## THE NURA RIVER BASIN

Kazakhstan is a Central Asian country with a transitional economy. This is placing increased pressure on all the country's water resources but no more so than in the Nura catchment. The Nura River lies in north central Kazakhstan and is characterised by very cold winters and warm dry summers, precipitation is only about 300 mm wit runoff and occurring only at the time of spring snow melt. There is no usable groundwater except in the river gravels. The river has three cities. The river terminates in the large and important international Kurgaldzhino wetland, a RAMSAR site. Unfortunately, due to the arid nature of the climate, the water resources are in great demand for domestic, industrial, and agricultural use which possesses an on-going serious threat to the long term sustainability of the wetlands.

## WORK PACKAGE 4 – HYDROLOGICAL MODELLING AND WATER ABSTRACTION

The rapid development of Astana and the increased water demand mean that there is an urgent need to assess the impact on the Kurguldzhino terminal wetlands. Unfortunately, the upstream river data is poor, and discharge data from the inter-basin Irtysh Karaganda Canal and industrial and irrigation abstraction data appear to be very unreliable and unusable. The data needed for reliable calculation of run-off are totally lacking. As a result it is not possible to realistically model the river. The contribution of the River Nura to the annual water balance of the wetlands was therefore established by comparing its discharge with mean annual water loss from the wetlands.


A revised methodology was developed and tested for establishing the annual evapotranspiration from the vast reed beds of the wetland system, using Landsat 7 data and a sensible heat balance approach to estimate real time evapotranspiration. This method uses the Monin-Oberkhov length as a keystone to the calculation. When tested on a fully-instrumented irrigated cotton field the results indicated that the methodology was highly reliable for establishing evapotranspiration. When applied to the reed beds the mean annual established evapotranspiration was calculated as a 1.2. times that of potential evapotranspiration. The mean annual evaporation from open water was established from the calculated potential evaporation multiplied by a $K_c$ of 1.05. The results show that maintaining the present surface area of the wetlands and the Tengiz Lake requires a mean annual catchment runoff of 1265 million $m^3$ per year, of which 386 million $m^3$ per year are for the wetlands.

The mean annual runoff from the river Nura into the wetlands is 284 million $m^3$ per year, corresponding to a mean flow of the Nura of 9 $m^3s^{-1}$.

Plans are being discussed to abstract up to 20 $m^3s^{-1}$ of water from the Nura River for the development and greening of Astana. Since the mean annual flow from the Nura river, which presently reaches the terminal wetlands, is just under 9 $m^3s^{-1}$, this would damage the wetlands seriously. Put simply, the loss of 1 $m^3s^{-1}$ inflow from the Nura is equivalent to losing a surface area of wetlands of 46 $km^2$. Abstracting more water from the river Nura is therefore not compatible with the RAMSAR convention. It is therefore of the utmost importance that the Kazakhstan government takes steps to ensure sustainable management of the water supply to the

## ABOUT TWIN2GO

*Twin2Go reviews, consolidates, and synthesises research on adaptive and integrated water resources management in basins around the world. The aim is to draw insights relevant to policy and research on issues around adaptive water governance in the context of climate change, and to make them transferable to other basins. Twin2Go further promotes sharing of research results with practitioners and high level decision makers through effective dialogue.*

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