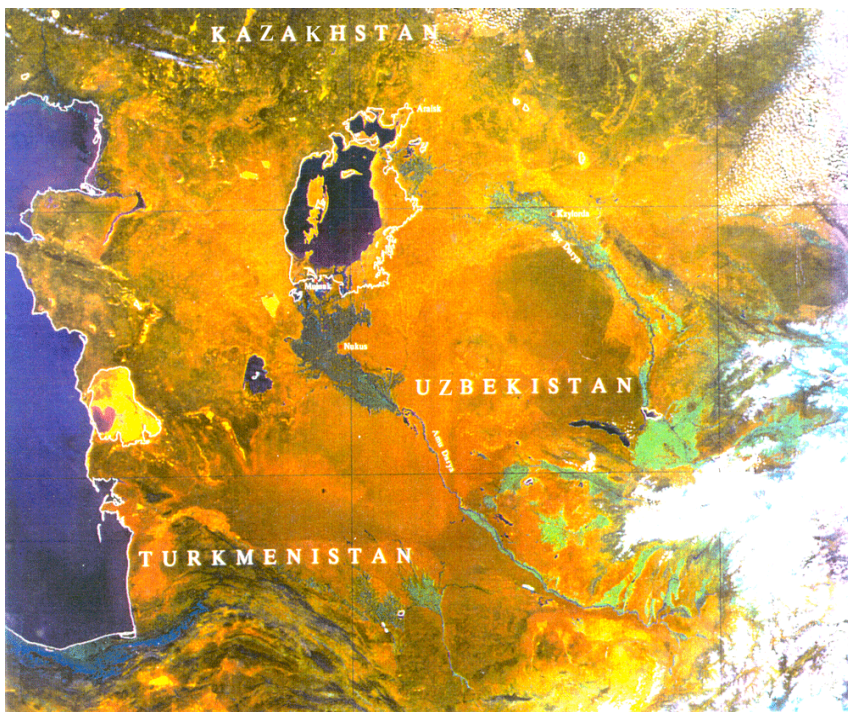




# **Results of HBV-Chirchik and water distribution modeling within the integrated model for the CHAB basin**

**Anatoly Sorokin, ICWC SIC, Uzbekistan**

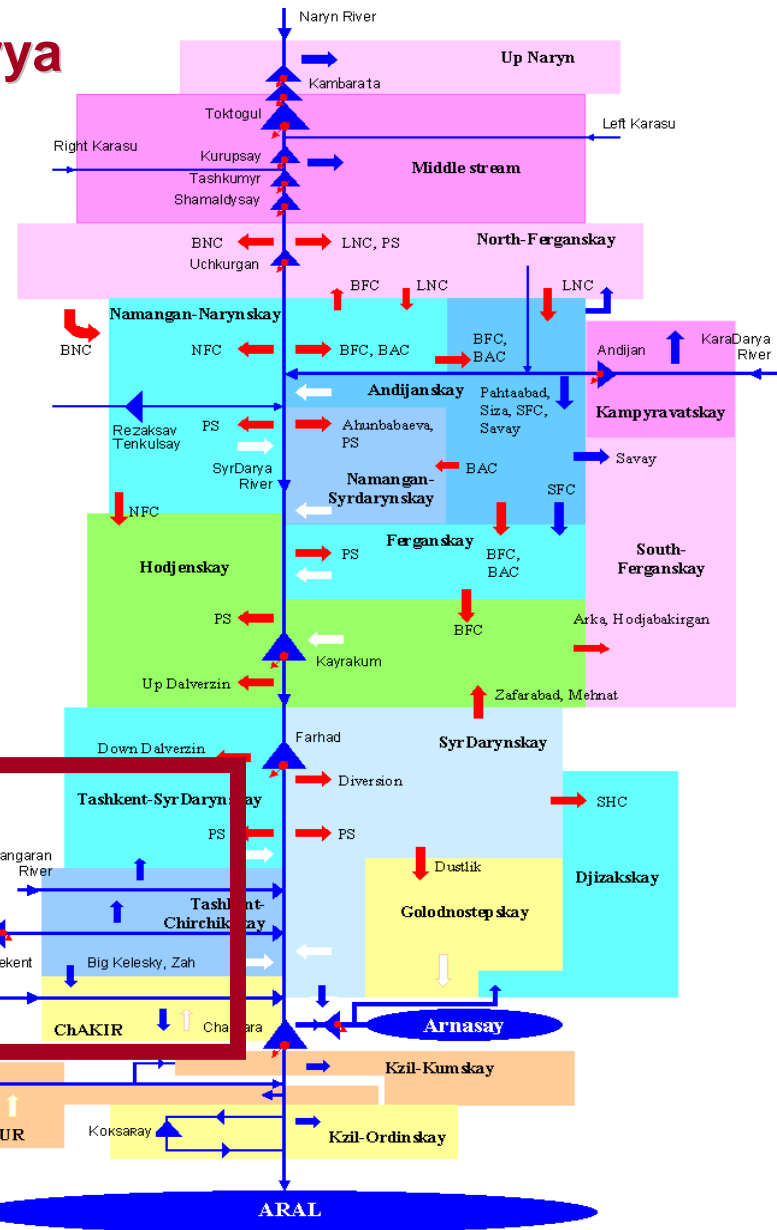


# Syrdarya

- River
- Intake
- Limit of BVO
- Outfall
- Reservoir, HFS

- Planning Zones
- Kazakhstan
  - Kirgistan
  - Tadjikistan
  - Usbekistan

- Canals
- LNC - JHK
  - BNC - EHK
  - BFC - BFK
  - BAC - BAK
  - NFC - CFK
  - SFC - IOFK
  - SHC - IOFK



**Chirchik-Akhangaran-Keles Basin (CHAB) is a part of the Syr darya basin (Aral Sea basin)** →



## HBV-Chirchik and water distribution modeling (GAMS-Chirchik)

### Water and Hydropower Block

Hydrological block HBV-Chirchik

- *Catchments zones*

Demand block WEAP-Chirchik

- *Irrigation zones*
- *Cities & Industrial zones*
- *Power stations*

Distribution & Balance block

- *Rivers & Canals*
- *Reservoir*
- *Demand objects*

Situation management

Data Base  
(scenarios)

Others models

Integration block  
Mosdew-Chirchik

- **Run-off prediction,**
- **Distribution of river flow among water network between consumers (irrigation zones, water supply objects, power stations, ecologic requirements)**

