Brugger, F. (2007): Present and future problems of water in developing countries. In: Lozán, J. L., H. Grassl, P. Hupfer, L.Menzel & C.-D. Schönwiese. Global Change: Enough water for all? Wissenschaftliche Auswertungen, Hamburg. 384 S. Online: www.klima-warnsignale.uni-hamburg.de

3.2.8 Present and future problems of water in developing countries

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SUMMARY - *The water crisis hits the developing countries the most. The challenge of providing safe water to more than 1 billion people – almost all of them living in developing countries and countries in transition – is enormous itself – and it is additionally confronted with the fact that aid to the water sector is declining since the end of the 1990s. Access to these basic services is not high enough on the agenda to meet the Millennium development goals. The urban areas and small towns where almost all population growth will take place are hot spots since even in the past the provision of water supply and sanitation services could not keep pace with growing demand as well as the insufficient sanitation services and missing wastewater treatment impact the quality of the anyway stressed and limited ground- and surface water resources.*
The second basket of problems arises from agriculture, which in developing countries consumes up to 90% of water, leading increasingly to competition between domestic, agricultural and industrial water users and between upstream and downstream users. Since irrigation is often characterised by strong inefficiency this wastage of resources more than the lack of renewable water resources will force countries to balance their water demand virtually through food imports from the world market. Land use patterns – in developing countries often characterised by deforestation, overgrazing and erosion – impact the functionality of the catchments and can severely affect the water cycle leading to high runoff after heavy rainfalls and early dry up of wells and rivers. Although addressing and overcoming these challenges needs financial resources and technical know-how transfer, most important are social and political innovations: first, introducing the river basin (on the regional, national and international level) as the most relevant area to manage water resources. Second, the development of the idea of hydro solidarity in sharing this scarce resource through co-ordination and integration of all relevant stakeholders in water use planning and protection of water bodies.

Women walking many kilometres with buckets on their heads to get to a waterhole where they draw a brownish kind of liquid or where they wait for hours in a queue.

This first customary association of ideas with the theme »water problems in developing countries« is as right as it is wrong. It is right because it draws our attention to more than one billion of people who have no access to clean drinking water. And it is wrong because the water problems of developing countries are much more serious than this: That water which is used in households and industry in developing countries is only a small part of less than one fifth of the whole consumption, but the lion's share is used for the production of food. But it is wrong as well because the way in which a country is using its water has a decisive influence on water conservation and on how much water is actually available. Thus we have at least given to understand the three most important dimensions of the water problem in developing countries that we shall be looking at more closely in the following chapters.

Water supply

Problems such as »water supply« or »access to clean water« exceed by far the need for water for drinking and cooking and include at least the need for water for a minimal hygiene of the body. The need for sanitary installations is closely related to the mentioned need – the need for regular body hygiene as well as for a safe disposal of faeces and sewage. In densey populated areas as well as in areas with a high groundwater level these items directly influence the quality of available water. Thus to the 1.1 billion of people with no access to clean drinking water we must add another 2.3 billion of people with no access to sanitary installations, even not to the most primitive kind.

Access to clean drinking water and to sanitary installations play a key role in overcoming poverty and in sustainable development. The most important connections between poverty and access to clean drinking water are to be found in the following domains[1] :

Health: Countries with the lowest number of people with access to clean drinking water have the highest rate of child mortality. Diseases are spread, not only directly through the consumption of polluted water (such as diarrhoea, causing over 2.2 million deaths annually among children below 5 years of age[2]) but indirectly through lack of sanitary installations too (failure to clean one's hands, transmission of skin and eye diseases such as trachoma[3]).

Education: Lack of access to drinking water has an impact on the schooling of children due to absence caused by illness and to the time consuming search for water. The latter is true for girls mainly. And quite often these are not sent to school owing to the lack of sanitary installations at the schools.

Income/Consumption: Impaired health and much time spent in the search for water limit the possibilities to do paid work. Those inhabitants of slums or illegal settlements within the boundaries of big cities, who normally have to buy their water from flying merchants or from tank-lorries

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spend a large part of their income on water and often pay a price up to ten times higher than the price that better-off people, who are connected to the communal water supply system, would pay.

On the level of political economy the intense correlation between poverty and water becomes very obvious in the strong correlation between the gross national product of a country and access to water. In this not only the individual but also the economic dimension are expressed: for a functioning industry a reliable and well functioning water supply is an absolute requirement. In developing countries breakes of considerable lengths in the water supply must be considered normal due to braekdowns of the often insufficiently maintained system or to illegal tapping.

