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BEAM

Aral Sea Basin Economic Allocation Model

Aral Sea Basin Economic Allocation Model is an analytical instrument which constitutes a decision support system to facilitate achievement of a long-term comprehensive regional agreement on the optimal management of water resources in Central Asia taking into account interests of all states of the Region (in accordance to the Joint Statement of Heads of states-founders of IFAS).

A thorough and credible analysis that catalogues and quantifies the potential benefits, that the countries individually, and the region as a whole, stand to reap, give a basis to facilitate dialogue and conduct efficient negotiations conclude a viable and sustainable agreement and also on the details of any such arrangement by providing the countries with a basis.

BEAM undertakes assessment of the economic value of various allocations of water by countries (in particular, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) and sectors (agriculture, energy, industry, domestic use and nature).

*Pareto Economic optimum is formulated as following – water resources allocation is optimal, if it cannot be changed further in such a way that would improve the situationof one group of water users, without compromising the situation of others.
In this regard, the economic compensation for changes in use and appropriate allocation of water can help to ensure that benefits acquired by one group of water users may be partly used to offset losses incurred by another group of water users.
If benefits exceed losses, the economic compensation can ensure that the new water allocation is Pareto optimal.
Thus, changes in water allocation can be in the interests of different groups.

This informational paper presents a description of the BEAM, its characteristics and parameters, aims and methods of using the model.

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ОТ АМЕРИКАНСКОГО НАРОДА

DHI

COWI

Global Water Partnership
Central Asia and Caucasus

Set of activities on the model development was accomplished on behalf of the Executive Committee IFAS and USAID a project team consisting of experts from DHI, COWI and Global Water Partnership CACENA.
Activities included development of a conceptual basis of the model, data collection, and development of various scenarios of economic optimization.

Support of USAID

This study "Comprehensive analysis of the economic value of water resources use" is made possible by the support of the American people through the United States Agency for International Development (USAID) and represents USAID's contribution to the Third Aral Sea Basin Program (ASBP-3). The contents are the sole responsibility of the EC IFAS and do not necessarily reflect the views of USAID or the United States Government.

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The key criteria of **BEAM** is economic optimization

The BEAM model allocates water across time and space to different uses so that the economic value of water use is maximized.

The purpose of the BEAM model is 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 also facilitates estimation of the economic impact of changes to water allocation patterns on different water user groups within the basin: separate states as well as different sectors such as irrigation and hydropower.

In this context the model allows to estimate the economic impact of changes to physical infrastructure such as new hydro facilities and introducing methods of irrigation efficiency improvements.

Three principles – Effectiveness, Efficiency, Equity

The concept of the model focuses on the following principles of economic management of water resources:

- **Effectiveness**
assessing if water use in one sector, for example hydropower, at the expense of water use in another sector, for example agriculture, increases the economic value of water use.

- **Efficiency**
assessing the extent to which water efficiency/productivity is increasing, particularly within irrigation.

- **Equity**
analysis of who will gain from changes in allocation of water, and who will lose.

BEAM centers around these three E's when dealing with allocation of water.

The three E's are very dependent on each other, so that changes in the parameters of effectiveness affect the efficiency choices of allocation, which again affects equity considerations.

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Key issues which **BEAM** allows to analyze

The core questions around effectiveness focus on today's situation and changes that can be made in order to improve overall economic effectiveness of water use:

- What is the economic value of the use of the basin water today, based on the water's part of value creation in the 5 sectors? (agriculture, energy, industry, domestic use and nature)?
- What is the economic value of changing the use of water between the 5 sectors? How are the changes in value distributed across the 5 countries?
- How can the operation of parts of the water system (e.g. reservoirs, canals) be improved in order to increase effectiveness of the different economic sectors?
- How will environmental requirements (e.g. improved runoff to the Aral Sea) change water allocation, at what cost, and with which measures (e.g. changed crop patterns)?
- Is it possible to calculate "fair prices" for water, and to what extent can these prices be used as guidance for production decisions in agriculture, hydro power and industry?

Effectiveness – allocation of water to different human, economic and ecological purposes in order to maximise the general welfare from using the water It could be also referred to notion of rationality.

Efficiency questions address the technical level of water management, where improvements in technology or practices lead to less water use for obtaining the same output. Among efficiency questions are:

- What is the economic value of increasing the efficiency of water use (e.g. in reservoirs management) in different sectors, and how does this value scale against the needed economic investments?
- Where does improvements in efficiency materialise in more productive allocation of water use?

Efficiency – improving of the delivery of water services (methods) in order to use less water
It could be also referred to notion of productivity.

Briefly: what the difference between effectiveness and efficiency
Effectiveness is about achieving best result
Efficiency is about doing something in the effective / productive way (using less resources).

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Equity questions evolve around the socio-economic impacts of altered prioritisations of water flows. The core questions are:

- How do altered water allocations impact the different countries in monetary terms? Are there obvious compensation opportunities that will lead to Pareto improvements?

