Journal of Modern Science tom 3/26/2015, s. 235–250

Drought and water shortages in Asia as a threat and economic problem

Sergiusz Prokurat
Wyższa Szkoła Gospodarki Euroregionalnej w Józefowie
sergiusz.prokurat@gmail.com

Abstract

The paper touches on the economic and political issues connected to water shortages in Asia, including droughts, and the economic consequences of the lack of quality water. Access to water is a global economic and political challenge and it's predicted to continue to be important issue for many countries because in the coming years we will be seeing rising water demand, on par with demographic growth. Water will become an increasingly valuable resource, especially in Asia. The data presented in the article based on statistics of water sources, total water withdrawal, access to drinking water**,** water consumption per capita, access to piped water indicate that Asian countries are prone to potential political conflicts caused by the struggle for water. In summary, since in Asia are no systematic evaluations of the negative effects of water-related problems for economies there is a need to create more accurate calculations and contingency plans. For this purpose such measures should be introduced in Asian countries.

Keywords:

Asia, drought, economy, impact, water, quality of water

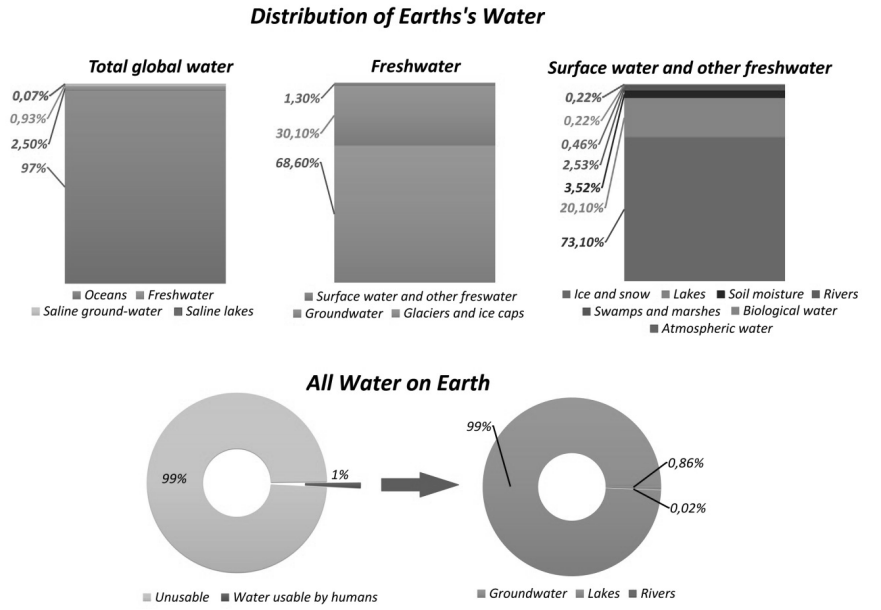
Introduction

Water is a substance which is indispensable to life and is also the most common chemical compound on Earth. We see it throughout or life cycle, on every step. It is an important element of the world economy, as it has shaped cultural exchange for centuries. Water is symbolically considered one of the elements, four in European culture, or five in the Chinese and Japanese version. In many religions submerging in water symbolises a cleansing and rebirth. Water is opposed to fire, air and earth in Europe,

and fire, metal, wood and earth in China, with the Japanese considering it as opposing fire, air, earth and thunder. It symbolises life, fertility and cleansing. The quantity and quality of water determines economic development, health, through access to clean drinking water, the security of populations, if we take into consideration areas at risk of flooding, the state of the natural environment and development of non-production industries such as tourism and leisure (Kundziewicz and others, 2010).

The amount of water on Earth is estimated at 2.2 x 1018 tonnes. Humanity has access to around 30-50 thousand km3 of drinking water a year. Each day we use huge quantities of water – by cooking, taking a shower, doing the laundry or washing the dishes. Meanwhile the large majority of water on Earth is salty. Only 2.5 % of the resource is drinking water, of which 68.6% is trapped in glaciers. This means that water which is actually available for drinking is just 1% of global water resources, whose use is specified by chart 1.

