



Layman's Report

Pro-Aquifer

Protecting Trans-boundary Groundwater Sources from Pollution:

Research, Training and Guidelines for Israeli
and Palestinian Municipalities

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EcoPeace/Friends of the Earth Middle East (FoEME) is a unique organization that brings together Israeli, Palestinian and Jordanian environmentalists to advance both sustainable regional development and the creation of necessary conditions for lasting peace in the region. FoEME has offices in Tel Aviv, Bethlehem, and Amman. It is a member of Friends of the Earth International, the largest grassroots environmental organization in the world. For more information, please visit: www.foeme.org.

House of Water and Environment (HWE) is a Palestinian not-for-profit organization that aims to promote practical research into the current and future state of water resources and the environment. HWE serves as a regional base for networking and partnering around the common theme of water resources and environment sustainability and aims to implement a wide range of activities including research, community water development projects, information dissemination, and training. For more information, please visit: www.hwe.org.ps.

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EXECUTIVE SUMMARY

The purpose of this document is to explain in layman's terms the "Pro-Aquifer" Project.

Cooperation between Israel and the Palestinian Authority is essential for the preservation of water resources. The reason is simple; both parties share specific water resources. The Mountain Aquifer that supplies about a third of Israel's water intake also constitutes the main water resources for Palestinians living in the West Bank. A mutual working framework that is both efficient and promotes cooperation, in order to protect the ground water of the Mountain Aquifer from pollution, is worthy of all support. This project, which received financial support from the European Commission; fosters cooperation between Israeli and Palestinian organizations and institutions.

Various forms of human activity threaten ground water quality; taking a car to the garage, manufacturing a consumer product in a factory, or fumigating crops. All these activities have side effects, for example, oil leaks and untreated chemicals find their way into the sewage system, or chemicals accumulate and seep into ground water over time. Pollution caused by a variety of human activity is countered by an infrastructural system intended to take care of different hazards. Sewage is collected into a sewage line system and treated in a sewage treatment plant, solid wastes of various kinds are gathered into transfer stations, and pesticides are regulated by both laws and by-laws. However, the management of infrastructure, both physical and legal, constitutes a major challenge. Population growth, the large variety of activities, and development costs create a gap between the number of hazards that require treatment and the ability of the system to cope. In this way sewage lines collapse from overload and inadequate maintenance and in many cases infrastructure does not even exist and cesspits can still be found. Unsorted solid waste is illegally dumped and unregulated agricultural activity causes organic overload to the soil. There is a delicate balance between the cycle of contaminating activity on the one hand and treatment activity on the other, which poses a constant threat to our shared water sources.

Most of the human activity takes place within the boundaries of a local authority. The local authority, among its many activities, supplies water, collects sewage and waste, promotes urban development and collects taxes. In light of all this, the delicate balance between contamination and its prevention exists within defined physical and judicial boundaries. Environmental hazards have an address. In the case of the Mountain Aquifer, the address is to be found on both sides of the Green Line and the responsibility for water preservation is incumbent on Palestinians and Israelis alike. Therefore, in our evaluation of the potential alleviation of pollution causes that threaten the ground water of the Mountain Aquifer, we must take into account the decisive role of the local authority in fostering the preservation of these resources.

Introduction

The European Water Framework Directive defines the subject of ground water preservation as a unique and important goal. In order to achieve the goal, the Directive calls for the establishment of managerial mechanisms and preventive measure against the contamination of ground water. The Pro-Aquifer Project relates to these issues, as applying to the ground waters of the Mountain Aquifer that are shared by both Israelis and Palestinians, from the unique perspective of the Local Authority. The project was funded by the Life Financial Instrument of the European Union and was implemented over two years, commencing in January 2007 and completed in December 2008.

