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Watercourses and International Lakes

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Thematic assessment of the water-food-energy-ecosystems nexus**Draft assessment of the water-food-energy-ecosystems
nexus in the Alazani/Ganykh River Basin**

Prepared by the secretariat with input from experts

Summary

At its sixth session (Rome, 28–30 November 2012), the Meeting of the Parties to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes requested the Task Force on the Water-Food-Energy-Ecosystems Nexus, in cooperation with the Working Group on Integrated Water Resources Management, to prepare a thematic assessment focusing on the water-food-energy-ecosystems nexus with a view to its publication prior to the seventh session of the Meeting of the Parties (see ECE/MP.WAT/37, para. 38 (i)).

The present document contains the draft nexus assessment of the Alazani/Ganykh River Basin. The draft assessment is the result of an assessment process carried out according to the methodology described in document ECE/MP.WAT/WG.1/2015/8 developed on the basis of a desk study of relevant documentation, an assessment workshop (Kachreti, Georgia; 25-27 November 2013), as well as inputs from local experts and officials of the riparian countries. The draft assessment of the Alazani/Ganykh was circulated for review and comments to the authorities of the riparian countries. Subsequently, stakeholder consultation workshops on the findings of the assessment were organized with the support of the European Union Water Initiative's National Policy Dialogues on 24 February 2015 in Tbilisi and on 26 February 2015 in Baku.

The present document contains a short version of the Alazani/Ganykh Basin assessment, prepared based on a more detailed assessment report reviewed by the riparian countries¹. The comments and additional information provided by the countries has been taken into account in its preparation. Only the short version of the document contained in WG.1/2015/4 will eventually be included in the final version of the assessment publication. For background information on the methodology and for the decisions that the Working Group on Integrated Water Resources Management may wish to take, please refer to document ECE/MP.WAT/WG.1/2015/8.

¹ A draft version of the detailed assessment report, the “Alazani/Ganykh” is available among the documents of the third Meeting of the Task Force on Water-Food-Energy-Ecosystems Nexus (Geneva, 28-29 April 2015) at <http://www.unece.org/index.php?id=38157#/>

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INTRODUCTION

Aim, objectives and scope

The Nexus assessment of the Alazani/Ganykh basin aims to support transboundary cooperation by Georgia and Azerbaijan in the areas of water, energy, food and environmental policies by strengthening the knowledge base for integrated policy development and decision making.

The specific objectives of this Nexus Assessment are:

- to describe the governance context
- to identify key drivers of pressures on the basin's resources
- to identify and analyse key intersectoral issues
- to explore the potential solutions to increase the benefits provided by the management of the basins' resources that could be achieved through more coordinated policies and actions, and through transboundary cooperation
- to identify the benefits that the adoption of a nexus approach can potentially deliver

The scope of this Nexus Assessment is limited to testing the nexus assessment methodology developed in the framework of the Water Convention and to providing a scoping level assessment of the relevant issues and some possible synergetic actions (or nexus solutions) in response. This preliminary analysis (largely qualitative) could serve as the basis for more detailed analyses, focusing on some of the specific intersectoral issues identified.

Assessment process

The Nexus Assessment in the Alazani/Ganykh basin was carried out at the request of the governments of Georgia and Azerbaijan.

The Alazani/Ganykh Nexus Assessment made use of a multi-stakeholder approach involving Georgian and Azerbaijani representatives of relevant economic sectors (notably agriculture and energy), water and environment administrations, state companies or utilities and civil society.

Information for the pilot nexus assessment of the Alazani/Ganykh basin was gathered through: (i) a basin-wide multi-stakeholder workshop that took place in Kachreti (Georgia) from 25 to 27 November 2013; (ii) two questionnaires, one factual and one perception-based (both distributed at the workshop); a desk-review of information from national strategic or policy documents, as well as documentation from relevant studies and projects, notably those prepared as part of the the United Nations Development Programme (UNDP) Global Environment Facility (GEF)-funded project "Reducing Transboundary Degradation in the Kura Ara(k)s River Basin" (UNDP/GEF Kura project), or referred to by the workshop participants.

Basin overview

Location and extension. The Alazani/Ganykh basin is a sub-basin of the Kura-Ara(k)s basin. The Alazani/Ganykh River, shared by Georgia and Azerbaijan, has its sources in the Great Caucasus Mountains in Georgia and flows South-East along the Alazani plain (an inter-mountainous depression) to Azerbaijan and discharges in the Mingchevir Reservoir. The Alazani/Ganykh Basin extends over an area of 11,717 km², with 59% of the basin being in the territory of Georgia and 41% in Azerbaijan. The river

known as Alazani in Georgia and Ganykh in Azerbaijan has a total length of 391 km, of which 282 km forms the border between Georgia and Azerbaijan.

Landscape and climate. The upper basin is characterized by an alpine landscape, with an elevation 2,600-2,800 m a.s.l. The floodplain landscape surrounding the meandering river in the lower basin consists of agricultural land, broadleaved dominated forest as well as steppe, bush and semi-desert (AWC, 2002). The basin is located in a transition area between a sub-tropical continental climate and a humid climate. It is relatively dry -- precipitation ranges from 300-500 mm in the Georgian, part to 440-1240 mm in the Azeri part (AWC, 2002). The annual average temperature ranges from 9 to 14°C, with temperatures seldom going below -20 °C or above 40°C.

Water resources. The basin has abundant water resources (AWC, 2002) and their overall quality is good (Roncak and Pichugin, 2013). The Alazani/Ganykh river has an average discharge of around 110 m³/s in the Mingechevir reservoir. The Alazan/Agrichay aquifer (a confined (artesian) transboundary aquifer covering majority of the basin) is the largest groundwater resource in South Caucasus. Groundwater from the Alazan/Agrichay aquifer is used to supply irrigation schemes (80-85%), drinking water networks (10-15%) and industry (3-5%).² The water stored in the Mingechevir reservoir on the Kura River which the Alazani/Ganykh empties to, is used to irrigate about 1 million hectares (The World Power Plants, 2014) and to fuel a 418 MW hydropower plant that constitutes 39% of total installed hydropower capacity in Azerbaijan (AzerEnergi, 2013).

