

SECTION 3

Challenges for Well-being and Development

The provision of adequate drinking water is just one aspect of the role played by water in meeting basic needs and contributing to development. Having enough water to cover domestic hygiene needs promotes better health and well-being. Sanitation facilities help to ensure the safe disposal of human waste and reduce disease and death. Adequate water supplies improve the prospects of new livelihood activities, including agriculture, that are otherwise denied and which are often a key step out of poverty. Industry at all scales needs reliable water resources to prosper and grow. Water also plays a key role in energy generation and transportation.

We must examine the current conditions of and the different demands being placed on water for food, human health, industry and energy, as increased competition will demand integrated responses in order to ensure that there is enough water of adequate quality to meet each of these needs in a sustainable manner.

Global Map 5: *Domestic and Industrial Water Use*

Global Map 6: *Sediment Trapping by Large Dams and Reservoirs*



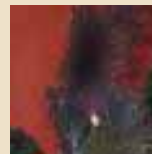
Chapter 6 – **Protecting and Promoting Human Health** (WHO & UNICEF)

This chapter reviews the main components of the water cycle and provides an overview of the geographical distribution of the world's total water resources, their variability, the impacts of climate change and the challenges associated with assessing the resource.



Chapter 7 – **Water for Food, Agriculture and Rural Livelihoods** (FAO & IFAD)

The demand for food is not negotiable. As the largest consumer of freshwater, the agriculture sector faces a critical challenge: producing more food of better quality while using less water per unit of output, and reducing its negative impacts on the complex aquatic ecosystems on which our survival depends. Better water management leads to more stable production and increased productivity, which in turn enhance the livelihoods and reduce the vulnerability of rural populations. This chapter examines the challenges of feeding a growing population and balancing its water needs with other uses, while contributing to sustainable development in rural areas.



Chapter 8 – **Water and Industry** (UNIDO)

Despite industry's need for clean water, industrial pollution is damaging and destroying freshwater ecosystems in many areas, compromising water security for both individual consumers and industries. This chapter focuses on industry's impact on the water environment in routine water withdrawal and wastewater discharge, analysing a broad range of regulatory instruments and voluntary initiatives that could improve water productivity, industrial profitability and environmental protection.



Chapter 9 – **Water and Energy** (UNIDO)

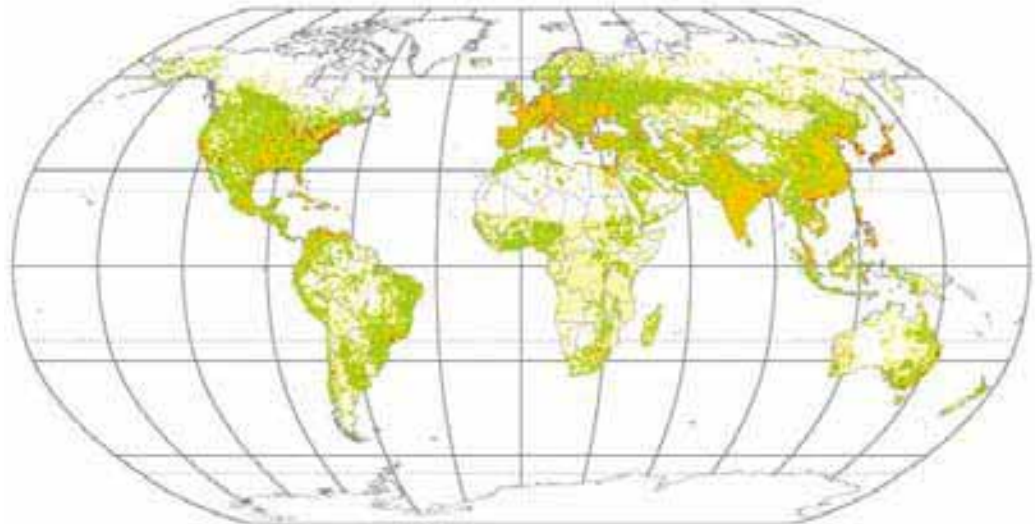
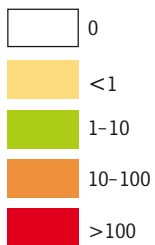
To be sustainable, economic development needs an adequate and steady supply of energy. Today's changing contexts require the consideration of a range of strategies to incorporate hydropower generation and other renewable forms of energy production to improve energy security while minimizing climate-changing emissions. This chapter stresses the need for the cooperative management of the energy and water sectors to ensure sustainable and sufficient supply of both energy and water.