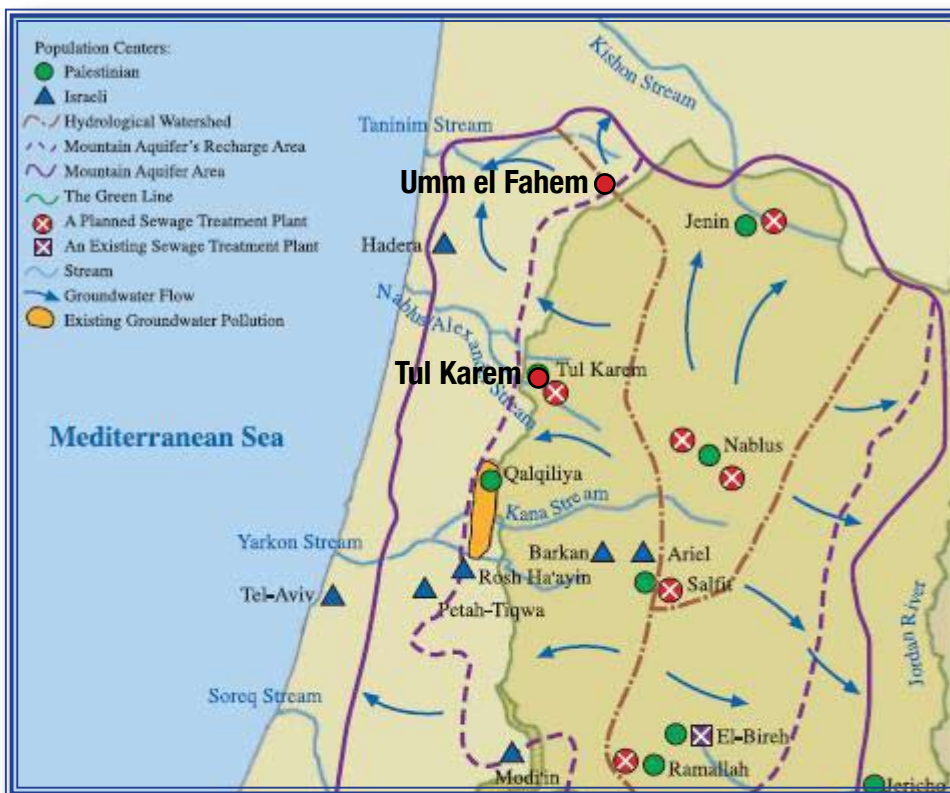
The Mountain Aquifer is located under the West Bank Mountain Range and spreads from the Jezreel Valley in the north to Beer Sheva in the south and from the Jordan Valley and the Dead Sea in the east to the Coastal Plain in the west. The ground water is considered qualitatively the most important water source for Israelis, presently supplying one third of its water. It constitutes the main water source for the urban and rural needs of all Palestinians in the West Bank. While control over water resources in Israel and Palestine is in the hands of the respective national leaderships, most of the human activity that threatens to contaminate ground water takes place within the jurisdiction of the local authority. Municipalities on either side of the Green Line have the ability to take preventive action and restrict polluting activities that take place within their jurisdiction.

In order to increase the local authority's capacity to deal with sources of pollution that threaten the ground water of the Mountain Aquifer, this project adopted an approach that combines several activities: scientific research, institutional research, advanced mapping technology (GIS), training for municipal employees and the creation of a framework for Israeli-Palestinian cooperation. The implementation of the project enables a local authority to obtain a bird's eye view of the environmental hazards in its jurisdiction and set priorities for treatment, an issue of critical importance in a reality of a wide variety of hazards and limited budgetary resources. In this sense the project is unique in that it focuses the attention of the municipality, at all its hierarchical levels, on environmental issues, particularly shared water resources.

The Pro-Aquifer Project focused on two municipalities as case studies, Umm-El Fahem, on the Israeli side and Tulkarm on the Palestinian side, and examined their ability to cope with the environmental hazards within their jurisdiction. These cities were chosen in light of their location on the recharge area of the Mountain Aquifer, the multiplicity of environmental hazards within their jurisdiction and the ease with which ground water can be polluted. The responsibility for the execution and management of the project was accorded to two organizations. On the Palestinian side the project was managed by House of Water and Environment (HWE), a non-governmental organization that conducts applied research on Palestinian water resources. The staff of HWE is composed of engineers, hydrologists and computer experts. On the Israeli side, the project was managed by Friends of the Earth Middle East (FOEME), a

non-governmental organization, consisting of environmentalists from Israel, Palestine and Jordan, working on issues of environment, natural heritage and water. In addition, the municipalities of Tulkarm and Umm-El Fahem assumed responsibility in implementing different stages of the project.

Umm-El Fahem is located in the northwest area of the Mountain Range in Wadi Arra, close to the Wall that divides Israel and the West Bank. This area, where an important part of the recharge of the Mountain Aquifer occurs, is a geological stratum with carbonate rock content. This geological formation enables aquifer recharge but is vulnerable to pollution of the ground water. 41,000 people reside in Umm- El Fahem, the largest Arab town in Israel. The municipal area is 22,500 dunams and the annual population growth is 2.7%. The residents engage in various economic activities, including trade, services and light industry.



