

## **Clean Water as a Human Right! Implications for Project Management<sup>1</sup>**

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### **Introduction**

On July 28, 2010, the United Nations General Assembly approved a motion making access to clean water a basic human right. Although the motion was non binding on member countries, and 41 countries did not vote for the resolution, it was nonetheless significant. Access to clean water is now considered a human right, along with access to food and a non-violent environment. So what does this have to do with project management? With nearly a billion people without access to clean water and nearly 2.5 billion without clean toilets and wastewater treatment, for one thing it means massive investment in water related projects in coming years.

But there are many other considerations as well, for example, the economics, politics and social impact of water-related projects in some parts of the world. Even in some parts of the Northern Hemisphere, where water is generally more plentiful, there are water shortages – for example, in California where agricultural use of available water is now resulting in potential problems.

At the same time, on a planet that is 80% covered with water, it seems ironic that there are shortages. The old adage, “water water everywhere, but not a drop to drink” comes to mind. So what are the issues?

I have been thinking about water off and on since reading the announcement about the UN vote in late July. It seems that there has been nothing written about this in the project management field, and very little in the press, even though access to clean water is widely recognized as a global social and economic issue. In some countries, the lack of clean water is already at a crisis level.

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<sup>1</sup> Although this paper was written more than seven years ago, the topic seems more relevant than ever. All of the issues addressed in this editorial still apply; if anything, the problems are more acute as climate change has led to more drought-stricken regions around the world. And here in the United States, the recently headlined lead-tainted water system in Flint, Michigan has been a disaster, with serious health, economic, legal and political repercussions. The project management profession can play a unique role in solving these and other global problems. Hopefully this paper will stimulate more thinking and action in that regard.

I am not an engineer, scientist or expert on water or wastewater topics. Nevertheless, I have had some experience in this industry. One of my first jobs as a teenager, summer work after high school and before leaving home for university, I worked for the city engineer in my small home town. He was responsible for maintaining all city utilities and infrastructure, including roads, lighting, wastewater (sewers) and water system. I learned to mix chemicals for the water plant, clean and maintain the sewage treatment plant, and lay pipes and fire hydrants in a new residential development. I have never forgotten those experiences over 40 years ago.

More recently during 1993-1995, I represented two Texas-based water technology companies that were pursuing project opportunities in Russia and the former Soviet Union. One company was an engineering firm that specialized in the design of water and wastewater treatments plants, and in solutions for those types of projects. The second company sold equipment for water and wastewater plants, including pumps, valves, piping, etc. On their behalf, I met with Vodocanal executives in Moscow, Sochi and St. Petersburg, toured big water and sewage plants, discussed projects to build new facilities, and learned a great deal. I learned that nearly every Russian town and city needed new or better water treatment facilities. I also learned the hard way, becoming quite ill several times, that water borne diseases occur even in modern cities and hotels.

As I have gotten older, it seems that I drink more water. And when I am traveling, I have become much more careful to have water with me, whether traveling by auto, air, train or taxi. I have become more aware of the body's need for water, both for survival and better health. Water is a personal need, a very personal topic, not just an industrial, economic or social issue. It deserves more attention. Here in North America, and I think in most fully developed countries, water is taken for granted. It's considered free or cheap, because it is generally readily available. This is a huge mistake, in my opinion. So this month I want to discuss some aspects of the clean water issue that may often be overlooked, or unknown to too many in the project management profession.

### **Some Issues and Perspectives**

Here are some issues that are discussed in more detail below:

- The Human Rights Aspect
- Global Demand – Water Projects as a Growth Field for PM
- Water Projects as a Base Global Industry
- Water Projects in Economic Development Programmes
- Water Projects for Emergencies and Natural Disasters
- Industrial Wastewater Treatment
- The Supply Chain – Projects in Related Industries
- Clean Water Technologies – R&D Projects



- Complexity Issues – The non-technical factors
- Economics of Water – other uses for water (industry, etc.)
- The Politics of Water
- The Ultimate Solution – Water & Energy
- Drinking Water for Your Project Team
- The Water Tower – An American Icon

Qualification: this paper is not a fully researched treatise but rather includes my personal observations and opinions. If I err with facts, I think they will be close enough and the message should be clear. Water is a huge global topic and we need to take it more seriously.

### **The Human Rights Aspect**

According to press coverage immediately after the UN vote in July, access to clean drinking water is now an official basic human right - just like the right to food and the right to live without torture and racial discrimination. The resolution was approved by the United Nations General Assembly without opposition. Although the decision does not make the right to water legally enforceable, it is symbolically important and places more political obligation on national governments. The resolution highlights how urgent the issue of water shortage is for a growing portion of the world's population. [1]

#### **Grim statistics**

According to the United Nations Environment Programme (UNEP), 884 million people around the globe have no access to clean, drinkable water. Almost 2.5 billion people have no access to toilets and other sanitation facilities. Every year, more than two million people die due to a lack of drinking water and diseases caused by consuming polluted water.



