

Fragebogen der Enquete-Kommission des Deutschen Bundestages
„Globalisierung der Weltwirtschaft – Herausforderungen und Antworten“
zum Thema „Wasser – Ein weltweit immer knapper werdendes Gut“

Beantwortung der Fragen von

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I) Development Policy Aspects of Fresh Water Supply and Waste Disposal

Water Supply and wastewater disposal

1) What are the main causes for the scarcity of drinking water in various Regions?

(a) Water resources availability

The availability of water in any region depends to a large extent on the climate and more specifically on the distribution of rainfall in time and space. Although from the global scale water budget, it appears that there is enough fresh water to meet the demands of the human survival, both now and in the foreseeable future, however, water is often available in the wrong place, at the wrong time, or in the wrong quality. This uneven distribution is highlighted in the arid regions of the Middle East where low rainfall is usually combined with high rates of evaporation, and hence smaller amounts of water are available for human use.

(b) Increased Water Use and Demand and demographic shifting

Water shortages are becoming a global problem and the World is moving toward shortages of fresh water due to increased water use/demand. An illustrative example is the case of the countries of the Middle East and North Africa (MENA). The region, home to 5% of the world's population is poorly endowed with natural freshwater supplies and have less than 1% of the world's renewable fresh water. The population, which is growing against this background of finite freshwater resources, has doubled during the past 30 years to about 280 Million. Demand due to increased urbanization, industrialization, and agriculture development has exploded in recent decades, thus further stressing existing finite resources and reducing water availability for domestic purposes.

Other source of pressure on finite water resources originate from demographic and population shifting resulting from political instability and regional conflicts. Jordan offers a good example in this regard whereby the impact of limited water availability was exasperated by influxes of refugees during the 1948, 1967 war with Israel, and the massive inflow of almost half a million returnees after the gulf

war in 1990. Hence, the per capita share of renewable water resources dropped from 3000 m³ in 1946 to its present level of 170 m³.

(c) Water Quality Degradation

Loss of fresh water availability may also be due to degradation in water quality. Typical causes in the region include: contamination by fertilizers and pesticides, uncontrolled seepage from septic tanks, unregulated disposal of waste, groundwater salinization due to overexploitation and changes in surface water quality due to upstream diversions/abstractions, and increased treated wastewater effluents discharged to surface water bodies. The cumulative impact of water quality deterioration is taking a serious toll on many of the water resources in the region. Due to upstream abstractions, the total discharge of what could have been a major river in Jordan; the Jordan River, dropped from 1370 Million Cubic Meter (MCM)/year to 250-300 MCM/year, mostly as irrigation return flow, inter-catchment runoffs or saline springs diversions. In addition, the majority of the water flowing in Jordan's Zarqa River is presently treated effluent from the heavily urbanized area of Greater Amman and Zarqa. Morocco's most important river, the Sebou, has become a waste dump for the cities along its banks. Tunisia's largest reservoir, Sidi Salem, and Algeria's Mitidja and Saida aquifers are threatened by pollution from cities, industrial effluents and agricultural runoffs. The Nile water in Egypt is also contaminated by uncontrolled industrial and agricultural discharges.

2) What development trends can be distinguished?

(a) Development of water supply and wastewater disposal

Global water use has increased fivefold this century and today's per capita availability is predicted to decline by a third over the next generation. Water shortages are rapidly emerging even in water-rich countries and recent droughts in Europe and North Africa have emphasized the precarious balance between water supply and demand. In 1995, 29 countries with populations totaling 436 million experienced water stress or scarcity. By 2025 about 48 countries will do so and the number of people adversely affected will exceed 1.4 billion, the majority being in the least developed countries. This number however, is predicted to reach 3 billion people in 2035.

There are about 1 billion people without an adequate supply of drinking water, of which about 45 Million are living in the countries of the MENA region. In addition, about 2 billion people are without adequate sanitation services world wide, of which 80 Million are in the Middle East and North Africa, where water availability is falling to crisis levels. Annual per capita availability estimated now at 1250 M3 in the region is expected to fall to about 650 M3 by 2025. This however, masks extreme local variability. Per capita availability in countries like Jordan, Yemen, the West Bank and Gaza, the Gulf States, is less than 200 cubic meters, already way below the projected regional average in 2025.

(b) State of groundwater and potential threats

Due to severe water shortages, groundwater aquifers are being pumped unsustainably in many developing and some developed countries. To cover current deficits in Jordan, over-drafting of renewable groundwater resources is over 100% above safe yields. Over-drafting in Yemen is at 130% above safe yields. In Gaza, aquifers are being mined even faster. Similar practices are also present in the Gulf States. Overexploitation of groundwater aquifers has and will contribute significantly to the lowering of water tables, degradation of water quality, further damage to groundwater reserves through salt water intrusion or leaking of pollutants, and hence endanger the sustainability of such resources for future use.

Overexploitation of groundwater also poses problems on others sectors in the economy and is forcing agriculture practices to contend with increasing salinity. Increased salinity in groundwater also results from increased usage of treated effluent. Other prominent water quality issues include the loss of groundwater to foecal contamination in the absence of sanitation.

(c) Price Trend

There is increased understanding that effective water resources management includes the management of water as an economic resource. Subsequently, one priority issue for the economic management of urban water supplies is the commercial operation of the utility and accentuating the financial viability of the water sector operations. Presently, almost no water utility in the countries of the region recovers its full operation and maintenance cost, and hence, huge financial transfers are required. However, there is an emerging consensus that tariff structures that cover service cost should be designed while keeping lifeline use affordable to the poor. This will pose extreme challenge to water scarce countries such as Jordan, where development of additional water will be extremely expensive and will reduce even further its affordability to the poor.

3) What will be the consequences if no additional measures are put in place in the future with respect to water supply?

- (a) Shortage in potable water availability below limits of hygiene and internationally recommended standards will be reached.
- (b) Worsening crisis of water scarcity will adversely affect economic growth, and subsequently constrains the investment needed to improve water availability, access to water and adequate sanitation.
- (c) Decrease in food security and increased dependence on food trade.
- (d) Increased risk of friction and social tensions between countries / regions that have limited water availability and depend on shared water - as is already the case along the rivers Euphrates Jordan and others.