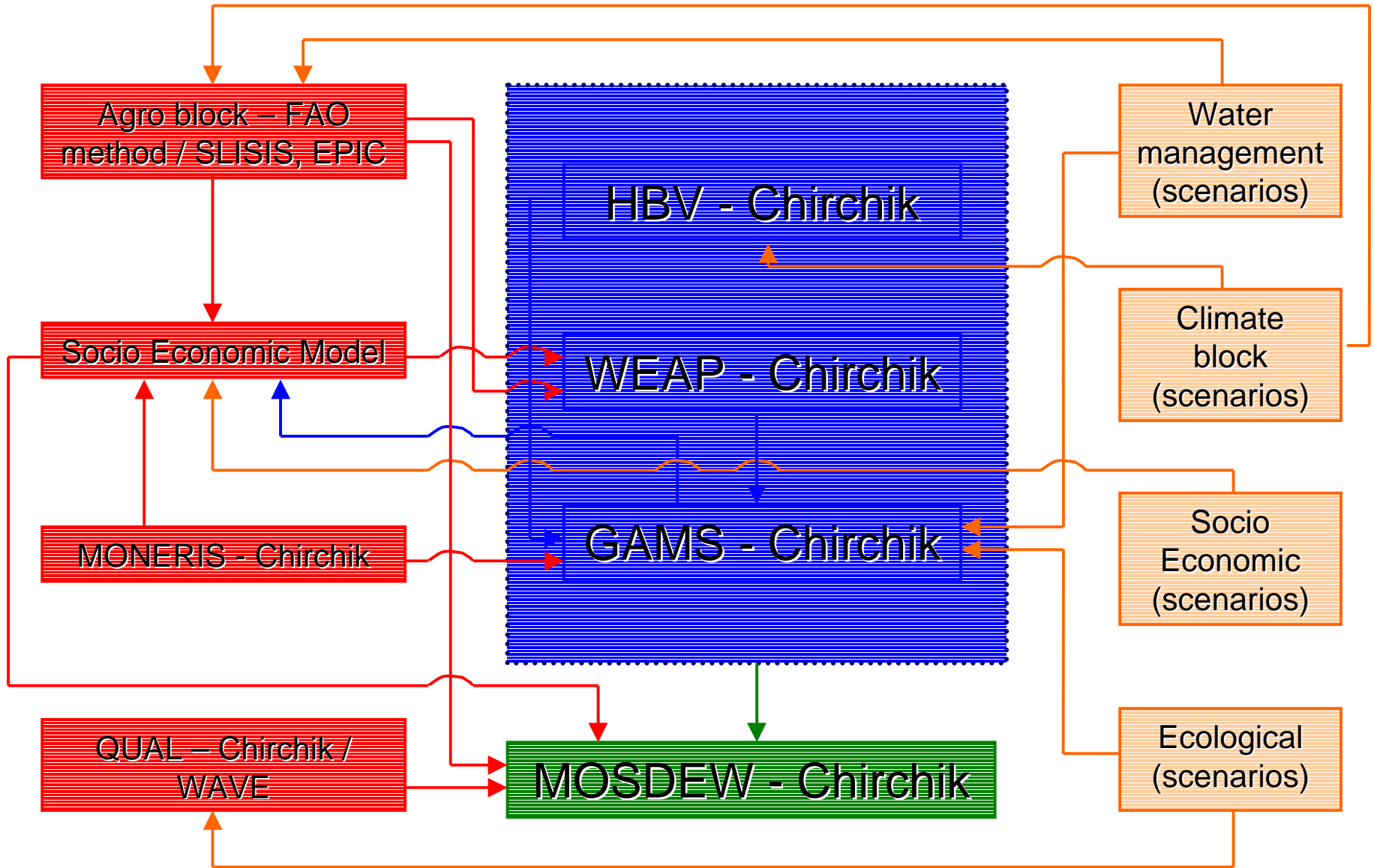




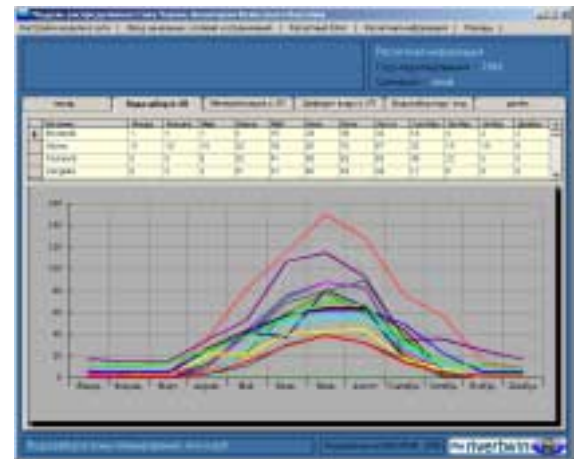
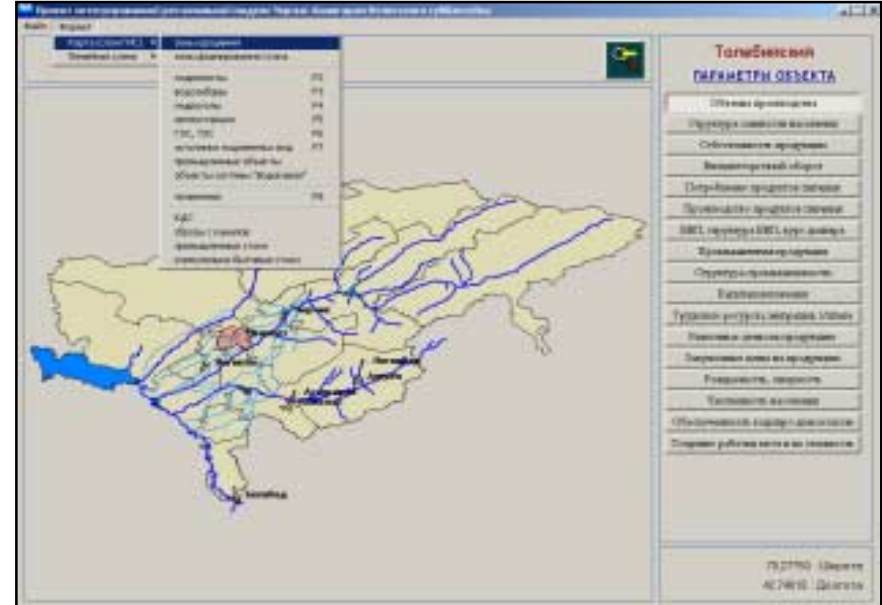
**Main task for HBV & GAMS-Chirchik is calculation and assessment of alternative strategies and scenarios for water resources management:**

- Water-salt balances of rivers, canals, reservoirs,