"Diarrhea is the second most important cause of the death of children below the age of five," said **Pablo Solon**, Bolivia's ambassador to the United Nations. "The lack of access to drinking water kills more children than AIDS, malaria and measles combined." [1]

#### **Water shortage and desertification on the rise**

Water shortages and the desertification of agricultural regions used to be almost exclusively Africa and Asia's problem - but now Europe is facing this problem too. In southern Spain, the desert expands by one kilometer northwards each year.

Meanwhile, water shortages are the cause of an increasing amount of domestic and international conflicts all around the world, such as between Israel and Palestine and in India and Pakistan. The problem is made even worse by privatization of water supplies driven by large food companies, which usually leads to higher water costs for consumers.

According to **Maude Barlow**, founder of the Canadian-based Blue Planet Project, people could not have predicted all these problems when the Universal Declaration of Human Rights was adopted by the UN in 1948. But she also believes that the increasing shortage of clean water is the worst human rights violation that exists. Her Blue Planet Project advocates the protection and the fair sharing of global water resources, and two years ago it initiated a campaign for a UN resolution on the right to water. [1]

### **The UN Vote**

Supported by 33 countries, it was Bolivia that presented the UN General Assembly with a specific proposal for the resolution. 122 of the 163 UN member states present voted for its approval. The remaining 41 countries - almost exclusively from the industrialized north - abstained from the vote.



In particular the United States, Canada and Great Britain attempted to prevent the vote for the resolution. However, the position of the world's wealthy northern countries was not as one-sided as it has been on similar topics in the past. Germany voted in favor of the resolution, and its representative **Peter Wittig** has distanced himself from the negative stance of the United States and other countries.

"Germany is committed to the realization of the millennium development goals, including that of reducing by half by 2015 the proportion of people without sustainable access to safe drinking water and sanitation," Wittig said. "We consider access to safe drinking water and sanitation as a component of the right to an adequate standard of living, recognized in Article 11 of the Covenant on Economic, Social and Cultural Rights." [1]

### **Human Rights Council Resolution**

Recalling the recent adoption of a similar resolution by the UN General Assembly, the resolution now adopted by the Human Rights Council took an important further step in affirming that "the human right to safe drinking water and sanitation is derived from the right to an adequate standard of living and inextricably related to

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the right to the highest attainable standard of physical and mental health, as well as the right to life and human dignity.”

“This means that for the UN, the right to water and sanitation is contained in existing human rights treaties and is therefore legally binding,” commented UN Independent Expert on human rights obligations related to access to safe drinking water and sanitation, **Catarina de Albuquerque**. “The right to water and sanitation is a human right, equal to all other human rights, which implies that it is justiciable and enforceable.” [2]

**Danielle Morley**, Executive Secretary of Freshwater Action Network, a global civil society network for water and sanitation, says: ‘We’ve been working towards this moment for a decade. This is a fantastic development and will have a huge impact on the water and sanitation sector. In 160 countries in all regions of the world, governments can no longer deny their legal responsibility to provide water and sanitation to the billions of poor people lacking access”

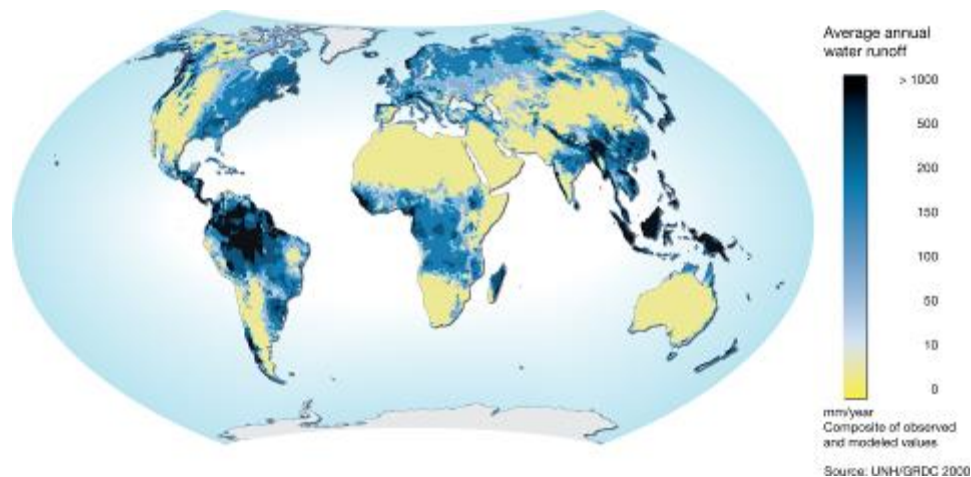
While about 41 States had abstained from the resolution that was passed by the General Assembly in July, the resolution now passed in the Human Rights Council was adopted by consensus with no member State to the Council requesting a vote. Various State delegations expressly welcomed the resolution. Even the United States highlighted that it was “proud to take this significant step of joining consensus on this important resolution regarding the right to safe drinking water and sanitation which is to be progressively realized [2]

### **Global Demand – Water Projects as a Growth Field for PM**

The World Bank reports that 80 countries now have water shortages that threaten health and economies while 40 percent of the world — more than 2 billion people — have no access to clean water or sanitation. As populations grow, industrial, agricultural and individual water demands escalate. According to the World Bank, world-wide demand for water is doubling every 21 years, more in some regions. Water supply cannot remotely keep pace with demand, as populations soar and cities explode. [3]

Population growth alone does not account for increased water demand. Since 1900, there has been a six-fold increase in water use for only a two-fold increase in population size. This reflects greater water usage associated with rising standards of living (e.g., diets containing less grain and more meat). It also reflects potentially unsustainable levels of irrigated agriculture. World population has recently reached six billion and United Nation's projections indicate nine billion by 2050. What water supplies will be available for this expanding population? [3]

Water quality is deteriorating in many areas of the developing world as population increases and salinity caused by industrial farming and over-extraction rises. About 95 percent of the world's cities still dump raw sewage into their waters.



