

INTERNATIONAL EXHIBITION – ZARAGOZA 2008
Water and sustainable development

Executive summary of the round table sessions on
“Integrated water resource management and the role of local authorities”



FONDATION
PRINCE ALBERT II DE MONACO



CONTENTS

1. Introduction.....	3
2. Sustainable management of water resources - definition	3
3. The prevention of water-related risks	5
4. Regional, state and continental water management. Moroccan and Latin American examples.....	6
a) Morocco's water policy (<i>d</i>).....	6
b) Water management in Latin America: looking for new alternatives (<i>r</i>).....	7
5. Case studies: Seville (Spain); the Bay of Toulon (France); Tangiers (Morocco); Quito (Ecuador);	Milan (Italy); Aguas Calientes (Mexico). 8
a) Seville (Spain) (<i>i</i>).....	8
b) The Bay of Toulon Provence Mediterranean Contract, France.....	9
c) Tangiers (Morocco)	11
d) Quito in Ecuador (<i>o</i>).....	12
e) Milan (Italy) (<i>s</i>).....	14
f) Aguas Calientes in Mexico (<i>q</i>)	16
6. Water in the future, a factor for war or peace?	17
List of round table speakers in Zaragoza	17

Within the framework of the 2008 Zaragoza Water Expo, the Prince Albert II of Monaco Foundation and the United Nations Institute for Training and Research (UNITAR) set up a round table on integrated water resource management and the role of local authorities. This took place during the thematic week “sustainable water management - villages and cities: drinking water, sanitation and development” from 17th to 18th July 2008.

The purpose of the round table was to examine the role of local authorities in integrated water resource management and to present good practice for cities and companies.

The summary presented in this document is based on the oral presentations given by the various speakers.

1. INTRODUCTION

Two years ago, the United Nations Development Programme (UNDP) published its world report on human development, pointing out the urgency of our planet's situation concerning water. This report confirms the fundamental right of every human being to have access to at least 20 litres of drinking water every day. Giving access to clean water, eliminating waste water and providing sanitation systems are the most fundamental basics of human progress. However, 1.1 billion human beings have no access to clean water and 2.6 billion no sanitation system. The risk is that water will become a source of conflict. Therefore, in order to address this risk, the concept of integrated water resources management (IWRM) saw the light of day. This was a development in the way of thinking which was brought to the fore at world water forums, the first of which took place in Marrakech in 1997, followed by the Hague, Mexico and in 2009 Istanbul. These international meetings highlight the fact that we cannot solve the problems of water on a one-off basis, by purely technical aspects. The entire water cycle has to be taken into consideration, from its source to its treatment after use. The spotlight is turned on the importance of access to water in the Millennium Declaration which includes chapters on this topic among the eight points for development (f).

2. SUSTAINABLE MANAGEMENT OF WATER RESOURCES - DEFINITION

The integrated management of human resources concerning water is a participative process for planning and implementation. This process is based on knowledge obtained from all the stakeholders to determine how to address the long-term needs of the region with regard to water and coastal resources, whilst at the same time preserve the natural ecological systems and encourage sustainable economic growth. IWRM has been introduced throughout the world as a recognised alternative to the style of water management of the past. It was introduced as a central element of decentralised democracy in the world of water management to promote the involvement and decision making of the main interested parties (g).

IWRM starts by collecting together data, analysing it and providing a description of the systems to then develop a consensus which is based on communication, education, monitoring and evaluation. IWRM asks stakeholders to modify their working practice and encourage people to take part in the process to achieve a greater global vision of everything revolving around their action and which is dependent on the actions of others (*g*).

By taking part in the IWRM process, the local authorities are best placed to guarantee the inhabitants of their district, town or village, access to clean water. Due to their close involvement with water consumers, they can more easily understand their needs. The local authorities also have a global outlook, an absolute necessary in identifying the appropriate private sector and institutional partners who will implement the target solutions identified throughout the process. The local authorities play the role of chief facilitators by managing water resources at the basic level of catchment areas, by optimising supply and by managing demand in a co-ordinated manner. This includes the adoption of cover policies, the use of technology using little water and the implementation of decentralised water management systems. The local authorities also have the key role of providing fair access to water resources for a participative and transparent governance and management (*g*).