Resource-based economic activities. Agriculture plays an important role in the basin's economy -- agricultural land accounts for 47% of the total land of the basin. In the Georgian region of Kacheti, which accounts for 38% of Georgia's arable land and 65-70% of Georgia's vineyards, the agricultural sector employs 82% of the labour force (Ministry of Regional Development and Infrastructure of Georgia, 2013). In Azerbaijan, the Sheki-Zagatala region relies on the basin's resources for the production of mineral water and soft drinks, fruits, vegetables, nuts, tobacco, dairy products and furniture (Azerbaijani authorities, 2015). The basin's morphology provides opportunities for hydropower production -- small and medium hydropower plants on both sides of the basin have combined total capacity of 38 MW (Ministry of Energy of Georgia, 2014), (UNIDO, 2013), (Lazriev and Arabidze, 2008), (ESCO, 2014) while a large potential of over 700 MW remains to be exploited (Platts, 2012) (see Figure 1). The basin also attracts tourism, thanks to its natural beauty (the Kakheti region in Georgia is famous for its protected areas) and the popularity of local food products and wine. Figure 2 illustrates the distribution of human activities in the basin.

² Second Assessment of Transboundary Rivers, Lakes and Groundwaters. New York and Geneva, United Nations, 2011.

Figure 1. Installed and planned hydropower capacity
Percent of total hydropower potential

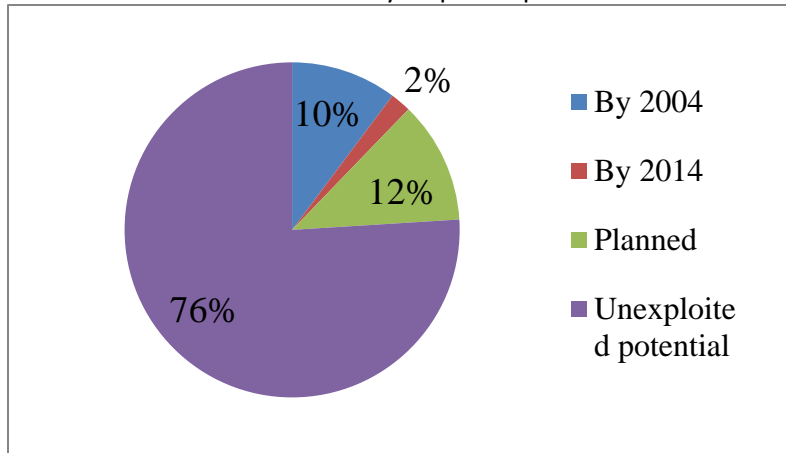


Figure 2. Distribution of human activities in and around the Alazani/Ganykh Basin

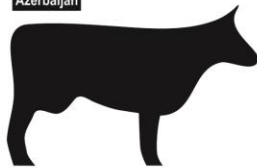


Nexus Alazani basin

Top agricultural commodities (in million US\$)

- Dairy and meat
- Fruits and nuts
- Grains, potatoes
- Vegetables

Azerbaijan



1 209
Source: FAOSTAT, 2012 data



306



186



174

Georgia



280



140



48



23

Hydropower facilities

Installed capacity (MW)



- Existing hydropower plant
- Projected hydropower plant

Landcover

- Forest
- Agriculture
- Irrigated agriculture

Other issues

- Inadequate wastewater treatment in urban areas

Population of major cities and municipalities

- More than 50 000 inhabitants
- 20 000 – 50 000 inhabitants
- 10 000 – 20 000 inhabitants
- Less than 10 000 inhabitants

Sources: Sources: FAOSTAT, 2012 data; Map "Energy sector of Georgia", USAID, 2013; GlobCover 2009; European Space Agency (<http://ionia1.esrin.esa.int/>); Rapid Assessment of the Rioni and Alazani-Iori River Basins of Georgia; Mariam Shotadze & Eliso Bamovi, USAID, 2011; Technical Assistance for Promoting Small Hydropower in Azerbaijan; UNDP and Ministry of Industry and Energy of Azerbaijan

DESCRIBING THE GOVERNANCE CONTEXT

Basin-level governance

Governance of water resources. There have been several attempts in the framework of international projects to establish basin-wide cooperation on the Kura River. So far these initiatives have not been successful. Azerbaijan seeks to promote transboundary cooperation through joint projects (Verdiyev, 2012). With the support of OSCE and UNECE, a draft bilateral agreement between Azerbaijan and Georgia on the shared water resources of the Kura River Basin is currently being negotiated. The agreement is foreseen to cover different water uses as well as the protection of water resources, the restoration of ecosystems and the management of the effects of hydrological extremes, and to include a multi-sector representation of authorities in the planned joint commission. In the framework of GEF-funded projects the development of bilateral cooperation is presently being supported.

Governance of other resources. International cooperation between Georgia and Azerbaijan is generally good. The two countries have participated in a number of joint projects -- for example on monitoring and assessment – and regional meetings. Environmental cooperation agreements were signed in 1997 and 2007, although they lack implementation mechanisms. A 1997 energy cooperation agreement has made possible electricity trading; natural gas is imported from Azerbaijan to Georgia.

Cross-sectoral governance at basin level. Inter-sectoral cooperation has been supported as part of the UNDP/GEF Kura project covering the broader Kura-Ara(k)s Basin, which delivered an extensive Transboundary Diagnostic Analysis and a Strategic Action Programme.

