



WUEMoCA - WebGIS for Monitoring the Water Use Efficiency in Central Asia

Lucia Morper-Busch (1), Rustam Toshpulatov (2), Gunther Schorcht (3), Maik Netzband (1), Sarah Schönbrodt-Stitt (1), Georgy Solodky (2), Anatoly Sorokin (2), Sherzod Zaitov (2), Viktor Dukhovny (2), Christopher Conrad (1,4)

(1) University of Würzburg, Institute of Geography and Geology, Department of Remote Sensing, Würzburg, Germany, (2) Scientific Information Center of the Interstate Coordination Water Commission in Central Asia, Tashkent, Uzbekistan, (3) green spin GmbH Würzburg, Germany, (4) University of Halle-Wittenberg, Institute of Geosciences and Geography, Germany

Efficient irrigation agriculture is essential for the sustainable regional development and adaption to climate change in one of the largest drylands in Central Asia, the Aral Sea Basin (ASB). It requires reliable and accessible data on the water use efficiency ('more crop per drop') and irrigated land use. The online information tool WUEMoCA (Water Use Efficiency Monitor in Central Asia) constitutes a continuous and automated monitoring platform that provides free access to spatial-temporal agricultural geoinformation such as crop types, yield estimations, and evapotranspiration assessments.

This information is derived from open-source optical satellite remote sensing MODIS imagery, freely available climate data, and available statistical data. From these data sources a set of indicators was elaborated, in collaboration with local users from water management and in compliance with the overall UN Sustainable Development Goals (i.e. SDG's zero hunger, food security and sustainable agriculture). The relevance of these indicators is justified by both, economic and environmental drivers.

The spatial focus of WUEMoCA lies on the irrigated cropland area in the ASB shared by Uzbekistan, Kazakhstan, Turkmenistan, Tajikistan, Kyrgyzstan, and Afghanistan. The developed indicator system currently consists of 22 indicators, which are grouped into categories referring to land use (e.g., net irrigated area and crop acreage), to cropland productivity (e.g., crop yield), and to the water use efficiency (e.g., irrigation efficiency, actual evapotranspiration as well as water availability). They are provided annually and multi-annually from 2000 until today. Thus, they allow to spot at the performance of the irrigated cropland (e.g., identification of marginal lands with low production, the localization of areas with lowest or highest land use intensity, and for assessments of the water use efficiency) over time.

The incorporated interactive 'User polygon Toolbox' substantially enhances the indicator set by including additional statistical inputs (e.g., water intake and crop prices) for own areas of interest.

The freely accessible online information tool WUEMoCA builds on flexible and extensible open-source packages. It is open to modifications and adaptations to specific user demands. The open-source tool consists of a server processing unit using JAVA and Python, and an OGC (Open Geospatial Consortium) compliant webGIS architecture. Its components are PostGIS database, GeoServer, and a customized web mapping application, built from JavaScript libraries such as Sencha Ext JS and OpenLayers. Standard geodata exchange formats are used such as WMS and WFS.

WUEMoCA contributes to the current database at the regional scale and is largely considered to support informed decision-making. The tool addresses national governments, regional and transboundary authorities as well as specialists at water management institutions. Potential users also include educational institutions and the scientific community. The tool is applied in study programs on geoinformation and remote sensing, as well as in environmental research in Central Asia.