

## **WATER CONSERVATION STRATEGY AND ACTION PLAN**

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### **Preface:**

The conventional water resources now available in Palestine are barely sufficient to maintain the current quality of life and economy. Attempting to meet the future demands by simply increasing withdrawals of surface and groundwater will result in further unsustainable development, with depletion of fresh water resources and widespread degradation. Because these conditions already exist, the reality of a constrained water supply must be considered in formulating the economic plans and policies. It seems likely that demand and supply can be brought into a sustainable balance only by changing and moderating the pattern of demand, or by introducing new sources of supply, or both. Above all, water losses should be minimized and water use efficiency increased substantially.

### **Goals:**

Conserve existing water resources by building public awareness and participation.

### **Policy:**

Conservation and optimal utilization of water resources should be promoted and enhanced by implementing management controls and water conservation measures.

### **Objectives:**

- 1- Reduce unaccounted for water to 28%-30% of supply by year 2010.
- 2- Rehabilitate existing wells and springs to improve efficiency.
- 3- Reduce system physical loss to 23%-28% of supply.
- 4- Reduce illegal connections to not more than 1% of supply.
- 5- Implement conservation education programs to include women and emphasize domestic conservation opportunity.

- 6- Modify legislation to strengthen and enforce water conservation, ensure licensing and encourage recycling.
- 7- Implement leak detection program.
- 8- Save 11% of annual supply through implementation of conservation measures.
- 9- Minimize water demands and losses through improving irrigation and domestic supply efficiencies.
- 10- Conservation measures will be initiated on existing irrigation schemes.
- 11- Install new meters where appropriate.

### **The Existing Situation:**

The present situation in the water sector in Palestine and the challenges to be faced are summarized by:

- Water resources in the region are extremely scarce, disputed and increasingly costly to develop which is limiting the opportunities for regional transfers. Water resources, particularly in the Gaza strip, are well above the level of stress due to water scarcity.
- Water demand is continuously growing due to population growth, economic development, and rising standards of living. Current population is about 2.1 million in the West Bank and 1.1 million in Gaza and expected to double in 20 years.
- Water supply and sanitation services are inefficiently delivered as well as inadequate, in respect of quantity, quality and reliability. Coverage is limited, the present net per capita consumption in the West Bank is 56 l/c/d and in Gaza it is 81 l/c/d, which is far below the acceptable standards.
- Tariffs are generally inadequate and many institutions are fragmented and lacking autonomy.
- There is insufficient control on water development and consumption and water losses are excessive.
- There is insufficient maximization of rainwater precipitation before this water is unacceptably polluted or lost to run-off.

- Wastewater, which is potentially a significant resource, is not yet satisfactorily reclaimed and utilized.

While the dominant water resource issue in the West Bank is access to the most economically exploitable resources, in Gaza the major issue is water quality, caused by over-exploitation of the coastal aquifer. In the West Bank, Palestinians have access to only 20% of these renewable resources, while only 5% of Gaza water conforms to WHO drinking water quality standards.

Due to the above mentioned, urgent actions are to be considered with regard to water management demand and conservation.

### **Managing Demand:**

Water shortages have already been faced as a result of scarce water resources and drought faced in the last years which might be overcome by managing demand through the reduction in water use -with no net loss in agricultural production or economic growth- this indicates what can be accomplished in the way of demand moderation. In practice, demand for water can be influenced by conservation measures in domestic, agricultural and industrial sectors, and by economic (pricing) policies. It is important to recognize that, while demand management efforts may economize on water effectively, they are also rarely costly.

### **Conservation:**

Given the inevitability of population growth, it is imperative that per capita consumption of water be addressed through conservation measures in all sectors of water use, and here we will concentrate on the agriculture and domestic sectors that consume 97% of the available water. Although the per capita in Palestine is below the WHO standards, conservation requires lowering the per capita water use without significantly degrading the economy or standard of living.

