

# ENVIRONMENT AND WATER RESOURCE PROTECTION: MEASURES TO MODERNIZE WATER INFRASTRUCTURE IN THE SOUTH CAUCASUS

Research on environmental problems in the South  
Caucasus Countries

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## LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AFD	The Agence Française de Développement
AFEZ	Alat Free Economical Zone
AOP	Advanced Oxidation Processes
AZN	Azerbaijani Manat
CEPA	Comprehensive and Enhanced Partnership Agreement
EIB	European Investment Bank
EU	The European Union
FAO	Food and Agriculture Organization of the United Nations
FEZ	Free Economical Zone
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
JICA	Japan International Cooperation Agency
K	Thousand
MBR	Membrane Bioreactor
MM	Millions
OJSC	Open Joint Stock Company
ÖP	Östlichen Partnerschaft
PPP	Public-Private Partnership
RO	Reverse Osmosis
SDG	Sustainable Development Goals
UNDP	United Nations Development Programme
USD	US-Dollar
WEI	Water Exploitation Index

## MANAGEMENT SUMMARY

The research identified that Some of the most common water issues and environmental problems in the South Caucasus countries include poor water quality and quantity, inefficient regulatory framework, and the need for transborder cooperation. Excessive pollution of transborder waters, including surface and groundwater resources, has negatively impacted the regular flow and availability of water resources in the riparian countries. In addition, policy, legal and institutional deficiencies in the region contribute significantly to the struggle against the water problems.

Azerbaijan, Georgia, and Armenia share several similarities in terms of their ecological problems related to water management. All three countries suffer from issues such as water scarcity, pollution, and inadequate infrastructure for water treatment and management. The degradation of river ecosystems and the impact of climate change on water resources are also common challenges faced by these countries. Additionally, the agricultural sector is a significant consumer of water, which exacerbates these problems.

In terms of business opportunities, German companies can leverage their expertise in water treatment, infrastructure development, and research to address the challenges and opportunities in water management in all three countries.

Investing in sustainable water management practices, reducing Greenhouse gas emissions, and promoting sustainable mining practices can help achieve Sustainable Development Goals (SDGs), including clean water and sanitation (SDG 6), climate action (SDG 13), and partnerships for the goals (SDG 17). By doing so, businesses can contribute to a more sustainable and environmentally responsible future for these countries.

### **Azerbaijan**

Deterioration of the aquatic ecosystem, water wastage in agriculture and lack of regional cooperation are cited as the main ecological problems. The study proposes the construction of new water reservoirs, the development of immediate water treatment plans, and the reuse of engineered water for irrigation as key solutions to address these issues. The most important conclusions for decision makers and German companies to establish business partnerships in Azerbaijan are:

- Focus on **building new water reservoirs and developing immediate water treatment plans** to combat overall aquatic ecosystem degradation and water wastage in agriculture.
- **Use of liberated territories with significant water resources and reuse of technical water** for irrigation.
- **Identifying capacity needs for building new reservoirs** and securing long-term financial support from international organizations.
- **Supporting ecological research** in monitoring transboundary rivers, assessing ground and surface water, exploring water-saving technologies and studying the impact of climate change on water resources.
- **Investments to prevent water pollution** by strictly protecting important water resources, establishing amelioration and irrigation systems in key regions, and installing quality sensors and automatic river monitoring stations.

Overall, **German companies can use their expertise in water treatment, infrastructure development and research to address the challenges and opportunities of water management in Azerbaijan.** In addition, the potential for business partnerships in the areas of technology transfer, capacity building and joint research and development initiatives can be explored.

Technological challenges of water management in Azerbaijan include the need for professionals in water reservoir construction and maintenance, purification technologies, wastewater treatment and reuse practices. The study cites several countries as potential technology sources, including Japan, Korea, America, Finland and Germany, with a focus on **German technologies in the field of hydrology.** Although the logistics of acquiring German technology can be complex, the study shows that the benefits of using these technologies outweigh the costs. However, the study also found that the lack of service and experience with German experts could be a disadvantage. The main conclusion for German companies is to consider **potential opportunities for future inquiries in the field of irrigation,** given the identified need and interest in German hydrological technologies in Azerbaijan.

The main takeaway for German companies is to use their public-private partnership (PPP) experience to engage with the Azerbaijani government and explore potential business partnerships in the development, financing and monitoring of water

infrastructure. Joint research can help identify specific areas of need and create opportunities for long-term engagement in the water sector in Azerbaijan.

## Georgia

The main ecological problems are related to substandard sewage networks, agricultural intensification and discharge of waste into rivers. Possible solutions identified include partnerships with Azerbaijan in EU projects, establishment of a permanent secretariat or working group to assess the situation in the Kura river basin, and financial incentives for behavioral change. In addition, efficient irrigation systems and ecological research support are essential. In terms of prevention plans, effective water treatment and watershed management systems are required. These results show what opportunities German companies have to work with Georgian government institutions and EU projects to address these environmental issues. **German companies can contribute their expertise in building efficient irrigation systems and developing water treatment plans.** They can also offer technical solutions to improve sewage networks and waste water management.

Above all, the importance of mechanical and biological sewage treatment plants in Georgia can be derived from the technological findings. **German companies can use their know-how in these areas to offer their services on the Georgian market.** Also important is the competition with Turkish companies, which should be taken into account when developing business strategies. With regard to the need for regulation, support can be provided for the development of water-related laws and the establishment of a water management system at national level. Here, German companies have the opportunity to work together with Georgian institutions and contribute their know-how in these areas.

Cooperation with international financial institutions such as ADB (Asian Development Bank), EIB (European Investment Bank), AFD (The Agence Française de Développement) and the World Bank creates **opportunities for private sector involvement in the water sector in Georgia.** However, challenges exist in the form of **limited opportunities for public-private partnerships**, the need for tangible profitability and sustainability of private sector partnerships, political perception and government decisions, and the requirement for Georgian language skills in tenders and litigation. Businesses should carefully weigh the potential risks and benefits of entering the



Georgian water sector and **consider partnering with local companies to break down language and cultural barriers.**

### **Armenia**

Because of the insights into the environmental issues in Armenia, companies can focus on investing in technologies and solutions that can help address these issues. For example, companies can invest in sustainable water management practices, including technologies for water conservation, wastewater treatment and water recycling. It is also important to support initiatives to combat climate change through companies reducing greenhouse gas emissions and adopting environmentally friendly practices. In addition, companies can help combat freshwater aquifer depletion in the Ararat Valley by investing in sustainable agricultural practices that help reduce water use and promote soil quality. You can also support efforts to improve Lake Sevan water quality, for example by investing in wastewater treatment and recycling technologies.

To counteract the degradation of ecosystems and biodiversity loss caused by mining, companies can adopt sustainable mining practices, such as reducing waste and pollution, and supporting reforestation and habitat restoration.

