Briefing Note

Water Scarcity and Agriculture

Background

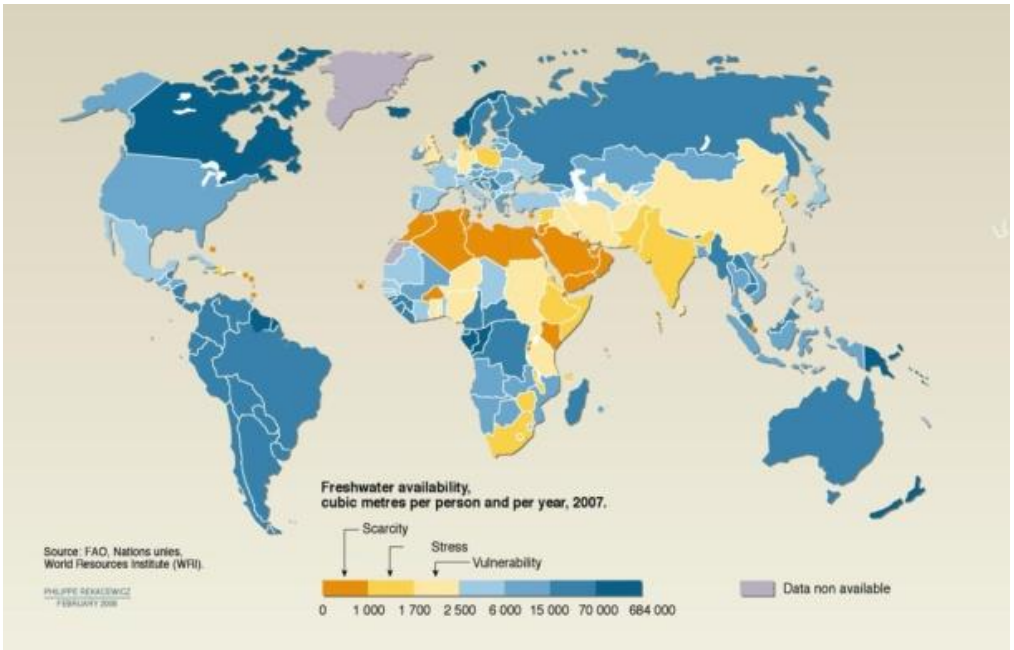
The world's population trebled in the course of the twentieth century. Freshwater use increased sixfold in the same period. For many regions this has raised a problem that is coming to be seen as one of the major challenges for the future of developing and newly industrialising countries: **water scarcity.** Large parts of Africa, Asia and the Middle East are affected by increasing water scarcity (see Figure 1).

The easily understood Falkenmark indicator is widely used to measure the complex feature of water scarcity.

The term **water stress** is used when a country's renewable water resources fall below a level of 1,700 m^3 per person per year.

Water scarcity occurs when per-capita availability is less than 1,000 m^3 per year, while to be classed as **absolute water scarcity** the figure must be less than 500 m^3 per person per year. In many of the above-mentioned regions the situation can already be described as one of absolute water scarcity. In Jordan, for example, per-capita water availability is less than 200 m^3 per year.

Figure 1: Global distribution of freshwater availability according to the Falkenmark indicator. The category of absolute water scarcity is not highlighted separately.



Source: UNEP, 2008.

Most of the water withdrawn from surface and groundwater resources is used by **agriculture.** Globally, agricultural irrigation is responsible for around 70 per cent of all water withdrawals; in the countries of the Middle East this figure rises to 95 per cent. Abstraction for drinking and household purposes accounts on a global average for around 10 per cent of water withdrawals; in many developing countries these uses may be only five per cent of the total. Industry accounts for around 20 per cent.

The question arises of how the increasing consumption of water by agriculture can be curbed without jeopardising the world food supply. By 2050 there will be another two billion people to be supplied with food and water. Additional challenges are posed by the rising demand for agricultural non-food products, especially biofuels and by changes in the timing and distribution of rainfall as a result of climate change. The FAO estimates that irrigated agriculture will require water withdrawals to increase by between 12 and 17 per cent by 2030 to secure the world food supply.

Increasing water scarcity in many regions is having direct effects on the ecosystems involved. Water management has in the past taken insufficient account of the water needed to maintain existing ecosystems and secure **biodiversity**. There have been many warning signals: the drying up of the Aral Sea in the 1980s, the destruction of half the world's wetlands in the 20th century, dramatic falls in groundwater levels in western India, northern China and elsewhere, and extensive damage to the biotopes of large delta regions such as that of the Indus. Already in the year 2000 environmental experts were stating that water withdrawals for agriculture need to be reduced by between five and ten cent by 2025 to prevent further environmental damage.

Agriculture must face up to the increasing challenge of reconciling its own demand for water with the claims of other water-using sectors, especially the environment. It must also secure the world's food supply and take account of the consequences of **climate change**.

GIZ's position

In the light of these considerations GIZ's position is as follows:

1. While water scarcity is caused primarily by the agricultural sector, **key solutions must, however, also be sought outside the agricultural and water sectors**. Demographic trends, changing consumption habits and the rising demand for agricultural non-food products, especially for biofuels are factors that call for intervention beyond the water sector. Water scarcity **needs to be treated as a cross-sectoral issue** (**water mainstreaming**).

2. Appropriate allocation of water resources requires information on the regional availability and development of these resources, yet this is often not available. Greater emphasis must therefore be placed on the assessment **and analysis of water resources**, the use of water resources in different sectors of the economy in the region in question, the quality and ecological function of these resources and levels of current and predicted use.