National-level governance

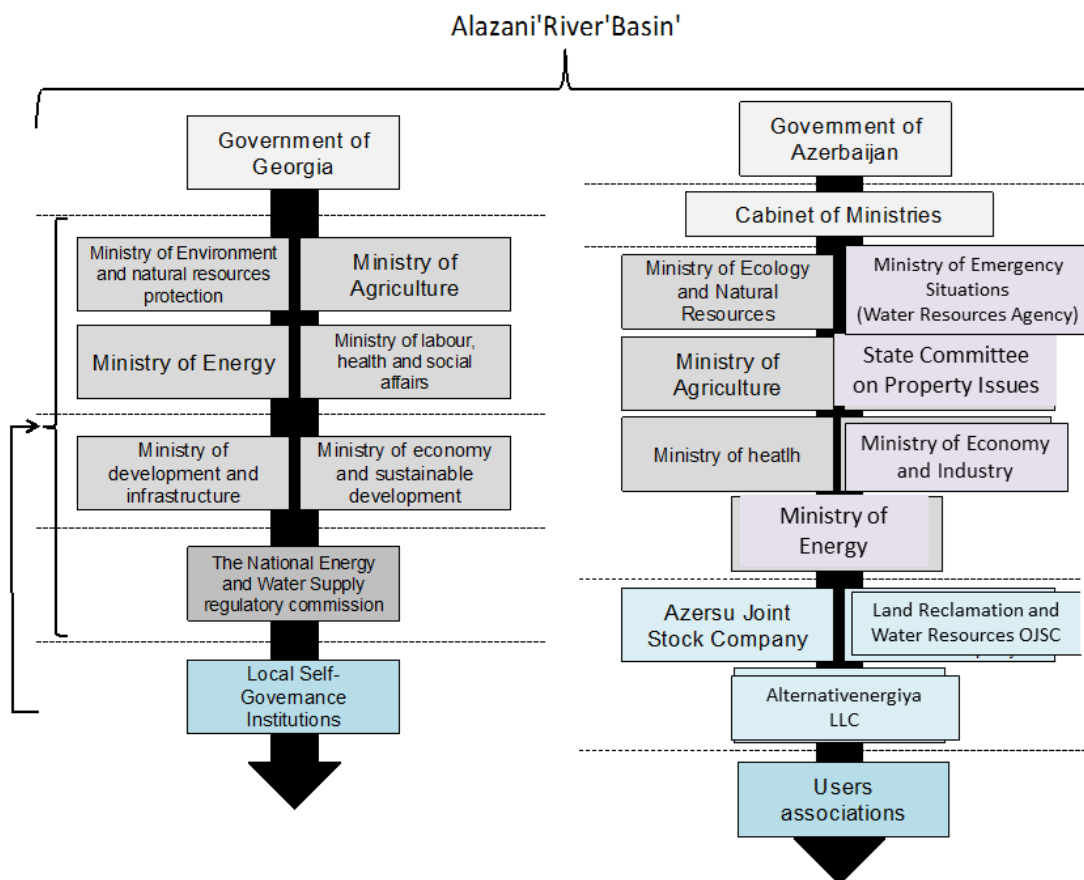
Legal and institutional frameworks. The institutional frameworks for managing the basin's resources are somehow similar but not identical – see Figure 1. Multiple ministries are involved – six in Georgia and seven in Azerbaijan. There is in general a high degree of control by central State institutions, although in Azerbaijan national policies are implemented by state owned enterprises to a higher degree than in Georgia. The multiplicity of agencies involved in the regulation of similar resources creates sometimes overlaps and coordination challenges: As both Ministry of Environment and Natural Resources Protection and the Ministry of Energy hold responsibilities in implementing Environmental Impact Assessment and granting of permits regarding hydropower in Georgia, coordination of efforts is necessary. In Georgia, the 1997 Water Law is in the process of being updated: A new Water Law incorporating the basin principle is expected to be adopted in Georgia by the end of the 2015. In Azerbaijan, preparation of the National Water Strategy has been ongoing since 2012 but final agreement has not been reached between different stakeholders as of yet.

Cross-sectoral governance. In Georgia, since 2013 the Economic Council coordinates economic policy and strategy, and the Government Commission on EU Integration coordinates sector ministries activities' focused on EU Integration. Policy integration and coherence and intra-government coordination are part of the mandate of the *Ministry of Economy and Sustainable Development*, which also has an important role in spatial planning and environmental impact assessment and in industrial safety control, and is also involved in spatial planning.

Multi-level governance. Since the 2005 Georgian municipalities are responsible for land use planning, forests and water resources management, and provision of water supply and sanitation services. as well as for the development of the local land reclamation system. They are responsible for supervising

measures for the rational use and protection of resources and must apply Georgian legislation. This strong delegation of competences to the local level shall be materialised through the granting of property rights regarding local forests or local water resources to Local Self-Governments. Irrigation associations briefly took over the responsibility for maintenance of local irrigation systems from municipalities, but they ceasing to operate left the continuation of responsibility unclear. In Azerbaijan, user associations are responsible for on-farm irrigation water distribution and management, and form a link to the private sector. Major investments for water supply, sanitation and irrigation infrastructure in Azerbaijan are carried out by centralised state-owned joint stock companies. The Alazani/Ganykh basin contains eleven administrative districts in Georgia and four in Azerbaijan.

Figure 3. Map of organizations related to resource management in Georgia and Azerbaijan



Supra-basin governance

European Union (EU). Both countries are pursuing closer economic ties with the European Union and are moving towards convergence with EU legislation. Development assistance projects have familiarized authorities with EU Directives, including the EU Water Framework Directive. The Association Agreement

between Georgia and the EU (signed in July 2014) foresees Georgia's approximation of its legislation to EU norms including environmental, water agriculture and energy related legislation. Azerbaijan is similarly following EU standards when developing national water legislation and standards. Processes of National Policy Dialogue under EU Water Initiative (EUWI) are ongoing in both countries to coordinate the establishment of coherent national water resource strategies.

