



International Water  
Management Institute



# Application of the water-energy-food (WEF) nexus concept to transboundary rivers of Central Asia

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Innovative water solutions for sustainable development

Food · Climate · Growth



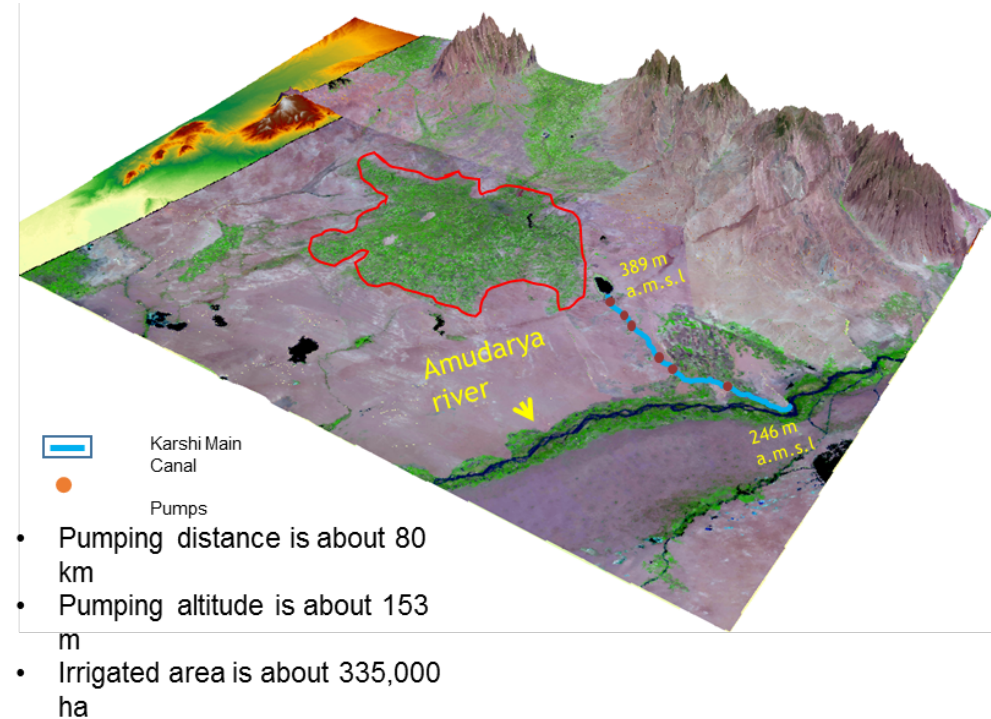
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# Water Resources of the Aral Sea Basin



# Water Resources Management Challenges in Central Asia

- ✓ Population growth along with emerging climate change has resulted in rising demand for **water**, **energy**, and **food** production;
- ✓ According to climate scenarios, Amu Darya river flow might be reduced 15% and Syr Darya 10% by 2050;
- ✓ Farmers use conventional irrigation practices that lead to excess drainage water runoff;
- ✓ Inefficient irrigation practices have led to water losses and caused excessive consumption of energy by outdated pumps.



# Return flow back to water bodies from lift irrigation scheme



Source: Avezmuradov (2018)

