Scenario building for future water management in the Chakir Basin

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Scenarios as a part of SP

- EUFWD
- MDGs

- Analyze
- Scenarios
- Plan actions

- IWRM principles
- Data base
- Governance in water

- Priority
- Public opinion
- Potential of development
- Institutions
- Law

- H Mod
- Agrarian
- Environmen

- SEM

- LAM
- DSS
- Monitoring system MS
- Ecological situation and biodiversity

- Water – soil relations

- Indication of water sufficiency

- Limitation
- Information
- Tools
- Requirement
## Dependence of population wellbeing on Water Sector

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Kazakhstan</th>
<th>Kyrgyzstan</th>
<th>Uzbekistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural population, %</td>
<td>44</td>
<td>66</td>
<td>59.6</td>
</tr>
<tr>
<td>Employment in Water – connected sphere %</td>
<td>32</td>
<td>53</td>
<td>68</td>
</tr>
<tr>
<td>Irrigated area per capita, ha</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Water availability by own water resources, m³/cap/year</td>
<td>1260 52 %</td>
<td>9439 100 %</td>
<td>1840 73 %</td>
</tr>
<tr>
<td>Contribution of water to generation of national income, %</td>
<td>27</td>
<td>58</td>
<td>52</td>
</tr>
</tbody>
</table>
Analytical survey

- assessment of the environment
- assessment of present water conditions
- identification of destabilizing factors
- assessment of existing material, financial and other resources
- evaluation of available water development
- assessment of institutional and legal aspects
- identification of the key challenges of future development
Growth of population, %
Saldo of migration population persons
Dynamic of investment on all sources on Tashkent province, mln. $

<table>
<thead>
<tr>
<th>Year</th>
<th>Investments, mln USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>340,4</td>
</tr>
<tr>
<td>1999</td>
<td>240,6</td>
</tr>
<tr>
<td>2000</td>
<td>209,9</td>
</tr>
<tr>
<td>2001</td>
<td>202,7</td>
</tr>
<tr>
<td>2002</td>
<td>160,5</td>
</tr>
<tr>
<td>2003</td>
<td>157,8</td>
</tr>
</tbody>
</table>
Present environmental losses:

Toxicological risk – 3.3 mln USD:
Fish productivity – 1.05 mln USD;
Human health – 10.0 mln USD;
Agricultural – 12.5 mln USD.
Socio-economic scenario
- BAU
- Selected
- Optimistic

Agricultural scenario
- BAU
- Selected
- Optimistic

Governance
- Water law and agreements;
- Support IWRM and its SP;
- Involvement stakeholders;
- Investment;
- Public awareness;
- Support subsidy for agriculture.

Climatic scenario

Water sector development scenarios
- Construction of reservoirs;
- River flow transfers
- CD requirements
- Neighboring country demands;
- Water conservation scenarios;
- Rehabilitation and modernization of hydraulic funds and structures.

Water demand

Water resources

Ecological scenarios
- Surface water quality trends;
- Groundwater quality trends;
- Land losses
- Change in percentage of forest lands in upper watershed;
- Ecological and sanitary releases.

Restriction:
- Investment;
- Energy production;
- Lands;
- Ecological flow.

HBW

Qual Chirchik
Future socio-economic development is determined by a few key lines that are characterized by the following indicators:

- demographic indicators (growth, morbidity, migration, employment);
- gross national income and its growth rates;
- change in industrial production volume;
- change of energy demands and requirement;
- change in volume of service sector output;
- capital investments, including local, loans, foreign;
- capacities to meet national food demand.
Dynamics of main crop yields in Tashkent province, t/ha

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>2.4</td>
<td>2.2</td>
<td>1.9</td>
<td>2.9</td>
<td>3.2</td>
<td>4.1</td>
</tr>
<tr>
<td>Corn</td>
<td>7.5</td>
<td>3.4</td>
<td>3.6</td>
<td>2.5</td>
<td>3.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Rice</td>
<td>5.5</td>
<td>5.3</td>
<td>5.1</td>
<td>3.4</td>
<td>3.7</td>
<td>4</td>
</tr>
<tr>
<td>Raw cotton</td>
<td>3.7</td>
<td>3.1</td>
<td>2.9</td>
<td>2.6</td>
<td>2.4</td>
<td>2</td>
</tr>
<tr>
<td>Potato</td>
<td>10.5</td>
<td>8.7</td>
<td>6.5</td>
<td>9.2</td>
<td>15.5</td>
<td>21.2</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2.4</td>
<td>2.2</td>
<td>2.1</td>
<td>2.0</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>Cucurbits</td>
<td>18.2</td>
<td>17.6</td>
<td>16.2</td>
<td>13</td>
<td>16.9</td>
<td>17</td>
</tr>
</tbody>
</table>
Specific driving forces for countries in transition (1)

- Socio-economic scenario

- Demography:
  - Transnational migration of population;
  - Internal migration – urban - rural;
  - Internal zonal migration;
  - Resettlement of qualified staff.

