CASE STUDY

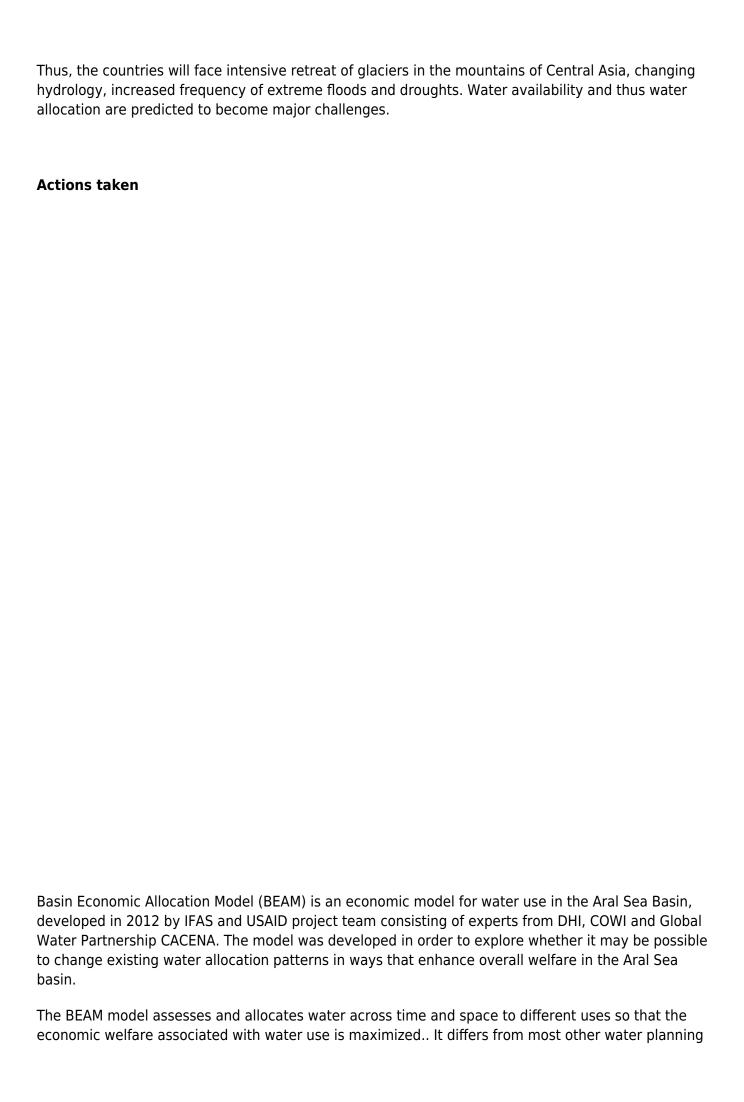# Transboundary: Basin Economic Allocation Model

Summary

Steadily shrinking for decades due to unsustainable irrigation policies, the Aral Sea is under increasing pressure, making both allocation and availability major challenges. Action has been taken and the Basin Economic Allocation Model has been developed as a long-term decision support system to facilitate putting "value on water use". This demonstrates that economic models can be applied to assess economic value maximization of different water uses.

Background

The Aral Sea Basin is located in the heart of the Asian continent, and covers the whole territory of present Tajikistan, Turkmenistan, Uzbekistan, the southern part of the Kyrgyz Republic, and the southern part of Kazakhstan. Some parts of the basin are located in the northern part of Afghanistan and Iran (about 8 percent), and some in China (less than 0.1 percent). The total area of the basin is about 158.5 million hectares. Most of the Central Asia's surface water resources are generated in the mountains in Kyrgyzstan, Tajikistan, and Afghanistan. These waters flow into the two main rivers to countries downstream – Kazakhstan, Turkmenistan, and Uzbekistan – which are a part of the Aral Sea Basin. Water resources are critically important to the region's economy, its people, and the environment. Irrigation, for example, is vital for agricultural production and most of the population of Tajikistan, Turkmenistan, and Uzbekistan depend directly or indirectly on irrigated agriculture. Water is also important for energy production – hydropower energy satisfies more than 90 percent of the total electricity needs in Kyrgyzstan and Tajikistan and is also an export commodity. The competing demands of agriculture in downstream countries and hydropower generation in upstream countries fuel serious political disputes in the region, putting water at the heart of regional security and stability. Water resources of the Aral Sea basin are under increasing pressure, particularly from the different sectoral needs in water use (e.g., conflict over whether hydropower or irrigation water use should take priority). Moreover, climate change is expected to have a significant impact on the basin.

Thus, the countries will face intensive retreat of glaciers in the mountains of Central Asia, changing hydrology, increased frequency of extreme floods and droughts. Water availability and thus water allocation are predicted to become major challenges.

Actions taken

Basin Economic Allocation Model (BEAM) is an economic model for water use in the Aral Sea Basin, developed in 2012 by IFAS and USAID project team consisting of experts from DHI, COWI and Global Water Partnership CACENA. The model was developed in order to explore whether it may be possible to change existing water allocation patterns in ways that enhance overall welfare in the Aral Sea basin.

The BEAM model assesses and allocates water across time and space to different uses so that the economic welfare associated with water use is maximized.. It differs from most other water planning

models with respect to the way in which water is allocated by the model.

In most other river basin planning models, water is allocated using fixed demands and/or prioritization schemes that satisfy some water uses before others (e.g., household use may take priority over irrigation). In the BEAM representation, water is allocated according to economic optimization criteria that are based on the principles of effectiveness, efficiency and equity.

BEAM is developed as a decision support system to facilitate putting "value on water use" and sustainable use of water resources in support of the countries development. The model estimates welfare changes associated with changes to how water is allocated between the five countries in the Basin (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan; water use in Afghanistan is assumed to be fixed).

Outcomes

The model addresses the Aral Sea Basin as a whole – that is, the rivers Syrdarya and Amudarya, including Kashkhadarya and Zerafshan, and the Aral Sea. The model covers five sectors: agriculture, hydropower, nature, households and industry.

The model is developed as a decision support system to facilitate achievement of long-term, comprehensive regional agreement on integrated use of water resources and environmental protection of the Aral Sea taking into account interests of all states of the Region (Joint Statement of the Heads of IFAS states-founders, Almaty 2009) and relevant issues of transboundary cooperation: sustainable water recourses management, food and energy security, mitigation of climate change impacts.

Use of BEAM model promotes stakeholder participation in water resources management. It will be accessible online for the public use.

Lessons Learned

The water allocation can be supported by models that assess economic value maximization of different uses.
Model can explore whether it may be possible to change existing water allocation patterns in ways that enhance overall welfare in the basin.

Model facilitates assessment of the economic impact of changes to water allocation patterns on different groups of water users within the basin, including the riparian states, as well as different sectors such as irrigation and hydropower.

Model allows users to estimate the economic impact of changes to physical infrastructure such as new reservoirs and irrigation efficiency improvements.

Model facilitates application of the IWRM modeling approaches and tools in the government policy

making and regional cooperation and contributes to development of resource efficient green growth strategy in the Aral Sea basin.

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Supporting Materials
Transboundary: Basin Economic Allocation Model

Related IWRM Tools
Socio-Hydrological Modelling, Valuing Water, Impact Investment Market Maps

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