Tulkarm lies in the western sector of the West Bank on the recharge of the Mountain Aquifer, close to the Wall that divides Israel from West Bank. The geology of this area is characterized by different types of carbonate rocks. This exposes the ground water to pollution, resulting from human activity that takes place in the city. There are about 86,312 residents within Tulkarm Municipality, engaged in economic activity such as trade, services and light industry. There is no heavy industry in this town.

JOINT MANAGEMENT

The Pro-Aquifer Project is a joint Israeli-Palestinian project, and as such, all its stages were planned jointly by the Israeli staff at FoEME and the Palestinian staff at HWE.

Within the framework of the preparations for the implementation of the project, a steering committee of Palestinian and Israeli academics and professionals was set up. The steering committee deliberated in detail over all the stages of the project in regularly scheduled meetings. Members of the committee were constantly available for consultation and to assist in obtaining essential data for the project.

Two work teams, one Palestinian and the other Israeli, were established in order to implement the fieldwork of Pro-Aquifer. These teams included municipal employees from Umm-El Fahem and Tulkarm. The teams engaged in the collection of data on different types of polluting damage being perpetrated and also conducted interviews with the employees and managers of various departments in the municipalities.

AIMS OF THE PROJECT

The overall mission of the Pro-Aquifer Project was to alleviate the sources of pollution that threaten the ground water of the Mountain Aquifer within the jurisdiction of Palestinian and Israeli municipal authorities. In order to achieve this, a number of aims were defined from which the various objectives of the project derived and which will be described below in the subsequent chapter that deals with the stages of the project

Aims:

1: To conduct research on the sources of pollution and the types of pollutants that exist within the jurisdiction of the Israeli and Palestinian municipalities. The research was conducted at two levels – at first researchers studied the sources and types of pollutants created by human activity, within the judicial boundaries of the respective authority. The second level of the research examined the institutional structure of both authorities with the intention of better understanding the actions, responsibilities and mutual connections between the various departments.

2: The creation of guidelines for the reduction and monitoring of the sources of pollution of ground water within the boundaries of the municipality. This aim assisted authorities from Umm-El Fahem and Tulkarm municipalities in dealing with the polluting effects that occur in their areas. It also included generic guidelines that constitute the requisite action for any municipality which chooses to independently implement the project

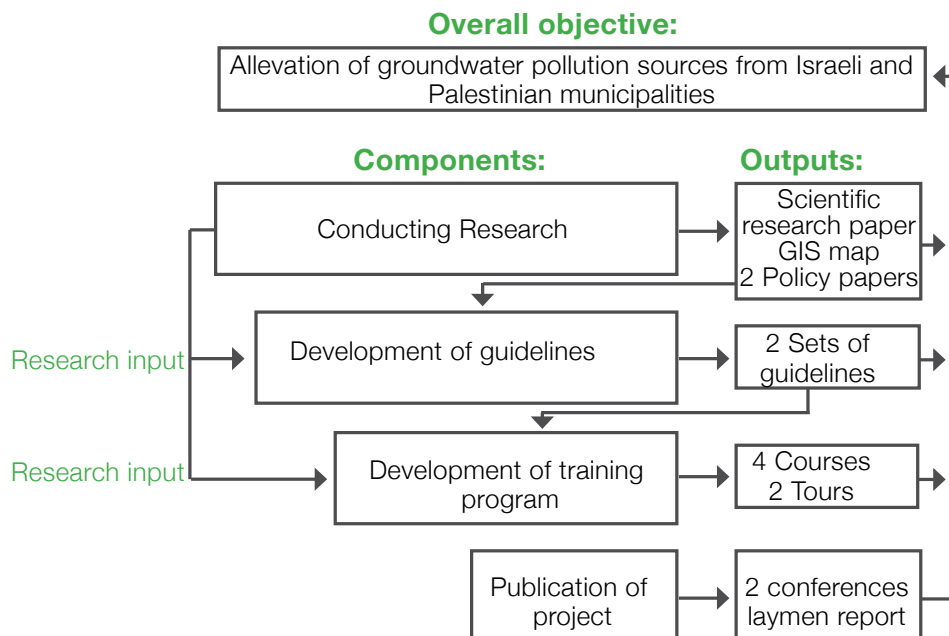
3: Strengthening the technical capacity of the local authority as regards to the environmental dangers to ground water. The project's assumption was that the prime pollutant of the waters of the Mountain Aquifer comes from various poorly managed and inadequate sewage systems. Training of municipal staff was undertaken to reinforce the technical knowledge of the authority's employees vis-à-vis methods and means of sewage treatment, as well as to improve the knowledge of the authority's management.