Climate change represents a wild card in this developing scenario. If, in fact, climate change is occurring — and most experts now concur that it is — what effect will it have on water resources? Some experts claim climate change has the potential to worsen an already gloomy situation. With higher temperatures and more rapid melting of winter snowpacks, less water supplies will be available to farms and cities during summer months when demand is high.. [3]

While quoting few sources here, the message is clear and more or less the same everywhere. Great water shortages already exist in the world. As populations, industrial uses and standards of living increase, demand for clean water also increases. The needs are growing, the demand is growing, shortages are growing — so the number of water related projects and the need for project management for those projects will also increase in the future. I think we can also see that the need for more projects and project management in this sector can only accelerate.

### **Water Projects as a Base Global Industry**

Stepping back from the human rights issue, and water shortages in some places, let us consider water and wastewater projects in industry and society in general. Clean water is needed everywhere, not just in developing countries or where water shortages currently exist. Clean water and wastewater treatment are a fundamental need and part of every living community on earth, existing towns and cities as well as new and growing developments.

Every city, residential neighborhood, business complex and industrial region must have water and wastewater treatment systems, for processing, distributing and

storing water. Every office building, every home, every facility used by humans must have water and sewage systems. Every organization, every gathering of humans, every event or special occasion must have water and toilet facilities.

For any new buildings, communities or activities, new water and wastewater treatment systems must be constructed, purchased and/or installed. For every existing building, community or city that has existing water and wastewater treatment systems, those systems and facilities must be maintained and eventually replaced.



For billions of people today, and the millions of buildings, communities, towns and cities, we can easily envision millions of water-related projects. Water and wastewater treatment projects represent a huge industry around the world. And for every water-related project, there must be a project manager. More likely, there are multiple project managers among the various organizations that are often involved with a water or wastewater treatment project. How many of these project managers hold project management certifications, have been educated in project management methodologies, or belong to project management professional organizations? In my opinion, this whole industry represents a growth opportunity for project management, and for those who want to both grow in this field and work in an industry that helps the human race survive and prosper.

### **Water Projects in Economic Development Programmes**

Now let us consider water projects in those regions and states where clean water is not currently available. Water projects must be considered and included in every economic development scenario, right along with food, housing, medical care, energy, transportation and other social services. Clean water, however, may in fact be the single most important type of project needed for economic development, as it is critical for human survival and health. It is also critical for healthcare, education, business and industry.

At the World Water Forum, whose members include the World Bank and the International Committee of the Red Cross, in Istanbul, Turkey in March, thousands of activists, entrepreneurs, mayors, parliamentarians and business executives

gathered for the weeklong event that is held every three years to promote ideas about conserving, managing and supplying water. Population growth and mobility, as well as increased energy production, especially of biofuels such as ethanol, are contributing to the high demand for water, UNESCO said on the first day of the forum. Climate change and the impact of the global economic meltdown were key issues on the agenda this year. [4]

"With increasing shortages, good governance is more than ever essential for water management. Combating poverty also depends on our ability to invest in this resource," said **Koichiro Matsuura**, director-general of the U.N. agency. He urged G-8 leaders to pledge investment in water resources to help prevent a "major water crisis."



UNESCO said half a billion people in Africa lack access to adequate sanitation, and that 5,000 children die daily from diarrhea, a disease that can be prevented with clean water. The agency said the number of people living on less than \$1.25 a day is roughly the same as the number without access to safe drinking water.

"In America, diarrhea is bad takeout," said **John Sauer** of Water Advocates, a U.S.-based nonprofit group. "In Chad, it's the

difference between life and death."

Two dozen U.N. agencies released a report that said GDP growth has been held back by as much as 10 percent in areas where water investment was weak and donors are not meeting aid commitments. "In recent years, the share of aid going to water supply and sanitation has stagnated at around 4 percent, while that to other areas of the water sector has actually dropped," Matsuura said. [4]

According to the UN, water demand is increasing partly because of the rising production of ethanol and other biofuels in countries such as Brazil and the United States. Large amounts of water and fertilizers are needed to grow the crops needed to make biofuels, placing additional stress on the environment. It said many countries have legislation that protects and manages water resources, but that the reforms "have yet to have any noticeable effect" because water policy needs to include decision-makers in other fields such as agriculture, energy, trade and finance. [4]

1.1 billion people lack access to clean water at all. Most of those people live in Africa and Asia. But if you ask them whether water is a human right, they will laugh the notion off. They will tell you that they walk up to 2 hours per day to fetch water



that is often found in muddy puddles from rain runoff during the few brief months when rain does fall. This kind of water is rife with disease-causing organisms, which they drink unquestioningly. The areas in which these grateful people live are suffering from soil erosion, decreasing tree coverage, and increasing malaria rates. The environment is deteriorating, and sanitation is simply horrific. Without adequate water for drinking and cooking, hygiene is sacrificed as well. They are forced to eat without washing their hands. [5]

Poor hygiene, in its unrelenting ways, cycles back into the water sources. When people lack decent latrines and sanitation resources, fecal matter and other biohazards circulate back into the muddy puddles from which the people draw their daily water. Even more prevalent are water sources damaged by animal waste. Given these remarkable challenges, what can be done to meet the global demand for clean water?