The local authorities have the power to demand a high level of performance, excellent treatment standards, minimal use of energy for reduced greenhouse gases and the recycling of treated effluent. The local authorities have the power to demand extremely clear sustainability indicators. To move forward in water safety matters, we need to implement a joint working process involving both the private and public sectors, research institutes and communities. It is by working together that the many advantages of a more localised and more carbon balanced lifestyle will be brought to the fore (*g*).

3. THE PREVENTION OF WATER-RELATED RISKS

Among the solutions for IWRM good practice, risk prevention is a key objective. This is because, amongst other things, sanitation and the consumption of drinking water concern food security, which is an essential element of human security. This new concept for human security, which appeared twenty or so years ago, includes the preservation of natural resources that many consider to be global public goods belonging to all (*h*).

We therefore need to reduce the risks by means of protective measures, the re-examination of projects or even implemented processes when such activities are deemed to be too dangerous. Local authorities and companies also need to finance the risks internally on a preventive basis by including contingency provisions on the balance sheet for companies, securitisations for large companies, insurance and reinsurance captives, and whenever possible by insurance cover for probable identified risks. Risk prevention includes the following:

- The exchange of good practice,
- The cross-referencing of lessons learned including the scenarios studied,
- The use of new information and communication techniques, mainly to alert, but also to inform the population,
- Modelling the practices to implement with testing laboratories regarding the rapid interpretation of results
- Proper risk mapping (*h*).

The principle of precaution which is still contested in several countries has been nonetheless a universal principle since the 1992 Rio Declaration. The Treaty of Amsterdam explicitly introduced it to the European Union for environmental matters; it is therefore a rule of law. (*h*)

As far as local authorities are concerned, the opening up and coordination of administrative services in addition to the identification of those in charge is a priority. The indistinct division of powers and the dilution of responsibilities in badly defined areas in reality represent a threat of permanent insecurity for councillors and local authorities. (*h*)

4. REGIONAL, STATE AND CONTINENTAL WATER MANAGEMENT. THE EXAMPLES OF MOROCCO AND LATIN AMERICA

a) Morocco's water policy (*d*).

Morocco is subject to a semi-arid Mediterranean climate with a maritime or continental influence. The uneven landscape means that the climate can vary significantly locally. 4% of the Kingdom's surface area has an annual rainfall of below 300 mm. The water stress level was reached in the year 2000 and chronic shortage risks being reached by 2030.

In Morocco, it is the Regional Council that is legally responsible for the management of water resources.

In 1967, King Hassan II launched a national policy for water with the construction of dams to irrigate 1 million hectares of land by 2000 and to give the whole population access to drinking water. Morocco currently has 103 major dams. In June 2001, King Mohamed VI launched an appeal for the implementation of a modern water policy.

The Regional Council, together with the various authorities, was involved in the construction of earth dams to be able to supply more towns.

Morocco suffers from the over-exploitation of its groundwater. For many years, cultivated land had been irrigated by a gravity system which is responsible for excessive water consumption. Recently, the drip system has been used for irrigation purposes.

The other major problem concerns the pollution of surface waters, lacking the recovery and treatment of waste water on the outskirts of major cities. The current objective, with the help of a concession agreement with Veolia, is to recover all this waste water so that it can be discharged into an offshore sewage outfall. However political will for the future is to treat this water so that it can be re-used either for agricultural purposes, or to supply the water table.

The setting up of a regional development scheme is one of the activities carried out by the Regional Council since it was nominated in 1997. This is being implemented in co-operation with the Rhône-Alpes Region in France and the region of Brussels which boasts great expertise within the field of the environment. The aim of this regional development scheme is to limit, through political counsel, the effects of drought in rural areas through water supply despite the large territorial dispersal. This work is being carried out with the help of the population, NGOs, the private sector and of course the State. Its indirect aim is to reduce rural exodus and at the same time clandestine emigration.