Chart 1. Earth's Water Sources

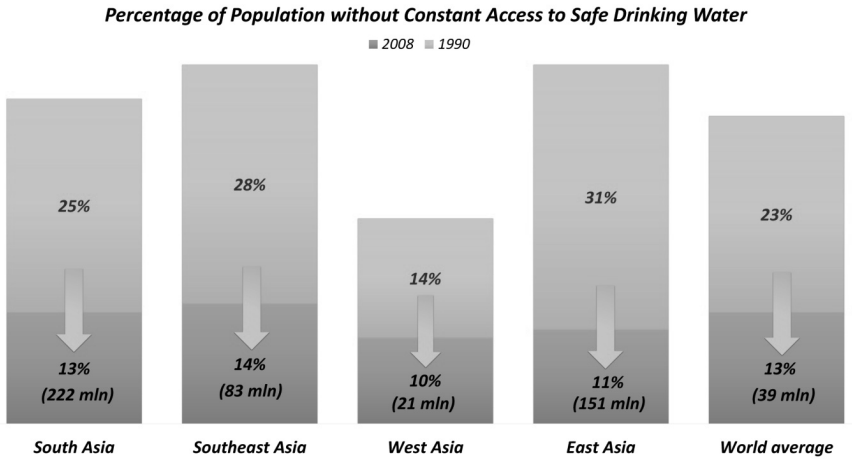


Source: own elaboration. Data taken from: United States Geographical Survey (Skiklomanov I., World fresh water resources in: Gleick P., Water in Crisis: A Guide to the World's Fresh Water Resources 1993).

Impact of availability of drinking and piped water

Although the last few decades have seen great and unprecedented progress in science and technology, leading to great changes in our ways of life, and providing an across-the-board rise in prosperity and improved quality of life, still many people in Africa and Asia are waiting for this change to transpire. China and India alone recorded almost half of the world's progress, with increases of 457 million and 522 million respectively since 1990. This is not surprising, however, since the inhabitants of these two countries represent 46% of the developing world's population.

Chart 2. Number of people who gained access to improved drinking water sources from 1990 to 2008 (millions)



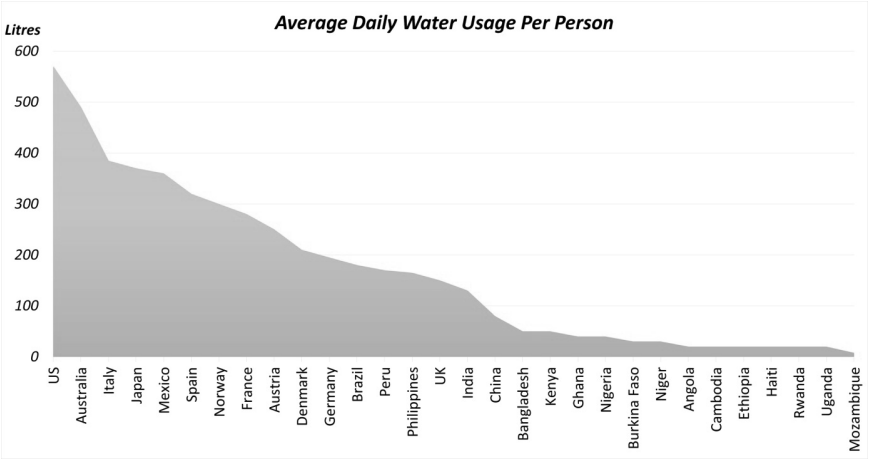
Source: own elaboration. Data taken from WHO, Progress and sanitation of drinking water, report UNICEF/WHO JMP, March 2012, http://www.wssinfo.org/fileadmin/user_upload/resources/JMP-report-2012-en.pdf