A lot can be done. First, there is no one-size-fits-all solution. Given its vital nature, water cannot be treated as a commodity alone. Research suggests that water, when commoditized in poor countries, costs more to the rural poor than it does to the urban wealthy. Local populations can offer help in bringing this resource to their communities, which flies in the face of privatization solutions proposed by international financial institutions and other development agencies. Water, delivered comprehensively through partnership, and maintained locally by women's groups and community-based organizations, yields pride, confidence, and economic development. [5] These are different projects, but projects nonetheless.

While again referencing only a few sources, the message seems clear. As economic development increases for those parts of the world that are still lagging, including many parts of Africa, water-related projects must be included. Clean water, sanitation and human health must underlie all economic development programs. If water and wastewater projects are not included, the plans are wrong. Considering the Millennium Development Goals established by UN consensus, various commitments to economic development and environmental protection at G-8 and G-20 meetings in the last few years, and the various programs and projects sponsored by the World Bank Group, the UN and various other multinational and Nongovernmental organizations, the number of water-related projects must number in the thousands. How are these projects planned and managed? This is another area of vast opportunity, and need, for the project management profession.

## Water Projects for Emergencies and Natural Disasters

And let us not forget the need for clean water in emergency situations. As populations have increased in many parts of the world, and with changing climates and more frequent extreme weather events, the number and impact of natural disasters seem to be increasing around the world. In every natural disaster, and many emergency situations, clean water often becomes a critical need.

This was clearly the case in Haiti following the massive earthquake there in early 2010. Now the country is facing an alarming Cholera epidemic, exacerbated by the lack of clean water.

In Haiti, contaminated water is the leading cause of infant mortality and illness in children. Germs for hepatitis, cholera, and chronic diarrhea are carried in water used for cooking and drinking. Nearly every water source in Haiti has become contaminated with human waste because of the absence of a sewage sanitation system. Haiti now has the highest infant mortality rate in the western hemisphere. The Pan-American Health Organization (PAHO) reported that more than half of all deaths in Haiti were due to water-borne gastro-intestinal diseases. Way back in 1990, The US Army Corps of Engineers said of Port-au-Prince, "Epidemics including malaria, typhoid, chronic diarrhea, and intestinal infections are caused by water contaminated by rubbish and fecal matter." [6]

An estimated 1.3 million people live in some 1,300 tent cities here, but only 70 percent of them have access to water, and much of this is not potable, according to Mark Schuller, a professor at the City University of New York who led an extensive survey on camp conditions this past summer. Only 60 percent of camps have properly serviced toilets. [7]

During natural disasters, the ponds, rivers and streams that supply water to the plant can be contaminated with some harmful contaminants. The water can become very murky, foul tasting and smelly. What is worse, city purification can break down during natural disasters, making contamination even more likely. [8]



After a natural disaster, safe drinking water is always among the most urgent needs. Without it, health conditions deteriorate. Illnesses spread quickly. That's why having equipment in place that makes it easier to provide water is so crucial in disasters. Water transportation and purification technologies, say authorities, should be part of the rapid response solution in emergencies. [9]

Natural disasters are catastrophic events with atmospheric, geologic and hydrologic origins. They include earthquakes, volcanic eruptions, landslides, tsunamis, floods and drought. Natural disasters can have rapid or slow onset, and serious health, social and economic consequences. During the past two decades, natural disasters have killed millions of people, adversely affecting the lives of at least one billion more people and resulting in substantial economic damage. Developing countries are disproportionately affected because of their lack of resources, infrastructure and disaster preparedness systems. [10]

Diarrhoeal disease outbreaks can occur following contamination of drinking-water, and have been reported following flooding and related displacement. An outbreak of diarrhoeal disease post flooding in Bangladesh in 2004 involved more than 17 000 cases, with the isolation of *Vibrio cholerae* (O1 Ogawa and O1 Inaba) and enterotoxigenic *Escherichia coli*. A large (>16 000 cases) cholera epidemic (O1 Ogawa) in West Bengal in 1998 was attributed to preceding floods, and floods in Mozambique in January–March 2000 led to an increase in the incidence of diarrhoea.

The risk of diarrhoeal disease outbreaks following natural disasters is higher in developing than in developed countries. In Aceh Province, Indonesia, a rapid health assessment performed in the town of Calang two weeks after the December 2004 tsunami found that 100% of the survivors drank from unprotected wells, and that 85% of residents reported diarrhoea in the previous two weeks. In Muzaffarabad, Pakistan, following the 2005 earthquake, an outbreak of acute watery diarrhoea occurred in an unplanned, poorly-equipped camp of 1800 persons. The outbreak involved over 750 cases, mostly adults, and was controlled following the provision of adequate water and sanitation facilities.



