management measures advanced. The second sub-goal is to promote efficient water supply. This would focus primarily on *privatization* options, broadly defined.
- *Integrative-comprehensive structures* – the fourth objective is to address all or most of the facets of aquifer management. This would require that an integrative-comprehensive structure be formed. The formation of such a structure can thus be viewed as a goal in itself, to be developed in a defined step-by-step process.

Following the discussions in the second phase workshops, where additional benefits of the privatization option were identified, the two goals previously grouped together under the title "efficiency" were separated. Therefore, the current framework has five goals.

The approach advanced here, leading up to the five goals, is depicted conceptually in Figure 2. Initially, a limited set of activities is undertaken jointly. This serves as a basis for the joint water management (JWM) structures. Additional activities are included into the purview of the JWM over time and can lead up to one of the five basic options. Alternatively, from the second stage onward activities can be added horizontally, to widen the scope of the JWM structure. It is thus possible to begin with elements leading up to a crisis-management structure, but at a certain stage pollution prevention elements (such as coordination of wastewater standards and re-use) should be included.

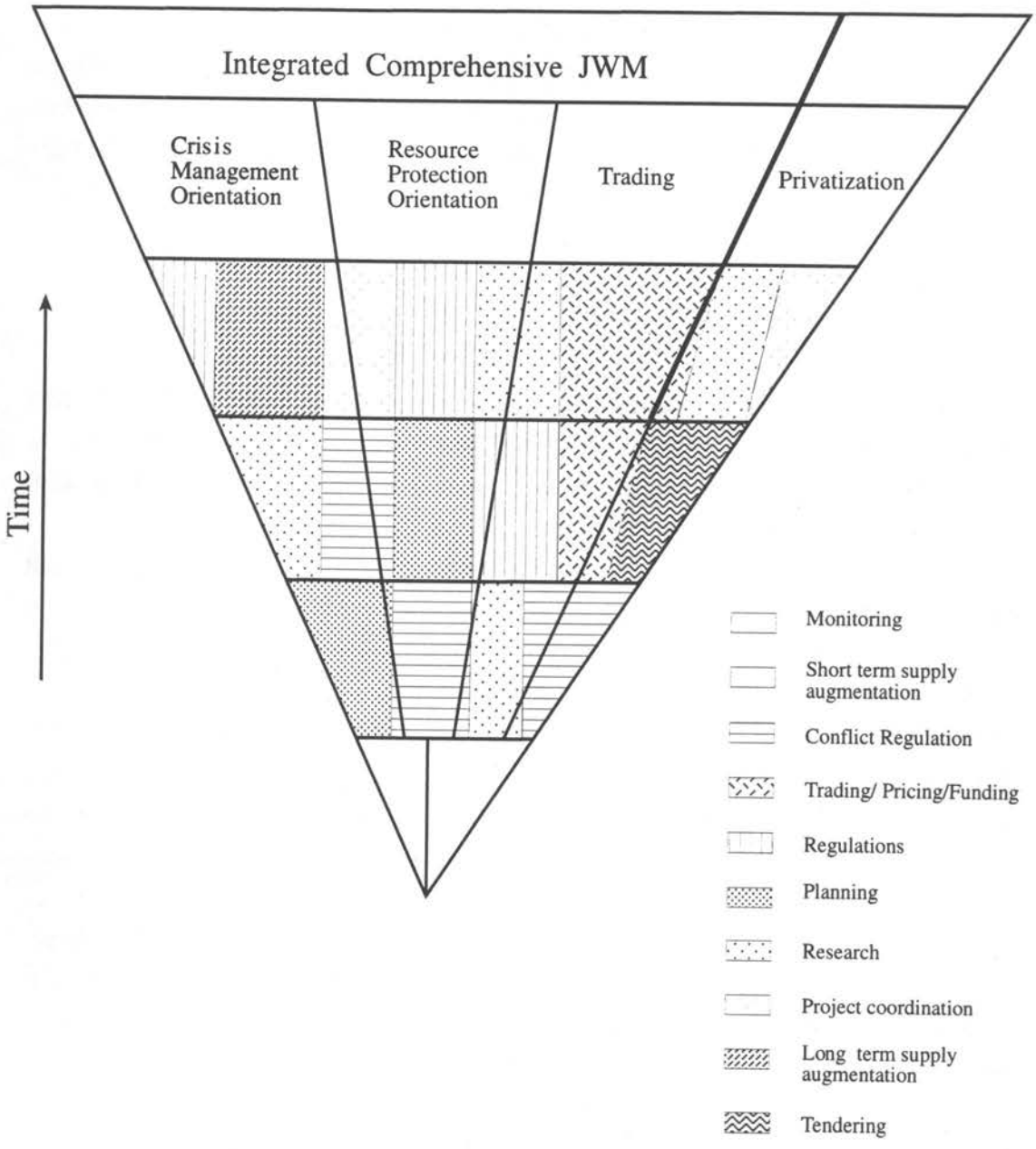
There are two caveats to this statement: (i) As privatization options involve contractual agreements, often with international firms, it may not be possible to change the purview of an institutional structure based on this approach as easily as other structures. The heavy line separating the latter stages of the privatization option from the others indicates this; and (ii) As a comprehensive-integrative approach includes most other facets it is likely to emerge as a combination of other orientations, rather than serve as an alternative to them. This option is, therefore, shown in Figure 2 as a combination that may evolve later than the other options.

Figure 2 is conceptual. It is necessary, therefore, to delineate the actual sequence of tasks for implementing each basic development path. A tentative suggestion for such institutional development is presented in the following subsections, for each direction.

However, before turning to this discussion it is important to clarify the assumptions under which this sequencing is done:

1. Many activities can seem pertinent to all JWM structures. Therefore, an effort was made to identify the minimal number and scope of activities that need to be incorporated in each stage to make the process rational and operational.

Figure 2: The Evolution of JWM



2. In formulating the structures it was assumed that an agreement on water rights and allocations should be reached separately. Therefore, each structure is designed so that it can be implemented regardless of the specifics of such an agreement.
3. In formulating the mechanisms it was assumed that JWM structures do not replace the existing water institutions of the different parties (the Israeli Water Commissioner and the Palestinian Water Authority) but rather supplement their activities.

2.2 Resource Protection Structures

Perhaps the most important inducement for joint management is the parties' shared interest in maintaining the water quality of the aquifer and its storage capacity. This factor makes joint management a potential win-win solution, and the lack of it a likely lose-lose situation.

Four or five stages can be identified in the sequence leading up to most resource-protection structures. As qualitative and quantitative monitoring of the aquifer and the compilation of resulting data in a joint database are prerequisites to any joint management effort (Haddad & Mizyed, 1995) they are placed in the first stage. At the second stage emphasis shifts to addressing the main threats to the aquifers. These often pertain to particular economic activities and to wastewater treatment (or lack thereof), discharge and reuse, as is the case in the Palestinian-Israeli scene. Therefore, prevention of pollution from economic activities, wastewater issues, preparation of plans for containing pollution incidents and resolving disagreements are placed in the second stage. The latter element is placed early so as to preclude the possibility of disagreements leading to a loss of confidence in the joint institutions, which could be detrimental to the whole process.

After the foundations for addressing the most immediate concerns have been laid, more comprehensive long-term issues can be addressed. These include the capacity to set standards for water quality and wastewater treatment and re-use, control of solid and hazardous wastes, coordination of re-

search on long-term threats to the aquifers and the advancement of possible solutions to such threats.

In subsequent stages joint planning and funding of projects that may help protect the aquifer (most notably wastewater treatment plants) can be introduced, as can drought planning (to preclude over-pumping) and assumption of drilling licensing power.

2.3 A Crisis-Management Orientation

The management of any aquifer faces its most severe test during crises. Several types of crises are possible: (i) sudden crises, such as the spilling of toxic material in highly porous areas, the discovery of hazardous materials in drinking water coming from certain wells, or the breaking of levies built as part of aquifer recharge efforts; (ii) cumulative crises, stemming from the cumulative effects of certain trends or natural events, such as droughts; and (iii) over-pumping by one side, above the quantities agreed upon. Such crises may cause widespread public concern, especially if domestic supply is affected.

Crisis management involves three basic actions: first, recognition of the crisis (the realization that a crisis has occurred); second, agreement on the steps that need to be taken to address the crisis (contingency planning); and third, implementation of the crisis-management scheme, which requires the availability of appropriate facilities, accurate real-time data, personnel and means.

In order to identify a crisis, and agree on its extent, it is necessary to establish a joint monitoring and data-sharing system, including the monitoring of both water extractions and use. In addition, to identify a crisis it is necessary that background information be available to serve as a basis for monitoring and inspections, as well as the basic knowledge necessary for both contingency and drought planning. The monitoring and data-sharing activities should be institutionalized, therefore, in the first stage of developing a crisis-management structure.