One in nine humans on Earth suffers from chronic thirst and diseases caused by drinking polluted water (WHO, 2014). 82% of those who lack access to improved water live in rural areas, while just 18% live in urban areas (WHO, 2014). In all 2.6 billion people live in inadequate sanitary conditions (UNHDR, 2006)[1]. Most problems are concentrated in Africa and Asia – this is where most people afflicted by thirst, malnutrition and associated illnesses live. The lack of water paralyses the development of individuals and society as a whole. This is one of the main reasons for

which millions of children can't go to school. These children cannot afford the luxury of learning because they have to help their mothers supply the household with water. The crisis in fresh water access is also being exacerbated due to population growth. From the mid XX century, as a result of the demographic boom, the population of our planet has tripled. While the demographic situation of more advanced countries seems to be stabilising, less developed regions are seeing huge population increases, especially in large cities. In areas where urbanisation is accelerating, the development of the infrastructure capable of providing drinking and sanitary water is far behind current needs.

The rich world uses much more water than the developing world does. Consumption increases with GDP per capita which is shown in chart 3. In most European countries the average amount is around 200-300 litres daily. In African countries, such as Mozambique, average daily water consumption per capita was below 10 l. This is against the backdrop of international organisations, which recommend a minimum of 20 l of water (not including the water needed for washing clothes), available at most 1 km from the household. Increased water consumption is correlated with increasing income, as measured by Gdp per capita. In countries suffering from water shortages it is the subject of speculation.

Chart 3. Water consumption levels in chosen countries



Source: own elaboration. Data taken from UNDP Human Development Report 2006

Access to fresh water is an indispensable condition of social development and the fight against poverty – without satisfying this need the development of education and healthcare is simply impossible. Water quality is also paramount for the generation of human capital. As found by WHO studies, every minute a child dies from a water-related disease (WHO, 2008). In Southern Asia, the proportion of the population using shared or unimproved facilities is much lower, and open defecation is the highest of any region. Although the number of people resorting to open defecation in Southern Asia has decreased by 110 million people since 1990, it is still practised by 41% of the region's population, representing 692 million people. Open defecation is highest in rural areas of Southern Asia, where it is practised by 55% of the population (WHO, 2012). Among the problems related to water shortages and its inadequate quality P. Gleick specifies (Gleick, 2012):

Waterborne diseases – caused by the ingestion of water contaminated by human or animal faeces or urine containing pathogenic bacteria or viruses (including cholera, typhoid, amoebic and bacillary dysentery and other diarrheal diseases). Diarrhoea is the 4th leading cause of child death, a majority of which are water-related (UN, 2013).

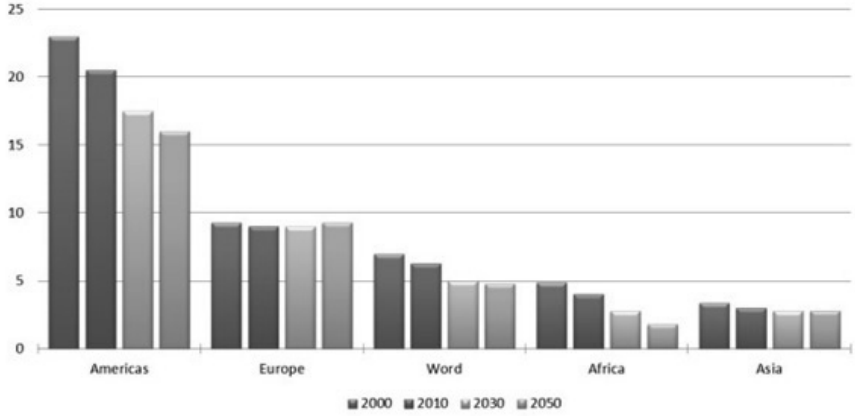
Water-washed diseases, caused by poor personal hygiene and skin or eye contact with contaminated water (scabies, trachoma and flea, lice and tick-borne diseases).

Water-based diseases, caused by parasites found in intermediate organisms living in contaminated water (dracunculiasis, schistosomiasis, and other helminthes);

Water-related diseases: caused by insect vectors, especially mosquitoes that breed in water (include dengue, filariasis, malaria, onchocerciasis, trypanosomiasis and yellow fever).