In the United States, diarrhoeal illness was noted following hurricanes Allison and Katrina, and norovirus, Salmonella, and toxigenic and nontoxigenic *V. cholerae* were confirmed among Katrina evacuees. Hepatitis A and E are also transmitted by the fecal–oral route, in association with lack of access to safe water and sanitation. [10]

Leptospirosis is a zoonotic bacterial disease that is transmitted through contact of the skin and mucous membranes with water, damp vegetation, or mud contaminated with rodent urine. Infected rodents shed large amounts of leptospires in their urine. Flooding facilitates the spread of the organism due to the proliferation of rodents and the proximity of rodents to humans on shared high ground. Outbreaks of leptospirosis occurred in Taiwan, China, associated with Typhoon Nali in 2001, and following flooding in Mumbai, India, in 2000. [10]

Needless to say, during and following natural disasters and emergencies, supplies, delivery, distribution, storage and maintenance of clean water are critical projects. And any one disaster or emergency will involve far more than one water project; there will be water projects needed for every cluster, grouping and community of people involved, including refugee camps, emergency workers, government and volunteer organizations and local communities. In addition, such extreme weather events as fires and tornadoes can result in power outages that in turn disrupt the availability or delivery of water – i.e. water plants shut down or damaged. Clearly this whole area represents another industry where projects are increasing and project management is needed.

### **Industrial Wastewater Treatment**

Another area that is often overlooked outside of the specific industries involved is industrial wastewater treatment. We often hear about water pollution caused by power plants or large processing facilities. But in fact, many industries rely on clean water for operations. In agriculture and food processing in particular, nearly



every facility uses vast quantities of clean water, requires huge investments in wastewater treatment, and is subject to regulatory compliance and monitoring (at least in industrialized countries). Some operations are notorious for water pollution.

For example, poultry and pork processing plants can create huge environmental disasters if wastewater treatment and discharges are not well engineered and managed. I toured several massive poultry plants in Russia where water pollution was a huge problem for a hundred miles around the facilities. Each plant required the ability to treat and control millions of gallons of heavily polluted water.

Mining industries and communities are especially vulnerable to water pollution and wastewater treatment issues. I toured a massive gold mine in Siberia one time, then witnessed a yellow lifeless stream some miles away where we tried to enjoy a picnic lunch. Other industries that are and should be subject to strict wastewater

processing requirements include pharmaceuticals, chemicals and petrochemicals, automotive, power, oil & gas, and all heavy industries.

The latest environmental disaster is happening in Central Europe - edging around the Danube River Basin is a toxic waste spill from an industrial alumina plant reservoir located near the Hungarian town of Kolontar, in the vicinity of Lake Balaton, 160km southwest of Budapest. Initially reported as lethal, the spill, a by-product waste from industrial manufacturing in the form of red mud, seeped across soil and groundwater, posing a high risk of toxic contamination and extensive ... environmental damage in the area. As the sludge oozed toward the river Danube, fear grew that it may spread the pollution faster carried by its stream, which is thought to be harmful to the delicate ecosystem and population health. [11]



WWF is fearful of the long term environmental impacts of the toxic mud disaster in Hungary, following the breach of the residue reservoir of the Ajkai Alumina Refinery about 160 kilometres south west of Budapest. Four died, six are still missing and 113 were injured as about one million cubic metres of red mud erupted over six villages at 12:25 Monday after the dam broke.

The possibly slightly radioactive and highly corrosive material contains toxic heavy metals such as lead, cadmium, arsenic and chromium and has so far covered around 40 square kilometers. The mud has a pH level of up to 13 and acids are being poured into the Marcal to neutralize the alkaline stream before it reaches the Raba and the Danube. [12]