- In this regard, how are the different sectors and regions affected in terms of employment, output and exports?

- Are there some groups of water consumers that are particular "hurt" by a certain change in water allocation?

Equity – fairness of social and economic consequences of changing priorities of water distribution and efficiency of the water supply system.
The model allows to consider possibilities for a more equitable distribution of water resources in the region (taking into account different socio-economic priorities, such as employment, compliance with environmental requirements).

Application of **BEAM**: Aims and methods

BEAM was developed based on a comprehensive analysis of the economic value of integrated use and protection of water resources of the Aral Sea Basin, in order to analyze the situation in water management and possibilities for improvement.

Decision making support system

BEAM can serve as a decision support tool to policy makers in the region when negotiating on water allocation, considering major investment decisions in the water, food and energy sectors, and when exploring consequences of climate change for the economic development in the basin.

Strategic development: policy and planning

BEAM model is aimed at examination of water use and allocation on the basis of economic principles and according to 'Green development' agenda.
Outputs of BEAM analysis facilitate development of a resource efficient green growth strategy in the Aral Sea basin in various ways:

- It promotes the formation of interdisciplinary conceptual approach – economic optimum as essential to the successful management of water resources, which provides opportunities to deepen and broaden the analysis.

- It provides a tool platform for effective cooperation in transboundary water management and adequate solution to the issues.

- It provides input to setting sustainable development goals for water use, food and energy production, because it addresses these issues in an integrated and holistic manner.
The **BEAM** acknowledges strong inter-dependence between long-term sustainable water resources management, food security and sustainable energy supply.

- It provides a tool to integrate policies of climate adaptation and mitigation at all levels of water use.

- It promotes participation of the stakeholders in water resource management, in particular because it will be accessible for public use.

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Using **BEAM**

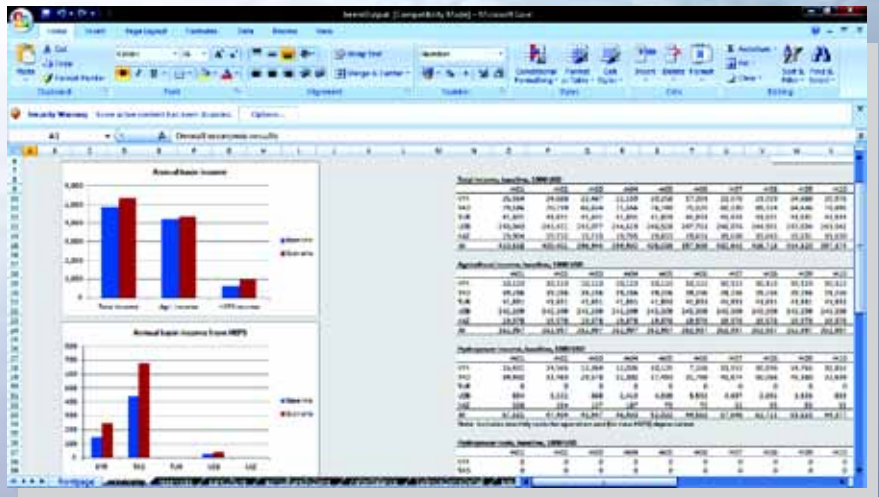
Executive Committee IFAS aims to disseminate the model for use by experts of different sectors of economy, analysts, and managers.

In the early stages the trainings on the use of the model will be conducted, and in this regard Executive Committee IFAS expects an expression of interest from experts to participate in the training. As part of training sessions experts will become familiar with the economic principles underlying the concept of the BEAM model, and the basic structure of its representation in the user program.

The user interface for the input data developed in Excel will be available on the Internet. By means of the drop down menu users will be able to develop their own scenario research in water management and in accordance with set parameters and input data to obtain an optimal solution in the form of graphs and tables for comparative analysis.