Finally, it is important for companies to promote good environmental governance by supporting efforts **to strengthen environmentally relevant policies and enforcement mechanisms.**

Another way to address the environmental issues in Armenia is to foster partnerships with international donor organizations and international financial institutions to increase the technical capacity of government institutions. This can lead to the successful implementation of **capital investments and pilot projects to address water scarcity**, depletion of groundwater resources, degradation of water quality of the Sevan, extreme weather events, ecosystem degradation and weak environmental policies.



## 1. Introduction

Water sustainability plays a crucial role in building healthy environments, societies as well as economies. The reason is that ensuring safe water, adequate sanitation and hygiene for communities can improve the quality of lives not only for humans but also for animals and other living organisms in those communities. Additionally, improved water quality has indirect economic benefits from small-scale households to large-scale economies such as boosting economic growth and reducing poverty rates. Unfortunately, the environment is negatively affected due to human-induced reasons such as rapid industrialization and economic development. Many rivers and lakes are excessively polluted, and some parts cannot be used by humans or other living. Thus, attention must be paid to managing water resources more efficiently and sustainably to avoid severe in the long run when countries can be faced water scarcity and other water-related issues.

The South Caucasus region comprises three countries - Azerbaijan, Armenia and Georgia. The geostrategic position of the South Caucasus countries makes them significant players in international trade as the supply of goods increases from east to west. Western companies that expand their suppliers expand the role of those countries. The connection of the middle corridor of the countries of the South Caucasus from China to Europe contributes to the economic development of the countries of the South Caucasus; in addition, the region has developed as a transit centre for Europe's energy supply in recent years.

### **Objective of Research**

The framework analysis "Environment and Water Resource Protection: Measures to Modernise Water Infrastructure in the Southern Caucasus" is to identify challenges, prospects, and market opportunities for establishing sustainable water infrastructure in the Southern Caucasus countries, namely Azerbaijan, Armenia, and Georgia. It introduces the problems, then analyses the water infrastructure in the region countries, and ultimately illustrates market entry opportunities for foreign private companies for development in relation to environmental and sustainability goals.

## Methodology

The research initially reviews existing water management systems in the Southern Caucasus countries in a comparison mode to assess their effectiveness. It sheds light on the importance of modern water infrastructure for the environment and water resource protection while listing existing policies, regulations, and initiatives related to modernization and environmental protection.

The next stage of the methodology was to identify the problematic areas as well as opportunities through in-depth interviews conducted in the 3 countries. This report, therefore, demonstrates the results of interviews conducted in Azerbaijan, Armenia, and Georgia. The sampling strategy used in this research was purposive sampling. This strategy involved selecting participants who were relevant to the research topic and had knowledge and experience in water resource protection measures in the South Caucasus. Overall, 7 interviews were conducted in Azerbaijan, 1 in Armenia, and 3 in Georgia.

In Azerbaijan, interviews were conducted with the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, Ministry of Agriculture, Azersu OJSC, Azerbaijan Amelioration and Water Farm OJSC, Baku State University, and Khazar University. Overall, 7 interviews were conducted and their results followed the business-related recommendations. It must be noted that according to the Decree of the Republic of Azerbaijan on 30th March 2023, Azersu OJSC and Azerbaijan Ameliorated and Water Farm OJSC were merged, and the State Water Resources Agency was created under a common name.<sup>1</sup>

In Georgia, 3 main stakeholders were involved, namely GIZ Georgia, National Environmental Agency, and KfW Development Bank.

In Armenia, only 1 stakeholder was involved, which is GIZ Armenia.

Through the study, the general overview of water and environmental problems in the three countries was desk reviewed, which was followed by stakeholder mapping with a key emphasis on the water sector/management. In addition, the priority sectors and investment opportunities in Azerbaijan, Armenia, and Georgia were identified in

<sup>1</sup> Website of the President of the Republic of Azerbaijan Ilham Aliyev, 2023

close association with the UN Sustainable Development Goals (SDGs).<sup>2</sup> Finally, the results of qualitative analysis with interviews were summarized and conducted with the stakeholders in the 3 countries. The findings have been analyzed in classifying the insights into 3 categories, namely ecological problems and prevention plans against water pollution, technological challenges and support, and finally, public-private-partnership in the water sector, which were used to address the critical practical recommendations for businesses and decision-makers.

## 1.1. South Caucasus Country Profiles

The South Caucasus region comprises **three countries – Azerbaijan, Armenia and Georgia** (see Figure 1 on page 13). The geostrategic position of the South Caucasus countries makes them significant players in international trade as the supply of goods increases from east to west. Western companies that expand their suppliers expand the role of those countries. The connection of the middle corridor of the countries of the South Caucasus from China to Europe contributes to the economic development of the countries of the South Caucasus.<sup>3</sup> In addition, the region has developed as a transit center for Europe's energy supply in recent years.<sup>4</sup>

## 1.2. Geography and Politics

### 1.2.1. Azerbaijan

Lying west on the Caspian Sea, Azerbaijan is a landlocked country in the South Caucasus, bordering Russia to the north, Georgia and Armenia to the west, and Iran to the south. Its geographical location, connecting the European and Asian continents, makes Azerbaijan a significant player in international trade. Trade relations of Azerbaijan with the EU are mainly conducted through the export of oil and gas (about 4.6% and 2.3% of EU oil and gas imports in 2021, respectively). In December 2020, the project of the gas transport corridor in South-eastern Europe was completed, and with it, the export of natural gas from Azerbaijan to Europe started. As a result of the ongoing Russia-Ukraine war in Europe, the demand for natural gas in Europe increased, so Azerbaijan and the EU agreed to double the capacity of the gas transport corridor by

<sup>2</sup> United Nations, 2023

<sup>3</sup> Strohbach U. GTAI Germany Trade & Invest, 2022d

<sup>4</sup> Strohbach U. GTAI Germany Trade & Invest, 2022c

2027.<sup>5</sup> Although Azerbaijan ensures its economic freedom thanks to its rich oil and natural gas reserves, one of the government's tasks is to develop the non-oil sector. The main objective is the development of competitive industries and service sectors.<sup>6</sup>

### **1.2.2. Armenia**

The country lies south of the Greater Caucasus mountain range and borders the north western end of Asia. To the north and east, Armenia borders Georgia and Azerbaijan. At the same time, its neighbors to the southeast and west are Iran and Turkey, respectively, Nakhichevan, an exclave of Azerbaijan, borders Armenia to the southwest.<sup>7</sup> The legal basis for Armenia's relations with the EU is the Comprehensive and Enhanced Partnership Agreement (CEPA), signed in 2017. Thanks to this agreement, which will come into force in 2021, both sides will expand economic ties and ensure Armenia's trade partnership with the EU. At the same time, close ties with the Union give Armenia privileged access to the European single market; Armenia benefited from the EU's GSP+ regime until January 2022. In addition, the countries of the European Union are essential partners of Armenia in foreign trade, so 19% of the total transaction (2021) of Armenia is conducted with these countries.