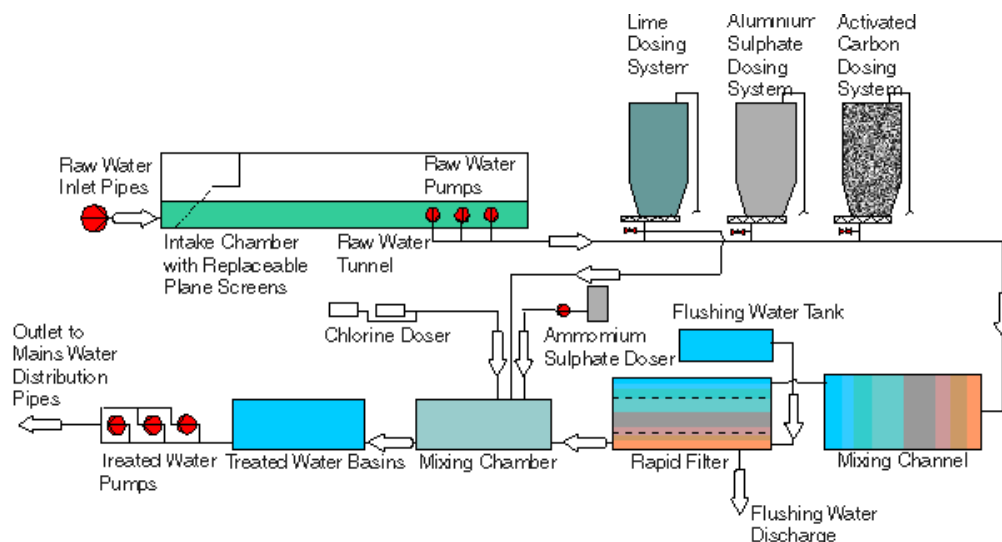


Wastewater treatment for industrial plants and facilities is an enormous industry, far larger than most project management practitioners realize. This is another big field for projects and project management. It is also an area that needs special attention in developing economies and countries where industries are new, regulations may be inadequate or non-existent, governments may be weak, and industrial and environmental protection experience at low levels. These are all areas of consideration for project management.

### **The Supply Chain – Projects in Related Industries**

So in which industry are all of these projects? Is it a water and wastewater treatment industry, hydrology, engineering, construction, water technology, equipment or what industry? These are good questions. In fact, water and wastewater treatment projects involve many different industries. If we look at the supply chain for any big water or sewage plant project, we find the following:

- Water/wastewater engineering and design companies;
- Pumps and valves;
- Filtration and other technologies;
- Piping, of various types;
- Construction;
- Power suppliers;
- Construction equipment suppliers;
- Real estate development;
- City planning and management;
- Water and wastewater utilities – city departments
- Utilities companies
- Project management services
- Water packaging and delivery companies



### ***A typical water treatment process***

The range of industries and organizations involved grow even more when you include water for emergencies and natural disasters, regulatory agencies.

So how many projects and project managers are there on a typical water plant project? There should be one for every company in the supply chain, probably 5-10, depending on the size of the project, location, technologies involved and other factors. A water or wastewater project does not just involve one project and one project manager, but rather teams of organizations, project managers and project teams. This is a very ripe field for advancing project management, in my opinion.

### **Clean Water Technologies – R&D Projects**

Like any other industry, water and wastewater processing requires investment into research and development of new technologies, equipment and solutions – for both small and large processing conditions.

As the demand for clean water increases worldwide, many new and enhanced technologies and solutions are emerging. These range from advanced water filtration systems to water plants powered by solar and wind energy systems. All of the organizations involved in researching and developing new solutions and technologies for cleaning, packaging or delivering water have projects and project management requirements. This is another growing field, but one where project management is often a part-time job held by an engineer or company executive.

In addition, some organizations have sprung up around the world to sponsor and support research and development in this field. One good example is The Centre for Clean Water Technologies at the University of Nottingham in the UK. This

organization was established as an international Centre of Excellence for the development of Advanced Technologies in water treatment. Its overall objective is to focus on multi-disciplinary research activities in the following areas: Drinking water treatment; Waste-water treatment and re-use; and Process water treatment and re-use. According to their website, research projects in the group range from fundamental scientific studies through to the application and commissioning of novel technology. Examples of Advanced Water Treatment technologies under development include: Nanowater research; Atomic force microscopy in process engineering; Novel development of membrane technology; Photocatalytic and photo-assisted oxidation processes; Adsorptive micellar flocculation; Membrane filtration with pre-coagulation; and Desalination. [13]

These are good examples of research topics and project underway at organizations worldwide. And every research project is a “project”, with objectives, funding, budgets, schedules, scope, team members, deadlines and deliverables. This is another field where scientists and technologists can use more project management education and support, especially related to simple tools and methodologies. In any case, it is also a growth field for project management.

### **Complexity Issues – The non-technical factors**

Complexity, and the management of complex projects, is one of the hottest topics in the project management field this year. On the surface, water/wastewater treatment, or delivery of packaged water during emergencies, would seem to be rather simple, straightforward projects, without a lot of complexity. However, when one considers the economic, political and social issues, complexity increases rapidly. This is even more true when water projects are part of development or emergency response programs.

In many cases, stakeholders for a water project can involve governmental agencies, technology or solution providers, construction contractors and suppliers, financing agencies, citizens and workers. When multiple countries are involved, for example, when a water source crosses borders, the number and range of stakeholders multiplies. For delivering water after a natural disaster, dozens of organizations can be involved. In some cases, laws, cultures, religions, historic relationships, personalities and other factors come into play. These aspects of water projects increase the complexity, and the difficulty, for completing otherwise seemingly straightforward projects and programs.

### **Economics of water – Very Short Summary**

From **Elizabeth Dickinson** in *Foreign Policy Journal* on 29 July 2010, the day after the UN vote to make access to clean water a human right: “All humans need water. But companies, industries, governments, power plants, and nearly everything that creates economic wealth also require water. And for those entities, water has an



economic value. (Water also has an economic value to humans, the way food does.) And like all things that create economic value, we don't have an unlimited supply of water. That means that no matter what, there will be limits about how much any one person or business can use.

Rights to something like water usually imply that there is also no price -- and often no limits. This is the situation in much of the world today, actually -- and in much of the world, there isn't clean water to go around. Elsewhere where the price is too low, for example in the United States, commercial over-use is a real problem. In the U.S. case, underpriced water in the Western states, particularly California, has boosted agricultural use of water and discouraged conservation -- to the extent that the state faces an impending water crisis.