The largest challenge for the enlargement (and improvement) of the water supply is to be found, on the one hand, in rural areas; on the other hand the need for both is quickly increasing in the slums of fast growing cities, too. The number of inhabitants of slums increased since 1990 by 36% (mainly due to rural exodus). At the beginning of the new millennium more than three-quarter of the inhabitants of big cities of developing countries lived in slums[4], where the risk to get ill as well as child mortality are often higher than in rural areas[5]. It is believed that future increase of the world's population will be up to 90% in slums of developing countries, most of all in smaller towns and in villages (see *Fig. 3.2.8-1*). Thus the challenges towards infrastructure such as water supply and sanitary facilities are immense if more than filling the present gaps is anticipated but if the increase in population is born in mind as well. The UN programme for world population »UN-Habitat« expects that the 924 million of inhabitants of slums will have increased to 1.5 billion in 2020 and to 2 billion in 2030[6].

The following two examples illustrate the dimensions of the urban water problems: Merida is a town with 700,000 inhabitants on the Mexican peninsula of Yucatan. Like many other cities it has no installations for water supply. Close to all sewage flows through various kinds of septic tanks into the ground, without any treatment. The ground is porous limestone with many cracks. Thus the sewage finds an easy and quick way to the groundwater. This type of ground does not clean the water well enough so that many of the pathogen micro-organisms pollute the subsoil water. To put it in a simple way: the number of coli bacteria in underground water close to the surface exceeds the number considered the maximum by WTO more than one thousand times[7].

The booming cities of China – Beijing with 13 and Tianjin with 10 million inhabitants – are all situated in that part of the country which is poor in rainfall and – therefore – are experiencing a severe shortage of water. Because of excessive utilisation of underground water the ground has begun to sink with a menacing speed. But in the south of the country there is enough water drained into the sea by the river Yangtse. Therefore there are plans to divert part of these waters northwards. For 58 billion US$ three canals will be dug, each one 1,600 km long. For one an old, strongly polluted canal is used where water is pumped by 13 stations with an enormous waste of energy to the urban centres of the north while another canal is not only completely newly dug but, for its construction 300,000 people have to be removed from their lands.

One of the millennium goals that the global community has set is to reduce to half the number of people with no access to clean water by 2015. Hence each day 300,000 people should be connected to a safe drinking water system. Yet it can already be said that a number of countries will definitely not reach this goal. This is valid even more so for sanitation[8] The precarious situation in the field of sanitation not only leads to the pollution of underground water, in many parts of the world it also aggravates the tension between those people living along the upper reaches and those living along the lower reaches of a river: domestic and industrial sewage as well as agricultural pesticides along the upper course pollute the water which is absolutely necessary for those living along the lower course.

One of the reasons why the millennium goals are so difficult to achieve is the lack of financial resources: developing countries must double their investments in water supply and sanitation as compared to today. That is at least another 10 billion US$ per annum just in order to achieve minimal standards. Other estimates mention at least another 30 billion US$ per annum.[9] The fact that the amount of money released for improving water supply and sanitation in developing countries has been constantly reduced during the past few years impedes reaching the millennium goals. Between 1996–1998 and 1999 – 2001 the decrease was as high as 12%. If one adds multilateral aid the money spent between 1999 and 2001 for water supply was 3 billion US$ per annum to which could be added another 1.5 billion US$ in loans[10]. An investigation of OECD shows that only 12% reach the poorest countries

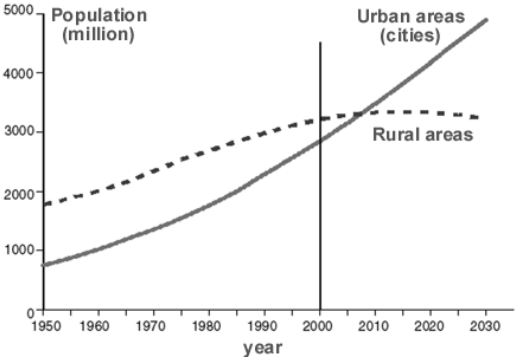

Fig.3.2.8-1: Population growth will take place mainly in cities.

in which less than 60% of the population have access to clean drinking water[11] . Great hopes were set on the private sector in the nineties. It was expected to produce additional financial means as well as technical know-how. Yet figures prove that private investments have decreased by 44% since 1997[12] . Today a number of endeavours are on the way to improve the rules and models of private sector participation in a way that also improves the concept of sustainable development[13] .