The National Office for Drinking Water (ONEP) is working with the authorities and NGOs to inform the population of the water issue so that tomorrow this water does not become a cause of international conflict.

b) Water management in Latin America: looking for new alternatives (*r*)

Latin America, as a sub-continent, suffers from the same difficulties as any other country in the world. An increasing population growth, a shortage of new water sources and major industrialisation leading to high levels of pollution. It is therefore becoming increasingly urgent to manage drinking water more effectively with three priority actions:

- To protect current resources,
- To manage available water,
- To look for alternative resources: Desalination or re-use of waste water to re-inject it into the aquifers.

The most urgent need is the protection of water resources, which requires significant investment in research to combat the presence of new chemical and agrochemical compounds in the water. At the same time, accidental pollution is becoming increasingly frequent (industrial hazards, broken pipes, explosions). Given the scarcity of water in addition to the potential problems of contamination despite the regulated protection of springs, Veolia has worked on the entire water basin so that it is possible to act as quickly as possible to minimise the risks and maximise water extraction.

Efficient management of resources begins by reducing loss, in many cities of the world between 20% and 50% of the volume consumed. Action must also be taken to encourage consumers to save water.

Last but not least, new sources of supply need to be found. Today, as far as waste water is concerned, a few examples show the way ahead: In Singapore, 1% to 2% of the city's water is re-used; in Australia, which has suffered droughts for the last seven years, certain municipalities re-inject their treated waste water into the water supply network; other countries bordering the sea use desalination.

The solution consisting of artificially refilling aquifers is today being discussed. However recycling requires strict regulations supported by laws to ensure the quality of the re-injected water from a health point of view. Strong political will is therefore essential. However, the type of treatment needs to be adapted depending on the prior and intended future use of the water.

Veolia has wide experience of refilling aquifers via infiltration after creating artificial basins. This method is not at all costly and feasibility studies are currently being carried out for its application in Latin America.

Future prospects could include the construction of desalination plants, the cost of which is dropping and the number increasing despite the price of energy. Furthermore, reverse osmosis will become widespread within the next 5 to 7 years and pre-treatment will make it possible to increase the life time of membranes.

5. CASE STUDIES: SEVILLE (SPAIN); THE BAY OF TOULON (FRANCE); TANGIERS (MOROCCO); QUITO (ECUADOR); MILAN (ITALY); AGUAS CALIENTES (MEXICO).

a) Seville (Spain) (i)

Seville had a population of 699 145 inhabitants in 2007 and enjoys a Mediterranean climate with continental influences. Its position, slightly away from the sea on the extensive Guadalquivir plain, allows it to benefit from a relatively mild and clement climate throughout the year. The average annual temperature is 18.6° C (minimum: +12 C; maximum: +25°C). However, Seville experiences particularly long and torrid summers, with average maximum temperatures reaching or extending beyond 25°C from May to October. Temperature peaks are reached between June and September, a time when the thermometer often registers more than 30°C and it has been known on occasions to reach 46°C.

The province of Seville is very much divided up in terms of water supply and distribution systems and sanitation, the management of which can be either public or private.

The firm EMASESA is in charge of managing 70% of the province's water. It supplies a population of approximately 1.3 million people. Treatment is standard except when the surface water is seriously affected by pesticides for example. Emergency measures are then implemented including oxidation treatment to ensure the exploitation of such water.

With regard to sanitation, the company covers 100% of the population with a target population of 1.8 million inhabitants. It manages water treatment plants (conventional) which discharge their water in compliance with the legal requirements.

The company also ensures the management of hydro-electric power plants which produce approximately 17 gigawatts/hour per year despite a water shortage at certain times of the year, with energy production from biogas as a supplement.

The company guarantees water management systems that meet the ISO 9001 standards and the 14001 Certificate. It has an energy efficiency goal and aims to be independent in terms of cost and rates. It trains its staff and is open to merging with other systems to reinforce its own. It is keen to implement innovations for the management of technological development in order to stimulate the company's creativity.