In the second stage a decision-making mechanism and clear guidelines for declaring a crisis situation need to be established. Such mechanisms are

especially needed to cope with sudden emergency-type crises. Crisis situations obviously involve much stress and ensuing potential for disagreement, especially as the requisite steps in such situations often impinge on practices and allocations of various water users, sometimes generating vehement opposition. Conflict-resolution and enforcement mechanisms should therefore complement all crisis-management efforts. As these elements are inherent to all crisis situations they should be incorporated as early as the second stage. If water supply shortfalls occur, in particular for domestic use, emergency procedures for augmenting supply should be enacted. Such procedures have to be planned in advance, at the second stage at the latest.

Over-pumping needs to be recognized and managed at the earliest stage because of its potential long-term impacts on the aquifer and in order to preclude the creation of vested rights in the over-pumped water. The terms for resolution of such a crisis have to be spelled out clearly at the outset, in the political agreement, and may include a process with several steps, beginning with fact finding and discussions within the joint management structure. The establishment of such a conflict-resolution mechanism should also be undertaken at the second stage. This issue is taken up in Section 4.

Drought management, including contingency plans and agreement on tentative response measures should be incorporated into the structure in the third stage. These measures should include means for transferring water between sectors and parties, including perhaps water-trading mechanisms. Since lessons can be learned from each crisis, it is worthwhile to have a feedback mechanism that will allow for adjustments when following these lessons. This feedback mechanism should be introduced in the fourth stage.

2.4 Efficient Water Use

As the demand for water rises the need to use it efficiently increases. An efficient water use pattern, from a societal perspective, requires that water be shifted between sectors and among users, so it may be used at any given moment by those needing it the most – in other words, that water be shifted from less efficient to more efficient uses, and that wasteful use within sectors

be eliminated. Market mechanisms are geared toward achieving this end (Dinar et al., 1997). If water is priced correctly, from a societal perspective (including social and environmental aspects), then it will be used in the most efficient manner and provide an incentive for eliminating wasteful use (Arlosoroff, 1997).[2] Essentially, all users will pay the full price of their usage and thus use water only to the extent that it is indeed beneficial from a societal point of view. However, administratively, it is difficult if not impossible to set socially-efficient prices in advance, especially as they would need to be continually adjusted to reflect changes in circumstances. If water trading is allowed, within an appropriate framework that assures that environmental and social aspects are accounted for, the prices determined by the market would provide the necessary signals for assuring continuous efficient water use.

In a market mechanism water is allocated at a price set by the free exchange of "equity through use" or property right to the use of water, either for a limited time period (a lease) or in perpetuity (a sale). The market is the institution that facilitates the exchange of water among sellers and buyers. In order for a water market to exist it is necessary that water allocations be clearly defined and well specified, that there be public information on the supply and demand for water and that there be a physical and legal possibility to transfer water (Lee & Jouravlev, 1998).

The specification of water rights, discussed in Section 4, is currently the main impediment to the establishment of water markets in the Israeli-Palestinian context (Lonergan, 1995). In order for a market to achieve the best overall results such specification should take into account the priority for domestic use and differences in water quality. The other necessities for a market are affected by the market structure. In essence, the utility of a market is a function of the cost of obtaining information, of bargaining and contracting, and of the policing, monitoring and enforcement of transactions (collectively known as transaction

[2] The role of markets and their limitations were discussed at length in the second workshop (see Haddad & Feitelson, 1995).

cost). The challenge is to minimize these costs, while assuring that the aquifer's quality is not damaged in a joint management framework.

The first stage in establishing a water market, in addition to the specification of water allocations, is the creation of a monitoring system that enables both the monitoring of the aquifer and the monitoring of water use. This is essential for the enforcement and policing of transactions, as without monitoring, cheating will ensue and undermine the market. This may be especially dangerous in a cross-boundary context, where establishment of confidence among the parties is of primary importance.

In the second stage the trading rules need to be agreed upon. In the joint management case, for example, it is likely that the trading rules would allow only for the leasing of water but not for outright sale of water rights. In this case time limits would have to be set. These would have to relate to the existence of fluctuations in overall water availability (that is, to the occurrence of drought years). Also, the rights to lease would have to be determined: would the market involve national authorities, regional utilities, local jurisdictions or private consumers? In addition, it would be necessary to determine at this stage the total quantity of water that may be traded and whether a water-bank system may be established.[3] As disagreements in such cases are likely, there is a need for agreement at this stage on a conflict-resolution mechanism geared to dealing with market transactions.

Once the basic trading rules have been agreed upon, the legal and infrastructure implications have to be drawn. From an institutional perspective this necessitates that the two parties make legal adjustments, as neither currently has the legal infrastructure to enable trade. At this stage environmental implications of trading may be reviewed and trading constraints introduced. The establishment of a water market also requires that a decision-making structure

3 A water-bank system essentially allows users to store surplus water, which can then be auctioned or sold, without losing the right to the water.

be established to plan and review the conveyance projects, if necessary, for transferring the water bought and sold.[4]

In the fourth stage the funding of water transfers would have to be discussed. It is also likely that the initial experience with the trading mechanisms could be evaluated at this stage. Such an evaluation may lead to adjustments in the trading mechanisms. This implies that in the agreements establishing a water market provisions should be made for adaptations and adjustments. Given the very limited experience with international water trading, in general, and the virtually non-existent experience of the two parties with water trading, in particular, the establishment of a water market would necessarily be a trial and error process.

2.5 Private Sector Participation in Water Supply

In the last decade awareness has grown of the private sector's potential to provide water and wastewater services in an effective and efficient manner. This may be of particular relevance in the West Bank, given the current situation of the water supply and wastewater treatment and disposal systems there. The advantages of private sector participation, however, are not limited to the West Bank. There is also growing interest within Israel regarding the privatization of certain water and wastewater services.

Private sector participation may have special appeal in the context of joint management. ***In addition to its efficiency and effectiveness, private sector participation may help reframe water and wastewater issues and overcome some of the problems stemming from lack of confidence between Palestinians and Israelis***. In essence, when services are supplied by a private enterprise, disagreements are likely to focus more on commercial or legal issues than on political ones. Also, the need to issue a tender would require both parties to combine their expertise to ensure that they get the best possible

[4] The model currently developed under a different roof on water markets may assist the bodies entrusted with these obligations.

deal vis-à-vis the private enterprise. This may change the overall framework from one in which the two sides simply face each other to one in which they have to cooperate so as to get the optimal deal from a third party.[5]

There are many possibilities for private sector participation in water and wastewater service provision (Lee & Jouravlev, 1997). At one extreme is full divestiture of the infrastructure and service provision. This is rare, and usually undesirable in a natural monopoly situation. At the other extreme is the contracting of service provision, where all infrastructure development is carried out by the public sector. Given the need for substantial infrastructure upgrade (or, in the case of wastewater treatment, the building of much of the infrastructure from scratch), this may not utilize the full potential benefits of private sector involvement. In the Israeli-Palestinian case, therefore, it is likely that some kind of franchising agreement would be sought. Such agreements include, though are not limited to, various build-operate-transfer (BOT) options, limited distribution contracts, etc.

The first stage in introducing private sector participation into a joint management framework is reaching an agreement on the type of franchising sought and which elements are to be franchised. Numerous possibilities have to be considered. They pertain to the level at which the franchising would take place (regional, national or local) and the services that would be supplied. It is possible that there would be several franchising agreements (for example, separate ones for water supply and wastewater treatment). At the same time it is important to agree on the issues that would have to remain in the public domain and the issues for which the private sector should be accountable. In particular, it is important to agree on the losses for which the private sector would be accountable.

5 Discussing the privatization experience of the Severn Trent Water in Britain, Baynard (1997) notes it was useful to overcome the cross-boundary problems between England and Wales.

Forms of Private Sector Participation (PSP) in Water Supply

With the exception of a few European countries, water supply and wastewater treatment services are generally publicly owned and operated. In recent years there has been a trend toward increasing private sector participation in the provision of such services. This has taken several forms, which can be roughly divided into two groups. The first group are arrangements where public ownership is retained (service contracts, management contracts, lease arrangements and concessions) while in the second private ownership is dominant (build-operate-own-transfer, joint ownership, mixed companies and outright sale).

- Service Contracts – Service contracts are the simplest form of PSP, whereby the public authority retains overall responsibility for operation and maintenance of the system, except for the specific limited-scope services that are outsourced.
- Management Contracts – Management contracts are a more comprehensive arrangement, whereby the public authority transfers to a private company the responsibility for the entire operation and maintenance system. This gives the private company the freedom to make day-to-day management decisions, without assuming commercial risks.
- Lease Contracts – In lease contracts a private operator rents the facilities from the public authority for a specified period and is responsible for operation, maintenance and management of the system for that period.
- Concessions – In a concession the private contractor, or concessionaire, has overall responsibility for the services, including operation, maintenance and management, as well as capital investments for the expansion of services.
- Build-Operate-Own-Transfer (BOOT) – Under a BOOT contract a firm, or consortium of firms, finances, builds, owns and operates a

specific new facility or system. After a predetermined period ownership of the facility is transferred to the public authority.

