Synthesis of the basins assessed and general conclusion

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Sava (shared by Bosnia and Herzegovina, Croatia, Serbia, Slovenia and Montenegro)

Alazani/Ganikh (shared by Azerbaijan and Georgia)

Syr Darya (shared by Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan)

Main sectors and activities affecting resources use and affected by environmental degradation:

- Settlements
- Agricultural production
- Small hydro expansion
- Tourism

Currently experienced in the basin:

Flash floods, riparian desertification, loss of forest upstream and fertile soil in agricultural areas

Main sectors and activities affecting resources use and affected by environmental degradation:

- Settlements (floods)
- Hydropower (flow reduction) and thermal production (cooling water)
- Agriculture (droughts)

Currently experienced in the basin:

Floods and droughts

Main sectors and activities affecting resources use and affected by environmental degradation:

- Agricultural expansion (including irrigation)
- Hydropower production

Currently experienced in the basin:

Food and energy insecurity, salinisation, loss of fertile soil, loss of hydro production in dry years

Similarities and differences

Area/aspect	Alazani/Ganikh	Sava	Syr Darya
Size (km^2)	11,700	97,700	Estimates up to 782,600
Countries sharing	Azerbaijan, Georgia	Bosnia and Herzegovina, Croatia, Montenegro, Serbia, Slovenia	Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan
Main water uses	Agriculture, hydropower	Hydropower and thermo-electric cooling, navigation	Irrigated agriculture, Hydropower and thermo-electric cooling
Main water management issues	Erosion and sedimentation; flood management	Hydropower expansion upstream, point source pollution (insufficiently treated wastewaters); flood management	Flow regulation (reconciling between hydropower and irrigation), diffuse and point source pollution
Main nexus interlinkages	Water-energy (hydropower), land-energy-water (biomass use, erosion/sedimentation, hydrological flow)	Water-energy (hydropower); land-water (sediment management)	Water-land-ecosystems (irrigation, salinization), water-energy (hydropower), land-ecosystems

Area/aspect	Alazani/Ganikh	Sava	Syr Darya
Legal basis of (water) cooperation	The Agreement between the Government of Georgia and the Government of Azerbaijan on Cooperation in Environmental Protection (1997) Memorandum of Understanding between the MoENR Azerbaijan and the MoEPNR of Georgia (2007, signed)	FASRB - has been strengthened with: Protocol on the Prevention of Water Pollution caused by Navigation (2009, signed), Protocol on Flood Protection (2010, signed)	Agreement on coop. in Joint mgmt. of Use and Protection of Water Resources of Interstate Sources. Establishment of ICWC (1992) Agreement on Joint Actions to Address the Problems of the Aral Sea and Sub-Aral Area, Env. Rehabilitation and Socio-Economic Dev. of the Aral Region (1993) [Agreement on the Use of Water and Energy Resources in the Syr Darya River basin (1998)]

Area/aspect	Alazani/Ganikh	Sava	Syr Darya
Level of formality of cooperation, scope, functioning	A bilateral agreement on Kura - being negotiated, which would provide for establishment of a joint commission. Technical cooperation rather regular.	A multisectoral basin commission (International Sava River Basin Commission), with subsidiary bodies, operates regularly; 4 riparian countries are Parties, 1 observer	Basin organization (Syr Darya Basin Water Organisation) at present time in practice does cover the whole basin
Scope of cooperation in terms of sectors	Technical cooperation on environmental protection (the new draft agreement proposes a multisectoral scope, including agriculture and energy)	River basin management, navigation, hazards, tourism	Earlier water and energy at the basin level; now practically no cooperation

Area/aspect	Alazani/Ganikh	Sava	Syr Darya
Energy cooperation frameworks	Fossil fuels (natural gas) import from Azerbaijan to Georgia.	Energy Community; increasingly the European Union market	Central Asian Power System (CAPS), the regional electricity grid, currently not optimal; bilateral trade deals
Main nexus opportunities	Facilitate access to modern energy sources and energy trade; minimize impacts from new hydropower development; catchment management to control erosion	Expand hydropower sustainably and integrate other renewable energies	Promote restoring and vitalizing energy market, develop the currently minimal trade in agricultural products; improve efficiency in energy generation, transmission and use; improve efficiency in water use (in agriculture in particular)

Impact of climate change

By 2050 Various sources*	Caucasus (Alazani/Ganikh)	South East Europe (Sava)	Central Asia (Syr Darya)
Temperature increase	+1.7°	+1.8°	+2°
Rainfall reduction (annual)	not all models agree	seasonal changes, decreas e in summer	precipitation intensity will increase (but not all models agree on mean annual precipitation)
Runoff reduction (annual)	especially in late summer and early autumn	some sections of the Sava will see a decrease of mean annual discharge	decrease by 12%
Water scarcity aggravated	not on large scale at Alazani/Ganikh basin level	not on large scale at Sava basin level	acute in some areas at Syr Darya basin level