IDENTIFYING DRIVERS OF PRESSURES ON BASIN RESOURCES

Economic development. Economic development in the basin will depend largely on two sectors: agriculture and hydropower production. Apart from agro-industry, industry is not expected to be a significant part of the development in Georgia's part of the basin. However, Azerbaijan envisages the expansion of industry, especially strengthening of the industrial infrastructure in each region.³ Tourism is expected to increase as a consequence of the regions' natural beauty accompanied with new investments in infrastructure and training local service providers and authorities. (Ministry of Regional Development and Infrastructure of Georgia, 2013; Presidency of Azerbaijan, 2014). Growing employment opportunities in the formal economy are expected to reduce fuelwood collection and deforestation rates – since 2003, about 24,861 hectares of forest have been lost in the Georgian side of the basin due to forest logging – equivalent to 8.1% of forest cover.

Agricultural development. Agricultural uses represent 58% and 76% of total water withdrawals in Georgia and Azerbaijan respectively. Demand for agricultural water use is expected to grow, following the expected increase in agricultural production – including crops, livestock and aquaculture. Agricultural production is expected to increase due to a combination of export-led demand as well as government support through a mix of subsidies, access to credit, infrastructure for irrigation, soil management, and research (World Bank, 2013). In the Georgian side of the basin the United Amelioration Systems Company of Georgia will increase agricultural land (up to 141 000 ha), with the rehabilitation of irrigation schemes is underway. Restoration of existing small reservoirs and construction of new riverbed-type reservoirs on the rivers Ilto, Stori and Kabala is planned also.

Energy development. Even if the basin has secure access to electricity, alternative sources, in particular hydropower, are being explored for export – e.g. through the "Energy Bridge Azerbaijan-Georgia-Turkey" project. In Azerbaijan, there are plans to exploit solar, wind, biomass and hydropower in the Balakan (1.44 MW), Zagatala (1.34 MW), Gakh and Samukh areas of the basin (Azerbaijani authorities, 2015). Georgia aims to decrease its dependency on fossil fuels by promoting renewable energies: for example, one of the Kakheti region's goals is to explore the potential for investing in biofuels (Ministry of Regional Development and Infrastructure of Georgia, 2013)⁴. There is also potential for geothermal sources

³ The directions are elaborated on in the "State program on development of industry in the Republic of Azerbaijan in 2015-2020", adopted by order of the President on 26 December 2014.

⁴ The main directions for the development of alternative and renewable energy sources are described in the draft strategy "On the design of public policies on the use of alternative and renewable energy sources in the Republic of Azerbaijan for 2012-2020", developed by the State Agency" and in the draft Energy Policy, recently submitted to the Parliament of Georgia for adoption.

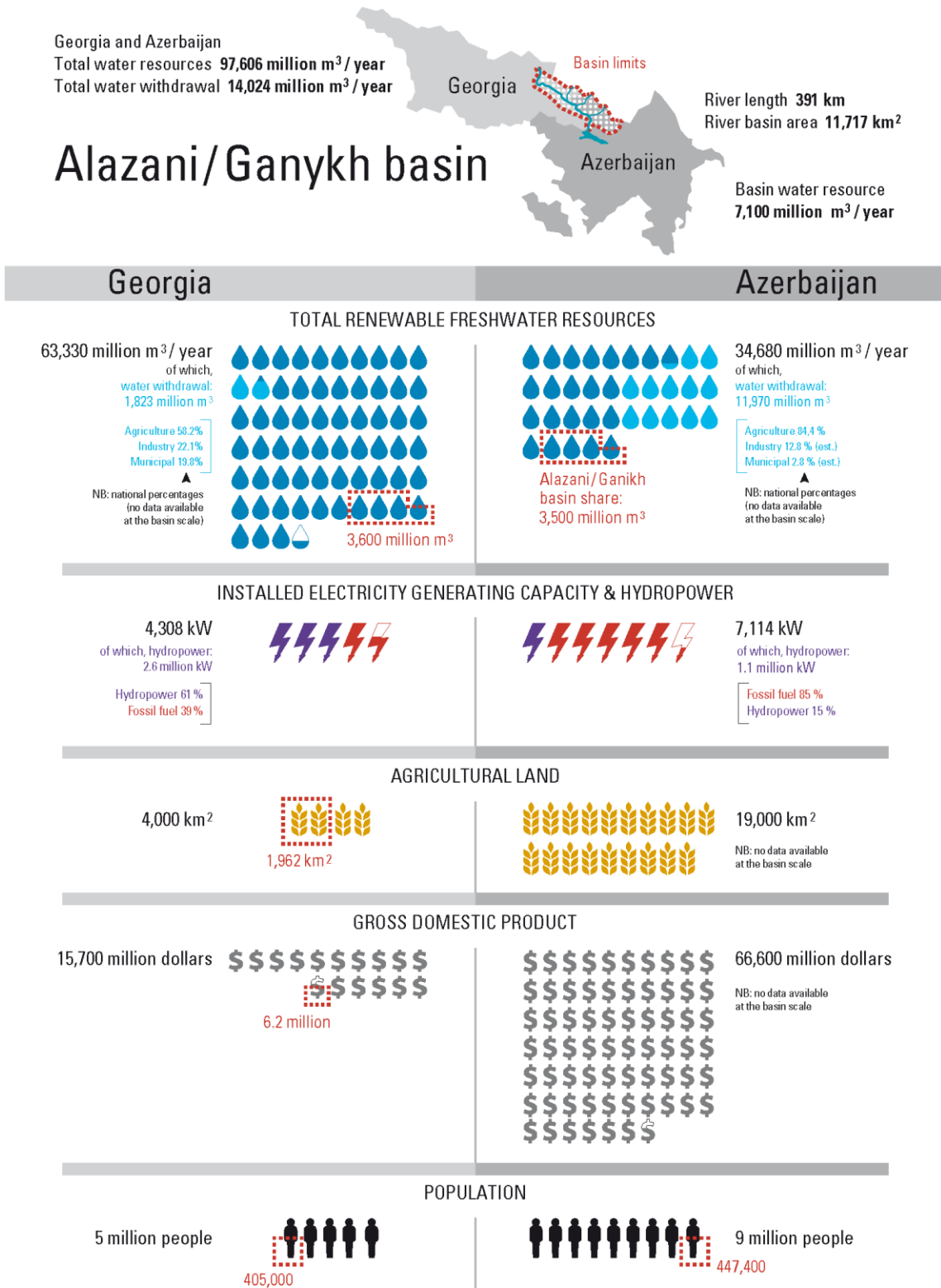
(Energy Charter, 2012). Azerbaijan supports small hydropower production (0.5 to 10 MW) through power purchase guarantees. Georgia supports renewable plants with less than 13 MW of generation capacity (including small hydropower) through long term purchasing agreements, feed-in tariffs and licence-free electricity generation (UNIDO, 2013). New investments in hydropower plants aim to benefit from carbon finance schemes, such as the Clean Development Mechanism credits (Energy Charter, 2012). It should be mentioned that hydropower development in the Georgian side of the basin is very difficult due to large width of the riverbed and small slopes. Hydropower plants with small capacity can be sited only on left tributaries of the Alazani/Ganykh River, the major part of which are torrential. Therefore construction and operation of hydropower plants on these rivers contains certain risks.