- (e) Additional Depletion of groundwater, resulting in dry-up of aquifers and deterioration of its quality and subsequent negative environmental and socioeconomic impacts.
- (f) Deterioration of service level in water utility and reduced customer satisfaction

4) What possibilities do you see for rectifying the existing and growing gaps in water supply and wastewater disposal within a reasonable period of time? What potential do you see for increasing the efficiency on the part of the major users (agriculture, industry, private users)? What instruments appear promising in terms of maximizing the efficiency of water supply and wastewater disposal? What according to experience, is the minimum level of public control that needs to be ensured?

- (a) On the possibilities for rectifying the existing and growing gaps in water supply and wastewater disposal within a reasonable period of time

Water Supply

The opportunities to close the widening gap between water supply and demand are in conservation, maximizing the development of traditional sources, developing non-traditional sources, and transferring water from agriculture to municipal and industrial sectors.

Clearly, conservation of resources is very important. However, in the case of Jordan, where we have a chronic water deficit, the present supplies are below requirements, the quantity of water saved will have a relatively small impact on the overall water available.

Traditional water sources are surface water and groundwater. As has been explained elsewhere in this document, many of the viable sources have been developed and, in many cases, are over-exploited. The development of the remaining sources must be a major component of closing the water supply gap in the region and alleviating the pressure on the already developed sources. Because the most easily available sources have already been developed, the new sources, which are further away and require more pumping, will be more expensive to develop and operate.

Non-traditional sources include water reuse, desalination of seawater, desalination of brackish groundwater, and fossil water.

Water reuse, for cultural and public health reasons, cannot be used for municipal supply. However, by using this water for irrigated agriculture or industry, it can reduce the demands on present and future water supplies. In Jordan over 90 percent of the treated wastewater is indirectly used for irrigated agriculture, and

future supplies offer an opportunity to sustain irrigated agriculture, especially where fresh water supplies are no longer available. There are increased challenges with managing irrigated agriculture with this water supply, which requires capacity building for farmers, and water and agricultural professionals.

Desalination of seawater is already widely adopted in the region, especially in areas where energy prices are low and the need is near to the coast. It will continue expand as a source of water. Despite recent developments that have resulted in reductions in the cost of desalination, it remains significant, especially in countries which don't have access to inexpensive energy. Conveyance from the coast to the point of use further adds to the cost. Further emphasis on improving the efficiencies of desalination is essential.

Desalination of brackish groundwater, where it is available, offers similar opportunities to using seawater and, because it is less saline, at a lower cost. Jordan is presently developing a brackish water source of 50-MCM/year to help address the water deficit of Amman.

Fossil groundwater, that is groundwater that has little appreciable natural recharge, is a significant source for development. In the case of Jordan, the Disi aquifer in the south of the country is particularly good quality, and will allow the country to meet 120-MCM of its water supply needs for the next 50 years.

Transfer of water from agriculture to municipal and industrial uses can provide urgently need water supplies. This, however, impacts the agricultural sector, and has significant social, legal and political implications. Returning treated wastewater to irrigated areas can alleviate such impacts, but requires the enhancement of management skills. Not all sources of water used for agriculture are suitable for municipal use

Wastewater Disposal

To protect the environment and to make wastewater available for use in irrigated agriculture requires the necessary infrastructure to capture, convey, treat, and dispose of the wastewater. The use of this effluent in irrigated agriculture not only offers an opportunity to reduce the demand on fresh water resources, but it allows for the return of the water to the environment.

(b) On the potential for increasing the efficiency on the part of the major users (agriculture, industry, private users)?

Water Supply

As agriculture is the largest user of water (~70% in Jordan), the potential to conserve water through increased efficiency, is the greatest, although in many

cases, including the Jordan Valley, the farmers are already using less water than is needed to maximize yields and, as is the case this year, have not planted the late summer crops because of lack of water. Water can be conserved in the conveyance and delivery systems, and on-farm.

In Jordan, industry presently only uses 4 percent of the total water supply, generally efficiently. Major users, such as power plants, have improved efficiencies through the use through process changes. The opportunities to conserve water by increasing efficiencies are limited.

Improving efficiency of municipal and domestic water systems can be achieved through rehabilitation of the physical system, improving the management of the systems, including private sector participation (PSP), and encouraging conservation by the users.

(c) On the instruments that appear promising in terms of maximizing the efficiency of water supply and wastewater disposal?

Water Supply

The most promising instruments for maximizing efficiency of water supply are rehabilitation and betterment of the infrastructure, improvement of the management and operation, public education, and realistic tariff structures.

The rehabilitation and betterment of the infrastructure applies to all the facilities, from the capture and conveyance, through to the taps or outlets of the user. Improving the management and operation includes reducing the quantity of unaccounted for water, and privatizing the system operations, as is being introduced in Jordan.

Public education is very important to ensure that waste of resources by the user is minimized. Even in Jordan, where the public is familiar with rationed water supplies, the use of water saving devices at the household level is being promoted. In addition, passing on the cost of delivering the water to the users in the form of water tariffs provides further incentives to conserve resources. However, to protect the poor, it is vital that there be cross subsidies.

Wastewater Disposal

As with water supply, the rehabilitation and betterment of wastewater infrastructure is key to improving the efficiency of the system. By increasing the number of households connected to the sewer system, the quantity of treated effluent available for return to the environment or for reuse increases. Furthermore, connection of households to the sewer system ensures that they are not polluting underlying groundwater or surface water sources.

Improving the management and operation of the wastewater system, as with the water supply, improves the efficiency. Jordan is in the process of privatizing the operations of As Samra, the main wastewater treatment facility for Amman.

(d) On the minimum level of public control that needs to be ensured?

The role of Government in water supply and wastewater development is to plan, regulate, monitor and enforce.

Concepts and Models

5) Is there any experience available with models which guarantee this minimum level of supply and disposal for the economically weak?

- **What are the most important models?**
- **How can they be financed?**

One model to guarantee minimum levels of supply for the economically weak is the consequent development and construction of piped water supply systems in combination with cross-subsidized water tariffs.