- Assessment and prediction of water availability for consumers (municipal, industry, power, irrigation),
- Improvement of the integrated model up to the Management tool – linking with others models

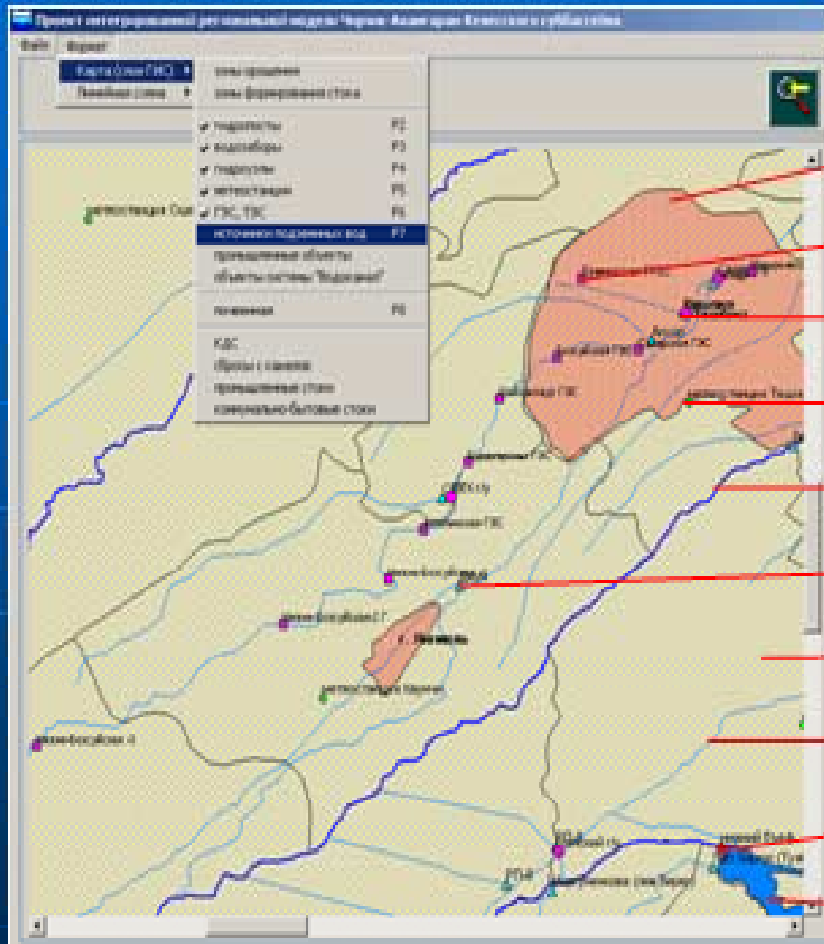
# HBV & GAMS - Chirchik within the integrated model (MOSDEW)