# Why WEF nexus concept important in transboundary river management context?

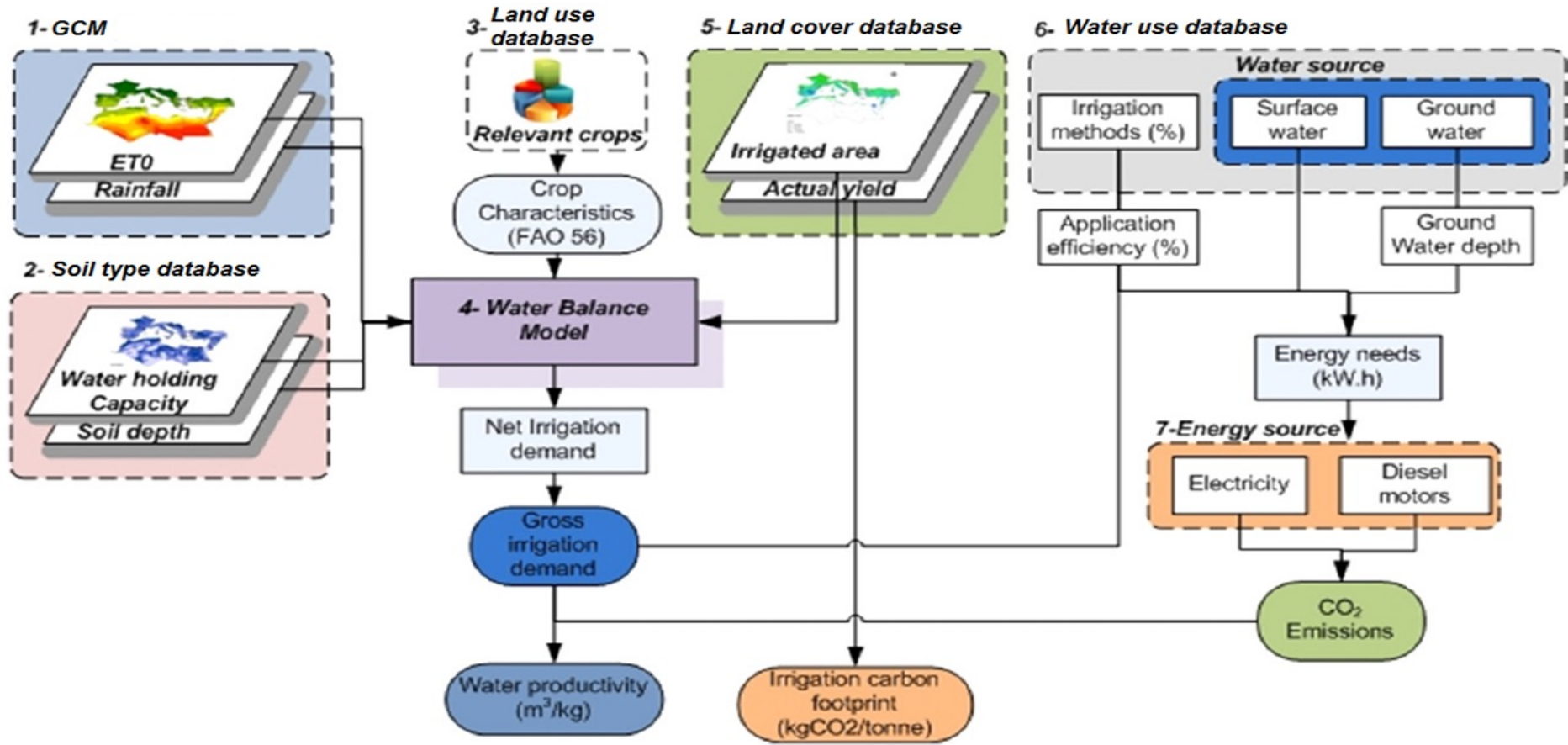
- ✓ The perfect storm of competition between water-energy-food as they interact with environment and the climate is perfectly illustrate Aral Sea Basin case
- ✓ The lack of systems approaches in the past resulted serious environmental degradation and social consequences in the region – Aral Sea disaster
- ✓ WEF nexus helps to identify and manage trade-offs and to build synergies, allowing for more integrated and cost-effective planning and decision making in Transboundary water management
- ✓ In Central Asia, however, the nexus between water-energy-food has not received adequate attention, with few studies that have been conducted falling short of quantifying nexus tradeoffs and benefits at a practical, small scale (Djumaboev et al. 2019)

# Application of WEF nexus in the lift irrigated areas of Amu Darya and Syr Darya River Basin within framework of USAID PEER project

## *Project objectives:*

- ✓ Create a spatial data base for estimating the sub-basin water and energy use efficiency using a combination of archival data collection, field data collection, and RS/GIS methods;
- ✓ Document best practices of farmers on water and land management implemented in the region;
- ✓ Assess the potential impact of improvements in the water use efficiency and energy use intensity through development of different scenarios;
- ✓ Prepare key recommendations for policy makers to improve existing water and energy management strategies on water use in transboundary rivers.

