

Hydrologic Cycles and Freshwater as Resources

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Summary

Water is a naturally circulating resource that is constantly recharged. Therefore, even though stocks of water in natural and artificial reservoirs help increase water resources available to human societies, the flow of water should be the main focus of water resource assessments. The climate system puts an upper limit on the circulation rate of available renewable freshwater resources (RFWR). Although current global withdrawals are well below the upper limit, more than two billion people live in highly water-stressed areas because of the uneven distribution of RFWR in time and space.

More than half of water withdrawals are for irrigation in the agricultural sector, and food importing countries can save water resources to be utilized to produce the corresponding amount of food products. From that point of view, food trade is called virtual water trade.

The balance between water demand and supply in Japan is not closed when considering the virtual water trade since food self-sufficiency in Japan is approximately 40 % and Japan is importing a lot of food.

Climate change is expected to accelerate water cycles, and thereby increase the available RFWR. This would slow down the increase of people living under water stress; however, changes in seasonal patterns and increasing probability of extreme events might offset this effect. Sea level rise will enhance the pressure of sea water intrusion into fresh ground water near the coast, and freshwater exploitation from ground water might face difficulties.

The ultimate objectives of future-oriented world water resource assessments are to show the international community what will happen if we continue to manage our water resources as we do today and to indicate what actions may be needed to prevent undesirable outcomes. In that sense, studies of future world water resources are successful if their predictions based on business-as-usual are proven wrong. In line with this, plausible scenarios informed by past experiences and current trends are built for future projections of the demand side.

Reducing current vulnerability is the first step to prepare for such anticipated changes. Technology transfer, capacity development, and necessary investment to countries in water trouble are, in turn, similar to a virtual water export since they will increase the availability of freshwater resources.