The problematic lack of water is a hallmark of the challenges facing Asia. Despite Asian countries growing dynamically in recent years, there is significant risk that growth will be stunted by factors such as the lack of water. In the last two decades broader access to fresh water actually overshot the Millennium Development Goals, as specified by the UN – the goal was to increase global fresh water availability from 76% to 88% in the 1990–2015 period.

Chart 4. Usable water per person in thousands of cubic meters

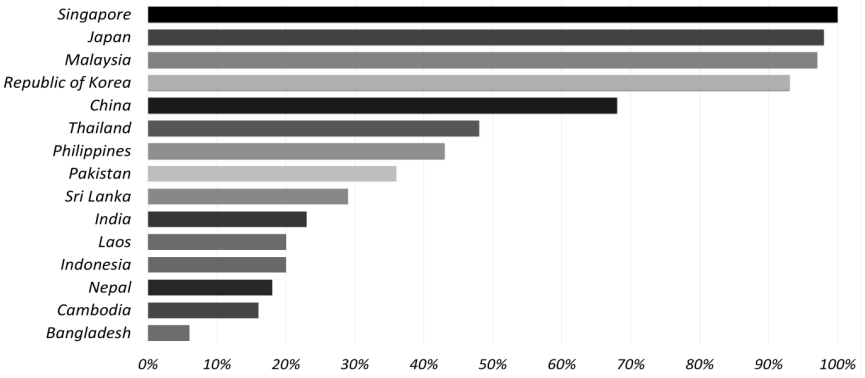


Source: own elaboration. Data taken from United Nations World Water Development Report 2014

Asian perspective on water

60% of the Asian population lacks a secure water supply in their homes. Although there has been progress in terms of providing drinking water in Asia, looking at the number of households that have piped water paints a dismal picture. In Bangladesh, to take just one example, one of the most populous countries in Asia, just 6 per cent of the population has access to piped water. Majority of the population living in Asia lacks access to a secure household water supply (Water Development Outlook 2013). As indicated by the graph, people in Bangladesh, Cambodia, Nepal, Indonesia, Laos, India and Pakistan see the lowest levels of piped water sources access. In the Philippines, Thailand progress has been made in providing people access to piped water. South Korea, Malaysia and Japan are the leading providers of piped water to its population. In Singapore, every household has access to fresh water. The data show wide discrepancies in access to safe drinking water, indicating that the region has a long way to go before people have the most basic facility – clean water.

Chart 5. Asia's access to piped water

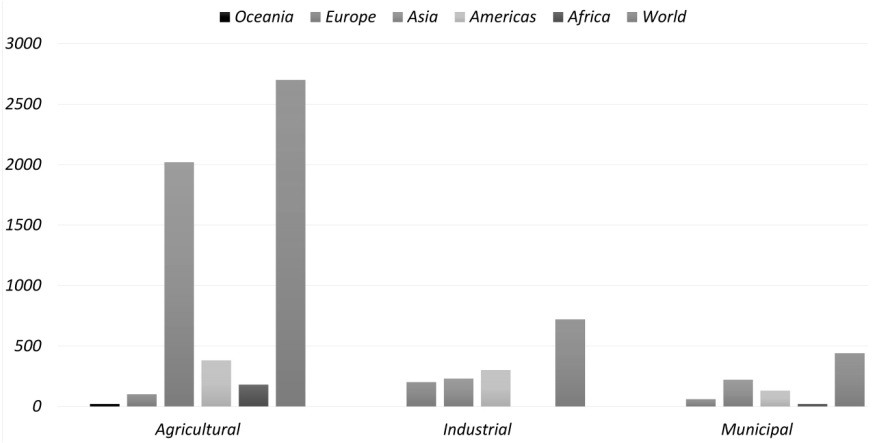


Source: own elaboration. Data taken from Water Development Outlook 2013

Gains in the use of piped water in households have indeed been made in these regions, but progress is mostly in the 'other improved' category of water sources. 65% of the populations in Southern Asia use other improved sources rather than piped water as their primary on premises source. The second group of countries is made up of Eastern Asia and Western Asia, where at least 70% of the population use piped water on premises**.** In Eastern Asia (dominated by China) a dramatic increase in piped water supplies has been achieved since 1990, with a gain of 35 percentage points in coverage of this category in the last 20 years. Eastern Asia is also the most improved region in the use of overall improved drinking water sources, starting at 68% in 1990 and achieving 91% coverage in 2010. This is a 23 percentage-point increase, much higher than any other region.

