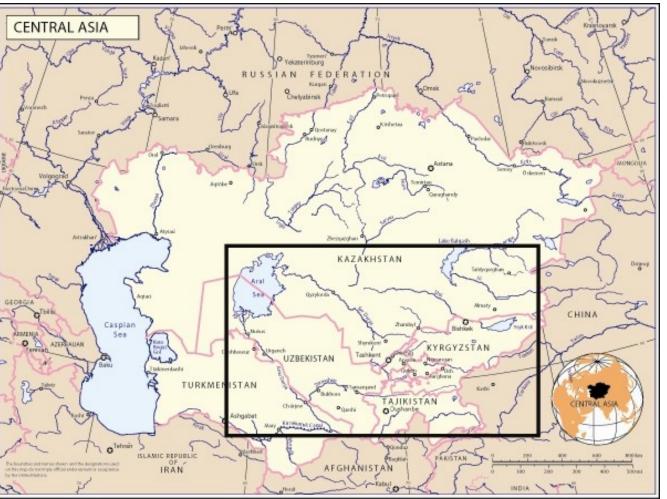


An Economics-Driven Approach for Optimizing Water Use in Transboundary River Basins

Tobias Siegfried¹, Niels Riegels², Silvio Pereira², Roar Jensen³, and Peter Bauer-Gottwein²

¹Earth Institute, Columbia University ²Department of Environmental Engineeing, Technical University of Denmark ³DHI Water Environment Heath

Central Asia



Map No. 2762 Rev.6 UNITED NATIONS June 2005

Department of Peacekeeping Operations Cartographic Section

UIU Syr Darya River Basin N Kazakhstan N43° Syr Darya Toktogul Kyrgyzstan River Reservoir Chardara Reservoir Naryn River Naryn / Syr Darya Cascade N41° Uch Kurgan Amasai gauge Depression **Uzbekistan** China N39° Tajikistan 50 mi 1 100 km E71° E67° E69° E73° E75° **DTU Environment**

Department of Environmental Engineering

Headwaters

DTU



Toktogul Reservoir

DTU



Ferghana Valley



Syr Darya basin land use

Kazakhstan

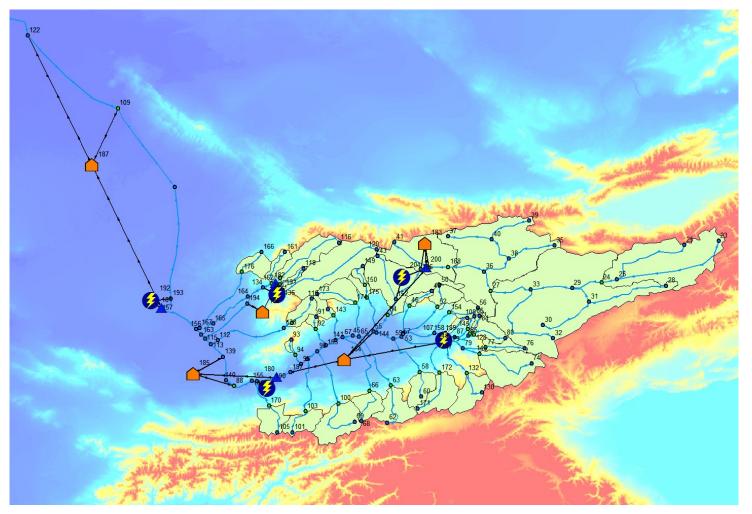


Landcover

大安三切

water evergreen needleleaf forest evergreen broadleaf forest decideous needleleaf forest **Kyrgysztan** deciduous broadleaf forest mixed forest closed shrublands Uzbekistan open shrublands woody savannahs savannahs Tajikistan grasslands permanent wetlands croplands urban and built-up cropland natural vegetation mosaic permanent snow and ice barren and sparsely vegetated 100 200 Kilometers 0 unclassified