Measures implemented to save water include the installation of alternative irrigation networks to avoid the consumption of drinking water for agricultural purposes as well as the

exploitation of process water. The renovation capacity of the networks is approximately 2% a year. At the same time, the installation of hydrometers enables users to be aware of their water consumption and the presence of any leakage in their own system. All the above action has been carried out in almost 40 000 homes resulting on average in a 25% saving in water bills.

In terms of social approach, the company is raising public awareness on the value of water. It runs educational programmes for children in primary schools on the true value of water (by means of a travelling bus) and carries out visits to companies. It is also trying to promote responsible behaviour for all and has set up aid and well-adjusted costs by means of cooperation agreements with the main actors involved and the authorities.

b) The Bay of Toulon Provence Mediterranean Contract, France.

Toulon registered a population of 167 400 inhabitants in 2005. The climate is the Mediterranean type, characterised by very strong sunshine, a very marked dry season in the summer with rainfall that is rare but sometimes violent, hot temperatures in the summer and mild in the winter. Due to its closeness to the sea, the temperatures remain relatively mild in all seasons.

The coastal area consists of two physical environments. There is the solid physical environment, the land, and the liquid physical environment, unsettled and in which it was necessary to define a zone where its management would be possible and coherent (*j*)

The land area, the catchment area nearby, features a certain number of human or even natural activities that have a direct impact on the marine environment (coastal line, continental shelf etc...). The marine area is subject to the influence of the catchment area. The border between the two is not fixed and depends on the winds and current. But the border exists and can be defined when physico-chemical or biological tests only measure the Mediterranean's background noise meaning there is no direct influence from the catchment area nearby (*j*).

Based on these physical facts, in order to obtain the foundations for direct integrated management, all the players had to be involved:

- Institutional players: councillors, representatives of State,
- socio-economic players from industry, commerce and transport,
- the population. (*j*)

Yet to begin with, the Bay of Toulon was in a sorry state from all the conflicts of use arising from multi-activity. The harbour comprises the following: the main port of the National Defence, a large number of industries, shellfish farming and aquaculture activities. Furthermore, prior to the construction of the purification plant, 20 million m³ of water was disposed of into the sea, without treatment, every year. The only solution that existed to “care for” this site was the Bay Contract. (*k*)

The Bay Contract is a global action plan to recover the quality of the water and aquatic environment in Toulon harbour and its catchment area. It is the only contract in France that has been brought to a successful conclusion and a second phase is already planned for 2010-2015 which will be a local application of the European Directive. (*k*).

This bay contract concerns all the towns situated in the catchment area, i.e. approximately 370 000 inhabitants. It includes large towns such as Toulon and la Seyne sur Mer as well as more rural towns such as Evenos, Le Rovest, Solliès-Ville, which produce diffuse pollution, more agricultural than urban. (*k*).

The principle of the Bay Contract is first and foremost a diagnosis, defining high-quality objectives, further studies then determining the action to be implemented. (*k*).

The main issue dealt with by the Bay Contract is to know how to optimise the management of sanitation networks and storm water networks, whilst at the same time maximising investment for the future. Management tools have been put into place to manage the current main constraints such as the population increase and climate change, which has resulted in less frequent but more violent rainfall leading to a high level of pollutant flow to be treated. 12-hour reports are established every day and tests carried out on an hourly basis around certain beaches. Changes in pollution are analysed depending on the wind and the current in order to ensure being able to anticipate or forecast problems in certain conditions. Simulations are to be carried out which will help with the decision-making process.

Active management policies have been set up including testing the bathing water and issuing a daily information bulletin to users. The results of such management and its acceptance by all the players and users involved in the Bay Contract are extremely positive (*l*).

c) Tangiers (Morocco)

Tangiers registered a population of close to one million in 2007. The climate in Tangiers is the Mediterranean type tempered by the ocean's influence and the Chergui breeze. It has four distinct seasons: a mild and wet winter, a warm and dry summer, moderately rainy inter-seasons.