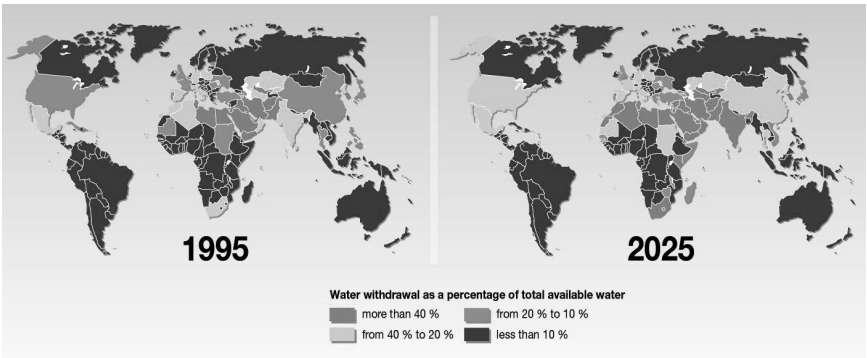
The Asia-Pacific is home to 60% of the world's population but it has only 36% of its water resources. Per capita water availability is the lowest in the world. The majority of the world's fresh water resources are used up by agriculture. Unfortunately, the low quality of irrigation system used in developing countries leads to significant waste. In addition, as a result of a wasteful economy woodland coverage is decreasing, and woods are a natural factor behind maintaining the quantity and quality of water resources. Agriculture is the largest water consumer in the world. It boasts 69% of global fresh water consumption. Africa and Asia have an even higher water intensity of their agricultural sectors (above 85%).

Chart 6. Total water withdrawal by sector (km3/per year)



Source: own elaboration. Data taken from UN FAO AQUASTAT, http://www.fao.org/nr/aquastat/ (accessed 2015)

Chart 7. Global water withdrawal map
(as a percentage of total available water)



Note: Water stress is defined as having a high percentage of water withdrawal compared to total available water in the area.

Source: taken from "Le Monde diplomatique" (author: Philippe Rekacewicz), February 2006.

The threats and risks linked to droughts and water shortages are prevalent due to the following reasons:

Natural reasons: Extreme hydrological phenomena – droughts and floods – have become a major problem in many parts of the world. Floods kill thousands of victims each year I developing Asian countries (especially in Bangladesh, China and India). In 1998 a flood in Bangladesh left nearly 70% of the country under water. The largest material damage caused by river floods, amounting to an estimated 30 billion dol., were recorded in China also in 1998. Such an overflow of water paradoxically causes a drinking water shortage. Meanwhile a drought, understood as a lack of water, is the natural disaster which is most difficult to face. Its direct cause is a lack of precipitation. Around 20–30 days without rain is enough to observe the drying out of soils and mass deaths of plants, and each day which passes without rain will only exacerbate the scale of the disaster – mass animal migrations, soil desertification, famine, and a highly increased probability of catastrophic fires. If such conditions are maintained for over a month, we can say with certainty that the natural catastrophe is in fact a full-blown drought.

The effects of droughts and water shortages can be divided into three groups: environmental, economic and social consequences. In the case of environmental effects: lower surface and subterranean water levels, lower flow levels (with a decrease below the minimum leading to direct danger for amphibian life), increased pollution of surface water, the drying out of wetlands, more and larger fires, higher deflation intensity, losing biodiversity, worse health of trees and the appearance of pests and den droid diseases. Economic losses include lower agricultural, forest, game and fishing output, higher food production costs, lower energy production levels in hydro plants, losses caused by depleted water tourism and transport revenue, problems with water supply for the energy sector and technological processes in metallurgy, mining, the chemical, paper, wood, foodstuff industries etc., disruption of water supplies for municipal economies. Meanwhile social costs include the negative effect on the health of people directly exposed to this phenomenon (excessive heat waves), possible limitation of water supplies and its increased pollution levels, high food costs, stress caused by failed harvests, etc. This is why droughts and fresh water shortages may be considered as a factor which increases the gap between developed and developing countries.