Conservation measures to reduce water demand are generally well established, but they often require societal or economic incentives to implement. Although some conservation measures are costly, most compare favorably with measures to increase water supplies. Moreover, water conservation measures invariably have a positive effect on water quality and the environment, if only by minimizing the impacts on freshwater resources and the volumes of wastewater generated by human activities.

**Domestic Sector:**

In the domestic sector, conservation measures are most effective when they have broad public support. Important voluntary domestic water conservation measures include the following:

- Limiting toilet flushing.
- Adopting water-saving plumbing fixtures, such as toilets and showerheads.
- Adopting water-efficient appliances (notably washing machines).
- Limiting outdoor uses of water, as by watering lawns and gardens during the evening and early morning, and washing on lawns and without using a hose.
- Adopting water-saving practices in commerce, such as providing water on request only in restaurants and encouraging multi day use of towels and linens in hotels.
- Repairing household leaks.
- Limiting use of garbage disposal units.

Public support of such measures is highly variable because many of them are voluntary, relying on individual actions, or have negative societal impacts.

The advantage we have in this regard is that the populations are relatively well aware of how water is used. Public awareness of levels of water use is the key to effective water conservation programs.

Involuntary conservation measures applied to the domestic sector are easier but more expensive to implement. Such measures include repairing leaking distribution systems and sewer pipes, expanding central sewage systems, metering all water connections, and rationing and water use restrictions. Improvements to municipal water systems, such as repairing or replacing leaking distribution systems, and achieving total metering of all water use could be accomplished as part of government policy. These measures are expensive, but the costs and potential water savings must be weighed against the costs of developing equivalent alternate supplies. The dynamic growth possible in both public and private sectors holds the promise of incorporating water conservation measures into the new infrastructures to be built.

Much of the apparent conveyance loss in municipal water systems is actually the result of the bad situation of the net works (relatively old), illegal or nonmetered connections, or errors in metering. Accurate

metering at all connections will promote the adoption of voluntary conservation measures as well as quantifying actual conveyance losses.

In conclusion, domestic water conservation efforts are attractive when evaluated against these criteria (Impact on Available Water Supply, Technical and Economical Feasibility, Environmental Impact, and Implications for Intergenerational Equity).

Although conservation will not usually result in augmentation of available supplies-one possible exception being the repair of leaky distribution systems- conservation measures are generally technically and economically feasible; have no adverse environmental consequences; and, by conserving current water supplies, tend to preserve the resources available for both present and future generations.

### **Agriculture:**

Through rationing, research, and possibly economic pricing policies, agriculture water can become more efficient. However, as regional nonagricultural water demand increases and the cost of additional water supplies grows more expensive, the role of agriculture in the area's economy will have to be reevaluated, so that as much water as possible is conserved. We might adopt agricultural practices more in harmony with the ecological realities of dry lands. Dry lands are and will likely remain marginal for subsistence agriculture, unless the practice is heavily subsidized by water drawn from elsewhere.

A number of useful practices are already used to some degree in the West Bank and Gaza, and these practices should be expanded to help conserve agricultural water use:

- Harvesting local water runoff and floodwater to increase water supplies for dry land agriculture.
- Reducing evaporative water loss by cropping within closed environment (desert greenhouses). This method is economic with land and water use, avoids soil salinization, and produces high yields of exportable crops, such as ornamentals, fruits, vegetables, and herbs.
- Using computer-controlled drip "fertigation" (fertilizer applied with irrigation water) and soil less substrates in greenhouses, which economizes on water and fertilizer use and helps prevent ground-water pollution.

- Considering the use of brackish water for irrigation of salinity tolerant crops.
- Saving more freshwater by switching to irrigation with treated wastewater or with brackish water if possible.
- Changing production from crops with high water requirements to crops with lower water requirements.

### **Pricing and Pricing Policies:**

Policies that subsidize the price of water or emphasize revenue recovery to the exclusion of economic efficiency are poorly suited to areas where water is scarce. Conversely, pricing policies that promote economic efficiency and economizing in water in water use are more appropriate for regions of increasing water scarcity.