By maximizing the access of the population to public, piped water supply systems, the dependency on high priced water tanker supplies or other alternative sources through private vendors decreases and the leverage of appropriate water tariffs, subsidizing the low-income group water consumption increases.

This model is applied in Jordan.

The funding of the initial infrastructure development is provided by the GOJ with the help of external donor assistance. The water tariff is structured in such a way as to guarantee the minimum needed consumption for hygienically safe living conditions at a subsidized fixed price per m³ and to recover these subsidies from customers with higher consumption. A progressive pricing per m³ is as well seen as a controlling mechanism to water wastage.

6) Are there any estimates of what it would cost to make good the gaps in water supply and wastewater disposal?

As discussed in the answer to question 4, the water sources, whether traditional or non-traditional, which can be developed become increasingly more expensive as the sources get further from the users or the technological requirements to develop the sources (e.g. desalination) increase. In Jordan, the projects now being development are expected to result in total water costs of around \$1.5

per m³. At 150-l/c/d (liter/capita/day), this translates into \$82/person/year.

Because the water supply consumed is very low, the wastewater produced is very strong and, therefore, expensive to treat to levels that can be safely returned to the environment or reused. Wastewater treatment costs to produce a good secondary treated effluent are at least \$0.50-m³.

Combining the water supply and wastewater costs, the cost to supply a cubic meter of water and return it to the environment is estimated to be \$2.00-m³, or \$110/person/year. To put this in perspective, the present GDP in Jordan is around \$1,500. As new resources have to be developed, this is expected to increase.

With respect to conservation, whether it be through public education, improved management or improvement of the infrastructure, costs are generally less. In the long-term, however, the quantity of water available is finite, and each incremental increase in efficiency will be increasingly more expensive than the last.

12) What are the connections between water as a resource, environmental protection and the needs for future generations, e.g. in terms of soil erosion, artificial interventions in river courses, preservation of groundwater, desertification, climate change, etc?

General remarks:

Water is of essential importance for any living being as it is a basic nutrient and water serves as a habitat for various plants and animals. But as well it is essential for any economical development. With regard to the physiological and ecological functions of water the necessary quantitative and qualitative needs are defined in international standards and can be used as a guideline. But besides these physiological and ecological functions water serves as an economical good as well, either as food, raw material for further processing, as energy source or as a mean for traffic and transportation. The demand exceeding physiological and hygienic needs depends on the economical development and the way of life and may vary considerably.

Sustainable development requires taking adequate consideration of the demands of future generations bearing in mind the physiological, ecological and economical functions of water. Hence sustainable water resources management and environmental protection are closely related.

Considering the very limited natural water resources in the Middle East and the presently high population growth it occurs to be a great challenge to apply sustainable water resources management avoiding water consumption on the

expenses of future generations. Reducing the population growth is the most challenging task towards a sustainable water management.

Regional Aspects

Water has been the key natural-resource issue during the three millennia of recorded history in the Middle East. No other region of the world embraces such a large area, with so many people striving so hard for economic growth on the basis of so little water. But within the region the availability of renewable water and the per capita consumption varies significantly from country to country. Some countries like Jordan, Libya, Saudi Arabia, UAE and Yemen already overexploit the renewable sources to meet their demands. Ground water resources are overexploited throughout the region. Current net per capita use for municipal purposes averages 230 l/c/d in Israel, 70 l/c/d in Jordan and 45 l/c/d in the West Bank.

In the Middle East and North Africa only 19% of the land surface receives good rainfall; with the partial exception of Turkey, the whole region is arid to semi-arid. In Africa and Middle East, water supply for agricultural, domestic, and industrial use, as well as for environmental use (rivers, habitat preservation, transportation, fishing), has kept pace neither with population growth, which is the fastest in the world, nor with economic growth, which is booming in many countries in the region. As a result, by 2025, the amount of water available per person in the Middle East and North Africa is expected to drop by 80%, in a single lifetime, from 3430 m³ to 667 m³. New or additional sources of water are becoming scarce and more expensive to develop [3.a]. The least cost solution for short and medium term fresh water development lies in saving water through demand management. In Jordan the total renewable water resources are less than 200 cm³ per capita and year. Considering the yearly population growth rate of presently 3 % the situation is likely to worsen dramatically.

But not only in terms of available water quantities the situation is likely to worsen. Deterioration of water quality endangers the development of future generations as well. The main causes of quality deterioration are insufficient sanitation, solid waste disposal sites in water sensitive areas, industrial wastes, intrusion of salt water due to groundwater overdraft and agricultural emissions.

(a) On Soil Erosion and agricultural emissions

An increase in soil erosion can be noticed almost all over the world and is on first rate due to inappropriate agricultural practices and/or desertification. The loss of protecting layers may pose severe problems for the groundwater quality as contaminated surface water can intrude into the aquifer without any filtering. On the other hand clay and silt sediments e.g. in the mud pans of the deserts reduce infiltration and increase evaporation.

Irrigation does not only increase yields significantly, it also poses environmental problems. In most countries in the region, agricultural runoff is the major non-point source of pollutants, including sediment, phosphorous, nitrogen, and pesticides. Per-hectare use of pesticides and fertilisers in Israel, Jordan, and Palestine rates among the highest in the world, and runoff is correspondingly high. One result of this is that over the past two decades, nitrate (from both fertilisers and reused sewage effluent) concentrations in the coastal aquifer underlying Israel and the Gaza Strip have doubled. In Syria, Al-Sin Lake, the main freshwater source, is polluted by runoff. Such problems are anything but inevitable. Practices like conservation tillage, contour planting, terracing, and the use of filter systems can control soil erosion and reduce phosphorous and nitrogen runoff by up to 60%.

Soil erosion and agricultural emissions need to be a major subject to any environmental protection policies in the region in order to ensure the usage of our scarce water resources in the future.

(b) Preservation of Groundwater

Groundwater comprises the major part of the total renewable water resources in Israel, Jordan and Palestine (1400 MCM/year out of 2700 MCM/year) [1], hence its preservation is of utmost importance for these countries. As mentioned above almost all countries throughout the Middle East region are presently overpumping the renewable groundwater. Jordan aims to reduce the groundwater abstraction, presently rating 160 % of the safe yield, to the safe yield by the year 2020.