# Interface Run of HBV-GAMS-Chirchik models in a cyclic, iterative process of optimization, simulation. Output for MOSDEW (integrated parameters)



## Viewing of GIS layers through the interface window



TOWNS

HPP, TPP

STRUCTURES

METEOSTATIONS

RIVERS

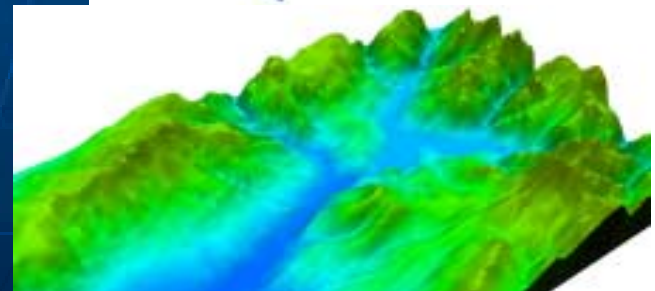
INTAKES

DISTRICTS

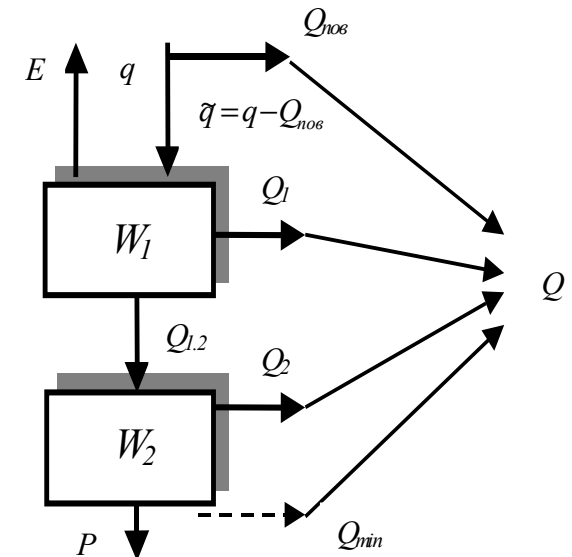
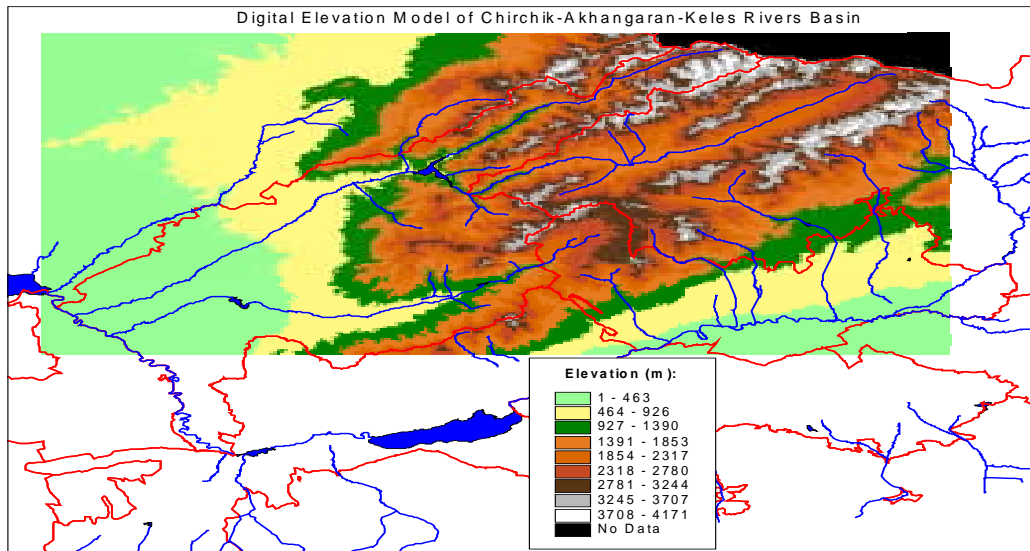
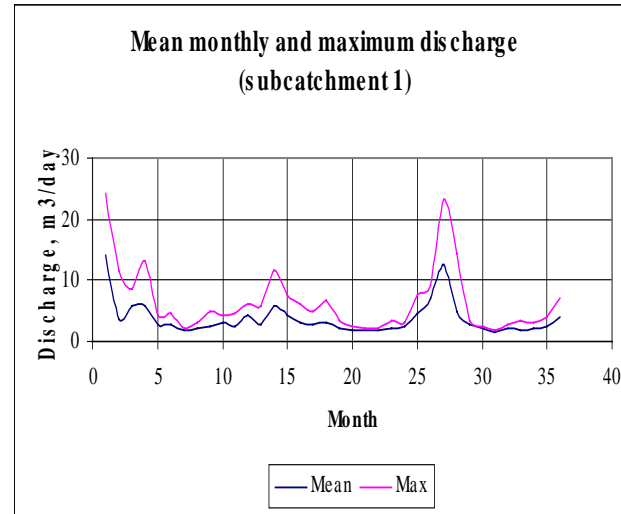
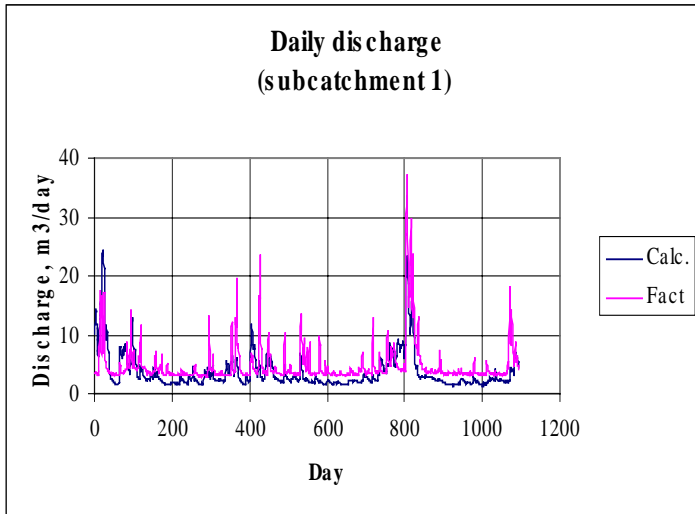
CANALS,  
COLLECTORS