- Joint Ownership – Under joint ownership a private firm and a public authority incorporate a firm under normal commercial code to own, operate and maintain a system. In this way a higher degree of PSP is assured, without forgoing public control.
- Outright Sale – The sale and private ownership of water supply and sewage systems may be prompted by the desire to disassociate the public sector from operations and maintenance. It is also a way for the public sector to raise revenues (the United Kingdom is the leading example of this option).

PSP involves three primary risks for the public sector: (1) services supplied by the private sector may not be in accordance with the desired standards; (2) the cost of such services could be much higher than that currently charged; and (3) the private firm could obtain effective monopoly power (primarily through its expertise) that may preclude any threat of terminating its contract or changing its terms. Therefore, in all PSP agreements a regulatory framework has to be included that will (a) ensure compliance with standards of acceptable service; (b) protect rate-payers from monopolistic behavior; and (c) create a business environment that promotes commercial viability and attracts the private sector.

Based on the decisions made in the first stage, the issues that would have to be addressed in a tender need to be identified in the second stage. In addition, it would be wise to establish in this stage the monitoring and data-sharing systems that would be necessary to monitor, police and enforce the agreement with the private enterprise. It is also necessary to establish the planning and approval mechanisms that would be able to evaluate and authorize investment and infrastructure decisions made by the franchise. Finally, there would be a need to establish the legal basis for privatization of the elements decided upon,

the fee collection and transfer mechanisms and any precautions necessary to prevent misuse of natural monopoly power and the mechanism to terminate the contract.

In the third stage the tender would be prepared, denoting the boundary conditions between the privatized elements and those remaining in public hands. The focal point of this stage would be determining the details of the agreement, so as to ensure the supply of efficient, effective and sustainable service. They must specify who bears what cost, provide the enterprise with incentives to provide high-level service and assure that the agreement is financially solvent so that it is sustainable over time. This is the most critical stage of the process, as mistakes made now would be hard to rectify once the tender has been issued. It is therefore important that by this time the two sides gain sufficient confidence in each other to work effectively toward protecting their joint interests – to receive high-quality service in an efficient and effective manner, without compromising social or environmental goals.

In the fourth stage the tender would be issued. At this time the two sides need to establish a mechanism and criteria for selecting from among the applicants. Given the novelty of a cross-boundary franchising effort, it may be useful at this point to obtain support from a third party in identifying the criteria and evaluating the applications.

The fifth stage would, essentially, be an evaluation stage in which the ramifications of the franchising would be analyzed. In particular, it would be important to analyze whether the franchise misused the natural monopoly power inherent in water supply systems. This may serve to improve further tenders (if the franchising is done piecemeal) or set the stage for the refinement of the terms once the original contract ends. It may also be necessary to refine the contract over time to address issues unresolved in the original contract, as far as is legally possible.

2.6 Comprehensive-Integrative Management

The goal of an integrative structure is to cover all or most of the aspects of aquifer management comprehensively (incorporating resource protection, crisis management, water supply, etc.), so as to assure the best results from an aquifer management perspective and to assure its long-range sustainability. To accomplish this, such a structure would need to be more than a combination of the previous three types of structures, as it would need to address issues not dealt with thus far.

As an agreed-upon database and monitoring system are prerequisites for successful comprehensive aquifer management (Haddad & Mizyed, 1995), a joint monitoring and data storage and compilation unit should be established at the outset. At this stage this unit, whose fieldwork would be conducted jointly by teams from both sides, would focus on monitoring the aquifer's parameters and water use.

In the second stage, mechanisms for resolving disagreements would be set up, as would a crisis-management unit. These are intended to ameliorate the dangers of an early crisis. It would also be necessary to establish a coordinated drilling and pumping permit system at this stage so that aquifer yield and quality would be sustained. Joint water supply planning, to address current supply problems, including water allocations to users would follow. Then, joint research could be initiated to address fundamental issues likely to be faced in the future by the aquifer managers.

In the next stage policies for drought situations would be set and agreed upon, as drought periods are those likely to cause the greatest stress in the system and put the JWM structure to its severest test. In order to help address future tensions and make necessary structural amendments reallocation mechanisms should also be established in this (third) stage. It would also be possible to add financing instruments and a joint water project management capacity at this point. A water levy on each cubic meter pumped could provide the essential financial resources for sustainable operations of the mechanism.

At a later stage a comprehensive regulatory capacity and enforcement unit should be set up which would be able to propose standards or by-laws and, following their approval, enforce them. This stage is perhaps the most

problematic in the transition from a comprehensive structure, covering many facets, to an integrative one, whereby a single aquifer management authority is established. Still, this authority should be linked to the legal water institutions of both parties.

In the next stage the regulatory capacity can be expanded to other issues, such as land use controls. Other issues might include water-trading mechanisms. A self-financing capacity may also be necessary. This could be achieved by imposing an aquifer-use levy, whereby the authority would collect a fee for any water pumped from the aquifer, and/or a water use tax.

2.7 Institutional Functions and Development

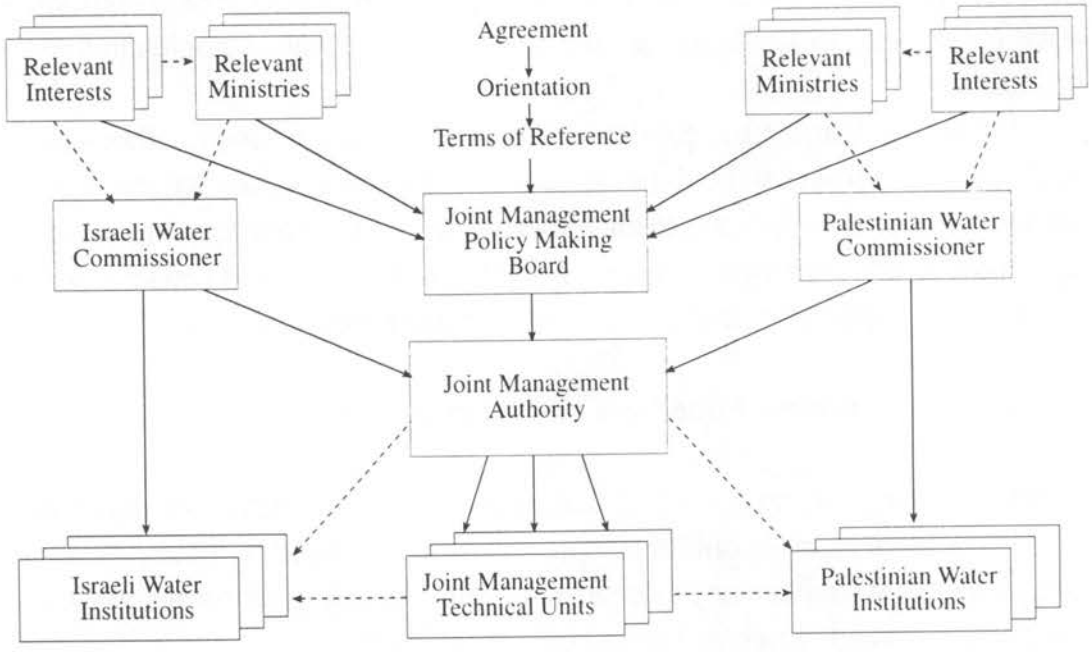
In addition to identifying goals and tasks it is necessary to establish institutional structures to carry them out. In our proposal we premised that the new structures should not supplant any existing institution. Therefore, all institutional structures would have the overall form shown in Figure 3.

As shown in Figure 3 the joint management mechanism (the central part of the figure) consists of three parts: initial steps required to set up the administrative structure, a joint management policy-making board and a joint management authority. These parts are described generally in the following sub-sections, and in greater detail in Section 3.

2.7.1 Initial Steps

Any joint management structure is set up according to agreed upon terms of reference (TOR). These would be part of the permanent status agreement between the two parties. The actual terms would be a function of the orientation chosen by the parties from among those presented in this section. Therefore, the parties would have to incorporate discussions on the choice of orientation and their institutional implications within the permanent status negotiation process. Naturally, it would be possible at a later date to change the terms of reference, as experience accumulates. To allow for this without causing undue tensions it is advisable that a procedure for introducing changes be included in the original TOR.

