

Science for Environment Policy

Equitable and efficient use of water resources is key to sustainable population growth

Population growth of any country is ultimately dependent on that country's access to freshwater resources, which also determines its capacity to produce food. A new study shows that population growth is expected to decline in countries with low water resources, as water-rich countries reduce food exports in order to feed their own growing populations.

The world's population is growing rapidly and is expected to reach nine billion by 2050. Global fresh [water](#) supplies are coming under increasing pressure, and more frequent extreme weather events, including droughts and floods, make it increasingly difficult for water-stressed nations to manage water resources. Water scarcity could have a major impact on the world's ability to feed its growing population.

In recent years, scientists have carried out research to predict how population growth could interact with patterns of [climate](#) and [land use](#) change to affect water availability and agricultural productivity. Much work has also been done to develop ways of dealing with a global food and water crisis, including technological and socio-economic solutions.

In this study, the researchers present two main results. The first result, based on empirical data of demographic growth and food trade, highlights a global water unbalance. In fact, demographic growth in water-rich countries does not account for their virtual water (i.e. water actually used to produce a given amount of food) exports, while trade-dependent nations increasingly rely on virtual water imports. Thus, water-rich and trade-dependent populations are relying on the same pool of resources for their long-term growth.

The long-term effect of such an imbalance is studied by comparing future scenarios, based on mathematical models of trade networks of virtual water. This theoretical prediction shows how global population is expected to change as water becomes a scarcer resource and water-rich countries reduce food exports in order to feed their growing populations.

The researchers made predictions based on two scenarios. The first modelled a situation where eventually water-rich nations export no food at all, because all resources are used to support local populations. The second scenario takes into account technological advances, changes in diet and land use changes that allow greater agricultural efficiency, leading to increased crop harvests and more efficient use of water. Under the first scenario, the model predicted that populations of water-dependent countries would grow for the first 25 years, and then decrease as access to water resources was controlled and reduced by water-rich countries, while the populations of water-rich countries continued to increase.

The rate of decline of populations in water-dependent countries was less severe if co-operative regimes were considered, i.e. if water-rich countries shared a proportion of their resources through food exports. This allowed long-term sustainable population growth across all global regions. Similarly, when improvements in agricultural efficiency and reductions in per capita consumption were taken into account, projected populations declines were also less severe. In the absence of co-operative measures, population decline in water-dependent nations was predicted to start in 2030. If co-operation does take place, the declines are predicted to begin between 2040 and 2060.

The study did not take into account other environmental, health and cultural factors that might affect population growth in combination with water availability. Trade and co-operation between water-rich and water-poor nations may go some way to enabling a more even-handed sharing of global resources and sustainable population growth, but it will not be enough to address the imbalance between nations, say the researchers. There is also an urgent need for investment in scientific research and policy changes that will allow water-dependent countries to become more resilient by improving their agricultural efficiency and by reducing water losses through water conservation measures and water harvesting.



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