HYDROPOSTS

RESERVOIRS

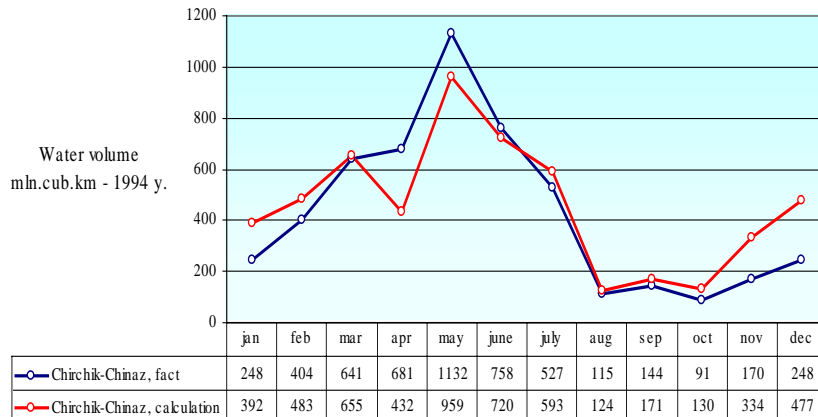
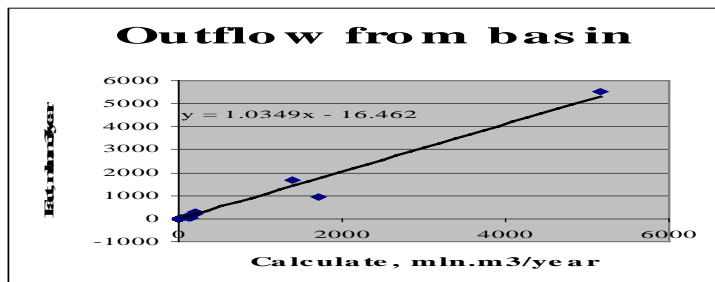
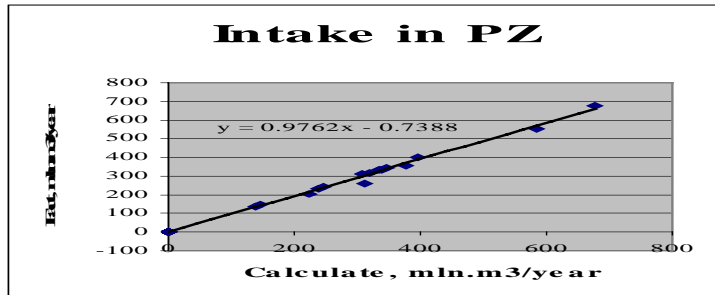