4:Creating an obligation for Israeli and Palestinian municipalities to constantly improve upon matters relating to ecology, in general, and to prevent water pollution, in particular. This aim was to create the potential for meetings, for the purpose of discourse and cooperation, between Palestinians and Israelis, who have a mutual professional interest in water. An Israeli-Palestinian exchange of information and cooperation constitutes a necessary basis for improving the potential of protecting common water resources.

Achieving the aims of the Pro-Aquifer Project enabled both Palestinian and Israeli municipalities to implement advanced technologies needed for the analysis and monitoring of environmental deficiencies. It improved each authority's understanding, at all its hierarchical levels, of its responsibility to preserve ground water. It strengthened the ability of the authority to cooperate with the neighboring authority across the Green Line. All these components are essential for the constant process of reducing sources of pollution, which endanger the ground water of the Mountain Aquifer.

THE STAGES OF THE PROJECT

The achievement of the project's aims necessitated their breakdown into achievable component objectives. Thus, the project was divided into four stages which sustained each other, each aim defining a number of objectives, which constitute the output of each stage.



Stage 1:

Within the framework of this stage an extensive survey, focusing on two issues, was conducted in the domains of Umm-El Fahem and Tulkarm. The first included locating and identifying environmental hazards, which included tracing the sources of the defects. The second concerned the activities of various departments in the municipalities: manpower, reciprocity between departments as well as connections between the municipality and external agencies. The defined objectives of this stage were the drawing up of a map designating the environmental hazards of Tulkarm and Umm-El Fahem as well as the writing up of a scientific document detailing the survey's findings.

Mapping the hazards

The hazard-map was constructed in a number of layers by means of GIS technology. Each layer supplied information about specific deficiencies. For example, the "business layer" contained information about businesses that contaminate, such as garages and mechanical car cleaning units. The "agricultural layer" supplied information about sources of pollution in agricultural activities such as chicken coops and cow pens. An additional layer contained information on contamination that originates from the sewage system – seepage, breaks, septic tanks etc. In order to evaluate the severity of the problem the various layers are superimposed on a hydrological and geological base layer. The employment of the hydro-geological model (Cost 620)¹ enabled the classification of hazards on the basis of their chemical composition and also determined their weight and impact on ground water. Thus, a map was obtained, which generated a spatial picture of the environmental hazards in Tulkarm and Umm-El Fahem, as well as an assessment of their severity. The ability to determine the location, the party responsible for pollution and the degree of severity of the hazard, constitutes a central building block for the compilation of a list of priorities for dealing with the hazards.



Figure 4.30 Combined environmental hazards map

¹ Vulnerability and risk-mapping for the protection of carbonate aquifers scope-goals-results. European Commission COST 620 Directorate-General Science, research and Development, 2003, Francois Zwahlen, chairman and editor in chief

The scientific document

The scientific document is included, attached to the map. Its purpose was to describe the survey findings, at both the physical level of the hazards and at the institutional level of the municipalities and their departments. The document addresses the different types of existing hazards in Tulkarm and Umm-El Fahem as well as detailing the functions of the different departments in the municipalities. The continuous presence of environmental hazards within the domain of the authority implies a systemic problem within the authority in managing the environment/environmental issues. Even though the municipality is incapable of preventing a person from committing an environmental crime, it does have the ability to maintain surveillance, to enforce the law and to educate the public on the possible impacts of their actions on the ground water. It is important to point out that the municipality itself occasionally functions as a business requiring regulation. If not carefully addressed, this situation can lead to conflicts of interest between municipal departments. In Umm-El Fahem for example there is a solid waste transfer station, owned and operated by the municipality, requiring a business license issued by the municipal business licensing department and yet is subject to environmental restraints enforced by the municipal sanitation department. In addition to enforcement, each municipality has the task of efficiently managing municipal infrastructure so that it will not pollute the ground water. Cooperation between the various departments of the municipality is a prerequisite for efficient management as is the cooperation between the authority and external agencies. The authority's ability to identify and monitor municipal actions that are liable to cause ground water pollution and to counter/restrict potential pollution is the supplementary building block for the treatment and removal of environmental hazards.