Domestic and Industrial Water Use

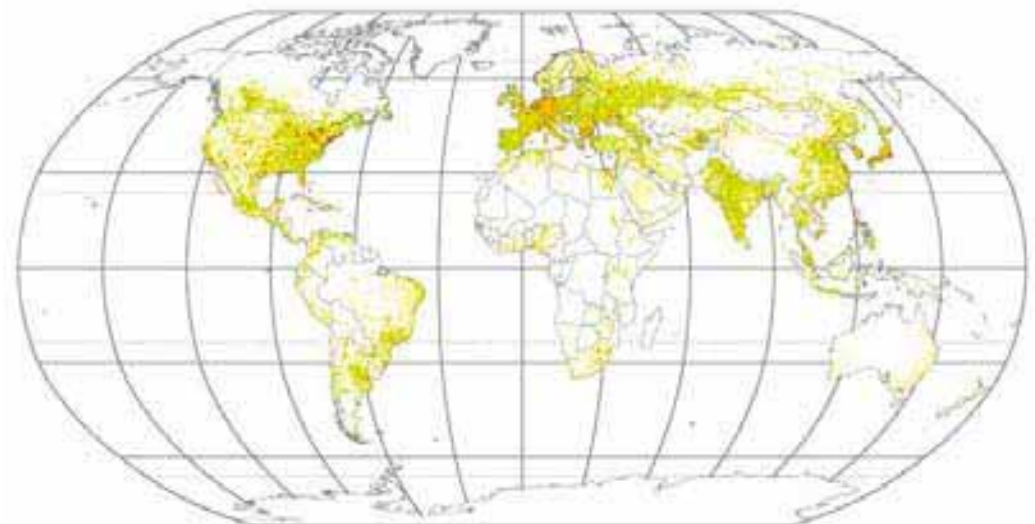
Freshwater is critical to the ever-growing urban populations around the world, as well as the industrial base upon which these modern societies are based. With rapid urban growth - often poorly managed - the delivery of adequate, clean, and reliable supplies of freshwater becomes an important development challenge. Calculating contemporary domestic and industrial water use is today based on educated guesswork, for many countries lack comprehensive and standardized survey systems to

determine water use. Decaying, poorly managed, and leaky delivery systems add to the difficulty. In the maps below, reported water withdrawals by country (WRI, 1998) were used to estimate domestic and industrial water use. The reporting year of national water use statistics differed from country to country. To make up for this inconsistency, regional water use trends reported in Shiklomanov (1996) were used to extrapolate national water use to a common year, in this case, the year 2000.

