Water Uses
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GWSP

Historical Water Uses in a Nutshell

MORE WATER IN HOUSEHOLDS

Due to population growth and rising levels of wealth in many countries, global domestic water use continuously increased since 1950.

NEW ECONOMIES, NEW WATER USES

Industrial water use is again on a rise since the beginning of the 21st century as a result of the growing economies within newly industrialized countries such as China and India.

POLICIES AND TECHNOLOGIES FOR WATER

Policies and innovations in water-saving technologies play a major role in the use of water by reducing global domestic and industrial water uses

Domestic Water Use

Annual withdrawals and consumption of water by households and small businesses.

Manufacturing Water Use

Amount of water used by manufacturing industries for final outputs, cooling and miscellaneous purposes such as cleaning and sanitation.

Thermoelectric Water Use

The volume of water withdrawn and consumed for cooling purposes in the thermoelectric power sector.

Overall, most of the water used for cooling purposes is returned to rivers afterwards with increased temperature, leading to thermal pollution which causes water quality deterioration.

60 YEARS OF WATER USE

Estimations of past freshwater use are an important information source for thinking about the future of water and the development of water-related sectors.
The total amount of freshwater withdrawal and usage depends on many factors, including population dynamics, industrial development and technological advancements. Industrial development increases water consumption while technological improvements enhance water use efficiency and thus reduce the amount of water abstracted. By analysing historical data on water consumption, which reflects socio-economic developments, implications for future sustainable water use can be derived. Although global assessments of water uses are crucial to understand how humans affect the water system, comprehensive data are often lacking.
In order to close the information gap with respect to historical water use, Flörke et al. calculated water use from 1950 to 2010 on a global scale by developing simulation models for domestic, thermoelectric and manufacturing water use (see boxes above for definitions). The estimations cover over 177 countries worldwide and are based on available historical data such as national statistics. Historical

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turning points and events which significantly influenced past water use could be identified. The study further addresses the estimation of wastewater (both treated and untreated) which is returned to the water cycle by domestic and manufacturing sectors.

DOMESTIC WATER USE

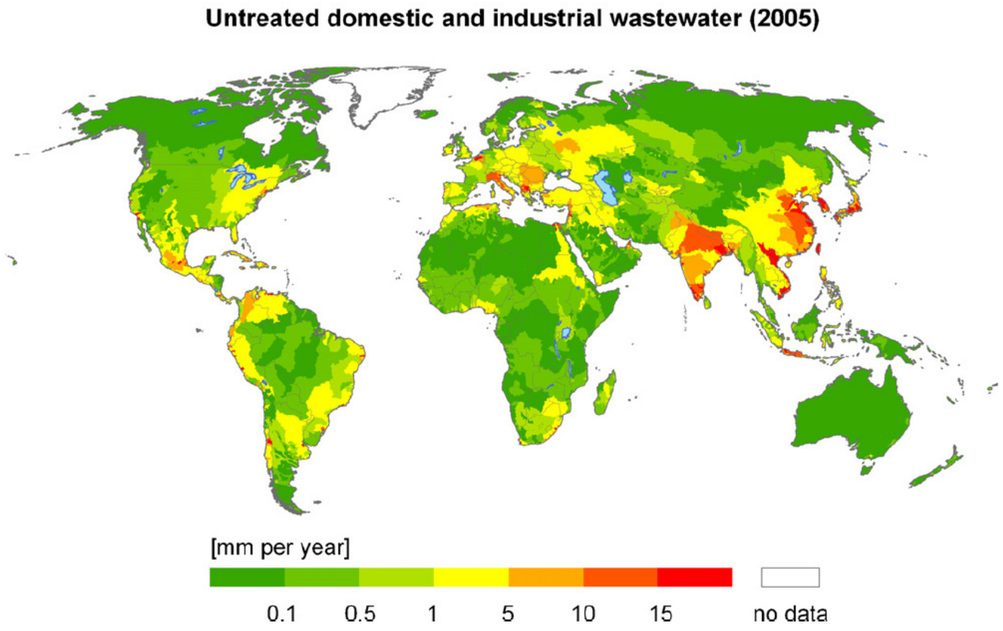
The study`s results reveal that global domestic water use rose at an average annual growth rate of 2.2% over the last 60 years. An increase in global domestic water withdrawals is apparent since 1995, mainly related to growing water demands due to rising population and wealth in Asia and Africa. The results highlight dominant water-using regions with high population density, e.g. western U.S., Europe, India and China. Asia shows an especially high domestic water demand in recent years. Increasing urban population leads to concentrated domestic water demand in many urban areas.

THERMOELECTRIC WATER USE

Global thermoelectric water use peaked in 1979 / 1980 during the oil crisis, followed by a decline until the mid 1990s and a moderate increase since then. Electricity production continuously increased, but technological advancements resulting in enhanced water use efficiency had a reducing effect on water withdrawals. In China, water withdrawals in the thermoelectric sector nevertheless doubled over the past 20 years as a result of the growing population and economic development.

MANUFACTURING WATER USE

Between 1950 and 2010, water withdrawal in the manufacturing sector increased by a factor of



Spatial distribution of untreated wastewater of the domestic and manufacturing sectors on river basin scale (1 mm = 1000m3/km2). Source: Flörke et. al (2013): 153.

3.6, despite water use efficiency advancements in production processes. The results show how global manufacturing and thus water use shifted from the American and European economies toward Chinese and South East Asian economies. In 2005, 49% of the global manufacturing water was withdrawn in China, India and Japan.
It appears that global water demand in domestic, thermoelectric and manufacturing sectors will continue to rise in the next years due to population and economic growth. Especially in emerging countries, water use can be expected to further increase. This development poses challenges in particular with respect to the treatment of wastewater.

Wastewater

Between 2000 and 2010 wastewater produced by domestic and industrial sectors increased by 22%, threatening human health and the environment. Hotspots of untreated wastewater could be

found particularly in South and Southeast Asia, but also in Europe, Northern Africa, and Central and South America.

Since technological changes play a major role in both enhancing water efficiency and treatment of wastewater, investments in technologies are essential in order to reduce water withdrawals and the contamination of freshwater resources. Further growth of the global population and economies, particularly those of emerging countries, implies that also global water demand will continue to rise in the future.

Enhancing water security and the reduction of untreated wastewater are among the most important actions to be undertaken to reach the Millennium Development Goals.

BASED ON THE PAPER

Flörke, M., Kynast, E., Bärlund, I., Eisner, S., Wimmer, F., Alcamo, J. (2013): *Domestic and industrial water uses of the past 60 years as a mirror of socio-economic development: A global simulation study*. Global Environmental Change 23,144–156.

SUGGESTED READING

Alcamo, J., Flörke, M., Märker, M. (2007): *Future long-term changes in global water resources driven by socio-economic and climatic changes*. Hydrological Sciences Journal 52 (2), 247–275.

Kummu, M., Ward, P.J., de Moel, H., Varis, O. (2010): *Is physical water scarcity a new phenomenon? Global assessment of water shortage over the last two millennia*. Environmental Research Letters 5, 034006.

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IMPRESSUM

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Intenational Project Office (IPO)
June 2013
Design: Sina Marx

The GlobalWater System Project seeks to answer the fundamental and multi-faceted question:

How are humans changing the global water cycle, the associated biogeochemical cycles, and the biological components of the global water system and what are the social feedbacks arising from these changes?

GWSP is a joint project of the four Global Environmental Change Programmes: DIVERSITAS, the international programme of biodiversity science, the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP) and the World Climate Research Programme (WCRP).