The lack of financial resources is by far not the only challenge for developing countries in the field of water supply. One other main fact that worsens the water crisis is found in the institutional weakness of many suppliers of water, such as Civil Service and governments. »Water is not scarce; it is simply badly managed«[14] is a fitting description of the situation. There is no doubt that the performance in the water section is insufficient throughout, primarily because of inefficient management with high technical losses (up to 60% and even higher losses due to leakings in the supply system), of financial losses (only a small part is charged at »political« prices that do not cover the actual costs), surplus employees with lack in know-how and because of political interference. Many decisions are politically motivated. In addition many governments do not consider water supply and sanitation as matters of first priority. An actual analysis of official strategies to fight poverty[15] in African countries reveals that – with the exception of Uganda – water supply and sanitation are not given high priority[16] . Yet these Poverty Reduction Strategy Papers (PRSP) are more and more considered important in the co-ordination and the setting of priorities of donating countries. The problem is aggravated by the current tendency to take decisions at the regional or local level. While this tendency must be considered reasonable in principal, it must be kept in mind that in developing countries those responsible at the local level very frequently do not have the necessary education nor the financial means to fulfil the expectations. The fact that in most developing countries several ministries are responsible for solving the water problem is another hampering factor. This complicates co-ordination and – where water is scarce – the competition between ministries has a very negative aspect.

Agriculture

The forecast, that by the year 2025 one third of mankind – but mainly in developing countries – will experience a shortage of water means, that there will no be water available for all requirements of households, agriculture, industry and a well functioning eco-system.

Agriculture is the highest consumer and the worst polluter of water (more than 2/3 and in developing countries up to 90%). Although globally only about 1/6 of agricultural lands are irrigated (about 250 million hectares) about 40% of all food is produced on them. On the other hand the efficiency of irrigation is deploringly low and therefore one of the key questions for the future is: How and how much can this efficiency be improved?[17] The problem lies not so much on the technical side – there are actually technically simple sprinkling irrigation systems available that can be paid off soon by small scale peasants[18] – it is far more a question of an incentive system that improves irrigation efficiency.

In addition water consumption in agriculture depends also on consumer habits. As soon as the amount of meat consumed goes up (which is usually the case when income rises) consumption of water rises exponentially: 260m³ of water are needed for the production of purely vegetarian food per person and year, if 20% of the energy in food is meat four times more water is needed[19] .

Actually the capability of a country to produce enough food depends on the amount of annually renewable water: if it is below 1,700 m³/(person×year) it is called a shortage of water, below 1,400 m³/(person×year) there is water stress and below 1,000 m³/(person×year) there is severe lack of water. The number of countries close to the critical situation – where the total consumption surmounts the annually renewable amount – is rapidly increasing. The result is lowering underground water levels. In coastal regions this leads to the penetration of salty sea water and the pollution of underground water reserves which makes them useless for human consumption.

Where the limit of food production is reached (through extension of agriculturally used land, higher or better harvests) there remains the possibility to import food in order to adjust the water budget virtually. There is a study that predicts an increase in food import of developing countries from 107 million t/year in 1995 to 245 million t in 2025, if »business as usual« is continued. For the production of the additionally imported 138 million t of grain 12% of the amount of water, that developing countries presently are using for irrigation, would be needed. This could alone be made available locally with improved efficiency[20]. Import is practicable only, if – apart from the question of resulting dependencies – other economic sections of these countries would generate enough income (e.g. through alternative use of water or the production of exportable agricultural products with a beneficial relation between price of water and product) to buy enough grain on the world market.

Resource management

There is a third challenge in the area of water besides water supply and agriculture: the destruction of the river

catchment areas from the mountains down to the coastal region. In developing countries the deforestation in the river catchment areas is an ever growing threat. Floods in flat areas and decreasing amounts of water during the dry season are signs for the impact on entire catchments. The loss of forests and wetlands decreases the biological diversity and the operability of ecosystems[21].

The dilemma in water distribution therefore is created not only by the conflict between the inhabitants along the upper and the lower reaches of a river or between water supply enterprises and farmers, there is also the clash between human activities and natural habitats. Many experts view the conflict between irrigation agriculture and nature as the key question of the world-wide water dilemma[22].

The water crisis is much more a problem of management than a hydrological one. Therefore we must seek its solution in Integrated Water Resource Management (IWRM) where all water-relevant sectors are co-ordinated. Here the river catchment areas are considered as the proper units because the decisive dependencies are to be found between different river areas. In addition land use in the whole water catchment area influences its availability and its habitats.

