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Pressures on rivers threaten human water security and biodiversity

Human pressures on freshwater resources have seriously reduced the security of water for people and river biodiversity across the world, according to a recent study. Almost 80 per cent of the world's population is at high risk from threats to water security and 65 per cent of river habitats are under threat.

Freshwater systems are endangered by the activities of a rapidly growing global population and, increasingly, the effects of climate change. Not only is water essential to life, but aquatic biodiversity provides important ecosystem services, including supporting the livelihoods of many of the world's poorest people.

This study investigated 23 individual environmental stressors caused by human activities that are affecting the health of rivers. All stressors were grouped under four themes: water resource development (e.g. building dams), pollution (e.g. mercury deposition), catchment or watershed disturbances (e.g. converting forests to agricultural land), and biotic factors (e.g. the introduction of invasive alien species). The researchers combined the importance of the stressors to develop digital world maps that show the level of threat to human water security and river biodiversity at a global scale.

Almost 4.8 billion (80 per cent) people in the world live in areas with significant water security problems or threats to river biodiversity. Areas of intensive agriculture (catchment disturbances) and concentrated settlements (with associated pollution by nutrients, pesticides and organic loads) typify these regions that are found in large parts of the United States, most of Europe (except Scandinavia and northern Russia), major parts of Central Asia, the Middle East, the Indian subcontinent and eastern China.

Only a small percentage of rivers in the world are minimally affected by human activity. These rivers occur in remote areas with low populations, such as northern Siberia, Canada and Alaska, or in uninhabited tropical places, such as parts of the Amazon and northern Australia.

International efforts so far to protect biodiversity have not halted the loss of habitats and species in most river systems. Sometimes improving water security can harm biodiversity, for example, building dams can disrupt river flows which can affect fish migration and nutrient flows downstream. There has been substantially less investment in biodiversity protection than in water security.

Massive investments in technological solutions and services to improve water infrastructure could significantly reduce the threat of water insecurity for around 850 million people in developed countries with a high threat of water insecurity, such as the US and Western Europe. This contrasts with expected low levels of water security investments in developing countries affecting 3. 4 billion people, particularly those living in most of Africa, much of central Asia and countries such as Peru and Bolivia.

However, the researchers suggest it is better to prevent river degradation rather than try to repair the damage caused by human activities. Positive steps to simultaneously protect water resources, river habitats and species include improved land management, better irrigation methods and protecting aquatic ecosystems as part of management systems.

Developed countries will need to change water security measures so that they also protect biodiversity. In the developing world, integrative management of water resources should be used to address multiple environmental stressors. For example, preserving river floodplains can protect areas and livelihoods from flooding whilst protecting local biodiversity.

Source: Vörösmarty, C.J., McIntyre, P.B., Gessner, M.O. *et al*. (2010) Global threats to human water security and river biodiversity. *Nature*. 467:555-561.
Contact: contact@riverthreat.net or cvorosmarty@ccny.cuny.edu
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