### **1.2.3. Georgia**

The country is located east of the Black Sea and south of the Greater Caucasus on the border of Asia with Europe. The country borders the Russian Federation to the north, Turkey and Armenia to the south, and Azerbaijan to the east.<sup>8</sup> As Russia is Georgia's leading trading partner, the ongoing war between Russia and Ukraine significantly impacts Georgia's economy. At the same time, migrant workers from Georgia contribute to the country's gross domestic product through repayments. In recent years, one of the government's main tasks has been a rapprochement with the West, and some steps have been taken to that end. Russia's war against Ukraine also increased Georgia's desire to join the European Union, and in 2022 it officially applied for the union. At the same time, as maintaining Georgia's internationally recognized territorial integrity is a priority, the country is also pursuing NATO membership.

<sup>5</sup> European Parliament, 2022

<sup>6</sup> GIZ Azerbaijan, 2022

<sup>7</sup> Howe G.M., Gvozdetsky N.A., Bruk S.I. Britannica, 2023

<sup>8</sup> GTAI-DWV, 2020



**Figure 1.** Overview of the maps of the South Caucasus countries. *Source:* Goruma, 2022.

The largest country in the South Caucasus, Azerbaijan is characterized above all by its rich mineral resources, especially oil and natural gas deposits, and the potential for agriculture and tourism (see Table 1). Due to its geographic location, the country is at the crossroads of international trade routes, making Azerbaijan a significant player in world trade. “The government’s new economic strategy for 2022 to 2026 wants to accelerate the restructuring of state-owned companies. Public finances and administration are to become more effective and efficient. Expanded public-private partnerships are planned in all sectors of the economy”.<sup>9</sup> By 2030, the national priority for the country’s socio-economy has been defined:

- A sustainably growing competitive economy.
- A dynamic, inclusive and socially just society.
- Competitive human capital and modern innovation space.
- Significant return to liberated areas.
- Clean environment and the land of “green growth”.

**Table 1:** Basic data of the South Caucasus countries. *Source:* GTAI, 2022. \*Prediction

	Azerbaijan	Armenia	Georgia
Official Name	Republic of Azerbaijan	Republic of Armenia	Republic of Georgia
Political System	Presidential Republic	Parliamentary Republic	Presidential Republic
Head of State	President: Ilham Aliyev	President: Wahagn Chatschaturjan	President: Salome Surabischwili

<sup>9</sup> Strohbach U. GTAI Germany Trade & Invest, 2023e

<b>Territory</b>	86,6K km <sup>2</sup>	29,7K km <sup>2</sup>	69.7K km <sup>2</sup>
<b>Population</b>	10,41MM (2023)	2,78MM (2023)	3,73MM (2023)
<b>Currency</b>	<b>Azerbaijani Manat (AZN)</b> 1 Euro $\cong$ 1,8007 AZN (01.03.2023) <sup>10</sup>	<b>Armenian Dram (AMD)</b> 1 Euro $\cong$ 414,98 AMD (07.03.2023) <sup>11</sup>	<b>Georgian Lari (GEL)</b> 1 Euro $\cong$ 2.7791 GEL (01.03.2023) <sup>12</sup>
<b>GDP per capita</b>	6.410 Euro (2023*)	4.986 Euro (2023*)	6.781 Euro (2023*)
<b>Unemployment rate</b>	5.8 % (2023*)	19 % (2023*)	19.5 % (2023*)
<b>Inflation</b>	10,8 % (2023*)	6,0 % (2023*)	6,0 % (2023*)

Armenia's economy is based on raw materials production, agriculture, and commodity production, especially fruits, vegetables and tobacco; also, the country's mineral and non-mineral reserves contribute to the growth of the country's economy. One of the central economic policies of the Armenian government is to attract investment to the land; for this purpose, the government intends to use the country's alternative energy potential. The government is focusing on the development of the innovative IT sector in the country. In 2022, many economic entities were created in this area. Carrying out successive reforms in the economic sphere is one of the goals set to improve the country's energy market<sup>13</sup>

The basis of the Georgian economy is foreign trade, agriculture and macroeconomic issues. The development of the tourism sector in the country is aimed at expanding the service area by restoring tourist facilities. At the same time, Georgia wants to increase the volume of investments in the domestic market by creating an attractive business environment. The government's main tasks are electricity, sewage management, road construction, and the renewal of social infrastructure. Goods exported from the country include re-exporting imported cars, and imported products include drugs, wine and alcoholic beverages. There is also potential for the development of the food industry.<sup>14</sup>

<sup>10</sup> Central Bank of the Republic of Azerbaijan, 2023

<sup>11</sup> Central Bank of the Republic of Armenia, 2023

<sup>12</sup> Central Bank of the Republic of Georgia, 2023

<sup>13</sup> Strohbach U. GTAI Germany Trade & Invest, 2023a

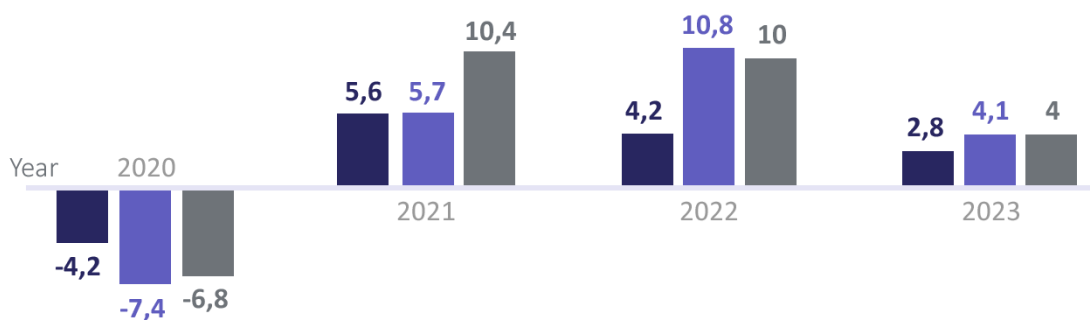
<sup>14</sup> Strohbach U. GTAI Germany Trade & Invest, 2022b

### 1.3. Economic Development

Economic growth in Azerbaijan is forecast to be between 2.5 and 3.5% in 2023. (see Figure 2 on page 16). As in recent years, in line with its monetary policy, Azerbaijan attaches importance to the development of the non-oil sector, and for 2023 growth of 5.6 % is targeted in this area. The government hopes to keep annual economic growth at 4.1% until 2026, and this indicator is 6.3% in the non-oil sector. A positive development is expected for 2023 in natural gas production, the food industry, information technologies, telecommunications, tourism, construction and transport.<sup>15</sup> At the same time, another goal of the government is the expansion of alternative energy sources, spreading wind and solar energy use, and improving and modernising water management.