Figure 3: The Joint Management Structure



2.7.2 Policy-Making Board

Given an agreement on the initial goal, some joint governing and policy-setting board or commission is needed. The role and authority of this central board are functions of the TOR and may evolve over time as the scope of tasks handled by the JWM structure expands. Thus, in a resource-protection structure this would be an aquifer protection board, whose primary role would be to set policies, approve standards, direct research policies and address disagreements not solved at lower echelons with regard to the aquifer. In a crisis-management structure this board would be responsible for setting drought policies, declaring droughts or emergencies, and approving plans for crisis situations. It may also serve as the second stage of a conflict-resolution mechanism. In a water-market structure this board would set the trading rules, to assure that environmental and social aspects are not overridden, and authorize trades. If private sector participation is sought this board would be responsible for preparing the tender, setting the evaluation criteria, choosing the winner among the bidders and overseeing the operations of the utilities. In a comprehensive-integrative structure this body would have the overall responsibility for setting the policies necessary for managing the aquifers.

These bodies would be composed of an equal number of high-ranking officials from the two sides' relevant agencies (environment, health, planning, etc.), as well as the Israeli Water Commissioner and the head of the Palestinian Water Authority. It is also possible to include at this level representatives or observers of interest groups, such as farmers or environmental non-government organizations (NGOs). These bodies would thus set policies taking into account a wide array of concerns of both parties.

2.7.3 Joint Management Authority

Below the policy-setting boards, that would convene only periodically, a joint management committee should be established, perhaps on the basis of the existing JWC. This body, that would comprise representatives of the Israeli Water Commissioner and the Palestinian Water Authority, would be responsi-

ble for the everyday tasks necessary to manage the aquifer. The nature of these tasks would be a function of the orientation chosen. In the case of an aquifer-protection orientation this body would be responsible for delineating aquifer protection zones, initiating inspections, setting standards, etc. In the case of a crisis-management orientation it would prepare the crisis-management plans and coordinate efforts once a crisis has been declared. It would also serve as the first stage of the conflict-resolution mechanism. If a water market is established this body would oversee and authorize trade. In the case of private sector participation it would be in charge of overseeing the activities of the private enterprise, licensing and monitoring. In the case of a comprehensive-integrative structure this commission would be in charge of licensing, standard setting, planning, artificial recharge policies, monitoring, etc.

To assist the central aquifer-management bodies in their activities joint technical units would need to be set up, in tandem with the addition of tasks or activities. In other words, as the structure evolves and new tasks are undertaken additional joint technical units would be formed, or the mandate of existing units expanded. Thus, the institutional structure would be both sequential and flexible.

Although some tasks and activities – the nature of which would be determined by the TOR – would be decided upon and conducted through the joint management authority and technical units, in all cases some of the operations and work would continue to be the responsibility of local units, on both sides. Thus, the establishment of a JWM structure does not imply that local water departments or utilities would be dismantled. Some of the tasks coordinated through the JWM structure could be carried out separately by local institutions.

In the first phase concrete suggestions for building up the institutions necessary to carry out the tasks were spelled out. However, these suggestions were intended only as an illustration of the possibilities and a base for discussions, and are therefore not reiterated here. Moreover, the changes that occurred since the first phase may have implications regarding the method and timing of the establishment of such institutional structures.

3. IMPLEMENTATION ISSUES

The approach outlined in Section 2 provides a general framework for formulating a JWM structure. However, in implementing this framework several issues have to be addressed. These include the starting point of the process, the rate at which the process is to proceed and its sustainability, identification of the participants and the relationship between this and wider societal processes. In the Israeli-Palestinian case these wider processes pertain especially to the overall peace process.

3.1 The Starting Point

The framework described in Section 2 was generic. In the Palestinian-Israeli case a coordinating mechanism was instituted in the 1995 Oslo B accords. This mechanism is composed of a Joint Water Committee (JWC), including Joint Supervision and Enforcement Teams (JSETs). These two might have developed on the basis of the work conducted in the first phase of this study.

The JWC was given a wide-ranging scope of action. Its tasks are to coordinate the management of the water resources, monitoring, water supply and sewage systems, to resolve disputes, facilitate information exchange and arrange for water supply from one side to the other. All water projects on the West Bank require the JWC's approval. The JWC was also to determine the changes in extraction resulting from climatological and hydrological variability. All decisions in the JWC were to be reached unanimously, thus giving each side veto power.

The JSETs were to supervise and enforce the implementation of the water article of the agreement (Article 40), including the monitoring of extractions, prevention of unauthorized drilling or connections, prevention of pollution and supervision of the operation and maintenance of different wastewater and drainage facilities. They are to be guided by the JWC. Overall, no less than five JSETs were to be established, and the members of these teams were to enjoy full mobility to all water and sewage facilities.

After more than two years of operation the JWC and JSETs have not met the original expectations, especially those of the Palestinians. Palestinian representatives in these bodies feel that the JWC has not addressed urgent Palestinian needs, as it delayed permits for Palestinian projects, and has thus served merely as a means for furthering Israeli control. Water supply to most Palestinian cities and towns continues to be precarious. In most locales running water is not available to all households throughout the year and many villages still do not have piped water. As a result there has been a loss of confidence in the coordination structures.

In the Israeli-Palestinian case the creation of a JWM structure would have to begin today with the existing coordinating mechanism. Essentially, the JWC role would have to be adapted to the type of JWM structure that would be agreed upon. In doing so, however, there would be a need to overcome the Palestinians' current misgivings with the operation of the JWC and JSETs. In other words, in contrast to what might have been expected, the current starting point for building a JWM structure today is difficult, as there is a need to overcome the distrust that has developed in the current mechanism. On the positive side, a legal basis for cooperation in groundwater resource management has been established.

It is important to note here that the mechanism established in the Oslo B accords does not amount to a JWM structure, as envisioned in this study. It was designed as an interim measure, primarily to coordinate actions initiated by the two parties during the transition period to the permanent status agreement. The mechanism was not intended as a structure that would actively manage the shared groundwater resource, or at least certain facets of it necessary to achieve a coherent goal. Nor did it include measures for developing the institutional structure, or resolving disagreements, since it was designed for an interim period. However, a basis for cooperation has been established.

3.2 Establishing JWM Structures

The first step identified in all structures is the establishment of joint monitoring structures and the sharing of data. In addition to the importance of such struc-

tures for the operation of virtually all JWM structures, they are seen as confidence-building measures. Yet, as van der Gun (1997) warns, such efforts may backfire if they lead to the creation of "data graveyards." That is to say, if monitoring and data sharing become an end to themselves and do not feed into a decision-making system they may lead to further erosion of confidence in joint management efforts. Thus, it is imperative that monitoring, modeling and data-handling efforts be well integrated in a wider decision- and management-oriented framework, and not become an end to themselves.

This problem is, however, part of a larger issue. There is a danger that if the first steps in the process take a long time and do not provide any tangible benefits for water users, especially in the Palestinian population centers, there may be further loss of confidence in the ability of the sides to work together. That is, if the process is slow and does not provide tangible benefits increasing pressure to break out from the confines of the JWM structure could be anticipated. Ultimately, this may lead to a breakdown of the chosen management structure, to the detriment of the aquifer, and hence future generations.

To overcome this problem ***it is necessary to ensure that the process does not get bogged down in its initial steps, and that concrete benefits be felt quickly***. This requires that, in addition to the considerations mentioned in Section 2, the benefits to the public at large should be considered when implementing a JWM structure. Also, it is necessary to build the system so it does not break down early. In addition, it may be worthwhile to make sure these initial steps do not involve issues that are likely to be contentious.

Another problem related to the process as such is the limited experience in structuring JWM systems. Thus, a trial and error process is virtually unavoidable. To prevent this process from becoming contentious and getting bogged down before any benefits are felt, it is necessary to incorporate modification and arbitration procedures at an early stage. Moreover, as the question of water allocation is of primary importance, the political echelon should establish initial water allocations, concurrent with a formula or system for modifying them over time. In this way some benefits may be felt early, without compromising the long-term desires of both parties, in turn allowing for a relatively quick agreement on JWM.

In contrast to the previous considerations that require speeding up the process of building JWM institutions, privatization calls for caution and detailed planning. As there is only scant local experience in setting up such franchising, and the firms with which such agreements are signed are usually large multinational companies with extensive experience (Beecher, 1997), the two parties should be wary of early contractual commitments with private companies. In this case it would be necessary, therefore, to differentiate between quick steps that can be taken by the two parties to provide immediate relief and build confidence while working carefully, and perhaps with outside help, in structuring the tenders.

3.3 Representation and Cooperation

In the framework outlined in Section 2 the implicit assumption is that most coordination and cooperation would be established at the national level. But that is not essential. Recently, an Israeli regional council (Emek Hefer) reached a tentative agreement with a nearby upstream Palestinian city (Tul-Karem) for the treatment and re-use of the city's wastewater. It is possible that local agreements regarding various facets of the water systems can be reached elsewhere, too,[6] and that positive experience at the local level would help build confidence in the ability of the two sides to work jointly on water management issues at the regional level. In other words, ***it is possible that encouraging local incremental initiatives would accelerate the establishment of a regional joint management framework***.