# Testing of HBV-IWS-Chirchik





# Distribution & Balance block (GAMS-Chirchik) Testing

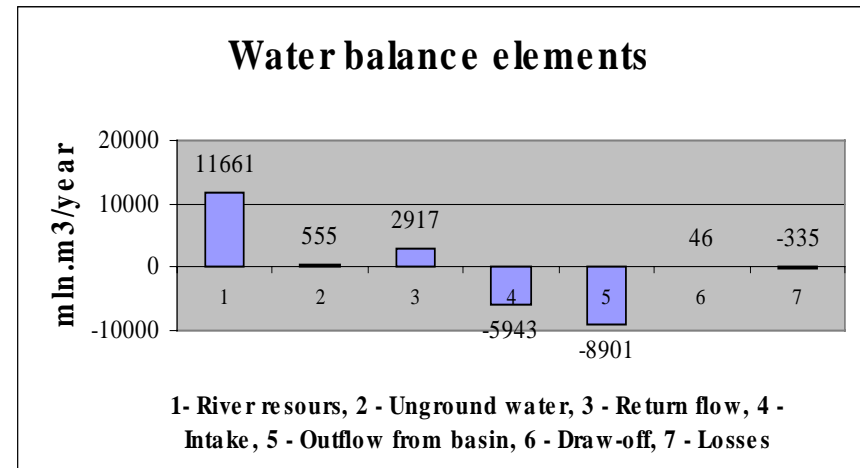


Balance elements	Calculation, mln.m3/year	Fact, mln.m3/year	Deviation, %
<b>1.Intake</b>	<b>4844</b>	<b>4984</b>	<b>- 3</b>
- Bostanlik	145	145	0
- Tashkent	346	348	- 1
- Yangiul	334	338	- 1
- Chinaz	232	238	- 2
- Parkent	135	140	- 3
- Ahangaran	308	308	0
- Yukachirchik	333	333	0
- Pskent	245	245	0
- Kuyichirchik	554	583	- 5
- Akkurgan	317	320	- 1
- Buka	398	398	0
- Keles	678	678	0
<b>2.Outflow</b>	<b>8901</b>	<b>9077</b>	<b>- 2</b>
<b>Chirchik/Chinaz</b>	<b>5516</b>	<b>5159</b>	<b>7</b>



#	Balance elements	Mln.m3/year
1	Rivers resource	11661
2	Un-ground water	555
3	Return flow	2917
4	Variation of water in Reservoirs	46
	Including:	
	- Charvak	53
	- Ahangaran	- 9
	- Tashkent	2
	<b>Total inflow:</b>	<b>15179</b>
1	Intake	5943
2	Outflow from basin	8901
3	Losses	335
	<b>Total outflow:</b>	<b>15179</b>

## CHAB water balance 1994

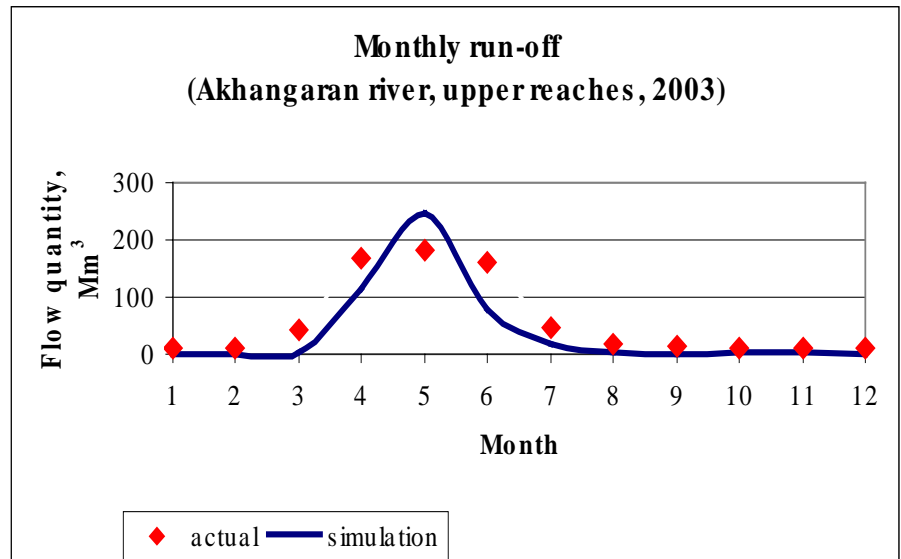
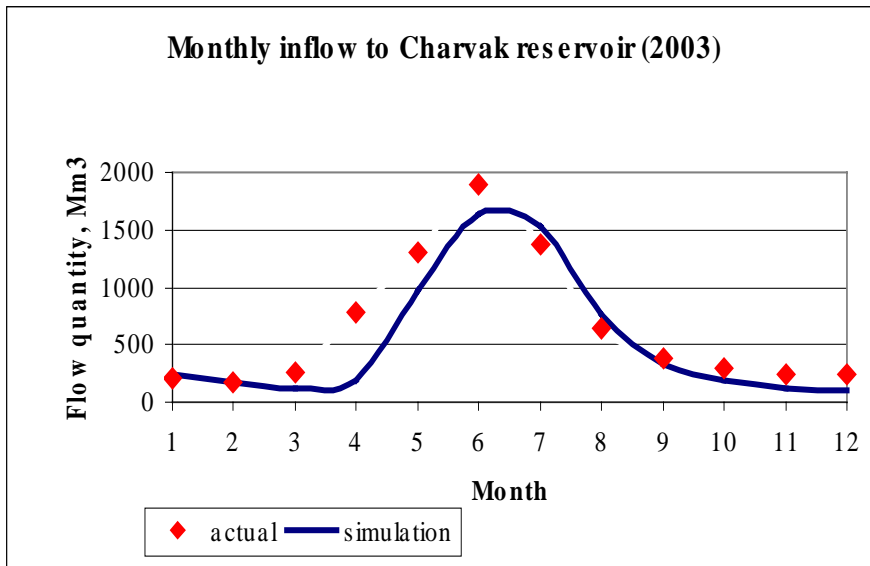
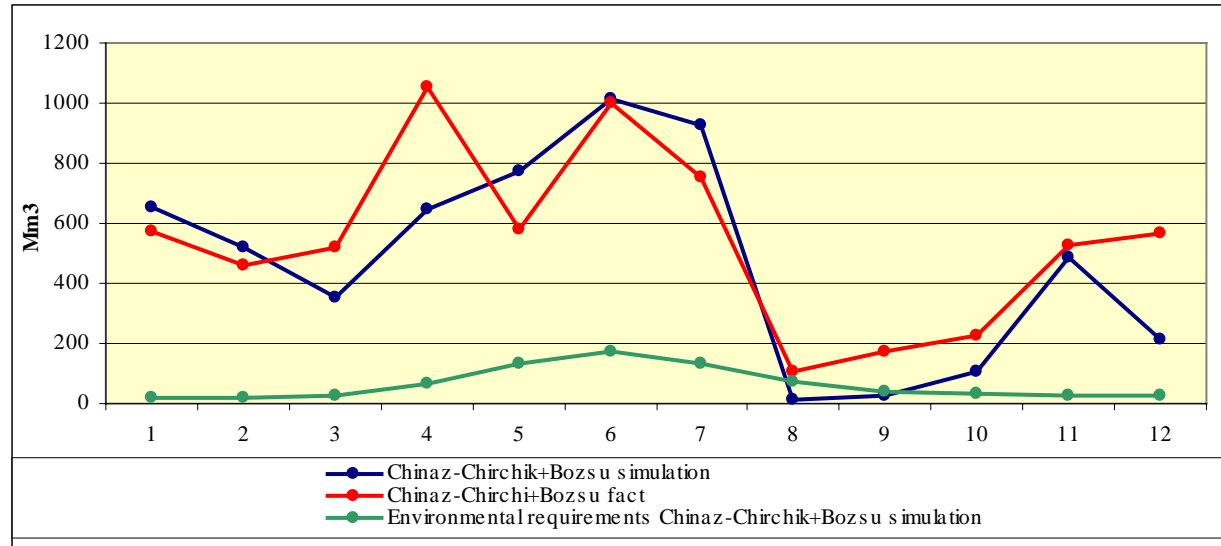