*WB, GFDRR, ICPDR, experts involved in the assessments

Nexus dimension

Alazani/Ganikh: lack of energy access aggravates deforestation and exposure to flash floods

Sava: targets for renewables and climate mitigation push the countries to develop more hydropower; environmental concerns for dam construction in environmentally sensitive areas

Syr Darya: energy and food insecurity are drivers for conflicting seasonal water uses and make the countries prioritise self sufficiency over cooperation

Approach to identifying solutions

Because of the different level of cooperation in each of the three basins, evaluating the possible actions to reduce negative impacts across sectors or to capitalize on synergies has different perspectives:

In the **Alazani/Ganikh**, transboundary cooperation is being built now between the two countries. In the assessment it was interesting to identify the main sectoral and intersectoral interventions needed.

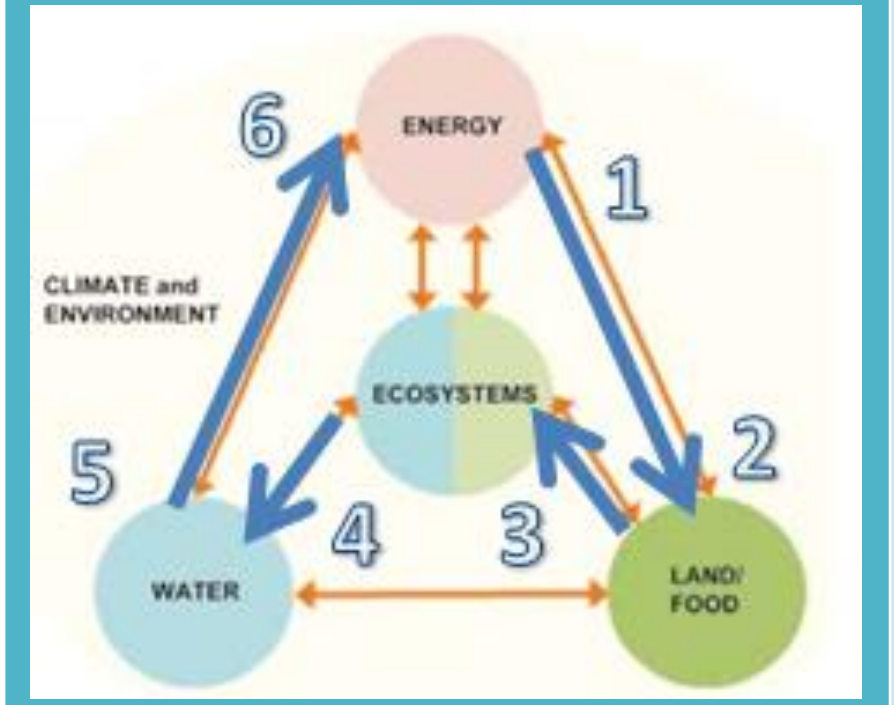
In the **Sava**, transboundary cooperation is advanced, covering multiple sectors and the ISRBC offering a platform for cooperation. Here it as interesting to explore how the existing cooperation could be improved, in particular from the governance and technical perspectives.

In the **Syr Darya**, transboundary cooperation is currently compromised by lack of trust. Here it was interesting to discuss how national policies could be aligned with a path towards restoring cooperation between countries.

General types of solutions

- Strengthening **coordination** and consultation: (SEA, jointly agreed guidelines and principles - e.g. ICPDR hydropower, regional integration processes, adaptation to climate change)
- Facilitating **trade**
- **Optimizing** operation of **infrastructure** (notably flow regulation), **multipurpose** designs, integrated renewables
- **Economic instruments**: Create conditions for motivating rational resource use (water, energy) and at the same time mobilize necessary resources
- Integrating **environmental** considerations into sectoral policies and decision-making and keeping the state of the environment under scrutiny
- Strengthening **monitoring** capacities and facilitating access to relevant information covering multiple sectors
- Science and **technology** (especially water and energy efficient technologies)
- **Investments**, creating an environment which encourages sustainability