To be implemented, a JWM needs to be accepted within each society. If any sector, on either side, feels threatened by the JWM proposition it is likely to obstruct its acceptance and implementation. Therefore, it is advisable that all pertinent sectors be represented within the JWM structure. Such a structure would need to recognize not only the needs and desires of the two parties, but

[6] An area where such an agreement is obviously needed is the Jerusalem region, where wastewater flows necessarily cross boundaries (Feitelson & Abdul-Jaber, 1997).

also those of the different sectors within each party, as many of the adjustments required over time may affect specific sectors, rather than the two parties as such. In other words, it is advisable that the composition of the managing board (whether the JWC or under a different name) be reviewed to ensure that all relevant interest groups from both parties are represented.

There is one group of participants that is of particular importance in a JWM framework but that cannot be represented within it: future generations. Essentially, the logic behind the JWM approach is to safeguard water for future generations. Yet, in everyday decision making their interests cannot be represented directly. Therefore, it may be useful to include within the JWM structure groups that may serve as proxy representatives of future generations, such as "green" NGOs.

3.4 The Overall Picture

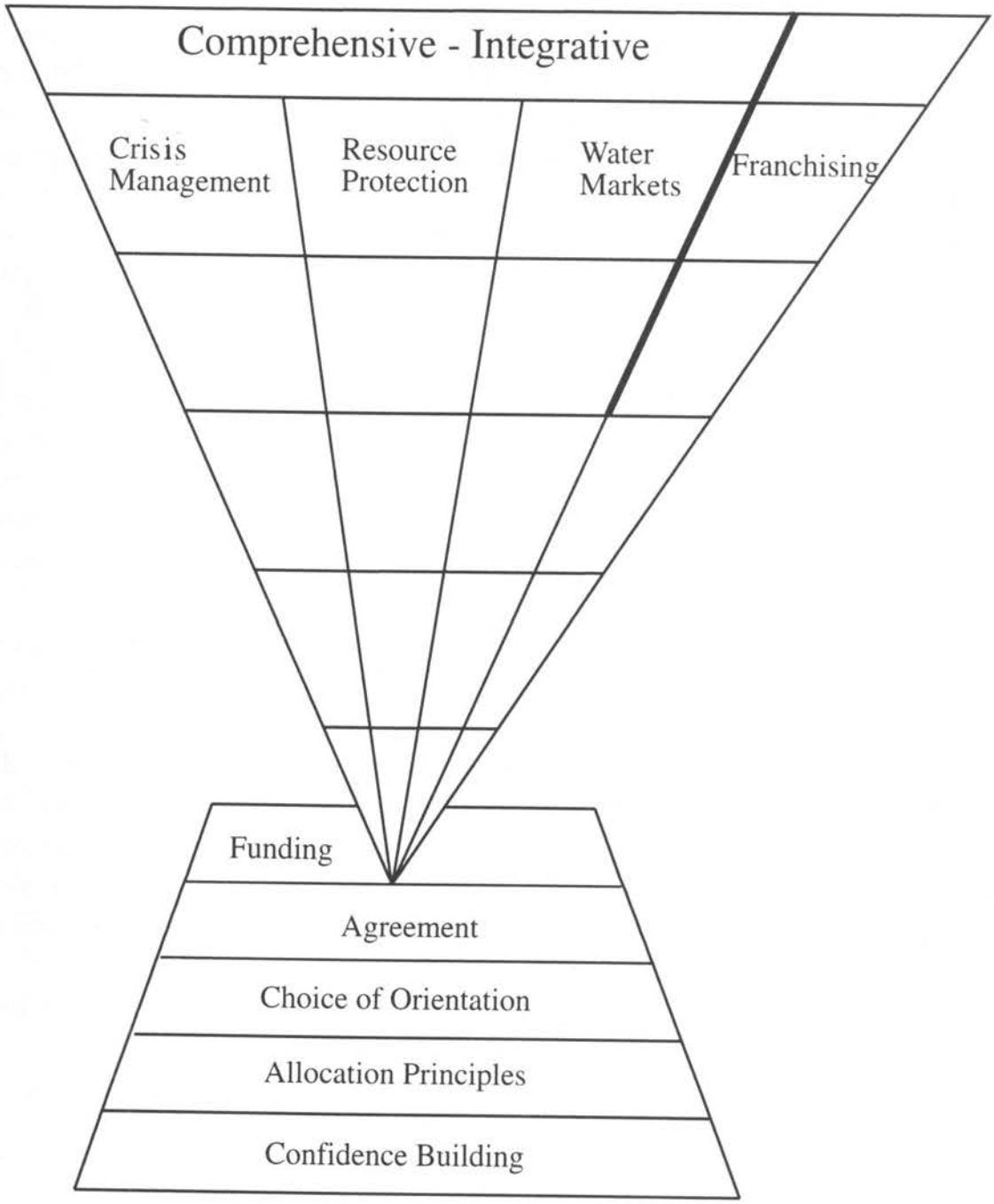
The decision to institute a joint management framework is usually set within wider international (or inter-jurisdiction) relations settings. These in turn are influenced by local legal structures and internal politics, as well as by the way water issues are framed and discussed within each society. In the Israeli-Palestinian case the joint management options would be discussed as part of the water negotiations, which is one element within the permanent status peace negotiations. The institutionalization of joint management would have to be embedded, therefore, within a wider set of agreements.

This set of agreements may have some implications for the framework itself. It is likely that some conflict-resolution mechanism would be established in this context. It may make sense, therefore, to embed the aquifer management conflict-resolution mechanism within the overall conflict-resolution mechanism. Additional issues that are likely to be addressed in the overall agreement are land use controls, funding of public works and environmental protection issues, and these may have implications on the joint management agreement. At the same time, the joint management framework may help address some of these issues, in particular the water quality issues that would be raised in environmental forums. The need to embed the joint management framework within

a wider set of agreements may, however, create difficulties that could slow down the implementation process, even after the framework is agreed upon. It is necessary to structure, therefore, the joint management framework in a way that allows the benefits to be felt early, regardless of progress on other issues.

Water issues would most likely be part of the public discussions surrounding the peace process. At present water issues are largely viewed by the public as a zero-sum game. The joint management framework shows water can, and should, be a basis for cooperation. Yet this view is not intuitively clear to much of the public at present. It would be necessary, therefore, to complement the implementation process with a campaign that ensures public comprehension and support of the joint management approach.

Figure 4: The JWM Framework and an Agenda for Implementing It



4. AN AGENDA FOR IMPLEMENTING JOINT MANAGEMENT

Considering the implementation issues raised above, ***it is clear that the joint management framework will not be implemented instantaneously. Rather, a series of steps will need to be taken to lay the groundwork for such a framework***. This section outlines the steps that are essentially prerequisites for implementing a joint management framework in the Israeli-Palestinian context. The agenda proposed here is, therefore, the basis for implementing the framework described in Section 2. This relationship is presented graphically in Figure 4.

4.1 Confidence Building

The sustainability of the aquifer is a shared interest of the two parties. However, the success of any joint management effort depends to a large extent on the confidence the parties have in the institutions and procedures involved. The basic assumption behind the flexible-sequential framework described in Section 2 is that as confidence in the existing joint management institution builds up their scope would be expanded, thus improving the management of the aquifer.

One of the major reasons for the current frustration on the Palestinian side is the lack of progress in domestic water supply to Palestinian population centers. Thus, augmenting water supply to the West Bank by accelerating development of the water sources referred to in the Oslo B agreement and by facilitating new water conveyance schemes or replacement of leaking systems could improve the atmosphere between the water experts on both sides. In particular, an effort by Israel to assure that water supply to Palestinian residences is not interrupted during the summer months may be well appreciated. International capital may also have a useful role in achieving this target by financing the schemes necessary to improve the reliability of Palestinian water supply systems.

The first step in the agenda, therefore, has to be a sincere attempt to rebuild confidence among the technocratic strata that would later have to work

together to make the joint management structure work. To this end, the modifications in the day-to-day operation of the JWC may be important. For example, rotating the chairmanship, making an effort to bring any project for discussion within a pre-specified time limit, full reporting of activities and nurturing a general aura of sincerity and openness in the discussions may help.

Other actions that may bolster confidence include allowing the JSETs the full mobility specified in the Oslo B accords and providing Palestinians with open access to data pertaining to the mountain aquifers, such as water levels in wells over time, water quality measurements and the amounts of water extracted. Creating a shared database may also facilitate the data exchange.