According to progressing groundwater quality deterioration an integrative approach is needed to reduce hazards from inappropriate waste disposal, industrial pollution, excessive application of fertilisers and chemicals in agriculture. The ideas of an integrative groundwater management are reflected in the latter groundwater policy of Jordan.

(c) On Artificial Interventions in River Courses

Major water resources in the Middle East region are shared between countries. The most important river basins are those of the Jordan, Nile and Euphrates/Tigris out of which only the Jordan basin is entirely within the region. Artificial interventions as dams e.g. to develop surface water resources for irrigation directly affect downstream users and the aquatic ecosystem of downstream segments of the river as it became evident in the lower Jordan River. During the summer the freshwater resources of the Jordan River are completely used for irrigation purposes; Also the resources of the Yarmouk River contributing to the Jordan River are almost completely used in late summer resulting in very poor quality of the remaining Jordan River water. In the result of the intensive surface water usage in the Jordan River basin and overdraft of

groundwater the water level of the Dead Sea dropped 21 meters in the period 1930-1998 consequently affecting the groundwater system.

Yarmouk River and Jordan River systems are essential for the development of the region. Jordan covers almost 1/4 of its water budget with Yarmouk water. The water allocation is not yet based on international principles like Helsinki Rules on the Uses of the Waters of International Rivers (1966) rather it is based upon bilateral basis with the consensus of the neighbouring countries.

Looking at the sources of the Nile, Tigris and Euphrates basins it becomes evident that the Middle East is extremely depending on external sources. About 85 % of the annual average discharge of the Nile originate from the Ethiopian highlands with most of the balance originating in Central Africa. The Euphrates originates in Turkey, which contributes 94 % of the flow. The Tigris receives 40 % of its flow from Turkey. The Turkish plans to develop huge irrigation areas within the South-Anatolia-Project may pose water shortage on Syria resulting in an increasing use of Yarmouk water affecting the Jordanian water budget.

(d) On Climate change

As for Jordan, with the exception of the hydrological year 1991/92, the last ten years can be considered as dry to very dry with rainfall far below the average causing severe water shortage due to very little surface water. The dams in Jordan contain presently only about 20 % of their capacity. Irrigation lands have been reduced by 50 % therefore. But long-term rainfall recordings do not yet allow describing a significant trend.

(e) On Desertification

Desertification has its origin in a complex of environmental and socio-economic interactions. In developing countries poor education is closely related to constrained economical development subsequent to a shortage of natural resources like water. The common result is a very high population growth rate. High population growth claims for intensified food production leading to growing livestock production and grazing intensity. But as fodder demand exceeds the natural productivity, soil protecting vegetation fades away. The soil becomes prone to eroding forces like wind and water, desertifications starts. If the productivity of the natural vegetation is reduced due to climate changes the desertification process is speeding up and can be considered as an additional threat to the region and an obstacle to sustainable development.

13) What are the consequences of privatization on water quality, water prices and the safeguarding of local water resources?

(a) General Introductory Remarks on Private Sector Participation

Public sector services in particular in developing countries usually suffer mainly from the more and more emerging consequences of one general political misconception, which is:

- Keep unemployment low with employing people in the public services at low salaries, yet strong protection from 'hire and fire' habits in the private sector.

Even though established with initial good welfare intentions, the present situation shows that:

- Low salaries prevent from hiring good qualified staff with adequate managerial skills
- The strong protection against 'firing' develops a 'laissez faire' mentality, where consequences of not performing the duties are not serious for the failing employee
- The idea of performance (in the sense of efficient service to the public) is rapidly deteriorating and the result is de-motivation because good performance is not honored (a result of rigid regulations in which performance bonuses are not established → brain-drain) and promotion is merely a matter of time of services in the institutions – not a matter of performance
- In general there is no strong technical and financial audit established which monitors commitments of the public institutions (if ever measurable formulated) with achievements; audit is merely bureaucratic and formalistic – instead of being target oriented
- Most of all, economical considerations are widely neglected
- There will be no improvements without incentives for the ones performing properly

It is believed to omit these negative aspects with private sector involvement. In particular the idea of efficient and economical service to the consumers' is expected to be revived.

Depending on the form of PSP chosen (from plain management contract to total privatization) the input from governmental budgets shall be reduced to a terminal Zero-value (full privatization) in parallel with raising service quality.

Since over-staffing of public service providers puts a significant threat to any economical solutions, the issue of reducing the number of public employees is the most pressing one. Without accompanying economical growth however, laid-off employees would not find employment in the private sector and might create inner-political difficult situations.

Water services deal with the widely accepted basic human right to have access to quantitatively and qualitatively adequate water. Governments worldwide tended (again in somehow misconceived welfare efforts) to ignore the related economical consequences with the effect that water was never really promoted as a commodity. The result of this policy was worldwide painfully experienced with growing population and its related exploding water demand. It is, thus, the problem of the developing countries to

- face reduction of a significant number of public employees and to
- attach to the services an appropriate economically sustainable price tag

Both problems put a severe threat on politicians. Yet – if no appropriate actions are taken, the situation will worsen further.

That's why the decision on the level of private sector involvement is highly political. This is further amplified because water services are an issue of national 'survival' and environmental importance.

With the above background the questions are answered.

(b) On the consequences of privatization on water quality, water prices and the safeguarding of local water resources

Each form of PSP requires formulation of a contract or other legal forms of documents. Technicalities, such as water quality and safeguarding of local water resources can be formulated to a high degree of precision. The consequences on these matters are, thus, controllable.

Whatever specifications of the technicalities are agreed upon, they will carry necessarily a 'price tag'. In particular in cases where new specifications exceed the present ones.

The issue of water prices depends (aside of the above) on the level of PSP; from no influence of the private operator under a management contract (which, however, influences the economical success of this particular PSP approach) to full authority of pricing under total privatization all shades are possible. Each form of PSP requires formulation of a contract or other legal forms of documents. Technicalities, such as water quality and safeguarding of local water resources can be formulated to a high degree of precision. The consequences on these matters are, thus, controllable.