Syr Darya basin simulation model

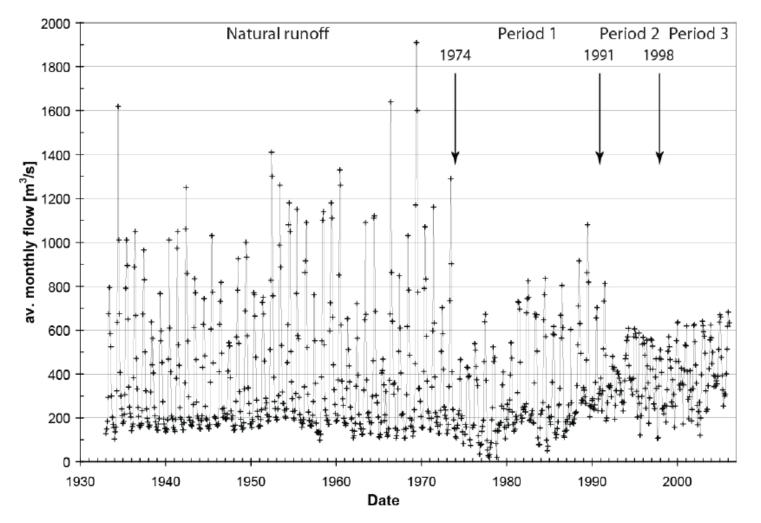




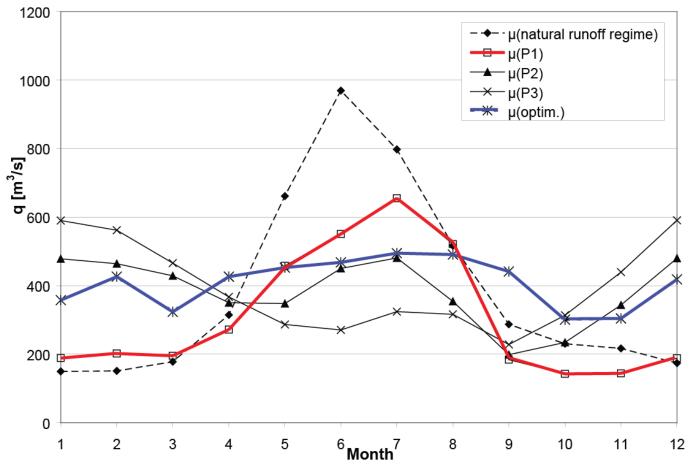
Economic valuation framework

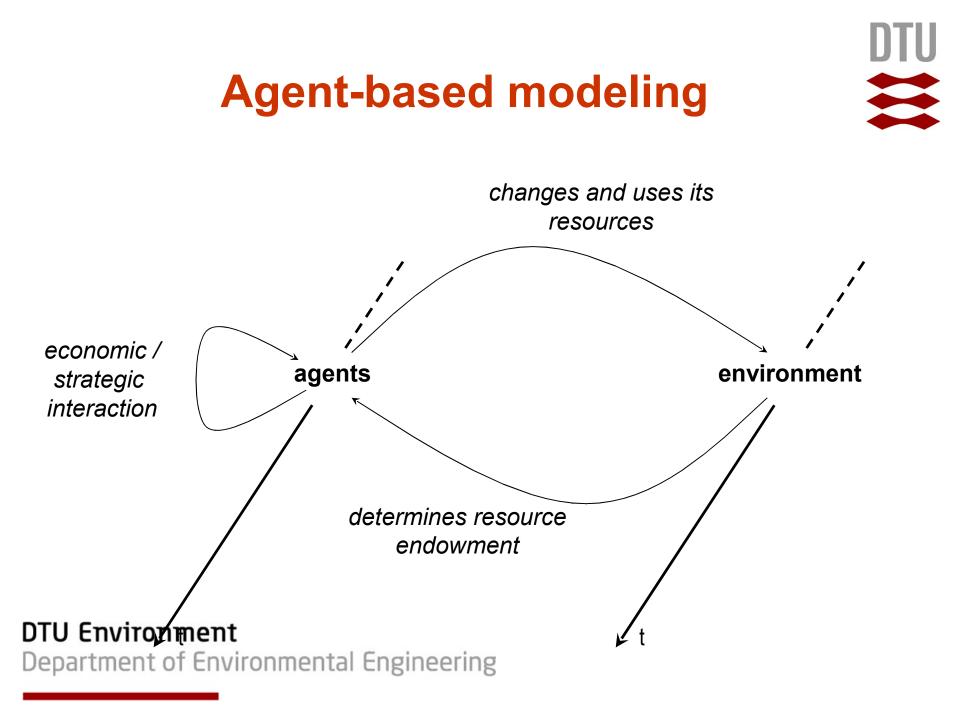
- Domestic/Urban use
- Irrigated Agriculture
- Industry
- Hydropower
- Ecosystems