Man-made risks: Intensive civilizational development and demographic growth have led to negative changes of the landscape as a result

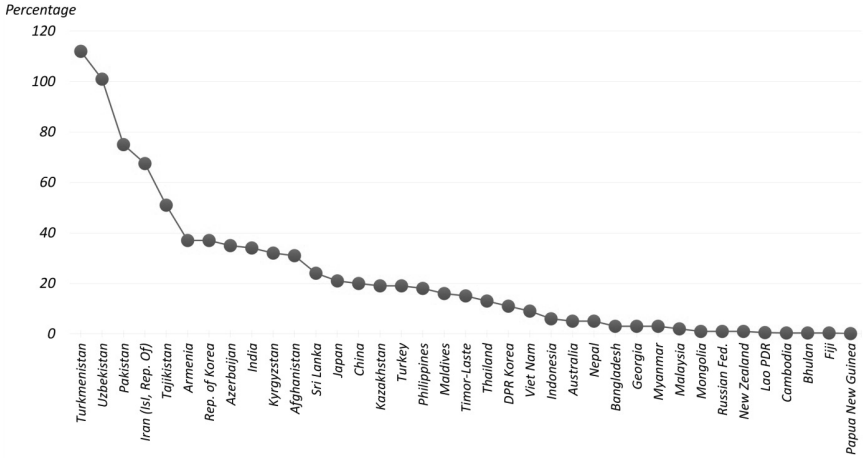
of human activity. The very quick changes in land use, with the wholesale substitution of stable ecosystems such as woods, meadows and wetlands into unstable ecosystem, specifically agricultural fields. This has led to rapid and negative changes in the heat and water balance of the entire country. Rising road, car park surface areas, i.e. impermeable surfaces in built-up areas decreases the amount of water soaked up by the soil and increases surface rundown, also compressing the time from precipitation to increased river water levels. In effect we are seeing depleted groundwater resources.

Apart from a growing population worldwide, which is a direct factor behind more irrigation, the global water shortage is also caused by our habits, especially by growing demand for meat, due to the much higher „water intensity" of meat products as compared to vegetables. The measure of this intensity is the water footprint, which describes the entire amount of drinking water used to produce a given good (also indirectly, i.e. with the use of irrigation). Information about the water footprint of products and tips on how to decrease your footprint show us how much average food products „costs". For example, producing one kilogramme of rice requires an average of 2500 litres of water, 1 kg of rye bread – 1600 l, 1kg of cabbage – 260 l, 1 kg of corn – 1220 l, 1 kg of potatoes – 290 l, 1 kg of beef 15400 litres, 1kg of pork – 6000 l, 1 kg of poultry – 4330 l, 1 kg of chocolate – 17000 l, while producing 1 kg of cotton uses up 10000 litres of fresh water (Waterfootprint idea, 2015).

In some parts of Asia, where water access is severely restricted, even small drop-offs in its availability or anomalous annual precipitation may endanger society as a whole. In order to ensure water access, the local giant, China, is constructing dams on the Mekong, leaving Vietnam, Laos, Cambodia and Thailand without water. In their conflict with China these countries have no other option but to complain. But Chinese plans go even further. A huge project of reversing the flow of the Brahmaputra (Chinese: Tsangpo) river, which after leaving Chinese Tibet flows through India and Bangladesh. The struggle for water in some afflicted regions has led inhabitants to hiring guards in order to protect wells and anther sources. In the macro scale this is best exemplified by the Amu Daria River, shared by Uzbekistan, Turkmenistan, Tajikistan and Afghanistan, which has been nearly completely dried out, so much so that it has ceased to reach the Aral Sea/Lake, which is evaporating in an alarming pace. The fact that Turkmenistan retains much of the water before it flows into Uzbekistan is merely an example illustrating the bigger picture.