Countries that have dramatically improved access to clean water in recent years, on the other hand, include those who have put a price tag on it -- Chile, for example, as well as Britain and Australia. Giving water a price (and certainly one that is bracketed by economic group, with different rates for private and commercial use) encourages conservation and smart use. Moreover, it gives private companies a real incentive to provide the stuff to more consumers. (In some communities, a push -- like a subsidy or a tax incentive -- would of course be needed.) In the end, all this will help bring more and more people onto the water grid. And that's what it's all about, right." [14]

The economics of water is a big issue, and often closely connected to politics and international relations. The subject cannot be dealt with here in any level of detail and deserves more time and discussion in any case. Nevertheless, the main point is that water has economic value, and the economics of water must be factored into water projects. Is this a new dimension of project and program management that needs further development?

### **Politics of Water – Another Short Summary**

More than a dozen nations receive most of their water from rivers that cross borders of neighboring countries viewed as hostile. These include Botswana, Bulgaria, Cambodia, the Congo, Gambia, the Sudan, and Syria, all of whom receive 75 percent or more of their fresh water from the river flow of often hostile upstream neighbors.

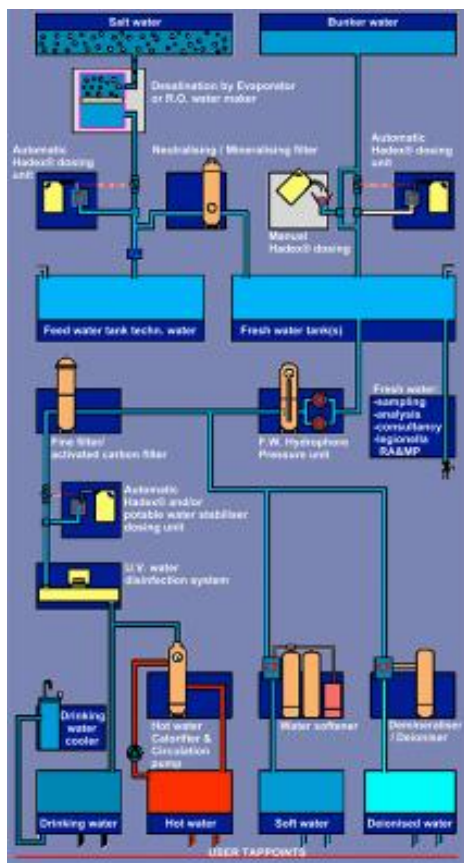
In the Middle East, a region marked by hostility between nations, obtaining adequate water supplies is a high political priority. For example, water has been a contentious issue in recent negotiations between Israel and Syria. In recent years, Iraq, Syria and Turkey have exchanged verbal threats over their use of shared rivers. (It



should come as no surprise to learn that the words "river" and "rival" share the same Latin root; a rival is "someone who shares the same stream.")

More frequently water is being likened to another resource that quickened global tensions when its supplies were threatened. A story in The Financial Times of London began: "Water, like energy in the late 1970s, will probably become the most critical natural resource issue facing most parts of the world by the start of the next century." This analogy is also reflected in the oft-repeated observation that water will likely replace oil as a future cause of war between nations. [3]

Global water problems are attracting increasing attention, not just at the international level, but also within the United States, in its popular press, in natural resource journals and as the subject of books. Former Sen. Paul Simon from Illinois recently authored "*Tapped Out: The Coming World Crisis in Water and What We Can Do About it.*" A book for the general, non-specialized audience, Simon's publication sounds an alarm about the approaching crisis. "Within a few years, a water crisis of catastrophic proportions will explode upon us — unless aroused citizens ... demand of their leadership actions reflecting vision, understanding and courage." [3]



## The Ultimate Solution – Water & Energy

A technological solution that some believe would provide ample supplies of additional water resources is desalination. Some researchers fault the United States for not providing more support for desalination research. Once the world leader in such research, the USA has abdicated its role to Saudi Arabia, Israel and Japan. There are approximately 11,000 desalination plants in 120 nations in the world, 60 percent of them in the Middle East.

Others argue that a market approach to water management would help resolve the situation by putting matters on a businesslike footing. They say such an approach would help mitigate the political and security tensions that exacerbate international affairs. For example, the Harvard Middle East Water Project wants to assign a value to water, rather than treat rivers and streams as some kind of free natural commodity, like air.

Other strategies to confront the growing global water problem include slowing population growth, reducing pollution, better management of present supply and demand and, of course, not to be overlooked, water conservation. As Sandra Postel writes in her book, *Last Oasis*, "Doing more with less is the first and easiest step along the path toward water security." [3]

The great dilemma is the fact that there are shortages of clean water on a planet that is 80% covered with water. If there is so much water in the oceans, why can't we clean it and use it for human needs? The answer, of course, is that it takes too much energy to clean the water, so the process is generally not economical. This has changed in some parts of the world where water is in short supply, the economic value has been set high enough to offset the cost of cleaning (or desalination), and technology has been improved enough to make the process worthwhile. This seems to be the case in the Middle East, where countries have wealth to subsidize the process.