14) What experiences and, where appropriate, programs exist in Germany, the European Union and elsewhere with financial instruments such as taxation of pesticides and /or financial incentives to reduce the use of pesticides/fertilizers by, for example, local water companies in order to lessen the detrimental impact of farming on groundwater?

The pricing for irrigation water in many cases is too low to form a considerable incentive for water saving. This is reflected in a low percentage of water costs (3-5%) in the overall production costs of agricultural produce. Even a significant increase of irrigation water unit costs (e.g. doubling the price per m³) will not provide a basic change of this situation.

The main incentive for farmers to use irrigation water efficiently originates from water scarcity. Restricted available water quantities make efficient on-farm use necessary in order to irrigate most of the potential farm land. Since fertigation (application of liquid fertilizer with irrigation water) becomes an increasingly common agricultural practice, water saving directly contributes to fertilizer saving, thus avoiding at the same time excessive use and deep percolation of water and fertilizer to the groundwater.

15) Do you think it is expedient to introduce private elements in water supply and wastewater disposal and how extensive should such elements be?

If conditions as described in the introductory remarks of this paper prevail, the answer must be an unlimited yes.

The extent of PSP is aside of the preparation of the political grounds mainly also a matter of technical / economical preparatory work. Without a serious and comprehensive analysis of the prevailing situation any step towards private sector involvement will be subject to believe rather than well founded expectations.

For example, entering a performance oriented management contract (the lowest level of PSP) without having clearly defined the 'status-quo' situation or the 'baseline' (e.g. technical and economical performance before PSP) will fail because the performance change cannot be measured.

Any bid to any contract of whatever level of PSP can only be as good as the circumstances are assessed and described. Omissions or inaccuracies lead to one-sided assessments of risks (from the bidder) which make either the PSP project expensive (and maybe uneconomical) or create endless disputes during the contract period, which, in turn, may jeopardize the effort undertaken in public to justify the private sector involvement.

16) What experiences have been made with privatization in industrialized and developing countries?

At present the active Jordanian experiences are limited to a management contract for the water supply and wastewater services in Greater Amman. We are convinced that this was for Amman the right approach. Further PSP projects are under preparation of which management contracts, formation of companies or BoT projects are under consideration in which the present experiences will be incorporated.

17) What motives and players have been most influential in privatization? What have been the results?

Players are:

- The governments of the states where the services are in public hands,
- The IMF with its economical review of the states and the related recommendations / country rating
- International financing agencies, which support PSP projects by providing assistance funds for project preparation and loans for implementation
- The private national and global water industry and, last but not least
- The consumers of the services

In general the target of all players aims at bringing the public water services to an economical sustainable track. Motives range from business approach (industry), via support (financing agencies, combined with a business component, namely providing related loans), global economical politics (IMF) to local economical and welfare politics (governments). The consumer's role is usually more on the passive side, yet can influence the political scene.

It is trivial to mention that the business approach is directly related to the scale of potential projects – the bigger, the more attractive for the industry. But also political considerations play a significant role (see also next question). Jordan experienced and still enjoys active support from the financing agencies but faces also quite some pressure from the agencies towards improvements of the economical sustainability of the water services.

18) What fundamental opportunities and risks for basic water supply can you identify in the possibilities of private and public ownership of water supply and disposal companies?

The opportunities of private sector involvement are pretty clear: reduction of state budget inputs into the public services and improvement of efficiency of services, together, however, with economically determined tariffs.

The main political risk is the preparation of the public opinion towards a fully-fledged economical treatment of these vital services in parallel with the obligation of the state to exercise social justice. One vital aspect is, of course, the consequential lay-off of public servants.

On the other hand, and this argument gets more serious with higher levels of PSP in direction of full privatization, these vital services are put into the hand of mostly international companies, which, if they fail in their obligations, may leave parts of a country in despair. Establishment of well qualified monitoring bodies is a must.

19) How significant is the current level of privatization in industrialized and developing countries respectively? What trends can be identified? What have been the dominant types of privatization so far?

PSP in Jordan is presently limited to the 'lowest' level, namely management contracts. The present contract for the water and wastewater services in the Greater Amman area covers almost 50% of the entire population of Jordan. Another management contract for the northern region of Jordan is under preparation (German support). In the closer future almost 70% of the water services will be privately operated.

In addition, a number of projects with different levels of PSP are under preparation (BoT, private or public companies under private sector legal environment).

20) Where do you see the interfaces between privatization and public control?

The major interface between PSP and public control is certainly the service tariff issue. This matter is everywhere in the world highly political and under tight scrutiny. Jordan is and will not be different.

In addition the availability of the water resources in terms of quality and quantity requires utmost attention. What success of PSP projects could be expected if water of sufficient quality and quantity cannot be provided to the private sector operators? In this field Jordan has to reconsider its policies between the two main competing sectors, namely the municipal services and the agricultural usage of resources.

Here will be one of the major challenges of political developments in which traditions, present market conditions and self-sustainability of the country's food supply play a major role.

In view of national interest public control over the water resources and its utilization is considered mandatory.

21) What are the opportunities and limits of closer collaboration between state-owned and private utilities in donor countries (e.g. Public Private Ownership)?

The opportunities range from partnerships (technology transfer) to formation of companies with a public institution as shareholder. They are thought to improve efficiency and economical sustainability / profitability.

Collaboration with utility companies in donor countries (Germany) in order to assist the present public services with expertise was envisaged already. Yet earmarked partnerships did not materialize because of the limited financial and personnel resources required for the exchange and training of specialists. Models, such as forming water and wastewater companies (under the company law) with public shareholders are under consideration. This process is under way in particular focusing on the legal aspects.

Towns and Country problems

22) How do you assess migration from rural areas resulting from water shortage?

Presently the increasing demand of water for M&I (Municipalities and Industrie) receives more attention and higher priority than the water requirements of the agricultural sector. It is expected that this trend will continue and even will be more manifested in future. With overall limited water resources this leads in consequence to an increasing gap in the supply of irrigation water to rural areas. Thus, diminishing economic possibilities for the rural population will enhance migration to urban centers.