In the densely populated coastal regions of South-East Asia, where nearly half of the Asian population lives, extracted groundwater is polluted by seawater, which causes severe water shortages in cities such as Manila, Jakarta, Bangkok, Dhaka and Karachi. This is why gigantic water dams are the decoration of many Asian waterfronts. According to UN Water Development Report, data from 2014, the situation is reaching an alarming level in Asia. Interesting data on the total water consumption per capita compared to all renewable water resources per capita paint a grim picture (UN FAO, 2010). Apart from Turkmenistan, which uses more water than it has (total consumption is higher than total renewable sources), it is clearly visible that some Asian countries have little possibility of a more effective water economy, with the exception of Singapore, which has at its disposal technology allowing for recycling urine into tap water (Upson, 2010).

Chart 8. Total water consumption per capita compared to total renewable water sources per capita

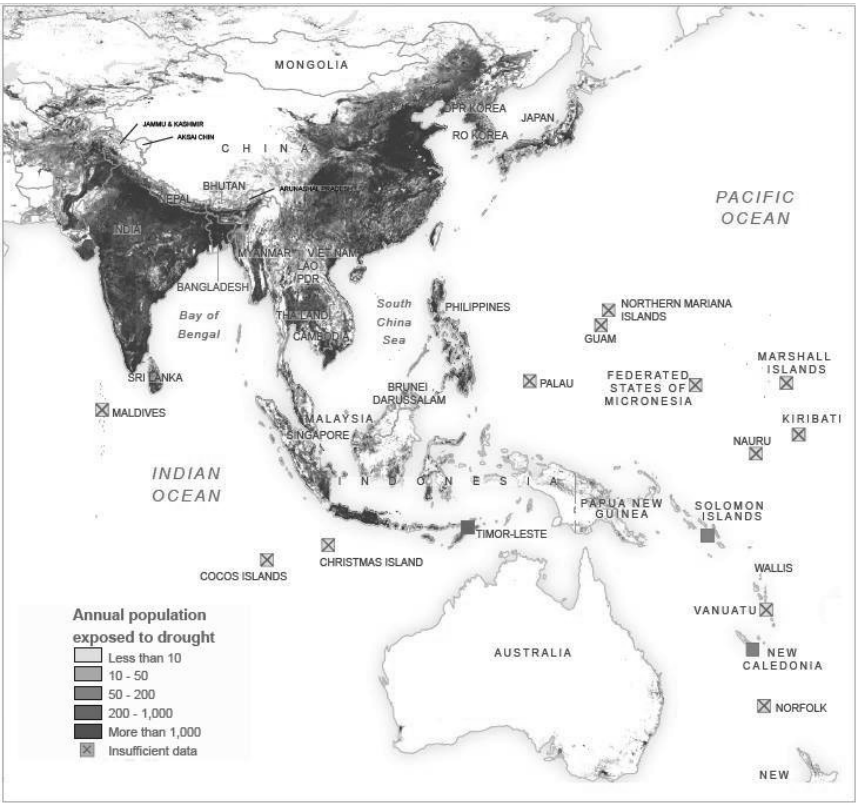


Source: own elaboration. Data taken from UN FAO (2010), AQUASTAT online database, Water use, by sector and by source, Total renewable water resources databases at: http://www.fao.org/nr/water/aquastat/main/index.stm

The solutions adopted in Singapore and statistical data show that Asian countries will soon have to adopt measures leading to more effective water use. Most farmers in Asia and the Pacific still use natural

„flooding" irrigation systems, while suing newer methodologies might decrease water consumption by half. It is worth noting interesting projects undertaken in China, such as the construction or expansion of coastal desalination plants, which will be located to the east of Beijing, in Tangshan (Caofeidian). The project's aims are to complete an extension of facilities by 2019, which according to the plan should provide one million tonnes of fresh water each day to the inhabitants of China (which may be as high as a third of daily consumption in Beijing). For now the plant

Chart 9. Annual Physical Drought Exposure in Asia-Pacific



Source: changed and adapted from: UN Cartographic Section, FAO, Global Discovery, UNEP/GRID. Designed by UNEP/GRID Europe for the Global Assessment Report on Risk Reduction (GAR), OCHA_ROAP_Drought_v1_2014, http://www.unocha.org/roap/.

is producing 50 thousand tonnes a day. In other countries government policy is an obstacle. Unfortunately, as long as the population has access to free or subsidised water, there won\t be any incentives for change.