Household consumption. More households are being connected to the energy and water networks, prompting an increase in the demand for electricity and water, as well as need for wastewater treatment. In addition, economic development is likely to modify consumption patterns towards higher per capita use of resources by those households already connected to energy and water networks. On the Georgian side 9.3 million m³ of untreated wastewater were discharged in 2013 (United Water Supply Company of Georgia, 2014). In Azerbaijan, construction of wastewater treatment plants is planned (Kahn, 7000 m³/day), ongoing (Shaki, 20000 m³/day) or completed (Zakatala district, 10000 m³/day) (Azerbaijani authorities, 2015).

Climate change. Both countries have experienced increases in temperature and future reductions in rainfall are expected (Westphal, et al., 2011). Very likely, this will reduce stream flow in the river by 9-13% between 2035 and 2065, particularly in late summer and early autumn (Inashvili, 2013).

Other claims on basin resources. Investments have been made to transport water from groundwater from the Alazan-Ayrichay aquifer to supply Baku, the capital (Ministry of Natural Resources of Azerbaijan, 2013) -- such as the 213 km-long Oguz-Gabala-Baku water pipeline, which can deliver 5 m³/s. (Azerbaijani authorities, 2015).

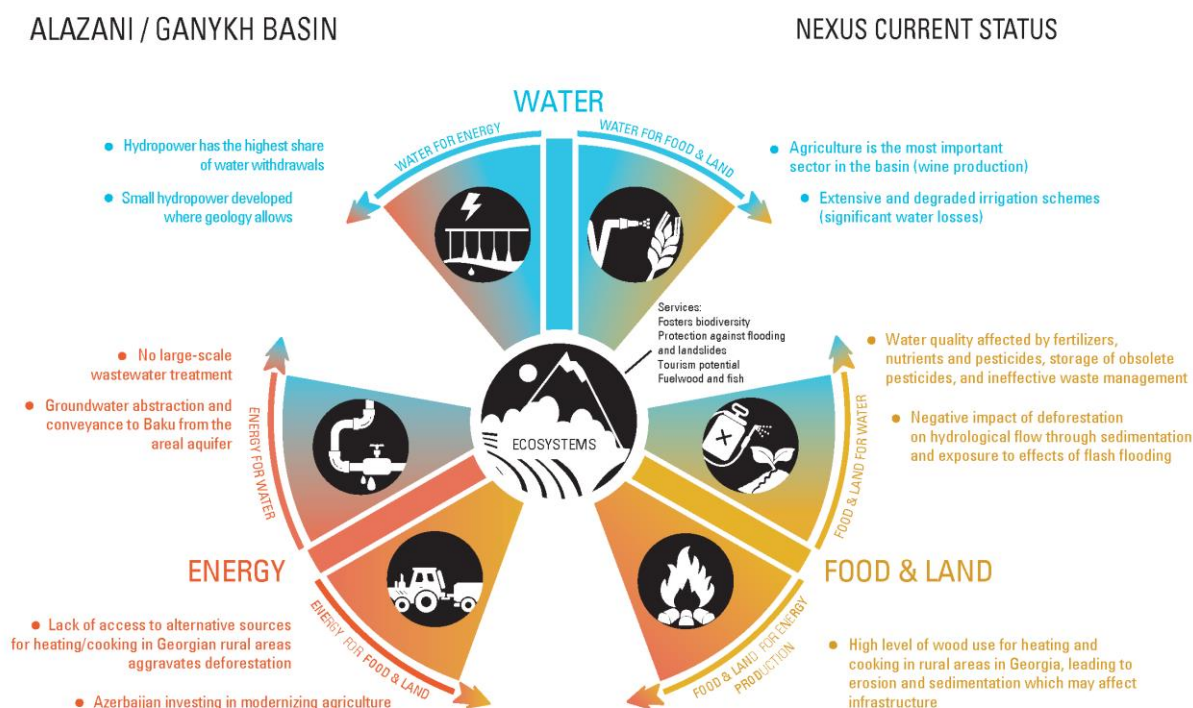
Figure 4. Key indicators describing the resources and socio-economics of the Alazani/Ganykh countries



ANALYSING NEXUS LINKAGES

Energy, water and land resources are closely linked in the Alazani/Ganykh basin. Figure 5 provides an overview of the current status of nexus linkages. In the Alazani/Ganykh basin land-water and energy-land links are particularly important.