Nevertheless, it seems to me that the real solution will only come when our global energy crisis is solved. Only when we have a new economical source of energy will current water cleaning, desalination and wastewater treatment facilities become truly economical. Then and probably only then can our global water problems be solved.

### **Water for Your Project**

Have you, your organization or project team considered the consequences of clean water shortages on your team members, suppliers or stakeholders?

According to a 2007 survey, with less than three percent of the world's water now reachable and fit for human consumption – a figure that is shrinking – 40 percent of Fortune 1000 companies surveyed said the impact of a water shortage would be severe or even catastrophic. Despite this, less than one-in-five (17%) say they have prepared for such a crisis, according to research sponsored by the Marsh Center for Risk Insights. Almost half of the Marsh Center survey respondents, 47 percent, said water is critical or very important to their day-to-day operations, but only 6 percent believe it is likely that in the next five to ten years access to water for manufacturing and drinking will be significantly reduced because of quality degradation or scarcity. [15]

"Many corporations across seemingly unrelated economic sectors are exposed to water scarcity and pollution risks, usually in their supply chains. Changes in our global climate, along with rising consumption levels, will dramatically alter water distributions and availability over the coming decades. Businesses need to take time to identify the challenges and opportunities posed by local



and regional changes in water availability."

Water-related costs already are climbing, as manufacturers must treat both source water and waste output to improve quality. Even non-water-intensive businesses are being affected as suppliers pass on their own water-related costs. Whether it's a loss of water, the outbreak of potentially fatal disease or the aftermath of a terrorist act, executives today are being tasked with risk-management responsibilities their predecessors never faced. "Business leaders have a fiduciary responsibility to their board, shareholders, employees and customers to understand the implications of emerging threats and take steps to address these challenges. It's no longer acceptable for CEOs to stand up and say, 'I didn't realize it could happen' after a crisis occurs." [15]

If you have employees, project team members, suppliers or stakeholders in different locations around the world, do you know what their water situation is? Does staff have clean water available, both at work and at home? Are sources of clean water at risk for your team or supply chain? These are real, human and serious questions that more project managers should be asking. Do we have clean water?

### **The Water Tower – An American Icon**

One of the most iconic images in North America is the small town water tower. When I was young, the water tower in my small home town was the highest and most recognizable landmark in the county. It was used as a reference point, for giving directions and for knowing where you were at any one time. You could see it for miles.

Another story from 47 years ago, as a right of passage when I was about 13 years old, I climbed the ladder up the side of our town's water tower. A classmate, Jeff Moore if I remember correctly, and I jumped the fence and climbed the tower, not without difficulty as it was very high. Looking back, it was a crazy dangerous thing to do, since we surely would have died if we had fallen.

I think most towns and neighborhoods across the United States each still has its own water tower. We have one here near our home, a half mile distant. Water towers are certainly American icons.



But aren't they symbols of much more? Clean water that has always been plentiful and inexpensive, another symbol of both freedom and excess. Are water towers common in other parts of the world? I found pictures of water towers in Germany, Australia and a few other countries, but I'm not sure. How many communities around the world can afford to pump and store millions of gallons of clean water, for distribution via gravity-based systems through dozens of kilometers of pipes and valves, all managed and maintained by efficient municipal utilities?

Some water towers are used for civic pride, symbols of community distinction – designed, painted, illustrated and showcased. Here in Addison, we even have a new water tower planned to combine water storage with wind energy production, a grand idea. Another major project for our small suburb of Dallas! One might conclude that towns and communities with water towers are communities rich with water. The water tower may be the symbol of real wealth today.



## Conclusion

I hope this article has helped clarify how important water is in this world, and how many projects and project managers are involved in delivering water and wastewater treatment – and clean water – to communities worldwide. Water projects are everywhere, wherever humans live and work. Six billion people, headed for eight billion by 2050, all needing clean water to both survive and prosper.

I was born and raised in Washington State, in the Northwestern USA, on the shores of the Pacific Ocean. Water was plentiful there. It rained a lot. There were always forests, streams, rivers, lakes, clean water and water towers.

Now I know that type of place is just a dream for over one billion people around the world. And with the planet's climate and weather patterns changing, who knows how long people living in the Northern Hemisphere will have the luxury of free and plentiful water. On the island of Cyprus, once a green island with all the water anyone ever needed, they now have water shortages and desertification. Droughts are becoming more common in some parts of Australia and North America. Water is precious. Clean water, however, must be delivered via projects. Project Managers and project management can make a serious and positive difference in this increasingly important application area.

Thank you for reading this journal and paper, and

Good luck with your projects.

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David Pells has been an active professional leader in the United States since the 1980s, serving on the board of directors of the Project Management Institute (PMI®) twice. He was founder and chair of the Global Project Management Forum (1995-2000), an annual meeting of leaders of PM associations from around the world. David was awarded PMI's Person of the Year award in 1998 and Fellow Award, PMI's highest honor, in 1999. He is also an Honorary Fellow of the Association for Project Management (APM) in the UK; Project Management Associates (PMA - India); and Russian Project Management Association. Since 2010 he is an honorary member of the Project Management Association of Nepal.

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