3. Under conditions of water scarcity, important aspects of agricultural water management need to be re-evaluated. **Economic analysis** needs to give greater weight to the economic appraisal of water allocation to different sectors and hence to the economic efficiency of resource allocation.

4. Due to increasing competition for the allocation of scarce resources, greater attention must be paid to shaping and strengthening the mechanisms and structures of **water governance**. The term ‘water governance’ embraces all the policy directives, laws, standards and rules at various levels that are necessary to ensure the effective and sustainable use of water in agriculture. It also relates to effective institutional structures for enforcing compliance with these laws and provisions. GIZ supports the view of the Global Water Partnership, which calls for enhanced efforts in water governance and notes that 'The water crisis is mostly a crisis of governance'.

Action required

In future it will be particularly important to place greater emphasis on the role of agriculture with respect to water scarcity and to encourage political and institutional reforms that promote cross-sectoral water

management. A general requirement in this context is improved analysis of available resources and their future development. In the face of increasingly scarce water resources, demand management will become more important.

1. **Raising awareness of the role of agriculture with respect to water scarcity**

There is at present insufficient awareness of the critical role of agriculture with respect to water scarcity. Discussion frequently focuses only on the inadequate availability of drinking water in developing countries. Another question relates to the **causes** of water scarcity and to approaches for appropriate **solutions.**. An increasing world population contributes to the growing scarcity of available freshwater resources not so much through its demand for potable water but through the need for food and agricultural commodities.

Therefore, greater emphasis needs to be placed on the contribution of agriculture – especially irrigated agriculture and agricultural production – to water scarcity. The effects of climate change must also be taken into account in this context.

2. **Implementing political and institutional reform**

German and international development cooperation must strive for greater **coherence** of agricultural, water and environmental policy, based on the principle of integrated and sustainable use of natural resources. The connection between agricultural water management and **agricultural trade policy** is particularly important. Hand in hand with the import and export of agricultural products goes a trade in **'virtual water'** (i.e. water used in the production of the traded goods); this trade and the resulting opportunities and challenges need to feature more prominently in any analysis. A critical aspect of this issue is the dependency of countries that have scarce water resources and limited potential for food production on countries that have an agricultural surplus.

Greater attention needs to be paid both to the frequent discrepancies between water catchment boundaries and administrative boundaries and to issues of cross-border water management. The **potential for intra-state conflict** that arises from water management in conditions of water scarcity is often underestimated.

A shift in the responsibilities of the public bodies charged with water management is needed. The core tasks of the responsible ministries should include a greater emphasis on **water governance**, while planning and implementation of irrigation measures should be largely decentralised, with greater involvement of the private sector. In general, too, greater efforts must be made to **tackle corruption**.

3. **Assessing and analysing resource availability**

In the light of increasing water scarcity, the level of water use in different societies and different economic sectors must be made more transparent and become the subject of discussion. Approaches such as measuring the 'water footprint', used to record water consumption in the manufacture of goods and services of all types, are heading in the right direction. In addition, sustainable water management in agriculture will in future require more sophisticated knowledge of the extent and development of existing water resources. **Improving the data** on the availability and quality of existing surface and groundwater resources is therefore particularly important, as is knowledge of the water requirements of the various sectors. Data collection and analysis should pay particular attention to **changes in the context of climate change**. Within river basins, accurate inventories of water availability, demand, consumption, return flows and losses **(water accounting)** are required. Such analysis must focus in more detail than before on the **water requirements for the maintenance of ecosystems** (environmental flows) and must create transparency with regard to the political, economic and institutional factors that influence water availability, allocation and use. Transborder analysis of surface and groundwater resources is becoming increasingly important. In newly industrialising countries in arid and semi-arid parts of the world, greater attention should in addition be paid to the advantages and disadvantages of using fossil groundwater resources and desalination of seawater when considering how to secure the supply of water resources (with desalination of seawater being relevant mainly in the context of supplying water to coastal towns/cities and centres of tourism).

4. **Shifting the focus of action from supply enhancement to demand management**

Opportunities for increasing available water resources (supply enhancement) will diminish. In view of this, it will be necessary to place greater emphasis in future on influencing and **managing the demand for water resources** in all consumption sectors, but especially in


agriculture (demand management). Steps to reduce water **losses** and increase **water productivity** in agriculture are a priority in this context. The GIZ Briefing Note 'Water-Saving Irrigation' explores this topic in more detail.

With regard to enhancing and securing water supply, a widened perspective of **'water storage'** is required. This covers various agricultural practices including water-saving methods of tillage and refers to small decentralised water harvesting systems and small storage systems as well as to large storage reservoirs and considers the links between them. The role and importance of large dams continues to be a matter of controversy and can only be usefully discussed on a case-by-case basis.

A nuanced view needs to be taken of the **use of groundwater resources**. In some regions it represents a realistic option for enhancing water supply. In other regions the resulting sharp drawdowns of groundwater levels trigger major economic and ecological damage. The potential of groundwater resources is closely linked to the ability of responsible regulatory bodies to establish an effective governance regime that prevents groundwater being withdrawn faster than it is replenished.

The **use of 'marginal' water** in agriculture will increase. Marginal water consists of reusable return flows from irrigation, brackish water and pre-treated wastewater. Experience of this type of use needs to be documented and utilised.

Note: The Briefing Notes on water in agriculture form a set of three. The first deals with the issue of water scarcity in agriculture, providing a general view of agriculture as one of the principal water-using sectors. The second is concerned with effective water management in agriculture and the third explores aspects of water-saving irrigation in more detail.

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