Armenia’s economy is expected to grow between 4.1 and 4.5 % in 2023. “Economic drivers are investments (forecast: +10%), construction (+8%), manufacturing, trade and services (each +4 to +5%). The construction sector benefits from expanding public supply and transport infrastructure”. Positive dynamics can be observed in the overall economy of Armenia in recent years so that growth in 2022 was 14.2% higher than in 2021. “The boom is based on high growth in the service sector (+28% to 5.9 billion), trade (+17 % to \$10 billion) and construction (+13% to \$1.2 billion)”.<sup>16</sup>

After the severe impact of the pandemic, Georgia’s economy has revived, and immigrants are contributing to economic growth. In 2023, economic growth in Georgia is expected to be around 4%. Improving tourism opportunities, expanding trade, buying and selling real estate, and attracting investment contribute to economic growth.<sup>17</sup>



<sup>15</sup> Strohbach U. GTAI Germany Trade & Invest, 2023c

<sup>16</sup> Strohbach U. GTAI Germany Trade & Invest, 2023b

<sup>17</sup> Schulze, 2023



■ Azerbaijan

■ Armenia

■ Georgia

*Figure 2. Economic growth of the South Caucasus countries, change in %, real, 2020-2023. Source: GTAI, 2022*

## 1.4. Economic Relations with Germany

Economic and trade partnership relations between Azerbaijan and Germany are continuously developing. Trade turnover between Azerbaijan and Germany in 2022 was 2.2 billion euros, of which 1,716 billion euros were Azerbaijani exports and 472 million euros in imports (see Tables 2 and 3 on page 17). Last year, Germany ranked 8th in the total foreign trade of Azerbaijan and 4th among the most important countries of origin of Azerbaijani imports. Azerbaijan's oil deliveries to Germany are one of the pillars of the entire trade. Thus, oil exports to Germany last year totalled 801,440 tons. At the same time, Germany completed the TOP-10 of Azerbaijan's top oil importers in 2022.<sup>18</sup>

Germany is Armenia's most important trading partner within the EU. Cars, finished chemicals, synthetic fibres, other machines, trucks and special vehicles are considered to be the most frequently exported goods from Germany to Armenia. The essential goods that Germany imports from Armenia are ferroalloys, semi-finished aluminum products, silk clothing, synthetic fibres, cotton clothing and spirits.<sup>19</sup> In 2021, Germany's total exports to Armenia amounted to 178.2 million euros, of which 26.2 % were machines, 16.5% were textiles and clothing, 13.3 % were chemical products, and 11.4 % were motor vehicles and parts. The total volume of German imports from Armenia in the same year was 108.8 million euros, of which 31.8% was iron and steel, 30.7 % was textiles and clothing and 28.9 % non-ferrous metals.<sup>20</sup>

Georgia is one of Germany's economic partners in the South Caucasus region, which is evidenced by the fact that Germany is Georgia's seventh largest trading partner, and about 300 German companies operate in the country.<sup>21</sup> In 2021, the total volume of German exports to Georgia was 379.9 euros, of which 27.3% were chemical products, 19.3% were motor vehicles and parts, and 14.2% were machines. In the same year, total

<sup>18</sup> Trend News Agency, 2023

<sup>19</sup> OEC, 2023

<sup>20</sup> GTAI, 2022a

<sup>21</sup> Botschaft von Georgien in der Bundesrepublik Deutschland, 2023

German imports amounted to 95.2 million euros, of which 34.2% was food, 34% textiles and clothing and 9.4% electronics.<sup>22</sup>

*Table 2: German imports from the South Caucasus – foreign trade (in million Euros). Source: Strohbach 2023.*

Country	2019	2020	2021	2022
Azerbaijan	1.348	734	705	1.716
Armenia	115	68	109	155
Georgia	60	74	95	102

*Table 3: German exports to the South Caucasus – foreign trade (in million Euros). Source: Strohbach 2023.*

Country	2019	2020	2021	2022
Azerbaijan	443	359	304	472
Armenia	180	187	178	476
Georgia	403	316	380	583

## 1.5. Investment Climate

The government of Azerbaijan has an “open door” policy to attract investment into the country’s economy. Currently, the government of Azerbaijan is taking measures to follow up on economic reforms in the country, further improve the business environment and develop the non-oil sector.<sup>23</sup> The priorities of the monetary policy of Azerbaijan include attracting investments in the non-energy sector, in transport infrastructure, especially in renewable energy sources. In recent years, Alat Free Economic Zone (AFEZ) has become a good investment location for Azerbaijan thanks to its strategic location. With its place as the regional transport hub, AFEZ is one of the players in the international supply chain.<sup>24</sup> AFEZ’s mission is to create investor-centric business solutions. With the reconstruction of Karabakh and East Zangasur’s economic

<sup>22</sup> GTAI, 2022b

<sup>23</sup> Ministry of Economy of the Republic of Azerbaijan, 2023

<sup>24</sup> Alat Free Economic Zone, 2023

regions as one of the government's main goals, more than € 2 billion of investments are expected to flow into this zone in 2023.<sup>25</sup>

The Government of Armenia strives to develop the investment environment in the country by facilitating the market entry of local and foreign investors. The basis of the country's investment policy is the creation of industrial parks. New investment policies were mentioned in the State Program for Socio-Economic Development for 2022-2026.<sup>26</sup> Free Economic Zones (EPZs) in Armenia offer a unique opportunity for entrepreneurs to set up businesses in strategic economic sectors and to produce and export goods with a reduced tax burden. The aim is to support effective business transactions and a rapid return on investment. Also, until January 1, 2025, a profit tax credit for agricultural products will be granted to develop the investment climate in Armenia. At the same time, there are exemptions from profit tax and a reduced income tax rate (10%) for certified IT start-ups with up to 30 employees.<sup>27</sup>

Georgia's liberal trade regulations offer investors a favorable opportunity to gain access not only to the country's 3.7 million inhabitants but also to the markets of the entire region, as there are no tariffs and import duties.<sup>28</sup> The Georgian National Investment Agency is running a marketing campaign to encourage more foreign investors to visit Georgia. The legislation creates favourable conditions for foreign investments.<sup>29</sup> The Investment Encouragement and Encouragement Act protects foreign investors for ten years from subsequent legislation changing the terms of their assets. The investment policy of the Government of Georgia in 2023 includes significant state investments in road and water supply, support to the construction industry, housing construction, repair and construction of schools, kindergartens, and support to the projects of small and medium-sized enterprises.<sup>30</sup>

<sup>25</sup> Strohbach U. GTAI Germany Trade & Invest, 2023e

<sup>26</sup> Strohbach U. GTAI Germany Trade & Invest, 2022a

<sup>27</sup> PwC Armenia, 2020

<sup>28</sup> Georgian National Investment Agency, 2023

<sup>29</sup> PwC Georgia, 2021

<sup>30</sup> Strohbach U. GTAI Germany Trade & Invest, 2023d

## 2. Overview of Water Management Issues in the South Caucasus

Transcaucasia is a geographical region with three central states – Georgia, Armenia, and Azerbaijan. The area has a diverse landscape, ranging from mountains and plateaus to valleys and rivers. The rivers such as Kura, Aras, Alazani, and Okhchuchay are among the significant water sources for South Caucasian countries. Among the countries in the region, Georgia is considered the richest in terms of water resources, with abundant water reserves from the Kura and Rioni rivers and several smaller rivers and lakes. On the other hand, Azerbaijan faces significant water scarcity challenges due to its arid climate and inconsistent rainfall patterns.