Rivers	Flow, cub km	%
Chirchik	9.573	82.1
Ahangaran	1.855	15.9
Keles	0.149	1.3
Parkent says	0.084	0.7
<b>Total</b>	<b>11.661</b>	<b>100</b>



# INTEGRATION 2003 year

HBV-Chirchik  
WEAP-Chirchik  
GAMS-Chirchik



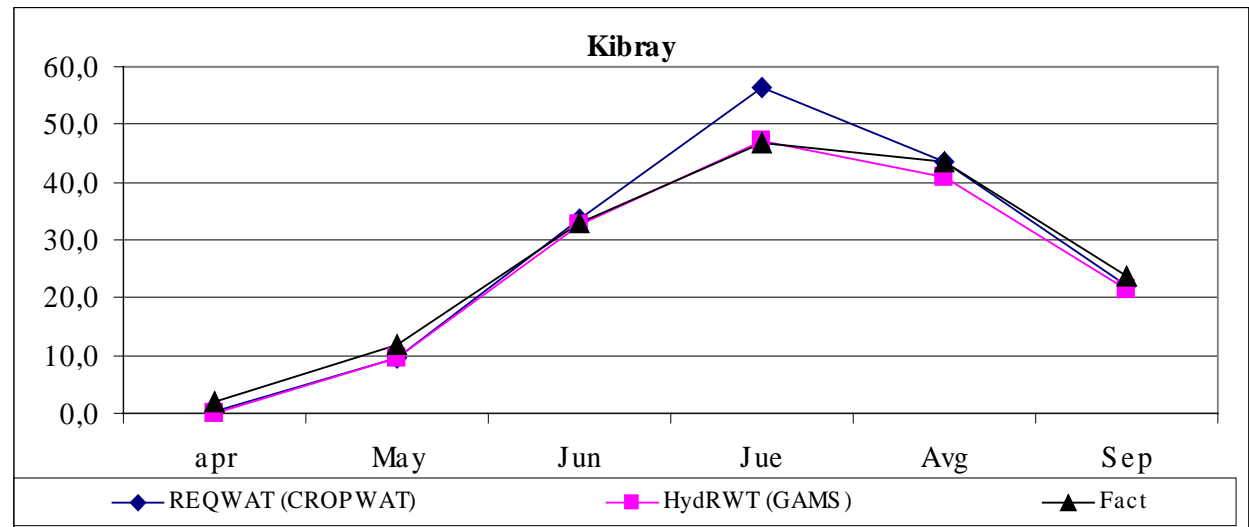
## INTEGRATION

## Comparison

- **HBV/GAMS-Chirchik**
- **WEAP - Chirchik**
- **Fact (2003 year)**

Year	Month	WEAP (REQWAT)	GAMS	Fact
2003	apr	0,2	0,0	1,8
2003	May	9,7	9,4	12,0
2003	Jun	33,7	32,8	32,8
2003	Jul	56,4	47,0	46,8
2003	Avg	43,4	41,0	43,5
2003	Sep	21,9	21,3	23,8
		165,3	151,5	160,8