### **Marginal Cost Pricing:**

The use of marginal cost pricing help conserve freshwater resources. As long as marginal costs are higher than average costs, the use of marginal cost pricing will ensure that revenue requirements are met. Marginal cost pricing also sends the correct signals to consumers about the true cost of water and, given some fixed level of benefits, ensures that the costs of providing the water are minimized.

### **Time-of-Use Pricing:**

Time-of-use structure discourages use of water during peak-use periods in order to ration water during high use but specifies lower pricing during off-peak usage.

### **Water Surcharges:**

Water surcharges, imposed beyond some set level of use, can be employed to discourage excessive use.

### **Water Markets:**

Water markets, where marginal cost prices are used, can help allocate water among sectors more efficiently. Markets permit transfers of water to occur on a strictly voluntary basis. Such transfers occur when the difference between the minimum price that sellers are willing to pay is sufficient to cover any costs of transport or treatment.

Even if water markets are never developed in West Bank and Gaza, simulation of water markets can be very useful in identifying the value of water for alternative uses and regions. Such simulation can also help identify additional water supply and conveyance facilities that are economically justified.

### **Regulatory Measures:**

The legal and regulatory framework for the water sector is currently being upgraded and under preparation, these sets of rules will be enacted and applied by the Palestinian Water Authority in carrying out its regulatory functions in the water sector. These regulations will secure an environmentally sound and sustainable development of the national water resources through issuing licenses that insure the society sufficient water with acceptable quality, carry out the needed control of the abstraction and supply and protect all water resources from depletion.

These regulatory measures are essential to conserve the water being pumped from the private owned wells, and will also enable in reducing the unaccounted for water.

### **Water Conservation Action Plan**

**Preface:** Due to the water scarcity and increasing demand on water in the West Bank and Gaza, we are in need to increase the awareness among the people of the vitality of water, and try to change the behavior towards water consumption and conservation, because ground water is the only source of water, which is been utilized from drilling wells and from springs.

Water supplied to West Bank -estimated population 2.1million-for the domestic sector in the year 2000 was around 60 Mcm, and the Israelis control more than 50% of this supplied quantity.

Due to the lack and shortage of water -specially in the summer time-because of the limited water resources and the control of the Israeli's occupation, in addition to the imbalance between water demand and availability specially after the drought seasons, and above all comes the misbehavior of the consumers in the way they are using water and wasting it without realizing its value.

So, the conservation and protection of the available water resources and limiting of water waste should become a top priority task.

A pilot area (Ramallah-AlBireh) was selected to apply the water conservation plan. This project will start in the year 2003 and will be funded by the Netherlands government, on the next year the project will be evaluated and recommendations will be taken in consideration to implement this plan in other governorates.

**Action Plan:** In this action plan, media will be used because they are many and its effect on people differs according to their nature, culture, and interests. T.V and Radio are considered the most used and present in houses, so they are the most effective in changing the attitude and behavior of the people towards water use and conservation.

### **T.V and Radio:**

T.V and radio entered nearly every house, and it has become necessary because it is both cultural and entertainment media in the same time, so we will be using it to give the information and what is required in so many different ways, that suits everybody and which will be as follow:

- Preparing T.V and Radio series to spot on the relation of water with the consuming sectors and view the present and future of water so as to develop a better understanding to the situation of water and the required roll of everyone.
- Preparing an explanatory film or program about the current and expected future water situation, explain about available water resources within the current political situation, the deficit in water balance, and how to use water in a high efficiency to reduce the existing water deficit.
- Make an open dialogue between the citizens and the water top officials, and giving the citizens the chance to present their water related problems and questions.
- Make short cuts and explaining the best ways in water usage and explaining the quantity of water used in every way, and each shot should be separate.
- Viewing some slogans that call for water conservation.
- Prepare and view the previous mentioned in cartoon.

Signs: Put signs at the entrance of the main cities, city centers and other places contain slogans and drawings indicating to one of many water conservation titles such as (towards water sustainability) so as to direct



the interests of the citizens towards water importance and the need to save it for future generations.