Figure 5. Nexus linkages in the Alazani/Ganykh Basin

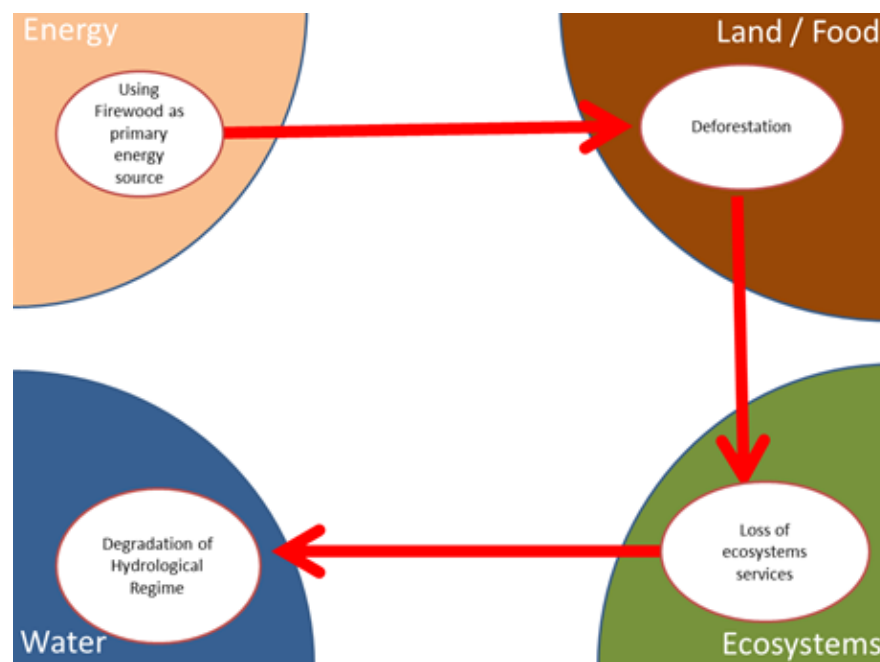


Land and Water. Growth in agriculture and agro-industry requires ensuring availability of water of adequate quality. Agricultural practices and infrastructure inherited from Soviet times result in excessive water usage for irrigation, leading to swamping of large areas and, combined with poor drainage and the use of certain fertilisers, water salinization. In Georgia, 35 to 40% of the water withdrawn from the river is lost (LEGC, 2013). At the same time, the lack of irrigation limits increased agricultural production -- 49 percent of households considered the lack of irrigation or drainage as a severe or major constraint to rural investment (World Bank, 2012). Agricultural discharges are causing increases in the concentration of pollutants (such as nitrite and nitrate and phosphate) leading to algae growth, deoxygenation and fish kills, and also affecting water uses downstream, including drinking water supply and recreational use. Contaminated land from illegal and scattered open-air landfills contributes to water pollution by infiltration to groundwater or contact with river flows from the banks. Old sites for the storage of pesticides have caused in the past significant toxic contamination by leaching through the soil, but nowadays they represent a minor problem (Elseud, 2013). The absence of legitimate sites for collection

and disposal of domestic waste in settlements located at the mouths of tributaries of the Ganykh, contributes to the pollution of water through infiltration into the ground water (Azerbaijani authorities, 2015).

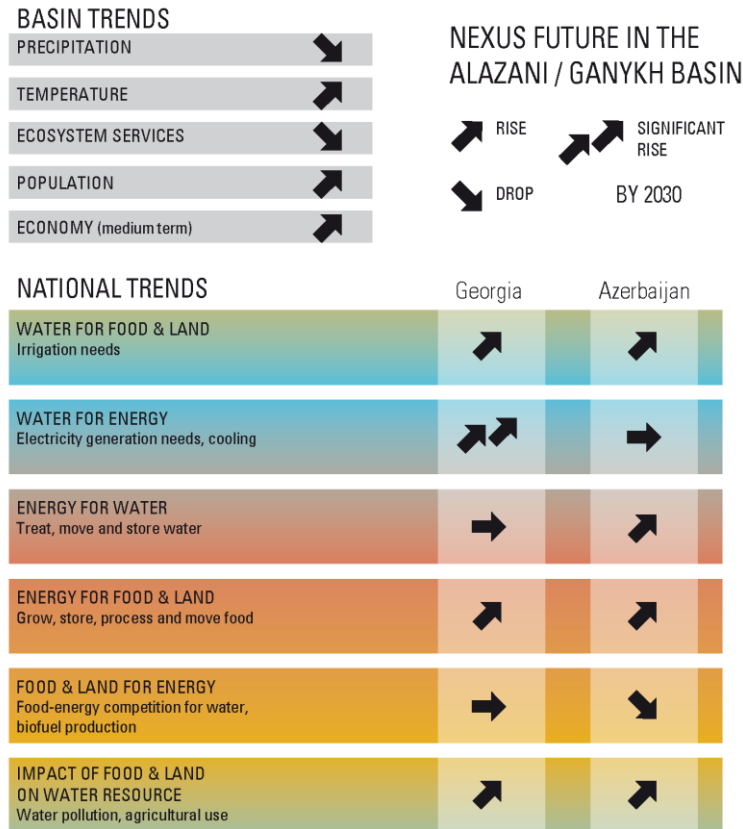
Energy and Land. Deforestation due to fuelwood collection is particularly pronounced in the upper Alazani in Georgia. Wood is harvested for heating and cooking purposes and mainly used in conventional stoves that produce high concentrations of particulate matter and smoke, a major cause of respiratory diseases. Although its use has been decreasing, firewood represents over 50% of household fuel consumption in the basin (LEGC, 2013). Deforestation leads to decreased water retention capacity of land, facilitating floods. It also leads to increased soil erosion which is predicted to be exacerbated by the the frequent and intense flooding and subsequent landslides expected to be caused by climate change (CENN, 2013). Sediment and mud negatively affect the performance and useable life of hydropower infrastructure (as well as irrigation and other types of infrastructure). They also affect riverine ecosystems and hydrological functions (Figure 6). Illegal logging for fuelwood drastically decreased in Azerbaijan after the expansion of the gas network to rural areas and the promotion of kerosene and in remote mountain areas (Huseinov, 2013).