Prior to the launch of the contract in 2002, all waste water was discharged directly into the natural environment without treatment, in wadis and rivers (Souani, Lihoud and Mharhar) arriving in the sea, mainly the Bay of Tangiers, close to the municipal beach. The existing systems were so severely clogged up that they had become useless. Sanitation for Tangiers became a strategic approach focused on three areas of impact:

- Human impact by improving the quality of the bathing water, cleaning up the Bay of Tangiers, eliminating the bad smells along the coast of the wadi and in urban areas, improving the health and living conditions of the population.
- Economic impact by promoting the development of tourism with hotel projects and "offshore tourism", urban development as well as connecting peri-urban areas, sometimes clandestine, to the network.
- Impact on the natural environment by improving the coastal and river eco-systems and by so doing cleaning up the wadis: Souani, Lihoud, Mharhar.(*m*)

Since 2002, a great deal of investment has been made in sewers, pumping stations and treatment facilities, including a purification plant and an outlet channel. The sewer system has been made twice as big compared to what previously existed, most of the blocked sewers have been restored, booster pumping stations have been reinforced and some created to carry all the waste water to the purification plant and a 2.2 km outlet channel has been installed. The purification plant was built on land reclaimed from the sea and will have a peak flow rate of 2.5 m³/s (schedule for 2027). Today, the plant already has a flow of 1 m³/s and industrial tests are currently being carried out. Shortly 90% of Tangier's water will be treated in the plant and carried in the outlet channel. (*n*).

To protect the Bay of Tangiers during the summer period, certain facilities have been set up such as a water pipe on the El Mourouj wadi (the largest wadi producing the most pollution) to collect and improve the quality of the bathing water.

In addition to these sanitation measures involving components manufacturers and operators, other measures were implemented at the beginning of 2004 prior to the installation of the systems and the creation of the plant:

- an oceanographic study and an environmental study,
- a campaign for testing the bathing water which is underway and which will continue

This action will make it possible to measure the results achieved as far as the quality of the bathing water is concerned and the restoration of the marine ecosystem. This project is part of a constructive approach which involves the population and which has won the support

of the locals vis-à-vis the improvements already achieved and those to come, such as the ecological quality of the bathing waters and the improvement of odour nuisance. These improvements have been achieved with the purification plant harmoniously integrated into the urban environment at the foot of the Tangiers medina.

At the same time the study was launched and in addition to these measures, a study was conducted with the research teams from the Veolia group and the Tangiers Health Delegation, to gauge the health effects in districts neither connected to drinking water, nor to sanitation systems and which were to be equipped in 2006 and 2007. The aim was to correlate the water supply and sanitation with the disappearance of diseases associated with the uncontrolled use of water or those close to waste water discharge points. The study was launched four years ago with assessments every 3 months including epidemiological monitoring, population surveys and the bacteriological monitoring of the water. The results of the study will be available at the end of 2008 when the facilities in these districts have been completed (*n*).

d) Quito in Ecuador (*o*)

Quito is the capital of the Republic of Ecuador. It is a mountain village with a population of over 2 million in 2007. The metropolitan district stretches over 4 204 square kilometres. The city lies at an altitude of 2 850 metres and some of the suburbs are located at an altitude of almost 3 000 metres. The city is in the north of the Andes cordillera. The average annual temperature is between 12 and 14 degrees Celsius.

A water flow of 7000 l/s is treated. In order to make the water drinkable and distribute it to the areas farthest away the "Empresa Metropolitana de Alcantarillado y Agua Potable" runs two hydroelectric power stations that produce approximately 24 megawatts. Over the past few years, efforts have been focused on the poorest suburban areas.

The local authorities have agreed to provide drinking water and a high-quality sanitation system for the community featuring a strong social and environmental responsibility component. A national water fund, with public and private funding, has been set up. The "Empresa Metropolitana de Alcantarillado y Agua Potable" is the largest company in Quito, the purpose of which is to maintain the distribution system whose water basins are situated along the Andes cordillera at altitudes of over 3 400 metres.