Mode of implementation

In order to implement this stage, the field teams of HWE and FoEME conducted a large number of visits to Tulkarm and Umm-El Fahem. The mapping stage was conducted by point visits monitored by town officials, using GPS instruments to determine the exact map reference of the hazards. The evaluation of the functioning of the municipal departments was conducted by means of a series of interviews with different officials and external agencies.

Stage 2:

In the framework of this stage an in-depth analysis of the hazards map, and the accompanying document, was conducted. This stage had two objectives. The first was the development of an environmental policy paper, specifically for Umm-El Fahem and Tulkarm. The second involved the development of a document, spelling out generic guidelines based on the case studies of Umm-El Fahem and Tulkarm. The generic document supplied a base from which other municipalities in both Israel and Palestine can independently implement the Pro-Aquifer Project.

The Policy Paper

The policy paper comprised a set of specific recommendations for the municipalities of Umm-El Fahem and Tulkarm to deal with environmental hazards within their domains. The document took into account the extent and severity of the hazards and also addressed the capacity of each of the municipalities to function as a coordinated unit in order to deal with the hazards. Since the environmental hazards themselves are continuous, ongoing and constitute a complex problem, the document put forward short, intermediate and long-term solutions. Application of the recommendations over time will establish environmental work practices and activities within the municipalities of Umm-El Fahem and Tulkarm, leading to an eventual reduction of the magnitude of pollution to the Mountain Aquifer.

The “Generic” Paper

The “generic” paper is a set of guidelines for those Palestinian and Israeli municipalities which choose to independently implement the Pro-Aquifer Project. The document derives its content from the experience obtained in carrying out the project in Umm-El Fahem and Tulkarm and offers guidance to municipalities, by means of seven primary recommendations, in implementing different stages of the project.

Modus Operandi

In order to implement this stage of the project a great deal of emphasis was placed on cooperation between the field teams of HWE and FoEME. A division of labour was set up between the teams, whereby the Palestinian team focused on the scientific analysis of the hazards and determining priorities for treatment. Meanwhile, the Israeli team concentrated on the analysis of the institutional structures in Umm-El Fahem and Tulkarm and laid out the necessary steps for strengthening the interdepartmental connections.

Stage 3:

Within the framework of this stage, a system of training programs was set up for the employees of the local municipalities of Umm-El Fahem and Tulkarm. The participation of staff from other municipalities, not participating in the project, was also permitted at this stage.

The objectives of this stage were to plan and conduct four training courses for the municipal staff, covering the following topics: sewage treatment, sewage management, geographical information systems – GIS, and the implementation of the guidelines for the Pro-Aquifer Project. In addition, two field trips for the participants of both the Israeli and Palestinian courses were organized to give participants a close-up view of the materials being studied.



Courses

Sewage Treatment – The course trained Israeli and Palestinian municipal staff in the various technologies of sewage treatment. Special emphasis was given to the municipality's ability to handle pre-treatment, a central factor of the authority's ability to prevent damage to the sewage system.

Sewage Management – Within the framework of this course, Palestinian and Israeli managerial staff were trained in the strategies of managing a municipal sewage system. Special attention was devoted to the advantages of employing GIS technology in managing the municipal infrastructure. The ability to prevent breakdowns, by means of constant treatment, strengthens the municipality's ability to prevent ground water pollution.

Geographic Information system – GIS – In this course, Palestinian and Israeli municipal staff were trained in the operation of GIS programmes. The course demonstrated the system's ability to monitor and analyze municipal activity and its influence on the environment. This technique visually illustrates the management of hazards to the ground water.

The Implementation of the Pro-Aquifer Project Guidelines – In the framework of this course, Israeli and Palestinian municipal staff were trained, in various ways, to apply the project in additional municipalities on both sides of the Green Line.

Modus Operandi

In order to determine the content of the training programme an in-depth survey of needs was carried out, designed to determine which study topics would impart the most important additional knowledge to the municipal staff. The courses were conducted in parallel in Israel and in Palestine. The course dealing with the Pro-Aquifer Guidelines was held jointly in Jerusalem. In addition, two joint study trips were conducted through the course to two different sewage treatment plants in Israel, with the aim of exemplifying the studied material, as well as promoting the establishment of a network of water workers on both sides of the Green Line.