Before the collapse of the Soviet Union, Transcaucasian states had a standard water management system. However, after the conditions had become independent, they did not establish any regulations for water governance until a certain period.<sup>31</sup> Whereas Armenia approved its Water Code in 1992, Azerbaijan and Georgia accepted their Water Codes in 1997. In addition, research reveals that majority of the water treaties belonging to South Caucasus countries date back to the Soviet legacy. Although, there have been several attempts to sign water treaties between Georgia and Azerbaijan, because of the Nagorno-Karabakh conflict, Armenia and Azerbaijan had not been able to collaborate to solve their water management issues.<sup>32</sup> However, the recent Karabakh war in 2020, which resulted in Azerbaijan's regaining control over its occupied territories, has paved a new path for regional cooperation on water management issues. The return of Azerbaijani control over the territories, including the Upper Karabakh region, has opened the possibility of joint management of water resources with Armenia, which could lead to more sustainable and efficient use of water resources for both countries (see Figure 3 on page 21).<sup>33</sup>

<sup>31</sup> Suny R.G. Britannica, 2023

<sup>32</sup> Kuyumjian N. Eurasianet, 2021

<sup>33</sup> Dilaver, 2022



Figure 3. Transboundary rivers and the South Caucasus. Source: Dilavar; 2022.

## 2.1. Problem Description

Some of the most common water issues and environmental problems in the South Caucasus countries include poor water quality and quantity, inefficient regulatory framework, and the need for transborder cooperation. Excessive pollution of transborder waters, including surface and groundwater resources, has negatively impacted to the regular flow and availability of water resources in the riparian countries. In addition, policy, legal and institutional deficiencies in the region contribute significantly to the struggle against the water problems. The research also adds that common water problems in the region include various approaches, standards, and methods for water management between the countries and an absence of a sustainable classification scheme in the South Caucasus.<sup>34</sup> With regards to regulatory problems associated with the management of water resources, the lack of available data, insufficient monitoring, and poor infrastructure cause significant distortion for the efficient governance and use of the waters among the riparian states.

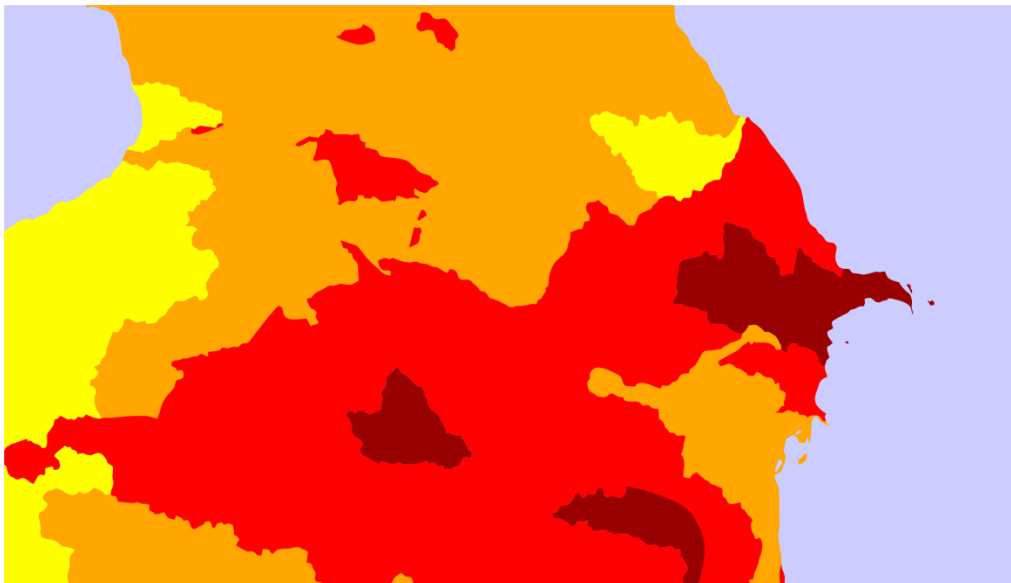
While examining the water issues in the region, it is important to keep in mind the transborder cooperation. The rivers that fall into category of transboundary waters should concern each riparian state individually and equally. For instance, in the case of Kura River, the longest and biggest river in the South Caucasus, Turkey is an upstream country for Georgia, Armenia and Azerbaijan, while Azerbaijan is a downstream country

<sup>34</sup> OECD, 2020a

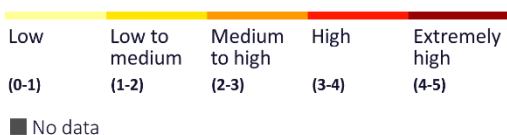
for all three countries specified. The importance of the issue is related to the fact that the way upstream countries manage and use their water resources affect the downstream countries. In the other words, if upstream countries (Georgia and Armenia) pollute or abstract large quantities of water from the trans-border water resources, the downstream countries (Azerbaijan) are most likely to be threatened with water scarcity. Additionally, since the Kura River is the largest source of drinking water and irrigation in Azerbaijan, the challenges put forth by the upstream countries will be faced mainly by its population rather than those of upstream. This is why the transborder water resources require a greatest need for considering collaborative action for the implementation of agreements with the neighbouring countries.

### **2.1.1. Azerbaijan**

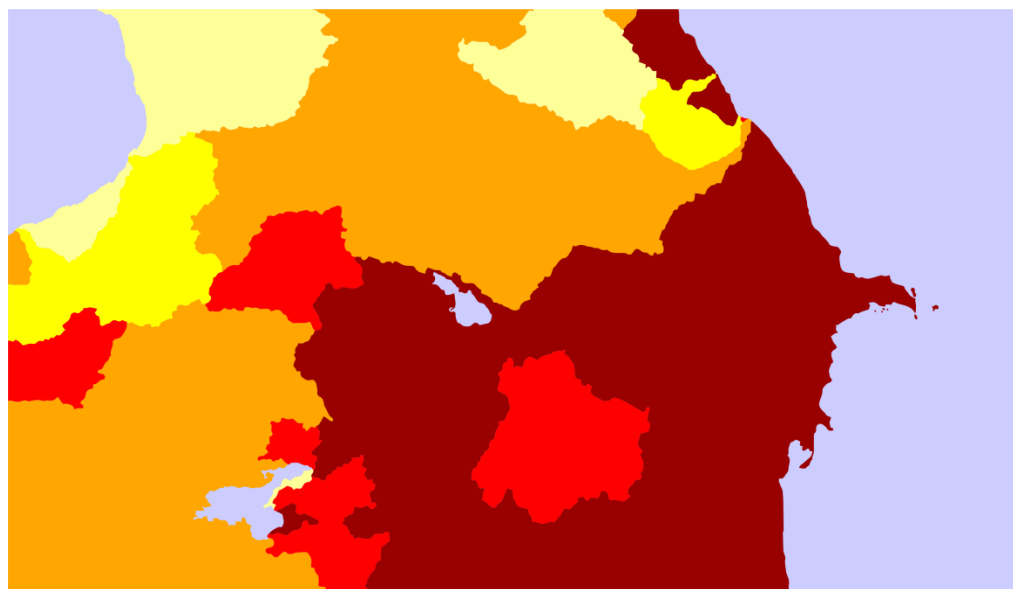
According to World Resources Institute's Aqueduct Water Risk Atlas, Azerbaijan's water stress level is "extremely high" (see Figures 4 and 5 on page 23). In fact, Azerbaijan is facing severe water stress conditions, with a high-water exploitation index and heavy dependence on external inflows from upstream basins. The water exploitation index in Azerbaijan was estimated to be 41.2 % in 2017, which indicates that the country is withdrawing water from its natural sources at a rate that is unsustainable in the long term. Furthermore, Azerbaijan's natural water balance is heavily dependent on external inflows from upstream basins, with a dependency ratio of around 71% on an annual scale. This means that changes in water availability in upstream areas can have a significant impact on water resources in Azerbaijan.