With a view to the future, in addition to the current needs of Quito, a river catchment project is currently underway to ensure a drinking water supply until 2060. The first stage of the programme will begin in 2012. The total cost of the project is approximately 1.2 billion dollars.

Preventive measures are already underway to address global warming and in particular to compensate for the melting of the ice layer on Itabasi Volcano and Antisana Volcano, Quito's main natural water reserves. These preventive measures are achieved through monitoring and therefore the reduction of loss and consumption.

The «Empresa Metropolitana de Alcantarillado y Agua Potable» is trying to introduce good practice to save water using zone meters, the modelling of the water distribution cycle, macro and micro measures. Quito managed to reduce loss from 48% in 2000 to 30% in 2008 and this downtrend is continuing. The average monthly consumption per household dropped from 40 m³ to 31 m³ during the same period thanks to major investment in infrastructure.

Educational campaigns designed for children and teenagers in particular were set up. The campaigns began in 2001 for a group of 500 students in suburban areas and today over 28 000 students are concerned. Students are informed how to use water correctly through lessons, books, drawings and building models as well as the way to make water drinkable.

Quito does not yet have a purification plant (plans are underway) but is currently building sewers along the rivers crossing the city so that waste water does not flow into them.

As far as the cost policy is concerned, in particular vis-à-vis the most underprivileged of society, it is based on effective and targeted costs according to household income. Grants partially financed by the central government are available.

Drinking water services now cover 97.6% of Quito and sanitation systems 91%. Since 2000, 2 358 km of drinking water networks have been built in addition to 2 355 km of sanitation networks. In 2000, 1.3 million inhabitants were concerned, in 2008 over 2 million inhabitants benefit from these services.

e) **Milan (Italy) (s)**

The City of Milan registered a population of approximately 1.3 inhabitants in 2007. The climate in Milan is continental with very marked seasonal differences: hot and humid summers and cold winters with potential snowfall. Rainfall is present throughout the year but is particularly heavy during the summer storms.

Water in the Province of Milan (Lombardy) is managed by a public company: “il gruppo Idra”. However its distribution is carried out by private companies.

Like in all other countries, water is a key resource for the country’s economic and social development. Water saving is achieved by loss control. Loss is estimated at 20% of the water consumed and up to 30% or even 40% in some districts. The national average is approximately 40%.

As far as sanitation is concerned, 68% of waste water is linked up to water treatment facilities. The remainder, mainly in rural areas, is discharged directly into the ground.

The supply and sustainable management of water in the civil and industrial sectors are closely dependent on a comprehensive water service, particularly on a sanitation level so as to reduce the impact on the environment. As in many other countries, water services need to take into consideration the following parameters:

- extreme natural events which are becoming increasingly frequent: drought or flooding,
- the population increase,
- lack of water resources,
- pollution of aquifer resources and surface water by farming or industry.

Water services need to meet 4 requirements:

- water quality: in the Province of Milan the quality of the groundwater is poor which means that $\frac{3}{4}$ of the water distributed has to be treated. It contains traces of iron, manganese and magnesium above the legal limits.
- The availability of water resources: this is relatively satisfactory in the Province of Milan, but in the summer period, there is an increase in demand and the water reserves are not sufficient. A constraint exists which requires the operator to implement measures to lead to water savings and enable it to be reused.
- Coverage level: sufficient for water services being close to 100%. Coverage however is less satisfactory with regard to the purification and treatment of water;
- Age of facilities: some facilities are more than 60 years old and need to be changed. In addition, great effort is being made with regard to remote monitoring equipment. This is crucial to guarantee the quality of the resources and to link up the systems one to the other. The equipment needs to be renewed every 8 to 10 years.

To improve the current purification system, the aim is to invest in separate networks in order to reduce the volume of water sent to treatment plants.

Water is not a commercial product like any other consumer product but has to be considered heritage. However, it is essential to fix a price for water to encourage more ecological and careful use of this resource. The European Directive on water resources requires member countries to establish policies to fix the prices for which all users - individuals, industrialists and farmers - will make a proportional contribution based on the polluter-pays principle. The directive allows for affordable supply agreements for the needy. The management of the entire sector must be independent from a financial point of view.