- Macroeconomics:
  - State priorities;
  - Industrial decline and available non-used capacities;
  - Transport availability;
  - Investment possibilities;
✓ Foreign investments;
✓ Investment climate;
✓ Internal market and internal prices.

c) agricultural development

✓ Public policy on restructurization and planning;
✓ Agricultural support;
✓ Water and irrigation priorities;
✓ Possibility and wish to reclaim and develop irrigated lands;
✓ Family support;
✓ Service and market infrastructure establishment;
✓ Extension service;
✓ Price and tax system;
✓ Link with the world food market;
✓ Ratio between market and purchasing prices.
Relationship between yield of land in cooperative and private farms, tn/ha on 2003

<table>
<thead>
<tr>
<th>Crop</th>
<th>Cooperative farms</th>
<th>Private farms</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>3.84</td>
<td>4.6</td>
<td>1.19</td>
</tr>
<tr>
<td>Vegetable</td>
<td>22.48</td>
<td>30.3</td>
<td>1.34</td>
</tr>
<tr>
<td>Grape</td>
<td>2.38</td>
<td>4.9</td>
<td>2.05</td>
</tr>
<tr>
<td>Fruits</td>
<td>3.21</td>
<td>5.7</td>
<td>1.77</td>
</tr>
<tr>
<td>Potato</td>
<td>21.10</td>
<td>29.9</td>
<td>1.41</td>
</tr>
</tbody>
</table>
Dynamics of production volumes per sector for 1990-2003.
Sequence of combination of Scenarios

- Water resource (regime, quantity) are created by combination of four options – two climatic and two water farming

<table>
<thead>
<tr>
<th>Climatic Scenarios</th>
<th>Water development scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$W_0$</td>
</tr>
<tr>
<td>1</td>
<td>C 1 $W_0$</td>
</tr>
<tr>
<td>2</td>
<td>C 2 $W_0$</td>
</tr>
</tbody>
</table>
Water demand is defined on the basis of building boundary curves for social-economic and agricultural scenarios (BAU and optimistic) by the comparison of needed and required investments. Combination balance between Water resources and water demands will permit to check requirement of environmental scenarios.
Business as usual scenario

- Population growth trend is at the same level (for both rural and urban population)
- Economic growth at current level (2003-2005)
- Economic structure without changes
- Industry and services without changes
- Capital investment amount at the same level
- Extension of private farming, gradual transition to free market economy.
- As to irrigated agriculture, no changes in:
  - institutional aspects of water management and actual water delivery regime;
  - costs for rehabilitation and maintenance of inter- and on-farm irrigation and drainage systems.
  - machinery maintenance costs.
Optimistic scenario

Stable population

- Moderate, sustainable economic growth.
- Gradual sustainable industrial development, full use of potential.
- Increased role of private small and medium scale business.
- In irrigated agriculture:
  - speeded up privatization of farms, with appropriate raise in farmers’ income;
  - institutional changes, implementation of IWRM;
Social economic and agriculture scenarios

F Volume of production mln. USD

2003 2010 2020 2030

Optimistic SE
Optimistic agricultural
BAU SE
BAU agriculture
How to find needed scenario?

Sequence of options:

- Restructuring of farms
- Increasing input of fertilizers
- Change of crop patterns
- Approach to credit line
- Reallocation of state investments
- Rehabilitation of irrigation system
- Modernization of irrigation technique
- Creation of market infrastructure
- And others
COMPARISON OF INDICATORS FOR SELECTION OF SCENARIOS

• Balance of water: resources and demands
• Balance of investments in sectors and total
• Satisfaction of ecological requirement
• Growth of GDP per capita
• Growth of employment
• Balance of energy: resources and demands
• Satisfaction of food basket
Managing system of water resources

BWO “Syrdarya”
Transboundary surface waters ICWC

Reservoirs and HES
JSC “Uzbekpower”
2,5km³, 1230 MWt

Chichik basin
organization of irrigation systems,
Minagrowater Uz
382 th. ha

Ground waters
confirmed resources
Ministry of Geology

Keles irrigation unit
South Kazakhstan province SCWR
26 th. ha

Irrigation systems and water canals

WUAs
shirkats
state farms
Transfer to hydro environmental management (proposal)