Pamphlets: Prepare a pamphlet under a slogan such as “I am a friend to water.... Are you?”. This will be distributed attached with water bills- with the help of municipalities and councils- to all water consumers. This pamphlet will contain information on the consumed water quantities in the different sectors so as to try changing the citizen’s attitude and behavior towards water by themselves and enhance their national feeling that water must be conserved, and conservation methods must be adopted also.

Newspapers: Subjects and articles about water issues with a special concentration on water protection and conservation, also advertisements about water conservation and existing water situation are to be published in the newspapers.

Competing articles about water conservation may be done, and a reward to be forwarded to the best article or topic.

Stickers and Procures: These are to be done and address the subject (how to use water more efficiently). It will include the quantity of water used in every aspect of usage, quantity of water saved if the method is changed, and the effects on water sustainability. In addition to the concentration on saved and wasted quantities.

These stickers and procures will be distributed to the water consumers and will include the following terms: Do you suffer from raise in the water bill? Did you think how to reduce the bill? All what you have to do is follow the followings.

## **Appendix 1**

Water is life ..... let’s save it !!

- Last summer was tough, do we want to face another tough summer?!
- Water is a treasure, let’s safeguard it like we do to our children and money.
- Water is the cheapest present, and the most precious when missed.
- Water is the spring of life, to use it economically is the responsibility of everyone.
- To protect our water, let’s prevent water theft.
- Every saved drop of water can save a life.

- Save water for yourself and for future generation.
- So much of our money is wasted substituting the wasted water, and that is because:
- Leaving the taps leaking without fixing them
- Not doing the required maintenance to the water tanks and pipes.
- Passing on a leaking pipe and not informing the authorities about it.
- We ask for our water rights, and we don't pay our bills.

## **Appendix 2**

### **In Your Home**

1. Never pour water down the drain when there may be another use for it; Use it to water your indoor plants or garden.
2. Make sure your home is leak-free. Check your water meter when you are certain that no water is being used. If the meter reading changes, you have a leak!
3. Repair dripping faucets by replacing washers. One drop per second wastes 2,700 gallons of water per year!
4. Install a toilet displacement device to cut down on the amount of water needed for each flush. (Don't use a brick! There are devices available at most hardware and home centers.) Be sure installation does not interfere with the operating parts. Consider low-volume toilets that use less than half the water of older models. NOTE: In many areas, low-volume units are required by law.
5. Take shorter showers. Replace your showerhead with an ultra-low-flow version.
6. Place a bucket in the shower to catch excess water to water plants.
7. In the shower, turn water on to get wet; turn off to lather up; then turn the water back on to rinse off. Repeat when washing your hair.
8. Operate automatic dishwashers and clothes washers only when they are fully loaded or set the water level for the size of load you are using.
9. When hand washing dishes, save water by filling two containers-one with soapy water-, one with rinse water containing a small amount of chlorine bleach.
10. Do not use running water to thaw meat or other frozen foods. Defrost food overnight in the refrigerator, or use the defrost setting on your microwave.

11. Don't let water run while brushing your teeth, washing your face or shaven.
12. Install water-softening systems only when necessary. Turn softeners off while on vacation.
13. Water lawns during the early morning hours when temperatures and wind speed is the lowest. This reduces evaporation and waste.
14. Install irrigation devices that are the most water efficient for each use. Micro and drip irrigation and soaker hoses are examples of efficient devices.
15. Report water losses (broken pipes, open hydrant, errant sprinklers, abandoned free-flowing wells, etc.) to the property owner, local authorities or your water management district.
16. Promote water conservation in community newsletters, on bulletin boards and by example. Encourage your friends, neighbors and co-workers to "be water smart".
17. Conserve water because it is the right thing to do- even when someone else is footing the bill, such as when you are staying at a hotel.
18. Try to do one thing each day that will result in saving water. Every drop counts!

### **Appendix 3**

Do you know that?

- 60% of water consumed in houses is used in bathrooms and in bathing.
- 15% of water used in houses is used in watering lawns and gardens.
- 20% of water used in houses is used in washing and cleaning.
- Only 5% are used for drinking and cooking purposes.