# Research Methodology



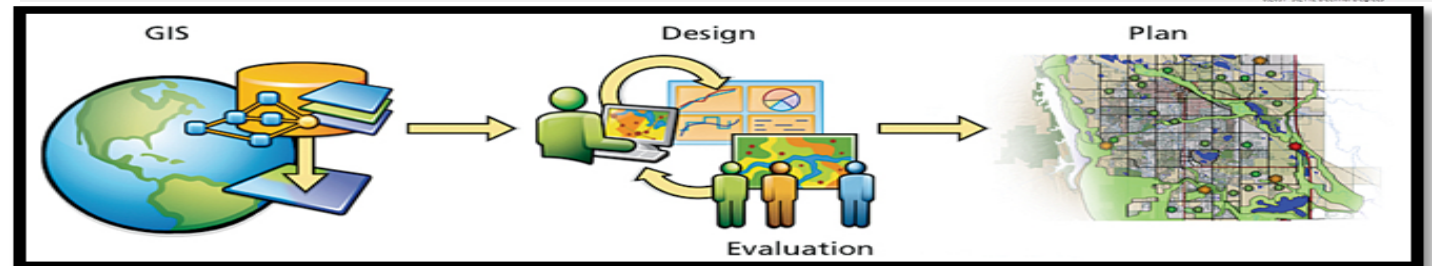
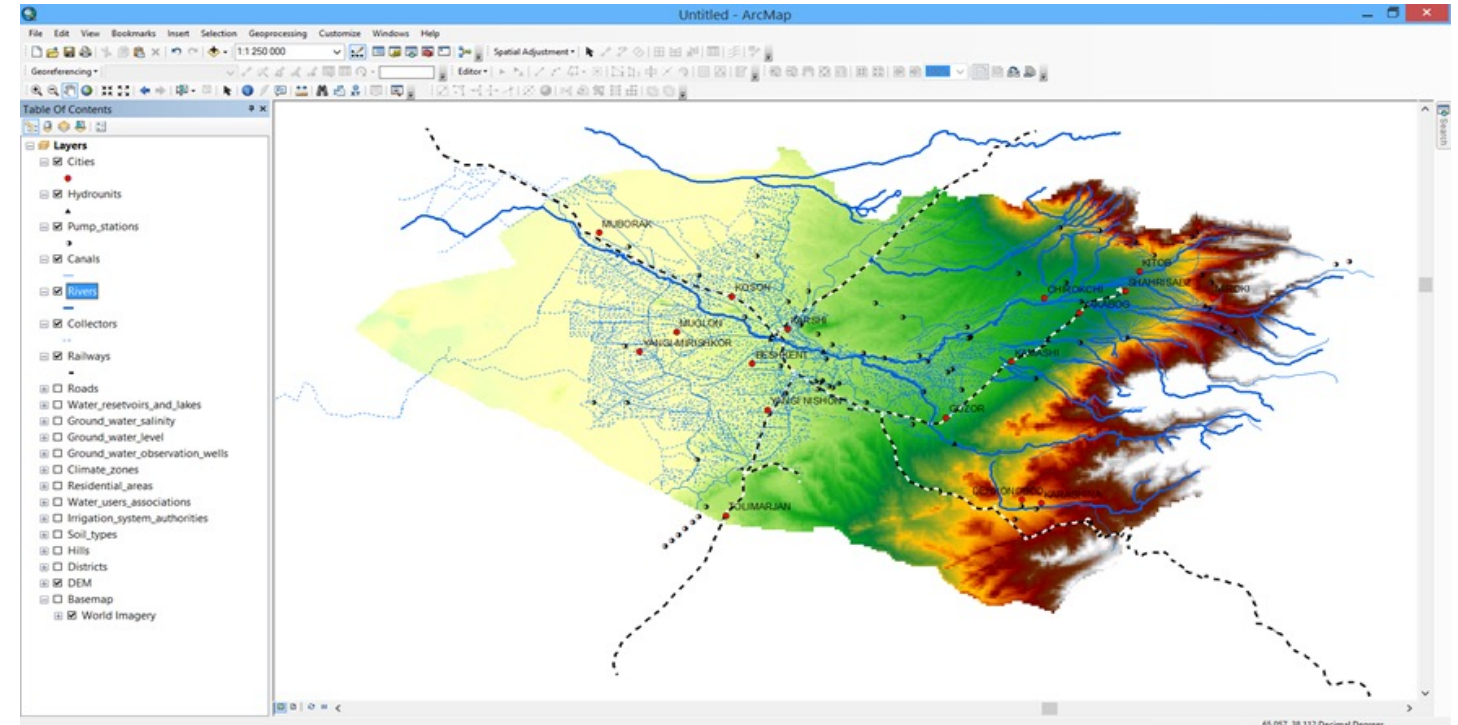
Adapted from DACCACHE et al. (2014)

# Geodatabase prepared for the sub-basin of Amu Darya and Syr Darya

Geodatabase is a collection of geographic datasets of various types held in a common file system.

Content:

- Agricultural administration
- Ground water
- Water resources
- Climate
- Soil
- Land cover/use
- Vegetation
- Crop classification





# Documented water saving technologies



# Water and Energy use in Karshi steppe of Amu Darya River Basin

Crop	Total pumped area, ha	Irrigation application, mm		Total water use, MCM		Total water saving, MCM	Electricity consumption, GWh		Total energy saving, GWh	GHG emissions, Kton		CO <sub>2</sub> reduction, Kton of GHGs
		Current	Improved irrigation practices	Current	Improved irrigation practices		Current	Improved irrigation practices		Current	Improved irrigation practices	
<b>Wheat</b>	102600	1011	587	1037	602	<b>435</b>	468	272	<b>196</b>	219	127	<b>92</b>
<b>Cotton</b>	119681	765	648	916	776	<b>140</b>	413	350	<b>63</b>	194	164	<b>30</b>
<b>Total</b>	222281	N/A	N/A	1953	1378	<b>575</b>	880	621	<b>259</b>	413	291	<b>122</b>