One of the impediments to the agreement on short-term projects for alleviating Palestinian water shortages is the perception that water is currently being wasted. Therefore, it is imperative that water conservation and demand-management measures be enacted by both parties – unilaterally – at the outset, and throughout the JWM operation. This should also indicate the good will of the two parties to manage the water resources judiciously. However, it is also possible that certain actions in the JWM framework be made contingent on prior application of water conservation or demand management provisions.

4.2 Allocation Principles

One of the pre-requisites for establishing a joint management structure is that allocation principles be agreed upon. While the actual allocations each side would obtain are subject to negotiation, certain principles and issues that should be considered in making the allocations and defining water rights can be advanced here, as they pertain to the joint management framework.

In a joint management framework the guiding principle is the wellbeing of people, current and future generations, and the protection of natural resources. As within 25 years, a single generation, most of the shared aquifers' water will be needed for domestic consumption, the implication of this principle is that water should be allocated on a per-capita basis. Ultimately, equitable domestic use per capita should be achieved.

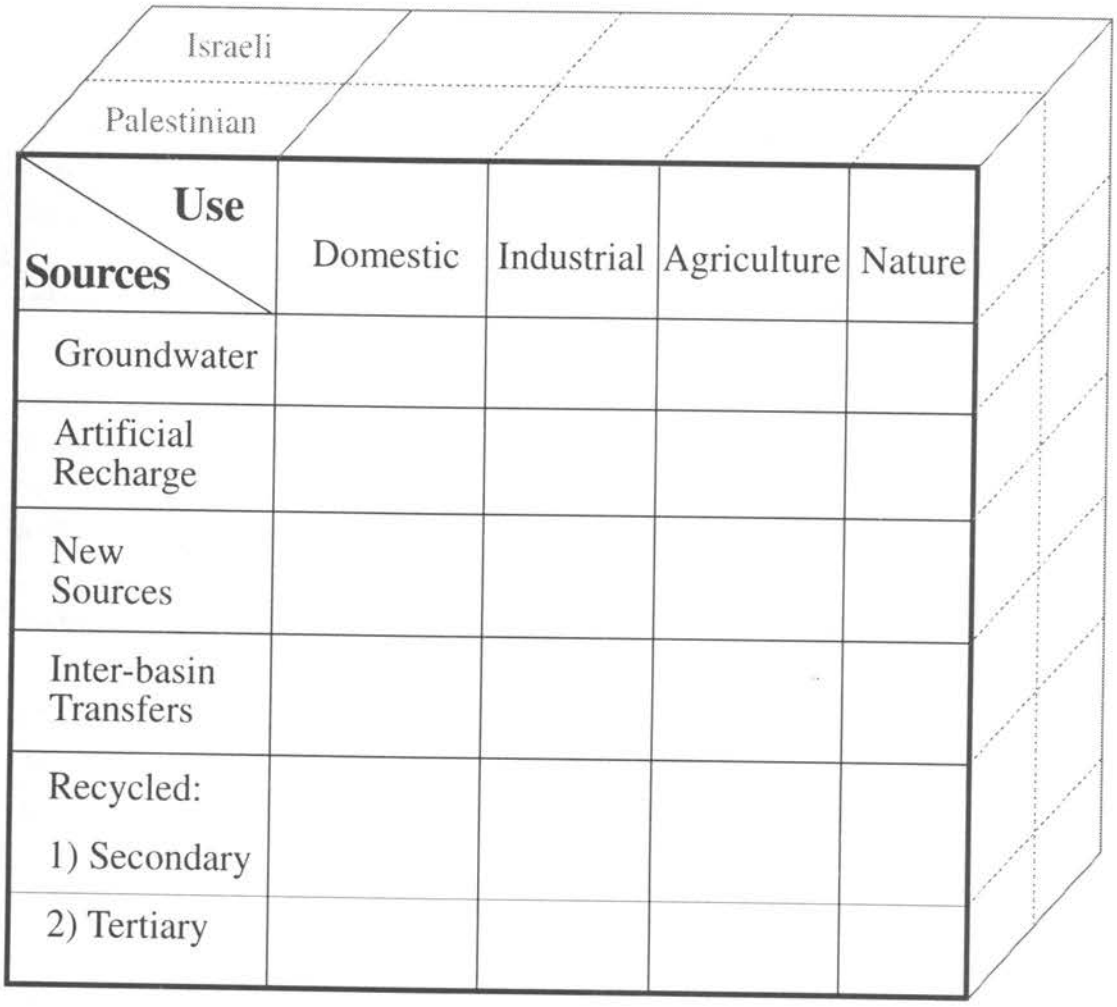
The amount of water that should be allocated per capita would be subject to negotiation between the parties. However, in making the allocations, and defining the scope of water rights, there is a need to address the climatological and hydrological fluctuations and differences in water quality. That is, the definition cannot be limited to a single amount of water. Rather, the timing of extraction and the quality of water extracted should be included in the parameters that define an allocation or right.

Once the per-capita principle and the need to account for fluctuations have been recognized it becomes clear that allocations would have to be modified over time – in drought years and as a function of changes in the total population and its distribution. Thus, from a joint management perspective, there would be an advantage for structures that facilitate modifications of water allocations and for definitions that allow such modifications without a need for renegotiations.

Water is often used more than once, for different purposes. A definition of water allocations as a single amount usually fails to take this fact into account. Therefore, water allocations should be made with a view toward the total water cycle, rather than merely at the point of extraction.

The water cycle view has several advantages. It makes a direct connection between water allocations and obligations – once water has been used return flows and wastewater flows are generated. These can be re-used. Therefore, it may be necessary to oblige the user to provide these flows and to assure that they be of a sufficiently high quality to allow for subsequent use. This view also highlights the fact that there are many sources for water, including water in an aquifer. For example, recharge enhancement schemes can be built to recharge water during a wet season for use in dry periods. Such investments should be recognized in making allocations, lest they not be undertaken due to the "free rider" problem. Finally, the water cycle view highlights the fact that wastewater is not only a liability but also a resource. A combination of all these factors suggests that water allocations should be defined in a multi-dimensional way, as shown conceptually in Figure 5.

Figure 5: A Typology of Water Allocations



Israeli

Palestinian

Use / Sources	Domestic	Industrial	Agriculture	Nature
Groundwater				
Artificial Recharge				
New Sources				
Inter-basin Transfers				
Recycled: 1) Secondary				
2) Tertiary				

Each box in Figure 5 should include two numbers: The percentage (or amount) of water one party would receive from a certain source for a certain use, and the percentage of this water it should discharge back.[7] In addition, it is possible to specify the minimal quality levels of the water it receives and discharges. The allocation would be defined therefore, as the percentage or amount received, the percentage of that amount to be discharged and the quality of water received and discharged. This framework for defining water allocations may provide more flexibility in managing an aquifer than the single-number allocations.

In the Israeli-Palestinian context this flexibility can be demonstrated in the recharge area above the western mountain aquifer. In this region it is important to limit, constrain or prevent use of low-quality wastewater. Yet, as the population grows, more freshwater is needed for domestic use (based on the per-capita allocation principle) and hence more wastewater is likely to be generated over the recharge area. If these two facets are combined, it is possible to allocate additional freshwater to the population (mostly Palestinian) over the recharge area, while obliging the recipients to return a pre-agreed percentage at a pre-specified quality level for re-use either in the (Israeli) coastal plain to the west or locally. In this manner farmers who would lose freshwater may receive recycled water instead, and the treatment of wastewater would be embedded in the freshwater allocations to the population centers over the recharge area.[8]

7 The return discharge would be a function of sewage systems, and hence a factor in making decisions and allocating funds for such systems.

8 This idea may have the additional benefit of making wastewater treatment on the West Bank more attractive to international funding agencies and donor countries. For further discussion on the advantages and limitations of this idea, see Feitelson (1998).

4.3 Choice of Strategy

Once the initial confidence-building measures have been implemented and the allocation principles agreed upon, negotiators would have to decide on the basic orientation of the joint management structure. It is not the purpose of this report to make a single recommendation regarding this choice. Still, several observations may be useful to negotiators in making this choice.

The resource-protection and crisis-management orientations are relatively compatible. Thus, regardless of which one is chosen as the initial focal point, it would be relatively easy to expand its scope to include elements from the second orientation. From an institutional perspective both have a similar logic – the creation of a cross-boundary administrative structure that would enhance the sustainability of the aquifer by formulating a joint strategy. They assure an obvious win-win outcome, without requiring substantial modifications in the way water policies are currently conducted (at least on the Israeli side).