Stage 4:

Four objectives were defined for the purpose of publicizing the project. First, a small-scale conference of fifty professionals, Palestinian and Israeli, engaged in an in-depth analysis of the hazards facing the Mountain Aquifer and the capacity of the Pro-Aquifer Project to deal with these hazards. Second, a “popular-styled” conference was held in which the project was discussed before a wide group of participating Israeli and Palestinian municipal staff in order to create exposure and interest within additional municipalities. Third, a paper was published in a professional journal, presenting the project to professional circles. Fourth, this layman’s report was prepared and distributed among as wide a circle as possible.

The Professional Conference

The conference enabled participants to discuss the problems facing the Mountain Aquifer in small workshop groups. This method was chosen to allow Israeli and Palestinian participants to be more active in discourse, as opposed to passively sitting through a lecture.



The “Popular” Conference

This conference allowed for general participation and was held in Umm-El Fahem. The project was presented to this forum and placed emphasis on the municipal activity of Umm-El Fahem and Tulkarm in carrying out the provisions of the policy paper.

The Professional Paper

The professional paper was designed for publication in a scientific journal in order to disseminate the activities of the Pro-Aquifer Project among professionals at an international level. This paper derives from the findings of the scientific paper written after the first stage of the project

The “Popular”/Layman’s Paper

The purpose of the document is to explain the principles of the Pro-Aquifer Project to as many municipalities as possible, in Israel and Palestine, who may be independently interested in applying the principles.

RESULTS

The Pro-Aquifer Project yielded quantitative results. One can enumerate the number of municipal employees who participated in various training courses, as well as the number of environmental hazards mapped out in Umm-El Fahem and Tulkarm. These various figures are of the utmost importance (detailed in the various project reports). Beyond the quantitative aspects to appreciate the results of the Pro-Aquifer Project in depth it is necessary to deepen the awareness of the qualitative importance of Israeli-Palestinian cooperation, the preservation of our water resources from the Mountain Aquifer and, finally, the role of the local authority in this cooperative effort.

The Pro-Aquifer Project details ways of managing/minimizing the risk of environmental hazards in such a manner that they become manageable for any authority that chooses to apply certain strategies (both in Palestine and in Israel). Thus, this is an environmental project, by any definition, which employs advanced technologies and offers both specific and relevant training for municipal staff. A major additional value of the project and one of its more impressive results was the direct meetings of Israelis and Palestinians to discuss mutual interests and act cooperatively.

The Pro-Aquifer Project, during its two years of implementation, has been a consistent channel for a creative meeting of minds between Palestinians and Israelis. Regular meetings dealing with water took place between Israeli and Palestinian professionals from different municipalities, together with academic staff and fieldworkers. The results are evident in the maps of the hazards drawn up for Tulkarm and Umm El-Fahem; reaching beyond their quantitative results, they are the positive outcome of cooperative thought. This demanded exchange of and cooperation over environmental information from both Palestinian and Israeli municipal employees. Field trips, in which Palestinian and Israeli professionals participated, also yielded beneficial cooperation beyond the direct issues of the project itself.

Above and beyond the quantitative results and the Israeli-Palestinian cooperation, the Pro-Aquifer Project, by virtue of its implementation in Umm-El Fahem and Tulkarm, created a mind-set transformation among the municipal workers themselves. The change is in the perception of the role fulfilled by the employee, incorporating environmental values into his everyday activity. There is a significant recognition of the fact that a breakdown in the sewage system does not merely conclude with its repair, but concludes only when the leaked sewage is drawn back into the system rather than being left to seep into the soil. Aided by GIS technology, managerial staff in the local authority are now capable of planning checks in hydrologically sensitive areas and of justifying more severe standards for the use of equipment in those areas. The internal cooperation within the authority is based on shared information, both visual and environmental, that now exists within the internal networks of those municipalities.

The Pro-Aquifer Project creates a way for the local authority to advance environmental issues within its jurisdiction. The GIS system, presented to the municipalities of Umm-El Fahem and Tulkarm, as well as training in the use of relevant programmes, constitutes a base for the generation of further layers of information, which the authority can use for the benefit of its population. For example, the authority can cross check the vital environmental data it

has collected against information about a new business enterprise requesting a license. In the event that proposed business activity has environmental implications, the authority can arrive at a decision with the appropriate ecological considerations in mind. This opens many opportunities, within the authority's domain, for a more environmentally favorable future.

The optimal way to measure the results of the framework presented by Pro-Aquifer Project is over time. Change, especially change in perceptions, is a long continuous process. The Pro-Aquifer Project, by means of its mapping system, supplies the authority with the capability of visually measuring this change over time, while employing environmental measures providing the tools for trans-boundary cooperation.