In terms of investment, whilst Portugal has a high investment level and benefits from national investment plans, in the Province of Milan, such investment depends on contracts with municipalities or groups of municipalities. This system is 100% from public funds and takes sustainability into consideration. This will make it possible to guarantee water costs which are sufficient to finance investment in new infrastructure.

In the Province of Milan, sustainability results in greater availability of natural resources at a constant rate of consumption and productivity. Such availability is therefore a factor of local development. It is essential to identify and strengthen collective legal systems in order to achieve the sustainable management of the resource. This should involve action on several fronts:

- to implement policies to rationalise demand,
- to promote integrated and concerted management amongst all the stakeholders in the catchment area so as to guarantee a fair distribution among a growing number of users, while at the same time respecting the environment,
- to make the water systems more efficient, particularly in farming, by developing environmentally-friendly irrigation systems that use less water.

f) Aguas Calientes in Mexico (q)

In Aguas Calientes, the climate is semi-desertic as half of the northern region in the Republic of Mexico is in the process of becoming a desertified area. The average temperature is 18 degrees Celsius, average rainfall is 511.8 mm. The quality of life in Aguas Calientes is such that many Mexicans move to live there.

A national award was presented to Aguas Calientes for the efficiency of its water management. Such success was possible thanks to close cooperation between various public and private players, also involving the federal state and the municipal authorities, as well as civil society. All these partners were proactive in the efforts.

Water is exploited in the water tables. 200 wells operate on a permanent basis. The pumping results in significant energy consumption to supply high-quality water to the town. With a temperature that rises to 45 degrees at the hottest times of the year and higher water consumption at this time, in order to meet the surplus demand, water has to be collected at increasingly greater depths. It therefore contains more salt and minerals.

Most of the water networks and drainage systems are very old and are located in the rural areas of the region. Water consumption is extremely high and more than often irrational. Excessive use of the aquifers has led to cracks in the ground, because the earth has become too dry, with adverse effects on buildings and houses.

The "Water Commission of the Aguas Calientes Municipality Council" has set up a social benefit fund for the over-60s and individuals suffering from a disability. Furthermore, a telephone helpline has been introduced to deal with complaints and intervene within six hours. A payment system for the water bills of individuals exists to avoid their having to line up.

Today, thanks to the efforts undertaken, less water is extracted despite an increasing population. This improved management has also resulted in almost 100% coverage of the water supply in Aguas Calientes. As far as the purification systems are concerned, the coverage is 98.3%.

All areas of society, in addition to the authorities, should be involved in the future challenges for water management and the protection of this resource in Aguas Calientes: NGOs, universities, schools and professional associations. For example a lottery is organised for individuals who pay their monthly water bill on time, giving them the chance to win a car or a house.

15 years ago, the current President of "The Water Commission of the Aguas Calientes Municipality Council" was one of the main opponents of a water management concession by a French or Spanish company. Today, he has affirmed that he is utterly convinced of the fact

that this model has been a success. According to the President, if Aguas Calientes wishes to become a leader in terms of water sanitation, purification systems and the successful involvement of society, water must not become a political affair but above all must remain a question of technical competence.

6. WATER IN THE FUTURE, A FACTOR FOR WAR OR PEACE?

The environment is continuing to deteriorate and climate change gathering pace. Environmental anxiety is sometimes aggravated:

- by the compassionate and anxiety-provoking attitude of the media,
- by the serious difficulties experienced by the welfare states,
- because public opinion is beginning to doubt scientific and technical progress.

For some, the future is no longer seen as a promise, but a threat (*h*). Public and private institutions, authorities and NGOs need to work together to inform the population on the issue of water so that tomorrow this water does not become a cause of international conflict (*d*).