## Peer reviewed publications

- Djumaboev K, Hamidov A, Anarbekov O, Gafurov Z and Tussupova K. (2017). Impact of Institutional Change on Irrigation Management: A Case Study from Southern Uzbekistan. *Water* 2017, 9(6), 419, doi: 10.3390/w9060419 <http://www.mdpi.com/2073-4441/9/6/419>
- Kakhramon Djumaboev, Ahmad Hamidov and Oytur Anarbekov 2017. Collective Action in the Irrigation Sector of Uzbekistan: A case Study of Water Consumers Associations (WCAs) in the Karshi Steppe of Uzbekistan. [http://centralasia.iwmi.cgiar.org/regional-content/central\\_asia/pdf/collective\\_action\\_in\\_the\\_irrigation\\_sector\\_of\\_uzbekistan.pdf](http://centralasia.iwmi.cgiar.org/regional-content/central_asia/pdf/collective_action_in_the_irrigation_sector_of_uzbekistan.pdf)
- Kakhramon Djumaboev, Tulkun Yuldashev, Bunyod Holmatov and Zafar Gafurov (2018). Assessing Water Use, Energy Use, and Carbon Emissions in Lift Irrigated Areas: A case Study from Karshi Steppe in Uzbekistan. Paper accepted for publication. *Irrigation and drainage journal of International Commission on Irrigation and Drainage*. <https://onlinelibrary.wiley.com/journal/15310361>
- Gafurov, Z., Eltazarov, S., Akramov, B., Djumaboev, K., and Anarbekov, O. 2018. *Geodatabase and Diagnostic Atlas: Kashkadarya Province, Uzbekistan*. Colombo, Sri Lanka: International Water Management Institute (IWMI). [http://centralasia.iwmi.cgiar.org/regional-content/central\\_asia/pdf/geodatabase\\_and\\_diagnostic\\_atlas-kashkadarya\\_province-uzbekistan.pdf](http://centralasia.iwmi.cgiar.org/regional-content/central_asia/pdf/geodatabase_and_diagnostic_atlas-kashkadarya_province-uzbekistan.pdf)
- Gafurov, Z., Eltazarov, S., Akramov, B., Djumaboev, K., and Anarbekov, O. 2018. *Information tool for Zafarabad district, Sogd province (Tajikistan)*. Colombo, Sri Lanka: International Water Management Institute (IWMI). [http://centralasia.iwmi.cgiar.org/regional-content/central\\_asia/pdf/information\\_tool\\_for\\_zafarabad\\_district\\_sogd\\_province\\_tajikistan.pdf](http://centralasia.iwmi.cgiar.org/regional-content/central_asia/pdf/information_tool_for_zafarabad_district_sogd_province_tajikistan.pdf)

## Project outcomes highlighted in social media

- ✓ A researcher journey to conserve water in Uzbekistan. <https://usaidcentralasia.exposure.co/a-researchers-journey-to-conserve-water-in-uzbekistan?source=share-USAIDCentralAsia>
- ✓ Research shifts policy from energy subsidy to water savings in Uzbekistan's irrigated heartland. <https://wle.cgiar.org/news/research-shifts-policy-energy-subsidy-water-savings-uzbekistans-irrigated-heartland>
- ✓ WEF Nexus, Water Productivity and Water Accounting. <https://events.development.asia/learning-events/wef-nexus-water-productivity-and-water-accounting>
- ✓ The Vital Resource: Water Management in Central Asia. <https://www.caspianpolicy.org/the-vital-resource-water-management-in-central-asia/>

# Dissemination of project results in International and National conferences



## Conclusions and Policy recommendations

- ✓ Current government policies on energy subsidy in the lift irrigated areas do not support water and energy savings. Therefore, if the government shifts subsidies from energy to water-saving technologies, it will reduce water and energy consumption in agricultural sector and mitigate competition for water and energy use at national and transboundary level;
- ✓ In addition, basin wide water productivity will be improved, return flow and CO2 emissions will be reduced and hence, the environment is protected;
- ✓ There is a need to introduce platforms to discuss the WEF nexus related issues in order to improve inter-sectoral cooperation, existing policies, strategies on transboundary water management in the Aral Sea Basin.

# Policy Uptake in Uzbekistan

- The results demonstrated multi-benefits of promoting new irrigation technologies in lift irrigated areas that were communicated to stakeholders from the presidential administration and the Ministries of Water Resources and Economy in Uzbekistan;
- The government has adopted a strategy to expand drip irrigation areas by up to 253,381 ha during 2019-2022, which will cover farmers' ~50% of drip irrigation installation costs and exempt them from land tax for five years;
- Our key recommendations helped government officials in Uzbekistan to expand the program target on water saving technologies including drip irrigation, sprinkler irrigation and laser levelling up to 450,000 ha in 2021. This program came into effect on December 11, 2020 through a Presidential resolution;
- The project interventions have led to the improvement of water use efficiency in transboundary rivers in Central Asia.



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# Thank you for your attention

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