Possible measures to counteract are directly related to the water allocation on a national level. Agriculture as a major source of income in rural area has to be provided with sufficient irrigation water. Especially when freshwater resources are re-allocated from agriculture to other sectors, appropriate compensation in quantity and quality of other water resources has to be provided to the farming sector in due time.

(a) Is it possible to stabilize population distribution?

(b) What measures would you propose to limit migration from rural areas?

Yes, the experience in the Jordan Valley (Jordan) offers a good example in this regard. In the early 1960's, due to limited water resources and political instability

in the region, there was increased population movement towards the country's urban centers, resulting in near evacuation of the Jordan Valley from its inhabitants. Beginning in the early 1960's, the equivalent of \$US 773 million has been invested by various donors and the Government of Jordan in the integrated socioeconomic development of the Valley.

With the development of surface and ground water resources, the construction of irrigation infrastructure, the implementation of social services and provision of electricity and potable water, the Jordan Valley has become a social magnet. The in-migration of people in search of greater economic opportunity has also created a corollary demand for goods and social services to support the population influx and the Jordan Valley agriculture sector transformed from a subsistence to a dynamic market orientation with corresponding rises in productivity and income. And in less than 13 years (1973-1986), the population of the Valley grew from 60,000 in 1973 to 124,000 in 1986, and is presently home for almost 250,000 people.

25)How do you think realistically the situation will develop in the future?

In near future the sector of M&I will predominantly be supplied with freshwater eventually allocated from former agricultural consumers. Irrigated agriculture in turn will increasingly depend on marginal water sources (brackish water, treated wastewater). Therefore water reuse on the fields will be established as the most common form of irrigation. At the same time consumption of treated wastewater in irrigated agriculture plays a vital role for environmentally proper disposal of the effluent originating from wastewater treatment plants serving M&I sectors.

28)What connections do you see between poverty and water shortage?

Water is the lifeline of human needs, and the backbone of economic development. Water shortage affects availability of water for drinking and industrial purposes, and impairs crop and food production, necessary for human subsistence and income generation of the rural population where agriculture remains the prevailing economic activity (as it is the case for many developing countries). Loss of opportunities for income generation and/or existing various sources of income due to water shortage will increase the pressure of poverty on the nation, and will hence negatively affect economic growth necessary for poverty alleviation. The vicious circle of poverty then takes over.

One aspect of poverty is lack of access to safe water, especially in rural areas, and lack of sanitation facilities in urban slums. Mortality and morbidity due to waterborne diseases are high among the poor. Vacant polluted and unclean sites in urban areas offer cheap opportunity to squatters and hence render them more vulnerable to environmental degradation. Another aspect of poverty is lack

of education. Other aspects include a) high mining of accessible scant natural resources, thus reinforcing environmental degradation, and b) high population growth with the resulting competition for the smaller water resource base of the world by a larger global population. This implies more pressure on finite water resources, which in turn is a threat to sustainability.

29) What consequences does water shortage have

(a) on health and life expectancy?

Hygienic conditions are closely depending on the availability of quantitatively and qualitatively appropriate water supplies. Unreliable and/or contaminated water supplies pose a high risk of a variety of preventable communicable diseases like infections and parasitic diseases.

Lack of access to safe drinking water is one of the "traditional hazards" related to poverty and "insufficient" development. As under water shortage conditions water prices will increase, there is a severe danger that the health status of poor families will be affected first if no appropriate means like cross-subsidies are implemented.

According to a study of Feachem, Kiellstram and Murray almost every second case of death in Africa was due to infections and parasitic diseases.

(b) on the economic development in the region?

Water shortage is in the Middle East a major constraint for the economical development due to comparatively high costs of water supply or lacking water supply infrastructure. The total costs of sold water in municipal and industrial supplies in Jordan in 1997 are estimated to be about 1.247 JD (1.7 \$US) per cubic meter. The costs for developing new water resources are rising rapidly. Many countries introduced low water tariffs with respect to the poor. If revenues do not cover the total costs of the supply, augmenting subsidies are needed to cover the deficit. This misallocation of public finances can be noticed throughout the region and reduces in addition to the anyway higher costs of water supply the competitiveness of the Middle East countries in the global markets due to limited public investments in other sectors like education or industrial infrastructure. In the worst case financial resources do not allow necessary investments in the rehabilitation of existing infrastructure resulting in high physical losses, lower cost recovery and slowing down economical development.

Agriculture is by far the biggest water consumer in the Middle East accounting for 50 to 90 % of the water consumption. In Jordan irrigation accounts for about 70 % of the total water consumption but its contribution to the gross domestic product (GDP) is only in the range of 5 to 7 %, its contribution to the employment

is only slightly higher. These figures indicate a low efficiency in water use because the development of other sectors of higher importance for the national income is constrained by water shortage. As additional water resources are hardly available and costly, optimising the water use efficiency is needed. Besides reducing distribution losses reallocating water from agriculture is likely to be an option to bridge the widening gap between the growing demand and the scarce renewable resources.

But implementing the reallocation of water from agriculture to other sectors is politically difficult for certain reasons:

- In rural societies old farmer families are by tradition politically influential.
- The direct contribution to the gross domestic product does not properly reflect the actual importance of the agricultural sector. In Jordan it was estimated, that approximately 28 % of the GDP depend on agriculture while its direct contribution reached only 6.5 % in the period 1988-1996.
- Alternative jobs are not available for farmers in the countryside. People have to move into the cities where job competition is already high. Increasing urbanisation apart from water resources, as it is the case in the northern part of Jordan, requires additional costly infrastructure.
- The farmers have to take the burden of water saving means but do not benefit.
- To depend on imported food poses the risk of further political dependence.

(c) On opportunities of girls and women and family structures?

It is commonly known that the opportunities of girls and women are depending on the economical welfare of a society resulting in good education and low unemployment. Water shortage constrains the economical development of the region. Hence it limits opportunities for girls and women to be emancipated from restrictions in education and business.