Uch Kurgan gage



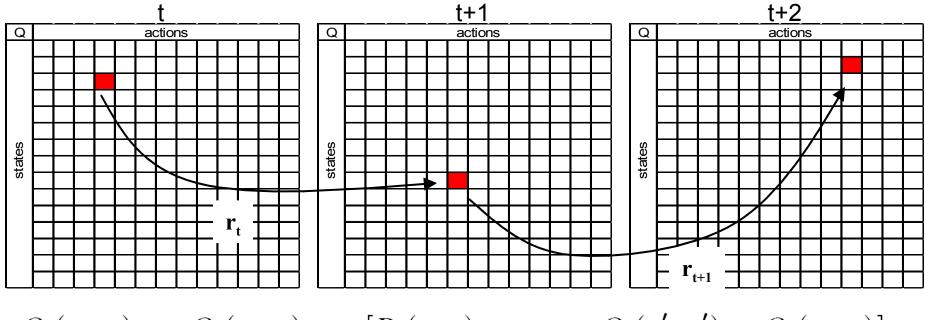
Uch Kurgan gage: Average monthly flows







State-action matrix

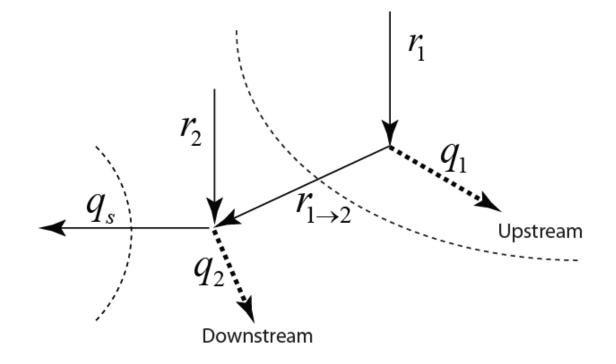


$$Q_i(\mathbf{s}, a_i) := Q_i(\mathbf{s}, a_i) + \alpha [R_i(\mathbf{s}, \mathbf{a}) + \gamma \max_{a'_i} Q_i(\mathbf{s}', a'_i) - Q_i(\mathbf{s}, a_i)]$$

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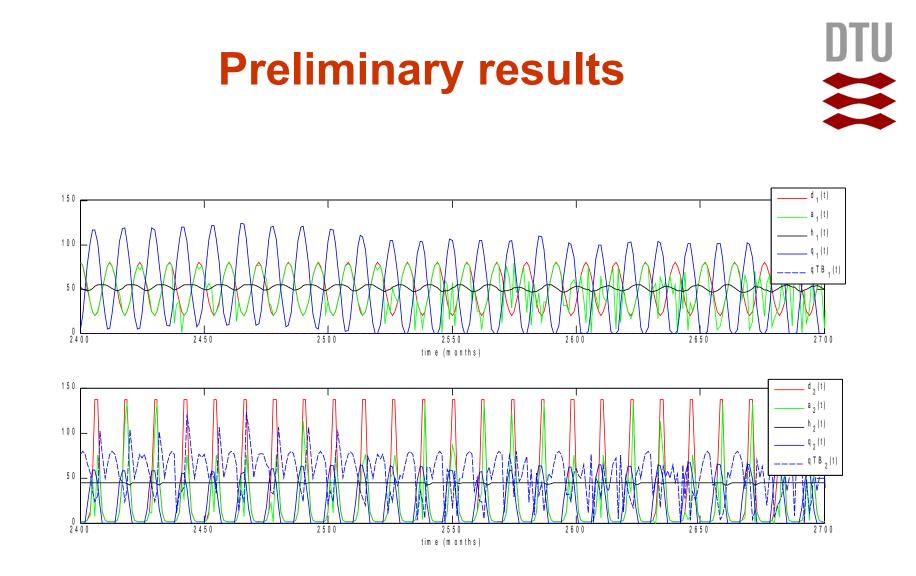
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Simplified Syr Darya representation



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