User interface:
input data

output data



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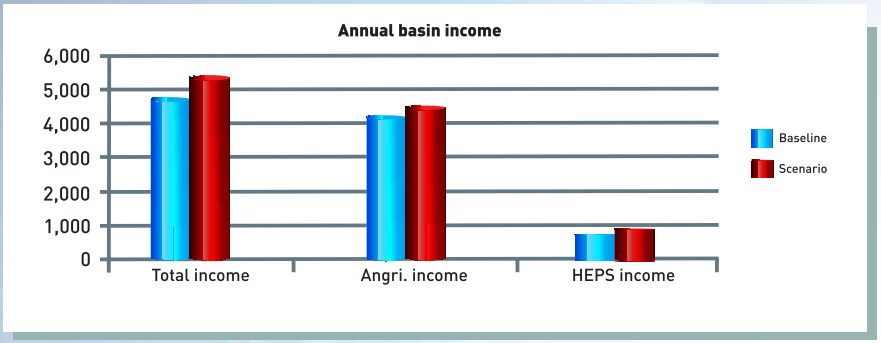
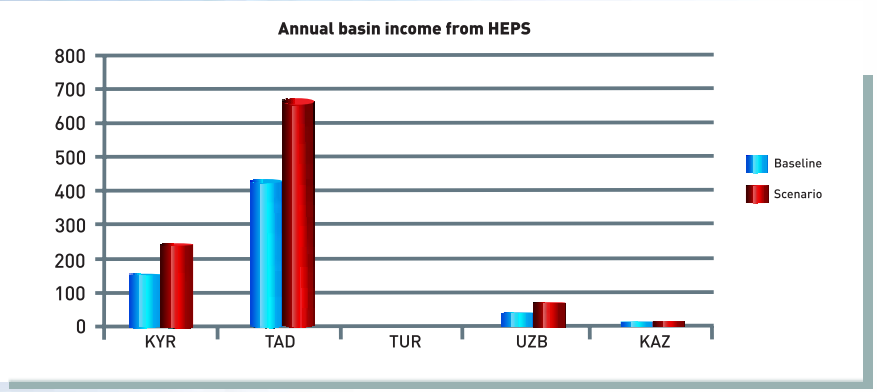
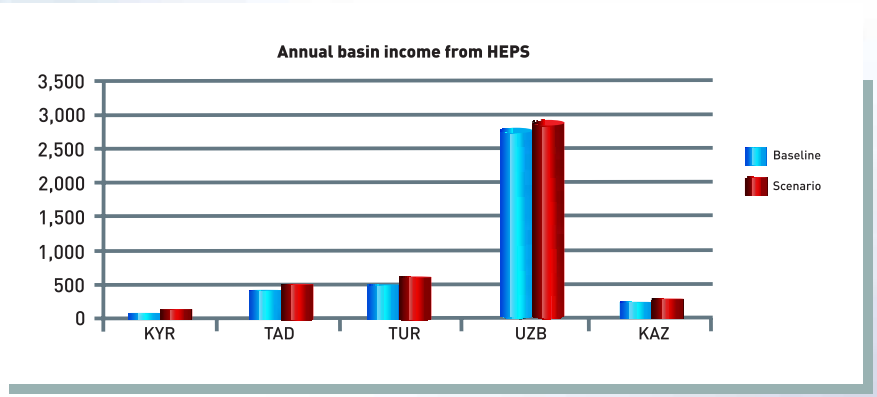
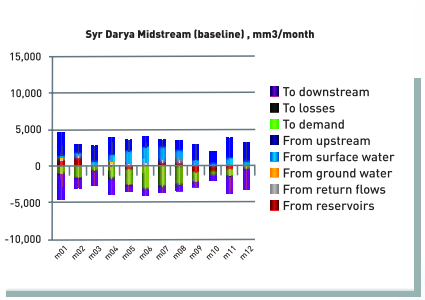
Standard graphs (examples) representing baseline and scenario developments: economics (general situation in the basin and by countries)

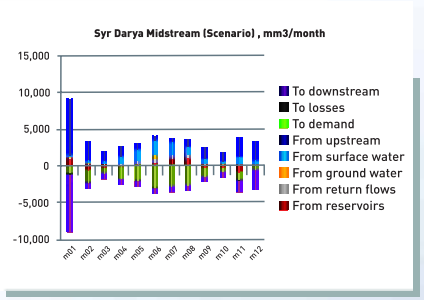


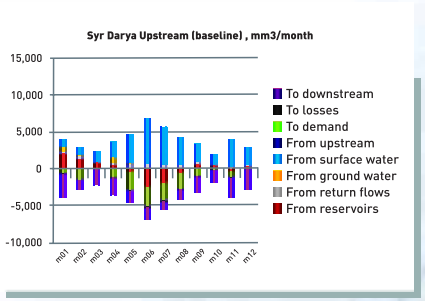


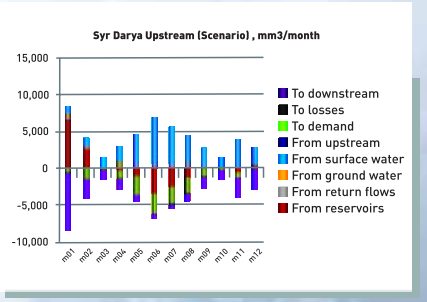


Standard graphs (examples) representing baseline and scenario developments: water balance by hydrological zones









Key documents

Project documents and informational materials provided by Executive Committee IFAS for introduction to the Model:

- Teaser (brief information)
- Model Concept
- Programmer's Manual
- User's Manual
- BEAM Glossary
- Economic benefits of water use (information)

Information about **BEAM** model

Information about project is available on the Internet at the website
of Executive Committee of IFAS **(www.ec-ifas.org)** in the ASBP section, Projects:
http://rus.ec-ifas.org/asbp/projects/regional-twd-support-in-ca-countries/

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