Annual domestic water use (2000) in millions of cubic meters per grid cell



Annual industrial water use (2000) in millions of cubic meters per grid cell



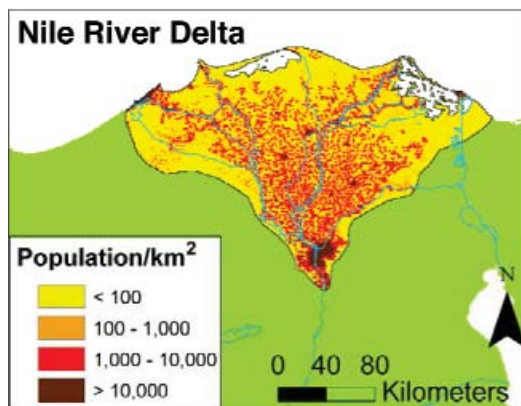
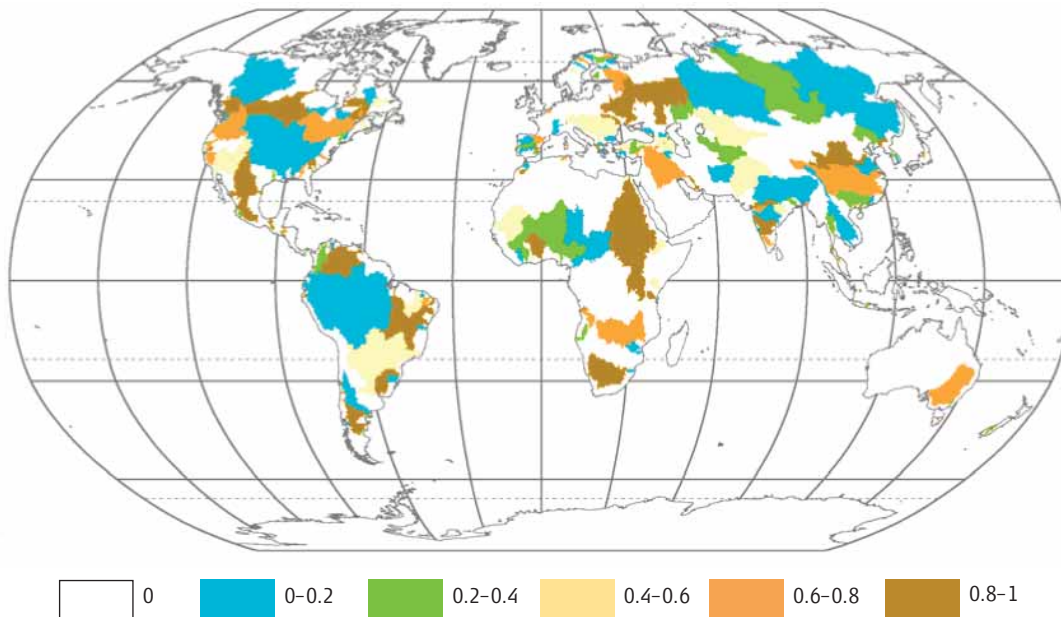
As shown in the maps above, a broad spectrum of water use arises, with high levels associated with dense settlement and advanced levels of economic development. Maps of water use such as these can be linked with those depicting water supply to define patterns of water scarcity and stress.

Sediment Trapping by Large Dams and Reservoirs

Dams and reservoirs create what are essentially large holding tanks that intercept and efficiently trap incoming particulate matter. Despite widespread increases in soil erosion from poor land management upstream, the construction of dams and reservoirs has made a significant impact on the transport of sediment destined for the world's coastal zones (Walling and Fang, 2003). At least 30 percent of continental sediment now fails to reach the oceans (Vörösmarty et al., 2003; Syvitski et al., 2005). Today, several large river basins, such as the Colorado and

the Nile, show nearly complete trapping due to reservoir construction and flow diversions. Given that most of the major reservoirs of the world have been constructed only over the last 50 years, by any measure of global change, the impact of these structures has been substantial, rapid and unprecedented. The map, based on information from large, registered reservoirs only, illustrates the variable efficiency of sediment trapping worldwide. The additional impact of many smaller but unregistered impoundments numbering around 800,000 is unknown (McCully, 1996).

Sediment trapping efficiency



The impact of interrupted sediment flows is of more than academic interest. Siltation of reservoirs means a loss of water storage capacity and a shorter lifespan or costly maintenance for expensive infrastructure designed to support hydropower generation, irrigation, or domestic and industrial uses. The delivery of adequate supplies of freshwater and nutrient-rich sediment is critical to sustaining coastal ecosystems and preventing coastal erosion, such as in the Nile Delta (right). A recent sample of 40 deltas around the world shows that more than 75% are threatened predominantly by the upstream loss of sediment and only secondarily by global sea level rise. In this sample alone some 10 million people in coastal landscapes risk being flooded (Ericson et al., 2006).