In rural societies, as being widespread in the Middle East, the traditional roles of women are prevailing and are heavily affected by water shortage due to an enormous pressure on the agricultural sector to provide water to be allocated to other sectors. This process is likely to terminate the typical social structure and family structures in rural environments. But as this typical social structure provides traditional tasks and social security to the women, water shortage poses the risk on women to lose their traditional role and their social security.

30) What opportunities are available to the German Water Industry and associated economic sectors in the international water market.

The high level of German water and environmental technology provides excellent opportunities not only in consultancy and construction, but as well in operation

and management of systems, as the increasingly difficult development of new water resources, decreasing water quality and increasing pollution levels require solutions beyond traditional techniques.

31) What failures to exploit these opportunities can you identify (in relation to the state and private sector)?

A major deficiency is the missing integration of state funded development programs and private sector expertise, which last not least end up in higher infrastructure development costs. The new initiatives like the Public Private Partnerships are still dominated by highly bureaucratic and time-consuming application and implementation procedures.

The financial risks of any engagement in developing countries can usually only be covered by large companies, thus excluding highly qualified smaller and medium sized companies.

It's difficult and costly for smaller and medium size companies to show a worldwide market presence. It may be useful to utilize some of the official agencies like GTZ in such activities and use them as well as contact points for the local private sector in the respective developing countries.

32) What opportunities do small and medium-sized companies offer in the field of technology transfer and/or the provision of adapted technologies?

In many cases very specified knowledge is available in small and medium-sized companies combined with high flexibility in services. In Jordan privatisation is envisaged in various fields of the water sector resulting in very specific needs e.g. in advisory engineering, water saving technology, leakage control and wastewater technology. First experiences occur to be very promising. Small and medium sized companies are already very active in the provision of consultancy services, which are usually funded through official development aid. Especially in the fields of water saving technologies, leakage control and PSP projects of medium size (water/ sewage treatment plants, operation and management of medium size municipal water and wastewater systems, industrial wastewater treatment). German companies are very competent and competitive. However, Small and medium-sized companies need to be promoted and assisted if they are not experienced in the Middle East market. In this regard private public partnership approach appears to be a very helpful and should be intensified.

33) Name the most serious international conflicts relating to water use. What regions are particularly affected?

The Euphrates, the Jordan, and the Nile are the major river basins in the Middle East with existing riparian conflict and have potential for future conflict and hostilities. Much has been written about them, collectively and individually either by politicians or scientists. A common denominator among them is the absence of comprehensive riparian agreements that regulate the rights and responsibilities of each riparian in water sharing, environmental protection, inefficient use, exchange of data and the avoidance of inflicting appreciable harm upon co-riparian.

The Middle East and Northeast Africa are the most affected regions. Regulation of water use and riparian allocations is of great importance to enhance cooperation among the parties. International agencies and donor countries are invited to play a more active role in helping countries to solve their problems and enhance regional cooperation.

34) Do you anticipate an increase in internal conflicts over water use, e.g. in relation to dam projects in developing countries and also in northern latitudes (e.g. recent developments in Spain)?

Construction of large dams on river courses by upstream users is the major cause for conflict in river basins. Especially, if there is no agreement to settle rights and allocations of downstream countries. A major issue in this regard that worsen conflict and increase tension among the parties is the build of dams with a large capacities exceeding the annual flow of rivers, which at the end harm the water rights of the downstream users.

35) What initiatives to defuse conflicts over water do you considering promising?

The Working Group on Water resources (WGWR) of the Middle East process has encouraged closer cooperation on water issues among the core parties of the region, namely: Jordan, Israel and the PNA. The main objective of the multilateral peace talks is to support the bilateral peace talks and to help the bilateral negotiations through facilitating the process by providing data, know-how and information on several matters of regional importance.

The WGWR works under four agenda items, namely: enhancement of data availability, water management practices including conservation, enhancing water supply, concept of regional water management and cooperation. The WGWR comprises 15 regional parties and 32 non-regional parties. It has initiated a wide variety of activities.

The group has commenced projects under the above mentioned agenda items in the fields of water data banks, wastewater treatment and reuse, public awareness and conservation, rehabilitation of municipal water supply systems, future water supply and demand among the core parties, water declaration, capacity building in the field of water and the establishment of a regional desalination research center in Oman. Unfortunately and due to the political situation and tension prevailing in the Middle East, the formal meetings of the WGWR were frozen. The WGWR is an acceptable platform for all parties to enhance cooperation. The WGWR could play a major role within the core parties in order to reach comprehensive and multilateral agreements between all the involved parties, which will pave the road for a unified management of the Jordan River Basin

The Danube River basin environmental program together with the Strategic Action Plan is a good example of cooperation among nations sharing a common watershed. In the last decades several bilateral and a few international agreements were signed between riparian countries. Due to political and economic changes in the former Eastern European countries the chance for intensive collaboration has been increased and resulted among others, in the environmental program for the Danube River basin. Together with the Strategic Action Plan they have the objective to improve the environmental state, especially water quality, in the basin. The program is designed to assist the Convention for the Protection and Sustainable Use of the Danube River, which has already signed by all Danubian countries.

The River Nile is one of the largest, longest, and most remarkable rivers of the world. Its course traverses ten countries: Burundi, Egypt, Ethiopia, Eritrea, Kenya, Rwanda, Sudan, Tanzania, Uganda and Zaire.

Cooperation among some of the Nile Basin countries started in the form of Bilateral agreements at the beginning of this century, but regional cooperation started in 1967 the formation of the hydrometrological survey (HYDROMET PROJECT). In 1992 the Ministers of the Nile basin were met and agreed to form a Technical Cooperation for the promotion of the development and Environmental Protection of the Nile Basin (TECCO NILE). An agreement to this effect was signed by six countries (Egypt, Rwanda, Sudan, Tanzania, Uganda and Zaire) and other four as observers (Burundi, Kenya, Eritrea and Ethiopia). A council of Ministers was formed (COM) and a technical advisory committee acting as steering committee (TAC) was also formed.

Most recently an initiative by the World Bank on the Nile Basin with support from the World Bank to enhance cooperation among the parties. More information could be collected directly from the World Bank.

36) What further initiatives need to be started without delay?