The water-market orientation has a somewhat different underlying logic, as it emphasizes the use of market mechanisms to enhance efficiency, rather than the management of the aquifer per se. While this orientation is compatible with a sustainable management perspective, it would not directly promote the sustainable management of the aquifer. In order to achieve this the definition of water rights, allocations and trading rules would have to be sensitive to climatological and hydrological fluctuations and to water quality facets. While there is substantial literature on these topics,[9] the practical experience is limited, and non-existent in the Palestinian-Israeli context. Thus, choosing this orientation should be made contingent on a definition of property rights that is sensitive to these facets. It is also likely that this orientation would require more preliminary studies than the previous two. Still, it can provide substantial benefits, especially as it allows for modifications in allocations without renegotiations.

[9] For a concrete suggestion see Vaughan and Emerson (1997). Their suggestion pertains to the Edwards aquifer in Texas, which has several similar attributes to the mountain aquifers.

Perhaps the most innovative orientation advanced as part of the framework is the franchising orientation. This incurs long-term contractual commitments, and thus may be less compatible with the other options. In a sense, while it is possible at any point to add this orientation or shift to it, it would be more difficult to shift away from it once an international tender has been issued. After contracts with large multinational firms have been signed such a shift also becomes legally problematic. Despite the limitations, this orientation has several important potential benefits that warrant its serious consideration. In addition to assuring a higher probability of efficient water supply and wastewater treatment services, it may be conducive for attracting foreign capital for building the greatly-needed systems on the West Bank (an issue touched upon again in sub-section 4.5). More importantly, this orientation may de-politicize discussions regarding water use, wastewater issues and infrastructure development and encourage cooperation among the two parties vis-à-vis the international consortiums.

The franchising option does not have to pertain to the whole aquifer, as in any case it is not proposed that the responsibility for the resource be privatized. This option can, therefore, be limited to certain elements of the water system, which are of importance from an aquifer-management perspective such as the wastewater treatment and re-use sub-system. It may be possible to conduct a trial and error learning process in implementing this orientation, whereby the experience gained in one place is used to improve subsequent tenders elsewhere. In other words, the implementation of this orientation can be gradual, even if no adjustments are made to signed contracts. Thus, while it may take more time to implement than the alternatives, this orientation may be more compatible with them than first meets the eye.

The comprehensive-integrative systems referred to in the literature are usually comprised of the first two orientations only. In some cases they may allow for the creation of water markets as well. A decision to try and directly establish a comprehensive-integrative structure has the benefit of assuring a long-term commitment to the sustainability of the aquifer. It provides a stronger statement than other options for the joint management framework. This may be important to allay the fears that the joint effort could fizzle after the first stage in

the process, producing no concrete benefits. However, this orientation may also seem more threatening to existing institutions, and may be perceived as encroaching on the sovereignty of the parties. In essence, it leaves less leeway for future modifications in the structure in response to changes in circumstances and policy preferences.

The important point that emerges from this discussion is that in choosing an orientation decision-makers should consider not only each option independently, but also the possible relationships between orientations. It is also important that research continue on those orientations not initially chosen, as some of the more promising ones are the least tried and understood options, especially in a joint management framework.

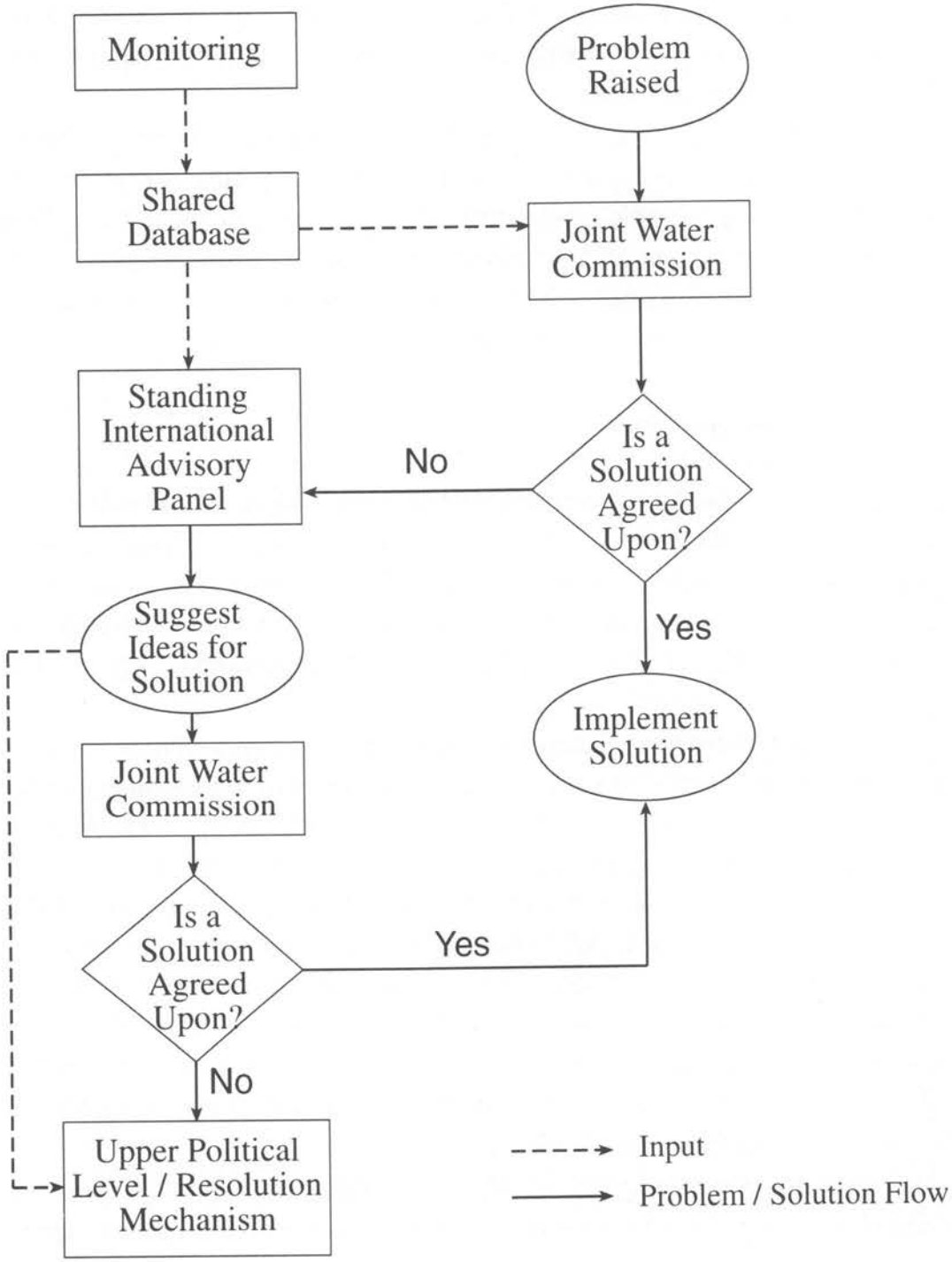
4.4 The Agreement

Once the basic orientation has been selected, the parties would need to institutionalize the JWM structure in a formal agreement. This agreement should reflect the principles for cooperation mentioned in the Introduction. While it is not our purpose here to address the legal aspects that would have to be dealt with in this agreement, it is possible to make several observations regarding content.

The agreement has to assure the two sides that they would be equal with respect to all water-related issues. To this end, the agreement should clarify the actions that need to be approved by the JWM institutions, the decision-making procedures, the actions these JWM institutions can take, and the means they will have to accomplish their tasks. The agreement would also have to clarify the relations between the JWM institutions and local jurisdictions, on the one hand, and the national bodies of the two parties, on the other. As the data exchange has become a source of contention it may also be necessary to specify which data and data sources should be part of the shared database, and how it should be maintained and accessed. To this end a GIS-based system may prove useful (Isaac & Oweiwi, 1997).

Given the complexity and novelty of the agreement it should include provisions that would clarify how misunderstandings and conflicts can be resolved,

Figure 6: A Possible Conflict Resolution Algorithm



how the JWM authority is to be upheld, and how modifications may be introduced in an orderly manner.

Given the current distrust between the two parties it may also be useful to include in the conflict-resolution mechanism some neutral experts, as potential facilitators allowed to assess the differences and raise suggestions. In Figure 6 a procedure for making use of such a function is advanced. Essentially, this procedure calls for the establishment of an international advisory panel that would receive periodic updates on the progress of the JWM agreement and have access to the shared database. If either party to the JWC raises a problem but no solution is agreed upon it would be referred to this international panel. The members of the panel would try to narrow down the issue under contention and suggest possible solutions. These would be referred back to the JWC. If they are not accepted, and no alternative solution is reached, the issue would be referred to the conflict-resolution mechanism that would be established as part of the permanent status negotiations (most likely involving the political level). The report and suggestions of the international advisory panel would be attached to this referral.