Water use in Kibray, mln/m3





<b>Balance elements 2003 (mln.m3)</b>		<b>5.INTAKE</b>	<b>3987</b>
-----		Including to:	
<b>1.RIVERS RESOURS</b>	<b>10368</b>	- Agriculture	<b>2969</b>
Including:		- Communal water	<b>938</b>
- Chirchik basin	<b>8978</b>	- Industrial	<b>80</b>
- Ahangaran basin	<b>980</b>	-----	
- Keles	<b>243</b>	<b>6.OUTFLOW FROM BASIN</b>	<b>8813</b>
- Parkent rivers	<b>167</b>	Including:	
-----		- Chirchik	<b>3647</b>
<b>2.GROUND WATER</b>	<b>571</b>	- Bozsu	<b>1113</b>
Including:		- Keles	<b>279</b>
- Chirchik basin	<b>394</b>	- Ahangaran	<b>3242</b>
- Ahangaran basin	<b>176</b>	-----	
-----		<b>7.REGULATION FLOW</b>	<b>261</b>
<b>3.RETURN FLOW</b>	<b>2610</b>	Including:	
Including:		- Charvak reservoir	<b>231</b>
- irrigation	<b>1271</b>	- Ahangaran reservoir	<b>0</b>
- other	<b>1339</b>	- Tashkent reservoir	<b>30</b>
-----		-----	
<b>4.TOTAL INFLOW:</b>	<b>13549</b>	<b>8.TOTAL OUTFLOW:</b>	<b>13060</b>
		-----	
		<b>9.BALANS:</b>	<b>- 488</b>
		%:	<b>3.74</b>



## **Brief Information Report of BWO “Syrdarya” on Testing the HBV&GAMS-Chirchik (RIVERTWIN)**

In accordance with the Terms of Reference, BWO “Syrdarya” in association with SIC ICWC provided a trial test of GAMS-Model for water resources distribution in Chirchik-Akhangaran-Keles Basin.

The tested model is a balance model that describes in detail the following components: (i) river network in the basin with all reservoirs, hydro power plants and gauging stations located within it; (ii) irrigation systems including canals, waterworks facilities, water intakes, escapes, water-measurement points; (iii) “Vodokanal” system that uses water from surface and groundwater sources; (iv) collector and waste-disposal network.

The analysis of the results enabled to draw the following conclusions and set some tasks for the next work stage.

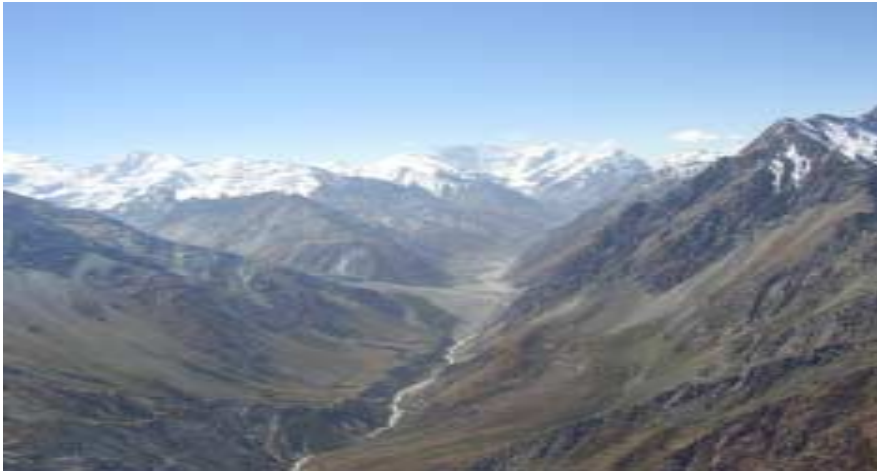
- The model showed good fitting (within a reasonable error in water balance of 5-6 %) of actual and simulation results regarding operation modes of reservoirs and hydro power plants, and water supply over outlets from irrigation network to districts
- The testing of the presented model version showed its efficiency and, in general, acceptable accuracy of computations.

The model may be used for variant calculations and development of proposals for long-term water resources management in the Chirchik-Akhangaran-Keles basin, with account of limitations and requirements to the whole Syrdarya river basin.



**Thanks for  
attention**

**Chirchik – Akhangaran - Keles Basin**



**E-mail: [dukh@icwc-aral.uz](mailto:dukh@icwc-aral.uz)**