Changing household fuel use in Georgia to improve flood control in Azerbaijan



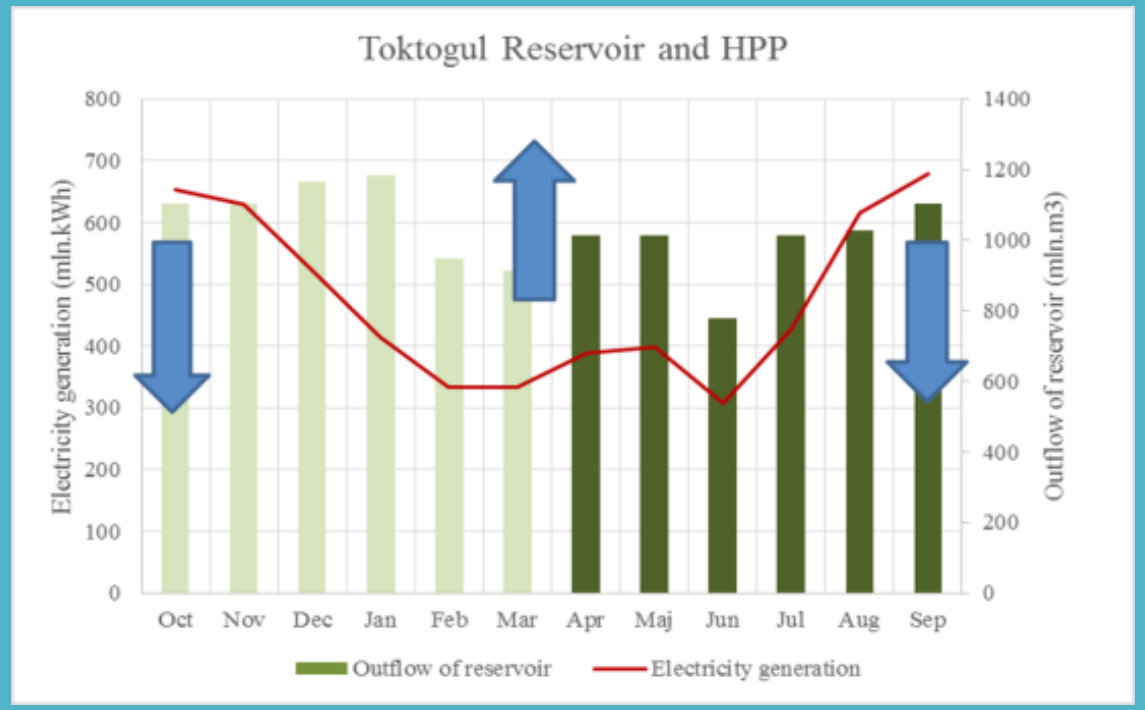
The impacts of the use of fuel wood in upstream Georgia in the Alazani/Ganikh basin (1) have important knock on effects. (2) Fuelwood harvesting leads to deforestation. (3) The loss of forest results in a loss of ecosystem service. Woods no longer retain water tempering runoff. (4) This increases the severity of flash floods resulting in expensive damage control in downstream Azerbaijan. (5) In turn hydro generation infrastructure is utilized in a sub-optimal way. A solution that has multiple benefits and potentially cheaper than flood control measures would be (1) to **substitute wood with modern fuels** improving indoor air. (2) decreased harvesting leading **to greater forest mass and carbon sink** (3). **Increased ecosystem service including natural flood control** (4) **less disruptive flooding** and damage and (5) better hydro generation performance.

Multi-purpose reservoirs and smart management to increase the deployment of renewable energy in the Western Balkans

Countries	RES share in 2009	RES share in 2020
Albania	31.2%	38.0%
Bosnia and Herzegovina	34.0%	40.0%
Croatia	12.6%	20.0%
Montenegro	26.3%	33.0%
Serbia	21.2%	27.0%
Slovenia	32.5%	39.3%

In the Sava river basin, each country has strong renewable energy targets. Power plants linked to dams are characterised by great ramping rates and can be used to **integrate other renewable** (wind and solar power). When the wind is not blowing or sun not shining, **hydro can be used to increase generation**. This will be key in **advancing towards renewable targets** (as well as GHG mitigation and energy security targets) responding at the same time to the increasing need of having **more flexibility in the energy system**.

Increasing Renewable Energy Technology (RET) deployment to improve agriculture in the Syr Darya basin and help recharge the Aral Sea.



In the Syr Darya basin, demand for electricity is needed during winter. This results in upstream hydro power being used during winter months (see figure). However, this result in water discharges being moved from summer to winter. The water discharged in winter freezes and then thaws in wetlands, not completing its journey to the Aral Sea. At the same time, irrigation requirements go unmet as irrigation water is needed in summer. However, it is possible **to 1)improve energy efficiency 2) improve trade and 3) increase the share of production from other sources (e.g. the wind energy upstream** where wind regimes are strong in winter). The result (shown in blue arrows) is to **reduce winter generation of hydro electricity and free up water for summer flows for irrigation and potential excess to charge the Sea.**

Conclusions

From conceptual framework to concrete application at local level – different expectations

Nexus for trasboundary cooperation:

Nexus issues and nexus ‘solutions’ (win-win)

Overall efficiency needs cooperation

Water as an entry point but dialogue over broader issues (e.g. energy security, trade)

A platform for intersectoral dialogue

Insights for cooperative solutions - not attempt to solve all issues together

What are the benefits of cooperation? Who can do what, and how?