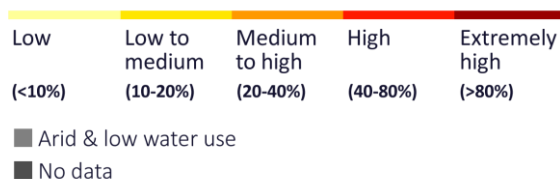
### Overall Water Risk



**Figure 4.** Water risk atlas, South Caucasus Region. **Source:** Aqeduct.



### Water Stress



**Figure 5.** Water risk atlas, South Caucasus Region. **Source:** Aqeduct.

**Note:** The figure 4 shows the baseline water stress in Azerbaijan, Armenia, and Georgia, while the figure 5 shows the future prediction of water stress in these 3 countries. Even though it is based on 'optimistic' scenario, Azerbaijan is likely to become extremely high-water stress country in 2030.

More specifically, the decreasing water levels in the Kura River, which flows through Azerbaijan and Georgia, have been a cause for concern in recent years. For instance, according to the Ministry of Agriculture of the Republic of Azerbaijan, the volume of water flowing into the Mingachevir reservoir during flood periods has decreased from 15-16 billion m<sup>3</sup> to 6-7 billion m<sup>3</sup> in recent years. Additionally, the forecast predicts a further decline of 20-25 % in water resources from 2020 to 2050.<sup>35</sup>

<sup>35</sup> Turan, 2023



Additionally, it is predicated that a further decline of 20-25 % might occur in water resources from 2020 to 2050. The river's reduced flow is partly attributed to climate change and partly to human activities such as damming and irrigation. This reduction in water flow has significant implications for the region, including impacts on agriculture, hydropower generation, and water supply for drinking and industrial use.

In addition to the challenges related to the Kura River, Azerbaijan also faces issues related to water pollution. Industrial and agricultural activities, as well as inadequate waste management practices, have resulted in the contamination of some of Azerbaijan's water sources.<sup>36</sup> The oil industry is another significant contributor to water pollution in Azerbaijan, with leakage of oil and other chemical substances into water bodies being a common issue. The Ministry of Ecology and Natural Resources in Azerbaijan has identified several heavy metals, including copper, molybdenum, manganese, iron, zinc, and chromium, inside water particles in the Okhchu river.<sup>37</sup> These pollutants can affect both surface water and groundwater sources, leading to health concerns among the population.

Even though Azerbaijan is the poorest country in the Southern Caucasus due to its share of limited water resources, it has a relatively high amount of water resources per capita compared to many other countries in the world.<sup>38</sup>

### **2.1.2. Armenia**

Armenia's water resources are primarily supplied by rivers and groundwater. The country has several major rivers, including the Araks, Hrazdan, and Vorotan rivers, which are important sources of water for irrigation, hydropower generation, and municipal water supply.<sup>39</sup> All the rivers in Armenia are tributaries of the Araks and Kura rivers. Most of these rivers are small and fed by melting snow, springs, and groundwater. This means that Armenia is largely dependent on its mountainous terrain and the precipitation that falls in these areas to replenish its water resources.

While Armenia is not a water-scarce country, it does face severe water stress conditions due to high demands for public water supply and agriculture. According to

<sup>36</sup> Emets Y. The Borgen Project, 2017

<sup>37</sup> Mehdiyev M. Caspian News, 2021

<sup>38</sup> Azersu OJSC, 2023

<sup>39</sup> Shahbazyan. Armenia Discovery, 2019

European Environment Agency the annual water exploitation index (WEI) was greater than 40 % in 2017, indicating significant pressure on the country's water resources. Most of the freshwater abstraction is used for public water supply (61 %) and agriculture (34 %), with total water abstraction for both sectors accounting for 95 % of the annual total freshwater abstraction in 2017.

According to the World Economic Forum's Global Competitiveness Index 2019, Armenia performs relatively well in terms of access to safe drinking water, with only 3.1 % of the population exposed to unsafe drinking water. In comparison, Azerbaijan and Georgia have higher rates of unsafe drinking water exposure at 10.3 % and 9.8 % respectively.<sup>40</sup> However, Armenia's sanitation services are inadequate, particularly in rural areas where over half of the population relies on unimproved facilities.<sup>41</sup> This lack of access to adequate sanitation facilities can lead to health problems and environmental degradation.

International organizations, such as the World Bank and the European Union, have also provided funding and technical assistance to support the development of Armenia's water resources and management. Despite these efforts, however, continued investment and attention are needed to ensure the long-term sustainability of Armenia's water resources and to address the challenges posed by climate change.

### **2.1.3. Georgia**

Georgia is rich in water resources. It has several large rivers, including the Mtkvari (Kura), Rioni, and Enguri, as well as numerous lakes, reservoirs, and underground aquifers. According to the European Environment Agency's report from 2020, Georgia's annual renewable freshwater availability per capita is consistently the highest among the Eastern Partnership (EaP) countries by a wide margin. In 2017, Georgia had an annual renewable freshwater availability per capita of 12,418 cubic meters, which is more than twice the amount of the next EaP country in the ranking, Belarus, which had 6,355 cubic meters.<sup>42</sup>

Additionally, Georgia has the largest glaciated area and greatest number of glaciers in the Caucasus region, with over 2,000 glaciers covering an area of about 1,000 square

<sup>40</sup> Schwab. World Economic Forum, 2019

<sup>41</sup> OECD, 2019

<sup>42</sup> OECD, 2020a

kilometers. Glaciers are an important source of water for Georgia, particularly during the dry summer months when other sources of water may be scarce.<sup>43</sup> The melting of glaciers provides water for irrigation, hydropower generation, and drinking water supplies.