Figure 6. Example of nexus chain in the Alazani/Ganykh basin



For the time being, water quantity is not a concern in the basin. The links between land, water and energy resources will intensify in the future. Socio-economic developments will drive a more intense use of resources in the Alazani/Ganykh Basin. However, not all the basin's resources will be affected in the same way. Water resources in particular will experience heavier impacts both from linkages to energy and land resources (see Figure 7).

Figure 7. Future trends among nexus linkages in the Alazani/Ganykh



EXPLORING SOLUTIONS

The pilot nexus assessment of the Alazani/Ganykh River Basin includes the preliminary identification of possible solutions to improve the management of the basin's land, water, energy and environmental resources. These potential solutions have been classified under five headings: institutions, information, instruments, infrastructure, and international cooperation and coordination.

Institutions

- *Establishment and strengthening of basin governance* —a key element would be the finalization and signing the draft bilateral agreement, currently under negotiation, on cooperation in the field of protection and sustainable use of the water resources of the Kura-Ara(k)s River Basin. At the national level a supporting action would be to complete updating the national water legislation, reflecting the basin principle. Capacity building at municipal government level in an important prerogative for success.
- *Developing mechanisms to identify and incorporate the wider nexus impacts in sector-based policy development* – both at national level and at transboundary level (for example in the framework of the upcoming Kura-Aras agreement)
- *Engaging water-user sectors in the on-going development of water laws, strategies and plans* – such as the updating of the Water Law in Georgia or the development of National Water Strategy in Azerbaijan.
- *Clarifying roles and responsibilities* – for example, for reparation and maintenance of irrigation infrastructure
- *Leveraging the support of development partners.* Technical and financial development partners (such as the European Union, OECD, UNDP-GEF, UNECE or USAID) play important supporting roles in the development and implementation of sectoral strategies. That support can be channeled to ensure that those sectoral strategies (like the new Energy Strategy for Georgia or intersectoral ones like the Strategic Action Plan for the Kura-Aras River Basin) take nexus linkages into account and include cross-sectoral actions.

Information

- *Improving the monitoring and assessment of basin resources and uncontrolled hotspots*, particularly basin resources exposed to increasing pressures (such as groundwater) and paying special attention to assessing the economic value of ecosystem services
- *Assessing nexus linkages when developing sectoral plans or assessments* – such as energy assessments, agricultural assessments, or health assessments – to take into account resource constraints and cross sectoral impacts
- *Developing and applying guidelines, drawing upon international experience*, to improve sustainability in the location, design and construction of hydropower plants⁵

⁵ Instructive to this end can be “Common Guidelines for the Use of Small Hydropower in the Alpine Region” (2011) developed in the framework of the Alpine Convention or “Guiding Principles on Sustainable Hydropower” (2013) developed in the framework of the International Commission for the Protection of the Danube River (ICPDR).

- *Providing extension services to upgrade agricultural and forestry practices* (including crop selection, water management, and application of agro-chemicals) informed by cross-sector knowledge

Instruments

- *Improving land use planning*
- *Mapping the current structure of policy instruments* (such as subsidies and water allocation rights) *and assessing their impacts*, in order to identify opportunities for improving alignment and improving coherence of policy instruments with policy objectives across different sectors
- *Introducing instruments to apply the “polluter pays principle”* for resource management and *“beneficiary pays principle”* for infrastructure financing (including private companies, public companies and agencies, and households). Well-targeted economic instruments that could motivate rational use of water and at the same time contribute financially to repairing and extending infrastructure. The need to for this is particularly pressing in agriculture.
- *Implementing a policy mix to promote switching from fuelwood to modern fuels basin* – particularly in the upper basin and building on the success of the Azerbaijani experience (which relies on subsidies and the development of gas infrastructure). Since Georgia does not have a similar fossil fuel base, switching from fuelwood would likely require planning electricity and fuel imports. Small hydropower plants could be developed seeking to keep environmental impacts low.
- *Reforming agricultural support packages*, so that they promote improved management of land, water, energy and environmental resources – for example by moving towards low-water-intensity crops – and preparedness to the effects of climate change – for example by training farmers in best farming practices
- *Introducing instruments to better manage the “small water cycle”* – they could include compulsory metering for households, promotion of low flow appliances, and regulations for water re-use and recycling
- *Developing environmental flow regulations* – this is particularly pressing because of the increasing interest in developing hydropower in both countries. Environmental flows should be established case by case, taking into account the single river ecosystem
- *Stepping up enforcement of existing regulations* – for example regarding wastewater discharges or solid waste disposal

Infrastructure

- *Investing in built infrastructure to ensure the preservation and protection of the basin’s water resources* -- from modernising irrigation infrastructure to building new wastewater treatment plants
- *Developing an approach to investing in flood management that integrates natural infrastructure* (such as on-going reforestation and afforestation efforts) *and built infrastructure*
- *Ensuring that new hydropower plants, driven by hydropower generation, are designed to maximise the benefits of multiple uses* (e.g., building them in combination with irrigation or

drinking water supply intakes) and minimize impacts on the environment, for example by preferring run-of-the-river type hydropower station designs.

- *Promoting the development of renewables (other than hydropower)* (such as the currently planned production of electricity and heat from biomass, solar, wind etc. in the Azerbaijani side of the basin).

International coordination and cooperation

- *Coordinating flood risk management measures*, including local infrastructure interventions, regular clearing and maintenance of river banks and emergency responses
- *Coordinating water quality protection measures*, with a focus on determining the type and scale of wastewater treatment facilities needed as well as on other interventions (such as water reuse) to reduce low-quality water discharges.
- *Facilitating information sharing and mutual learning* – for example in the area of economic valuation of ecosystem services, where Georgia has developed experience, or for the introduction of water efficient irrigation technology where Azerbaijan has made progress.
- *Coordinating climate change adaptation plans and measures*
- *Developing a strategic plan for the development of the hydropower potential* that incorporates a nexus approach for the identification of optimal hydropower growth and locations, and takes into account the cumulative effects of multiple hydropower plants. This would likely benefit beyond the Alazani/Ganykh basin area.