Ideally IWRM does not only consider interests of safeguarding and benefit. For sustainable functioning it is necessary to include cultural aspects as well as political, legal, administrative and economic aspects. Therefore IWRM is a process in which a number of individual measures are put together like in a puzzle[23]. The concept was formulated for the first time in 1992 already at the International Conference on Water and Environment in Dublin (the so called Dublin principles)[24] and was since concretised and verified again and again. One of the four basic principles of IWRM is – besides the treatment of water as a finite resource – the principle of a participative procedure (all groups concerned, including women, are actively integrated) as well as the rule that the cost of the water service are born by all users.

Finally two examples may illustrate the complex nature of IWRM:

a) Nepal is a country with enough water. Yet the farmers suffer from a seasonal shortage of water. Helvetas, a Swiss NGO, has stopped constructing simple potable water supplies but follows the principle of inclusiveness. The strength of this method can be seen in the exclusion of two main obstacles of IWRM: By this intersectoral co-operation the different political participants as well as other groups concerned are bound to co-operate. Secondly the training or education of the participants and those more concerned is pushed in the management sector thus creating capacities locally. The aim of the project is the creation of so-called »water use plans«. In these plans use potentials as well as necessary measures for the protection of the water resources are shorn as well as of those living along the river. This master plan serves the communal development committees as well as the regional authorities in planning, setting priorities and the realisation of sustainable water management. In this process scientists and engineers co-operate with the political authorities and especially the local population. The aim is to place the responsibility for the water management as close as possible to the users. Therefore the education of local authorities and organisations and the support in preparing management capacities are core elements of the programme[25].

b) The second example[26] from Guatemala includes all problems explained so far and their connections in a concentrated fashion. It shows furthermore that to think and act on the level of the river catchment area affords new ways of financing in order to allow the financing of measures to protect the resources. It is, therefore, a pilot project for overcoming the critical point of financing measures for the protection of resources. The idea behind it is: Users along the lower course – firms and communities – pay for the protection and the care for forests and sustainable agriculture of farmers and communities along the upper reaches of a river. This innovative project takes care of ecological, community and industrial interests.

The project was initiated by the local environment organisation Defensores de la Naturaleza and WWF Guatemala and works in the biosphere reservation called Sierra de las Minas, which extends over 240,000 ha. It reaches from sea level to more than 3,000 m and is home to more than 70% of all birds, reptiles and mammals of Guatemala. There are 63 springs of water which all flow into the three big rivers of Guatemala: the Montagua, the Polochic and the Salma. At the same time more than 300,000 people in 500 villages as well as big industrial plants (such as a paper mill, a brewery and a hydro-electric plant) make use of these waters and more than 100 small scale irrigation areas produce food and the agro industry melons for DelMonte. In addition, the most arid area of Central America – the Montagua River Valley – lies within this IWRM project. Peasants continue to slash virgin forest higher and higher up the along mountain slopes in the search for arable land and for fire wood. Thus the pressure on the Sierra is constantly increasing. Yet less forest also means less water: the storage capacity of the underground diminishes as it cannot hold so much rain anymore. During the rainy season too much of the water runs off while during the dry season there is not enough in store. As a result of excessive use the amount of water flowing through the Montagua decreases every year and the groundwater levels go down continuously.

The problem is due mainly to the lack of finances for protecting the forests so important for the water regime. In spite of the fact that protection from erosion benefits the

hydro-electric plants by 23 US$/ha yearly those farmers who – through sustainable agriculture – produce this benefit, are not compensated. The same is true in agriculture: although harvest increases 20 times on irrigated fields as compared to non-irrigated, no compensation is paid. The prices of water cannot pay for the administration and the infrastructure of water supply let alone assist in safeguarding the water resources.

A water fund will be created now. Payments of the users of water along the lower river in favour of those who safeguard the flow of water in the upper catchment will make sure that the amount of available water will not further decrease.

There are actually two sources of income for this fund: on the one hand the paymants of water users, on the other hand interests of a five million US$ fund created by a group of international donors and the World Bank. The money is spent on the management of protected areas, on reforestation of the source areas, compensation of owners of forests for their renouncement to intensive use and on the development of alternative sustainable sources of income.

The fund is managed by a committee of representatives of the biggest users (industry, agriculture, hydro-electric plants), local governments and the environment organisation Defensores de la Naturaleza.[27]

Conclusion

The way out of the water crisis is a social and political innovation process. Not specific hydrological or technical problems lie, therefore, at the centre of current or future water problems. In addition to financial and technical means there is a primary need for a social and political innovation process on the local, regional and intergovernmental level:

- new thinking within the frame of the water catchment area. This is the relevant base factor.
- new organisational units so that the inhabitants become capable of making decisions and of solving conflicts of interests constructively on the level of water catchments areas.
- development of material as well as immaterial incentive systems that promote careful use of the resource water on the individual level of households as well as on the level of food production and industry ♦

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