For example, Gorbatchev, the current President of Green Cross International, "Water, like religion and ideology, has the power to move millions of people. Since the very birth of human civilization, people have moved to settle close to it. People move when there is too little of it. People move when there is too much of it. People journey down it. People write, sing and dance about it. Never before has civilisation experienced such a global challenge, such an opportunity for solidarity in water management." (*g*).

Many people agree that water is now a worldwide problem. However the solution cannot be a worldwide solution but only a local (villages, towns) or regional (the Mediterranean for example) solution. According to some experts, there should be no water wars for two reasons.

- the major companies and States know how to deal with water issues. solutions exist (treatment, piping, desalination etc...)
- major organisations such as the United Nations, the World Bank, UNESCO and many others have an important power of dissuasion so as to avoid water-related conflicts.

In the future, water issues could be managed by reconciliation and become a solution for peace rather than a solution for war (*p*).

In conclusion, given the millions of human beings with no access to clean water or to a sanitation system, the risk of water becoming a source of conflict could partly be remedied by the integrated management of water resources (*f*).

LIST OF ROUND TABLE SPEAKERS IN ZARAGOZA

This summary is based on the talks and is not a word to word transcript.

(x) : means that this section was drawn up based on (x)'s presentation.

(a) H.E. Mr Bernard Fautrier, *Vice-President Chief Executive Officer, Prince Albert II of Monaco Foundation*

(b) Nicolas Frizon de Lamotte, *Administrator hors classe, Local Development Programme, UNITAR*

(c) Dominique Héron, *Director for international partnerships, Veolia Environnement*

(d) Abdelkébir Berkia, *President of the Regional Council, Rabat, Morocco*

(e) Roberto Contreras Martinez, *Director for drinking water issues within the National Water Commission of Mexico, la Conagua*

(f) Dr Philippe Roch, *Former Secretary of State and Director of the Federal Office of the environment, forestry and landscape, Switzerland. Facilitator of the round table on integrated water resource management and the role of local authorities.*

(g) May East, *CEO, CIFAL Findhorn, United Kingdom*

Topic: Local governments and integrated water resource management

(h) Francis Casorla, *UNITAR adviser and former Secretary General of Vivendi Environment*

Topic: "Prevention of water-related risks and criminal liability"

(i) Antonio Diaz Munoz, *Director of Operations and Urban Development, EMASESA, Spain*

Topic: "Integrated water resource management in the city of Seville"

(j) Patrick Philip, *President of the Scientific Council of the Toulon Provence Mediterranean bay contract, France*

Topic: the place of water in the Toulon Provence Mediterranean bay contract

(k) Gilles Vincent, *President of the Toulon Provence Mediterranean bay contract, Vice President in charge of the environment of the Toulon Provence Mediterranean conurbation committee, Department Councillor for the Var, Mayor of Saint Mandrier, France.*

Topic: the place of water in the Toulon Provence Mediterranean bay contract

(l) Thierry Witkowicez, *Director of Development, Veolia Water, South East Region, France*

Topic: the place of water in the Toulon Provence Mediterranean bay contract

(m) Dahman Derham, *Mayor of Tangiers, Morocco*

Topic: The challenge of sanitation in Tangiers and evaluation of the impact on health.

(n) Benoît Destremau, *Regional Director, Veolia Environment Morocco*

Topic: the challenge of sanitation in Tangiers and evaluation of the impact on health.

(o) Juan Meira, *engineer and manager of the Empresa Metropolitana de Alcantarillado y Agua Potable (EMAAP), Quito, Ecuador*

Topic: drinking water and purification system services in Quito

(p) Professor Raoul Caruba, *Consul of Mauritania, Organiser of the International Water Symposium in Cannes*

Topic: Nouakchott, a water capital in the desert

(q) Armando Lopez Campa, *President of the Water Commission of the Aguas Calientes Municipality Council.*

Topic: the water issue in the Municipality of Aguas Calientes

(r) Josep Fernandes, *Director of Water Division for Proactiva Environment*

Topic: Managing water in Latin America: looking for new alternatives

(s) Oronzo Raho: *CEO and Managing Director of Società del Gruppo IDRA.*

Topic: Managing water in Milan