Water shortages may turn it into a commodity of paramount importance to the economy. Within 50 to 80 years, with further integration of global markets and projecting rising transaction numbers, futures and other markets will be created – options, calls, swaps – on formal and informal exchanges, all trading in water. Various types and categories of fresh water will emerge, as we now see with the grades of oil. Water as an asset will become an important resource on par with oil, copper, agricultural resources and precious metals. Up to now the lack of reliable information sources on water supply has made it difficult to establish a market price. More research is needed, which would determine the profitability of water transactions. An additional problem is the fact that in many countries water is simply wasted, because it is delivered to the population at very low prices, often as a result of government subsidies.

Conclusions

Access to water is a global economic and political challenge. An estimated $260 billion is lost globally each year due to lack of adequate water supply and sanitation (WHO, 2012b). On average, every $1 invested in water and sanitation provides a $4 economic return (WHO, 2012b). Universal access to water and sanitation would result in an estimated $32 billion in economic benefits per year globally from reductions in health care costs and increased productivity from reduced illness (WHO, 2012b). Only 6% of international aid went towards investments in water and sanitation in 2011 (WHO, 2012b).

In Asia there are no systematic evaluations and wholesale analyses of the negative effects of water-related problems for economies. In the case of extremely agriculturally harmful atmospheric and soil droughts losses are usually estimated just based on lost harvests. Negative effects of these phenomena are also evaluated in woodland economies, with the basis of calculations being the amount of fires caused by droughts, young tree die-offs and increasing numbers of pests and diseases. But broader analyses based on economic losses caused by hydrological droughts are not conducted (including losses from transport and tourism, lower energy output in hydro plants etc.). In construction water shortages and climate change, causing dangers weather fluctuation are especially risky for commercial

real estate, which is he darling of investors. This is because building costs increase, their market value drops, higher insurance premiums are imposed, also construction costs are on the up and delays are more common. These higher production costs are passed on to investors. A solution or mitigation of these problems would be ecological construction, which by design is aimed at energy efficiency and media use.

In his book „Water: Asia's New Battleground", Brahma Chellaney says that the future of the continent may in large part depend on water. The author observes the link between water and national security. Water may be the cause of conflict and confrontation between countries.

What are the measures which can help avoid such a scenario? Water desalination is not profitable – its price is far above normal fresh water. But with the implementation of new technology it may well be worthwhile in the future. Better irrigation methods, creating drought-resistant crops, constructing power plants which do not use huge amounts of water for cooling, or using recycled water to flush toilets are just some ideas.

The main preventive measures include reducing population growth and preventing changes in the natural environment. This is increasingly true because in the coming years we will be seeing rising water demand, on par with demographic growth. Water will become an increasingly valuable resource, especially in Asia.

According to climate projections, in the future we are to expect prolonged dry spells (without precipitation or precipitation well below average), with the subsequent rise of temperature, which due to increased evaporation will further endanger the water balance. We can also expect future water deficits to be present on much larger areas and for them to be much more intensive. Up to the mid XXI century water demand will rise by 55 % – as per the UN's report on the Millennium Development Goals". The paper foresees that it will only take 50 years for the Earth to achieve a population of 9.6 billion people. Over 40 per cent of these will be faced with water shortages. The problem will be particularly acute for inhabitants of Africa, the Middle East and South Asia. According to the UNEP „GEOB 4" report, by 2025 water demand will rise by 50% in developing countries and 18% in the rich world, while water resources are not increasing – especially those of clean water.

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