Regardless of whether or not the conflict-resolution mechanism advanced in Figure 6 is accepted, it highlights some of *the issues that would have to be addressed in the agreement: whether third parties should have a formal role; the need to allow new ideas from uninvolved persons in conflict situations; the need to clarify at which point conflicts should be referred to higher echelons that are not part of the JWM institutional framework; and the need to ensure there is an agreed-upon shared database when addressing conflicts.* The same types of issues are also likely to be pertinent when the need to allow for modifications is addressed in the agreement.

In addition to addressing the relations between the two parties the agreement would have to deal with the local-regional-national interfaces. Two aspects are relevant in this context. One is *the issue of enforcement.* This was addressed in the Oslo B agreement in the form of the JSETs. In the permanent status agreement it would be necessary to address the problems identified in the operation of the JSETs. It may also be necessary to *specify adjudication procedures for dealing with offenders.*

The second aspect involves *the possibilities for local cooperation*. As noted above, these may be especially pertinent in the wastewater treatment and reuse field. As it is impossible to scope all the possibilities for such cooperation in advance, it is suggested that the agreement leave sufficient leeway for local jurisdictions to pursue such local cooperative options, and that the JWM structure be designed to accommodate such initiatives.

4.5 Funding

The operation of a JWM structure incurs costs. These costs include several components:

- Operating cost of the JWM institutions;
- Capital cost needed for the JWM operation or to meet JWM requirements;
- Operating cost of water facilities needed for the JWM operation or resulting from JWM requirements.

There are several possible revenue sources to cover these costs:

- General revenues allocated for the JWM structure by the parties;
- User fees for services;
- International funds of donor agencies and countries.

These revenues can be leveraged through various financial institutions. It is possible to create a special fund or bank that would specialize in leveraging the money derived from the three revenue sources, in order to obtain the maximal service from them for joint management purposes.

The revenue and cost streams vary over time. Capital costs are usually incurred in large lump sums. In contrast, operating costs are usually a relatively constant stream. Similarly, user fees are relatively stable. On the other hand, funds from international sources may be erratic as they are a function of the discrete decisions by the donor agencies or countries (whose considerations include many unrelated factors, such as changes in other areas competing for the same resources). General revenues may also be affected by local economic and political shifts. The general funding problem is, thus, to match rev-

enues and needs. This problem is made more difficult in a joint management context, as it is overlaid by the questions of how to allocate costs among the parties (and sectors within the parties) and who benefits from revenues from outside sources. Moreover, the answers to these questions may be affected by the choice of JWM structure.

The operation of the JWM structure itself does not usually require significant funds. However, these funds have to be forthcoming in a predictable manner. As these sums are not substantial it is suggested that these operational expenditures be borne by the two parties equally from general revenues.[10]

The capital cost and water facility operating cost attributable to the JWM structure would most likely include water conveyance facilities between the two parties, drilling and pumping, aquifer recharging, monitoring and wastewater treatment and re-use facilities (and conveyance of wastewater from the treatment facilities to re-use points).[11] One of the issues that would have to be addressed is the identification of facilities that are germane to the operation of the JWM structure, versus those that should be the responsibility of local jurisdictions or the two parties. The choice of orientations of the JWM structure may affect the identification of facilities as germane to the operation, and hence their applicability for receiving JWM funds. For example, if a crisis-management orientation is chosen it is possible that recharge schemes would get priority in receiving JWM funds, while if a water-market orientation is chosen water conveyance schemes, necessary to facilitate trades, would receive funding priority. Regardless of the designation of projects, it would be necessary also to establish an institutional mechanism to administer the funds. This unit could be administrative or set up as a fund or bank. In the latter case, it may collect user

10 By the term "general revenues" we mean funds that are not generated specifically for the JWM effort or by it. It does not limit the ways in which either party will actually raise the revenues, as it is possible to dedicate a certain revenue stream (for example a percentage of a certain fee or tax) to this purpose.

11 For discussion of some of the issues which may be included in these categories see Nevo (1994) and Dvoskin (1994). Dvoskin also identifies some potential sources for revenues.

fees from local jurisdictions for services rendered (for example, water conveyance) and combine them with international funds to leverage additional sums for capital investments at a better interest rate.

If a franchising orientation is chosen it may be possible to fund the elements selected to be franchised separately, as part of the franchising agreement. For example, if a certain wastewater system serving both parties is franchised it is possible that the generation of funds for its construction would be one of the elements included in the tender. While the financial terms may not necessarily be better in this case (because of the risk element to a private enterprise in a still-unstable region) this option may allow access to additional sources and provide international donors with greater interest in the success of the joint management effort.

It is not our goal to discuss here all the funding implications of joint management. Rather, the purpose of this section is to highlight the need for addressing the issues raised as part of the joint management agreement. However, as the funding aspects of joint management have not received sufficient attention to date, at least in the Israeli-Palestinian context, it may be worthwhile to conduct a special workshop or research to identify the options suitable for each orientation, and the institutional and legal requirements for setting them up.

5. CONCLUSIONS

Where water is concerned, Israelis and Palestinians can be viewed as Siamese twins – two entities sharing a vital resource. It is thus imperative that they manage this resource as best they can. This requires a sustainable development approach. As neither side can manage the aquifer independently in a sustainable manner they need to manage it jointly. Thus, they have to create a joint management structure. As there is only scant international experience in the joint management of shared aquifers, and as the extensive experience in managing transboundary surface water is not directly transferable to groundwater, it seems that the Israelis and Palestinians need to come up with novel solutions to the problem.

Based on five years of cooperative study a framework for developing a sustainable joint management structure for shared aquifers is proposed. This framework suggests that from a narrow base one of five strategies for a joint management regime should be chosen. Additional tasks can then be added over time as confidence in the structure grows. It is also possible to change orientations or expand the scope of an existing structure to include additional strategies over time. Eventually, a comprehensive-integrative management structure may evolve.

This general principle is limited only in the case where a franchising strategy is chosen, as at some point legal contracts limit the ability to shift away from this orientation. Still, this strategy holds special promise in a joint management framework as, in addition to its advantages in terms of efficiency and effectiveness, it may help overcome political obstacles and transform the content and form of discussion toward economic and supply issues rather than political ones. It may also force the two parties to cooperate closely in order to obtain the best deal from a private (often multinational) enterprise.

The implementation of this framework, regardless of the strategy eventually chosen, requires that several issues be addressed. Foremost among them is the mistrust between the parties. To overcome this distrust it is necessary to assure Palestinians of immediate improvement in water supply to Palestinian population centers, and that the process would not get bogged down before

discernible benefits have been realized. Other issues include the need to determine which sectors from each side to include in the joint management framework, the initial allocation of water between the two parties, the place of the joint management agreement within the overall peace process and the steps needed to implement the joint management approach.

To address these issues an implementation agenda is advanced in this report. It begins with steps that may help build up confidence, including adjustments in the operation of the JWC, supply augmentation to the West Bank and data sharing. Then water allocation principles have to be agreed upon. A water-cycle perspective of defining allocations (and rights) is advanced. It allows for greater flexibility in addressing the allocation of water among the parties, and focuses attention on quality issues and return flows. Special attention has to be given to the fluctuations in water availability and to water-quality issues. Once the allocation principles have been defined the orientation of joint management structures should be chosen. In making this choice decision-makers should consider the possible relationships among the different strategies in order to allow future generations to adapt the evolving structures to changing circumstances and policy preferences. This should be framed within a binding agreement. While this report does not deal with the legal aspects of the agreement it does make note of several issues needed to make the agreement sustainable. As any joint management agreement for a shared aquifer is novel, it is likely that many points will have to be clarified over time. Thus, special attention should be given to the conflict- and disagreement-resolution mechanisms. One suggestion for such a mechanism is advanced in this report. Finally, the financial ramifications of joint management have to be addressed as part of the agreement setting up the joint management framework.

The main lesson from this effort, however, is not limited to a specific aspect of joint management. It is that ***the aquifer can serve as a basis for Israeli-Palestinian cooperation, and thus advance the prospect for peace rather than be a source of contention. If the aquifer is indeed managed jointly in a sustainable manner both current and future generations of Israelis and Palestinians will benefit.***

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APPENDIX I

LIST OF THE PROJECT'S PUBLICATIONS

E. Feitelson and M. Haddad (eds.) *Joint Management of Shared Aquifers: The First Workshop*, The Palestine Consultancy Group and the Harry S. Truman Research Institute for the Advancement of Peace, Jerusalem, 1994.

M. Haddad and E. Feitelson (eds.) *Joint Management of Shared Aquifers: The Second Workshop*, The Palestine Consultancy Group and the Harry S. Truman Research Institute for the Advancement of Peace, Jerusalem, 1995.

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E. Feitelson and M. Haddad (eds.) *Joint Management of Shared Aquifers: The Fourth Workshop*, The Palestine Consultancy Group and the Harry S. Truman Research Institute for the Advancement of Peace, Jerusalem, 1998.

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