IDENTIFYING THE BENEFITS OF ADOPTING A NEXUS APPROACH

By adopting a nexus approach to the management of the Alazani/Ganykh basin’s resources, Azerbaijan and Georgia can exploit many potential benefits. The results of a rapid scoping of those benefit is summarized in Table 1. Table 1 follows the analytical framework for analysing the benefits of transboundary water cooperation developed by the ongoing UNECE project on identifying, assessing and communicating the benefits for transboundary water cooperation. Adopting a nexus approach under transboundary water cooperation would allow maximizing the potential benefits provided by the basin’s resources.

Table 1. The benefits of transboundary cooperation in the management of the Alazani/Ganykh basin’s resources

| | On economic activities | Beyond economic activities |
|--|--|---|
| From improved management of basin resources | Economic benefits <ul style="list-style-type: none"> • Increased productivity and profitability of agriculture • Preservation and development of aquaculture • Avoiding hydropower generation losses due to floods and reservoir siltation • Cost savings in drinking water treatment • Reduced economic losses from floods • Reduced public spending on emergency situations and repairing damage • Expansion of tourism industry | Social and environmental benefits <ul style="list-style-type: none"> • Health benefits from reduced indoor air pollution • Reductions in human losses caused by floods • Reductions in unemployment • Poverty reduction and increased living standards • Recreational use by local communities • Preservation of forest habitats • Carbon sequestration |
| From increased trust between Azerbaijan and Georgia | Regional economic cooperation benefits <ul style="list-style-type: none"> • Increased trade in energy carriers (electricity, natural gas, kerosene,...) | Geo-political benefits <ul style="list-style-type: none"> • Alignment to international and EU regulation • Reduced possibility of conflicts between Georgia and Azerbaijan |

CONCLUSIONS AND RECOMMENDATIONS

The sustainable use and management of the Alazani/Ganykh Basin's resources is essential for the development of the riparian regions in Georgia and Azerbaijan. The basin has productive agricultural land, attractive landscapes, and abundant and good quality water resources. The agriculture and tourism sectors, which rely on those resources, are expected to drive development in the riparian regions. Improving energy access and affordability in rural areas contributes to improving rural livelihoods.

The basin's resources are increasingly under pressure. Economic development is driving water demands and pollution from agriculture and households, the exploitation of hydropower potential, and water transfers to supply cities outside of the basin. Despite being reduced, poverty is still an issue and it is driving erosion and sedimentation from excessive logging for fuelwood and poor maintenance of river banks and irrigation infrastructure. Besides erosion processes, flooding of agricultural land plots also takes place.⁶

In the Alazani/Ganykh basin, there are multiple linkages between the different basin resources. Energy-land and land-water linkages are particularly strong. But second-degree linkages are also relevant – for example, lack of modern fuels in the upper basin leads to deforestation for fuelwood collection, which has impacts on land erosion and sedimentation, which in turn affects water resources and populations (through flooding) but also energy production in reservoirs (through siltation and the impact of floods). Therefore, understanding the consequences of different policy options requires looking at the chain of indirect impacts across sectors, and quantifying them whenever possible.

This assessment has identified a menu of possible solutions to support the sustainable use and management of the basin resources. They include solutions related to institutions, information, instruments, investments, and international cooperation and coordination. Often, coherent packages of measures will need to be devised – for example regarding agricultural support or promotion of fuel switching. A nexus perspective should inform the selection of measures -- for example, the development of the sustainable and multi-purpose renewable energy sources.

The current level of cooperation at the technical level is good, but management of the nexus requires stronger transboundary governance. The two countries are currently negotiating a transboundary agreement for the Kura-Ara(ks) basin, to which the Alazani-Ganykh belongs. Finalising that agreement represents a valuable opportunity for engaging different water-using sectors in cooperation at the transboundary level.

More intense transboundary cooperation on the integrated management of basin resources will bring additional real benefits. It will allow Georgia and Azerbaijan to exploit complementarities in their resource bases (e.g. Georgian forests, Azerbaijani gas), to optimise resources development as well as risk management at the basin scale (e.g. coordinated hydropower development, coordinated flood management), to effectively protect the resource base for regional economic development, and to generate new economic opportunities (e.g. through more intense energy trade). There are certainly opportunities for the two countries to learn from each other -- for example, Georgia would benefit from the Azerbaijani experience in promoting switch from fuelwood to modern fuels, and Azerbaijan could learn from the Georgian experience in economic valuation of ecosystem services.

⁶ In recent years, in the period of floods the river has washed off hundreds of hectares of agricultural land area in Georgia, significantly reducing land area that belonged to private farms.

Ultimately, stronger and more coherent national policies are needed to “manage the nexus”. To a large extent, the dynamics between the resources and sectors at the transboundary level are explained by national developments. Inter-sectoral planning needs to be strengthened. This will require improved information exchange, but also mechanisms to take into account cross-sectoral impacts when carrying out sector planning. The preparation of the National Water Strategy of Azerbaijan and the updating of the Georgian Water Law provide an opportunity to strengthen inter-sector coordination of water-user sectors. Similarly, the development of the new Energy Strategy for Georgia represents an opportunity to consider the chain of impacts on other sectors (agriculture, forest, tourism, urban development) of different energy policy options.

This pilot Nexus Assessment only provides an overview of the importance of the basin’s resource, the inter-sectoral linkages, potential solutions and untapped benefits. Further analytical, stakeholder engagement and planning work will be needed to identify what precise technical, policy or governance related measures and investment options to address the challenges and seize the opportunities.

The benefits and achievements that transboundary cooperation in Alazani/Ganykh basin will bring will in many cases extend beyond its borders, in particular at the Kura/Ara(k)s scale, but also at national level. For example, an eventual agreement on coordinated flood control could be easily upscaled.

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