In the Middle east there is an urgent need to start regional initiatives for the regulation of flow and environmental protection of the river basins in two basins, namely; the Jordan River basin and The Euphrates River Basin (Turkey, Syria and Iraq).

37) what role can and should national parliaments, private industry, grassroots organizations, non-governmental organizations, etc play?

National Parliaments can play a major role when it comes to the needed national legislation's to protect watercourses. Their support is very much needed for the endorsement of international and regional agreements on shared water resources.

Private industry and Non-governmental organizations can help in awareness programs not limited to the public but also the decision-makers to support regional programs in water issues. A cadre of highly trained professionals is the core of the technical cooperation in river basins. Therefore, training programs by industries and NGOs are extremely important to enhance capabilities and cooperation. The same also applies to institutional capacity programs and capacity building.

38) How do you rate the Guiding Principles adopted at the world water conference in Dublin in 1992? Do you agree with the call made by non-governmental organizations to add the words " All people should have the inalienable right to access to clean water at a reasonable price that they can afford " to the fourth principle?

Jordan has formulated its water policies and strategies in 1998 strongly emphasizing the necessity of users' involvement, planners and policy makers in water development and management. The participatory approach involves raising awareness on the importance of water among policy-makers and the general public. Decisions are taken with public consultation and involvement of users in the planning of water projects.

Jordan agrees with the call made by non-governmental organizations to add "all people should have the inalienable right to access to clean water at a reasonable price that they can afford" to the fourth principle, while recognizing the economic value of the water. In that context about 98% of the population of Jordan have access to potable water from water networks, and most of the cities are connected to sewage networks

39) Do you consider the time has come for a global (fresh) water convention as a comprehensive approach to resolving problems?

(a) If yes, what elements should it include?

(b) How can it be ensured that such a convention would make a successful contribution to solving the water problems of today and the foreseeable future?

Yes, major elements could be

- Principles for social, economical, ecological management and use of water,
- Principles for inter-regional resource management and transfer methodologies,
- Benchmarks for and recommendation of targets on major water related production, operation/ management and consumption criteria,
- Guiding principles for a market oriented approach to water management and resource allocation,
- Minimum levels of supply and protection of socially weak parts of the society
- Participation of stakeholders in planning, management and decision making process across all water sector activities.

To ensure that the convention would make a successful contribution to solving the water problems of today and a foreseeable future, international organizations, donor agencies and financial institutions could relate the level of support to individual countries to compliance and implementation of the principles as outlined in the water convention. A kind of international water court/ regulatory body should be established and safeguard/ watch the implementation of all actions.

40) What instruments can you identify which would provide a sound financial base for a water convention?

A sound financial basis could be created by a kind of worldwide cross-subsidy arrangement on water charges, by which consumers in water rich countries or high consumption would pay a consumption related percentage of their water bill towards a “water fund”, managed by a non-profit oriented international foundation or an existing, international UN body.

These funds could then be utilized to finance all water convention related activities and support projects/ measures in countries or organizations, objectively suffering from water scarcity and/or fulfilling criteria as for example

- compliance with principles outlined in the water convention,
- proven engagement in solving water problems in a sustainable way,
- long-term, future oriented development projects and water management.

II) Salt Water

1) Which areas do you think are in urgent need of regulation?

Contamination of coastal seawater must be successfully prohibited with proper enforcement. This is especially true for ecologically sensitive water bodies with slow water exchange processes in river estuaries and coastal gulfs. Pollution originating from land sources (rivers, municipalities, and industries) and sea sources (ships, pipelines) have to be successfully controlled in particular in internationally shared coastal areas.

2) How much time will it take to regulate these most urgent questions?

Because of its urgency a time frame of one decade has to be envisaged for negotiation and implementation of the objective stipulated under 1). At the same time tangible results have to be achieved within an even shorter period of time in order to avoid severe environmental damage.

3) Who are the most important people involved?

National governments, industries, and related international organizations (UNEP, WHO, ITLOS, etc.) are the most important stakeholders

4) How would you assess the interests of those concerned?

The private sector will tentatively accept these regulations if they are financially compensated for the additional efforts and the enforced restriction. At the same time equal treatment of national and international competitors has to be assured. Governmental entities are expected to actively work on such international regulations because of the urgency of the emerging problems as well as the increased environmental public awareness.

5) In what areas can you identify shortcomings in the implementation?

Enforcement of internationally agreed norms and treaties (e.g. *United Nations Convention on the Law of the Sea*) is still weak because of insufficient instruments of enforcement. At the same time economical considerations usually still dominate and counterweight ecological aspects.

6) What proposals can you make to remedy these shortcomings?

Strengthening the role of *International Tribunal for the Law of the Sea* (ITLOS), Hamburg, in handling and settling international disputes is seen as the most suitable remedy to overcome the present shortcomings.

7) Do you, for example, think it is necessary to negotiate a protocol to the maritime law convention on the sustainable use of the sea?

Besides bilateral and regional agreements and treaties the negotiation of a protocol to the maritime law convention appears to be urgently needed in order to provide the mutually accepted legal backbone as well as the platform for further effective international enforcement instruments.

III) General Question

1) In what fields do you see the most urgent need for research?

The major components of the solution to water supply gaps in the region are energy intensive, either for desalination or pumping, or both. Research focused on further improvements to desalination technology, particularly to improve the efficiency and lower the cost using renewable energy is required.

Intensified water related research is also required in the following fields:

- (a) Appropriate treatment, disposal, and agricultural use of sludge, (bio-solids) from wastewater treatment plants under semi-arid and arid conditions.
- (b) Wastewater Technology for sound environmental reuse.
- (c) Water reuse in agriculture, which will play a major role in freeing up fresh water and in effectively using the treated wastewater, will require greater expertise to manage at the farm level and within the irrigation systems. Developing the necessary knowledge and skills will require sustained applied research efforts and extension programs.
- (d) Environmental and health impacts of irrigation with treated wastewater on soil, groundwater, plants, and humans (workers, consumers)
- (e) Soil aquifer treatment (SAT) and aquifer storage (rock, soil) of treated wastewater for seasonal water reuse in agriculture
- (f) Low cost sanitation and water recycling.
- (g) Water conservation technology