Despite the abundance of water resources, the quality of water infrastructure in Georgia is not up to standards. The quality varies across different regions, with some areas lacking access to safe drinking water and adequate sanitation facilities.<sup>44</sup> According to Asian Development Bank (2021), residents of largest cities, including Kutaisi and Zugdidi, used to rely on wells, water tanks and pumping equipment. Under the Urban Services Improvement Investment Program funded by the Asian Development Bank, Georgia has taken a new step to improve water and sanitation infrastructure in 13 cities and towns, which will help address several water issues in the country.<sup>45</sup>

Georgia's water resources are becoming at risk due to the impacts of climate change, particularly from more frequent and severe droughts and floods.<sup>46</sup> As a result, it is essential to prioritize effective water resource management and develop resilience strategies to adapt to these changing conditions.

## 2.2. Existing Priority Sectors and Investment Opportunities in Azerbaijan

SDG financing and impactful investment results show that in developing countries, annual SDG financing has reached up to US \$ 4.3 trillion in 2022, while green investment in international projects has reached to US \$ 371 billion. The assessment report of Istanbul International Center for Private Sector in Development (2023) defines four priority sectors, and two of them include water-related investment opportunities, as given in Table 4.

**Table 4:** Azerbaijan's priority sectors related to water and investment opportunities. **Source:** Sustainera Solutions.



	Priority sector	Potential sectors of investment opportunities
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<sup>43</sup> USAID, 2017

<sup>44</sup> OECD, 2019

<sup>45</sup> Asian Development Bank, 2021

<sup>46</sup> World Bank Group, Asian Development Bank, 2021

	<p><b>Infrastructure</b></p>	<ul style="list-style-type: none"> <li>• Wastewater treatment for industry and households</li> <li>• Recycling facilities for the utilization of non-hazardous waste</li> </ul>
	<p><b>Food and beverage</b></p>	<ul style="list-style-type: none"> <li>• Modern irrigation methods and technologies</li> <li>• Smart agriculture solutions</li> </ul>

Key goals in the context of **Infrastructure** are:

- Considering the depletion of freshwater resources and population growth that affect half of the population by limiting access to drinking water, offer sustainable and economic solutions.
- Increasing the rate of waste generation and waste management outside of formal structures, including the disposal of waste that contributes to environmental pollution.

Key goals in the context of **food and beverage** are:

- Promoting irrigation supplies to the sector needs, introduction of innovative solutions, including irrigation equipment, optimization of soil productivity, as well as the whole sector productivity (see Figure 6).



Construction and operation of water treatment facilities that clean household and industrial wastewater, including oil-contaminated water for technical use such as irrigation.



Design and installation of irrigation systems that do not harm the climate, including micro irrigation and solar energy pumps such as a drip irrigation system that optimize water and energy use in agriculture and greenhouses.



Preparation of software solutions, including artificial intelligence (AI) technologies to digitize farms and greenhouses to support farmers, to monitor irrigation and ventilation to support the decision of farmers and increase.


*Figure 6. Focus on activities in Azerbaijan in the water sector related to SDG. Source: Sustainera Solutions.*

### 2.3. Existing Priority Sectors and Investment Opportunities in Armenia

Armenia's susceptibility is on the rise due to climate change, which is leading to a greater occurrence of severe weather events and exacerbating the process of desertification and land degradation. The sectors that are most vulnerable include agriculture, human health, water resources, forestry, transport, and energy infrastructure<sup>47</sup> (see Table 5 on page 29).

<sup>47</sup> EU4Climate, 2022

**Table 5:** Armenia's priority sectors related to water and investment opportunities.

	Priority sector	Potential sectors of investment opportunities
	<b>Food and beverage</b>	<ul style="list-style-type: none"> <li>• Crop production through efficient technologies</li> <li>• Support of fruits and vegetables, flowers</li> </ul>
		<ul style="list-style-type: none"> <li>• Agricultural productivity and water access</li> <li>• Waste management</li> <li>• Effective farming</li> </ul>

Key goals in the context of **food and beverage** are:

- Increasing agricultural yield using modern, eco-friendly, and effective technologies to guarantee a constant provision of vegetables, fruits, and flowers for both local consumption and exportation.
- Improving agricultural productivity and addressing the challenges related to water access and waste, which could ultimately facilitate farmers' livelihoods and environmental impacts (see Figure 7).



#### Implement drip irrigation on farmland using two models:

- The Farmer investment model, which involves investing in a network of drip irrigation pipelines and equipment.
- The government-farmer cooperation model, in which the government develops a tertiary system to bring irrigation water closer to farms.


**Figure 7.** Focus on activities in Armenia in the water sector related to SDGs. **Source:** Sustainera Solutions.

## 2.4. Existing Priority Sectors and Investment Opportunities in Georgia

In comparison to energy and transport sectors, Georgia allocates significantly less funds towards water and industry projects. Water projects make up a mere 5.0 % of the overall investment, equating to USD 1.1 billion, while energy and transport projects

make up most of the investment, comprising 50.4 % and 43.9 % of the total investment, totalling USD 11.6 billion and 10.1 billion respectively<sup>48</sup> (see Table 6).

*Table 6: Georgia's priority sectors related to water and investment opportunities.*

	Priority sector	Potential sectors of investment opportunities
	<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>• Water supply and sanitation</li> <li>• Irrigation and water management</li> </ul>

Key goals in the context of **infrastructure** are: (see Figure 8):

- Ensuring water supply and sanitation services to be accessible to the country's residents.
- Improving the delivery of irrigation and drainage services in selected areas (secondary cities and towns).



**Implement effective water management through:**

- Strengthening river basin management planning
- Storage and conveyance, sanitation, wastewater collection and treatment, and multipurpose infrastructure, which encompasses dams, reservoirs, hydropower and irrigation canals
- Building shared environmental information system

*Figure 8. Focus on activities in Georgia in the water sector related to SDGs. Source: Sustainera Solutions.*

<sup>48</sup> OECD, 2021



### 3. Stakeholders of Environmental and Water Resource Protection

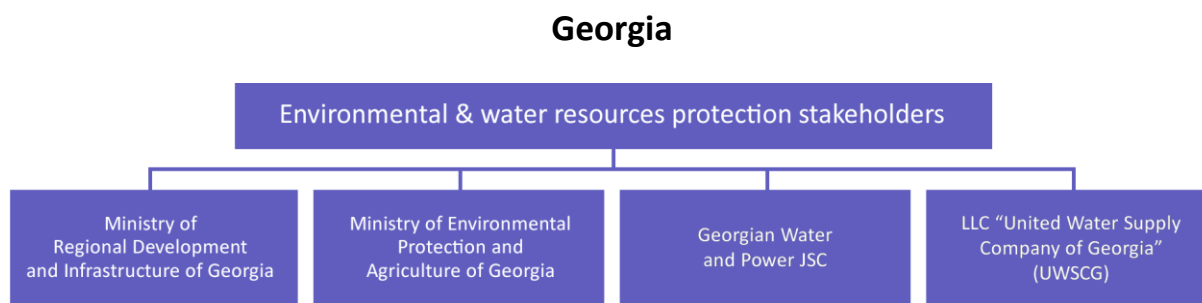
The most important stakeholders of environmental and water resource protection by country are in Figures 9, 10 and 11:



**Figure 9.** Stakeholder of environmental and water resource protection in Azerbaijan.<sup>49,50,51</sup>



**Figure 10.** Stakeholder of environmental and water resource protection in Armenia.<sup>52,53,54</sup>



<sup>49</sup> Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, 2019

<sup>50</sup> Azersu OJSC, 2023

<sup>51</sup> Azerbaijan Amelioration and Water Farm Open Joint Stock Company, 2023

<sup>52</sup> Schwab. World Economic Forum, 2019

<sup>53</sup> Veolia, 2023

<sup>54</sup> Independent Evaluation ADB, 2020

**Figure 11.** Stakeholder of environmental and water resource protection in Georgia.<sup>55,56</sup>

<sup>55</sup> Ministry of Regional Development and Infrastructure of Georgia, 2023

<sup>56</sup> United Water Supply Company of Georgia, 2023

## 4. Methodological Approach

### 4.1. Research Design, Methods, Data Collection and Analysis

The research adopted a qualitative research design that involved collecting data from key stakeholders through structured interviews. This design was chosen because it enables the researcher to collect rich and detailed data from participants, which can provide in-depth insights into the research topic. The research focused on the perceptions and experiences of key stakeholders on water resource protection measures, problems, technologies, and regulations in the South Caucasus region.

The questions were designed to explore the key themes of the research (see Table 7), which included:

*Table 7: The key themes of the research which are discussed in detailed interviews. Source: Sustainera Solutions.*

Topics covered through interviews		
Ecological problems (at a country level)	Technologies, technological challenges, support mechanisms	Role of private sector in water sector, partnerships
Solutions & additional steps to address the ecological problems	Water cleaning systems & technologies	Financial and institutional support to water research
Ecological (water) research	Source of technologies, need for German technologies	Partnership with the government/ministries in projects
Prevention plans against water pollution	Need for regulations to facilitate the technology sourcing	

The data collected from the interviews were analysed using a thematic analysis approach. This approach involved identifying patterns and themes in the data and organizing them into meaningful categories. The data analysis process involved the following steps:

- **Transcription:** The recorded interviews were transcribed verbatim into text format.
- **Coding:** The text data were reviewed and coded based on the themes and subthemes identified in the research questions.

- **Categorization:** The coded data were organized into categories based on the themes and subthemes identified in the research questions.
- **Interpretation:** The categories were reviewed and interpreted to draw conclusions and insights on the research topic.

## 4.2. Sampling and Selection of Study Respondents

The sampling strategy used in this research was purposive sampling. This strategy involved selecting participants who were relevant to the research topic and had knowledge and experience in water resource protection measures in the South Caucasus. The participants were selected from various government agencies. In total, 11 participants were selected, majority being in Azerbaijan, followed by Georgia.

In each country, in-depth interviews were conducted with different stakeholders. In Azerbaijan, the interviews were conducted with representatives of various government agencies, namely with Ministry of the Environment and Natural Resources, Ministry of Agriculture, Azerbaijan Amelioration and Water Farm OJSC, Azersu OJSC, Baku State University, Khazar University. In Georgia, the representatives of the National Environmental Agency, the KfW Development Bank and GIZ Georgia were interviewed. In view of the existing conflict situation between Azerbaijan and Armenia, it was possible to conduct an interview only with GIZ Armenia.

## 4.3. Ethical Considerations and Limitations

### *Informed Consent:*

Before the interviews were conducted, the participants were informed about the purpose and nature of the research, their rights as participants, and the use of the data collected. They were also given the opportunity to ask questions and provided with a consent form to sign if they agreed to participate in the study.

### *Confidentiality:*

The participants' identities and responses were kept confidential throughout the research process. The audio recordings and transcripts were kept securely and only accessed by the researcher and authorized personnel involved in the research process.

*Voluntary Participation:*

Participation in the research was voluntary, and participants were given the option to withdraw from the study at any time without any negative consequences.

*Data Protection:*

Data protection was an important ethical consideration in this research. The audio recordings and transcripts were stored securely and only accessed by authorized personnel involved in the research process. The data collected were used solely for the purpose of this research and were not shared with any third parties.

*Respect for Participants:*

The researcher ensured that all participants were treated with respect throughout the research process. Participants were given the opportunity to express their views and experiences in their own words without any bias or judgment. The researcher also ensured that participants' cultural values and beliefs were respected and acknowledged..

The research has some limitations that need to be acknowledged. Firstly, the sample size was relatively small, with only 11 participants selected from three countries. This may limit the generalizability of the findings. Secondly, the research focused on the perceptions and experiences of key stakeholders and did not involve an assessment of the effectiveness of water resource protection measures in the region. Finally, the research was conducted within a specific time frame, which may limit the scope and depth of the data collected.

## 5. Results

### 5.1. Results of Interviews. Azerbaijan

Overall, 7 interviews were conducted in Azerbaijan. The key stakeholders involved in the interviews and their roles in the national water sector are following (see Table 8):

*Table 8: Key stakeholders involved in interviews in Azerbaijan.*

Azersu	Ministry of Agriculture	Ministry of Ecology and Natural Resources
<ul style="list-style-type: none"> <li>• Collection, processing, transportation, storage and distribution of water from sources</li> <li>• Providing consumers with drinking water in a centralized manner</li> <li>• Sewerage services, implements collection, transportation, treatment and disposal of wastewater</li> </ul>	<ul style="list-style-type: none"> <li>• Information provision on farmlands (location-specific)</li> <li>• Water supply assessment of agricultural lands</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring and management</li> <li>• Regulation of water use, Protection of underground water from pollution</li> <li>• Unified water policy and strategy</li> </ul>
Azerbaijan Amelioration and Water Farm OJSC	Baku State University	Khazar University
<ul style="list-style-type: none"> <li>• Water management</li> <li>• Construction and operation of water infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Higher education institution</li> </ul>	<ul style="list-style-type: none"> <li>• Higher education institution</li> </ul>

The key findings from the interviews are given in Tables 9, 10 and 11 on pages 35, 36 and 38:

*Table 9: Ecological problems, research & solutions, and prevention against water pollution.*

Ecological problems	Solutions & additional steps to address the ecological problems	Ecological (water) research	Prevention plans against water pollution
<ul style="list-style-type: none"> <li>• Scarcity of water resources to become very actual in the next 10 years.</li> </ul>	<ul style="list-style-type: none"> <li>• 2020 - 2022 Activities Plan is in place in accordance with the President's decree.</li> </ul>	<p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• Monitoring of cross-border rivers (entering to the territories of Azerbaijan) with</li> </ul>	<ul style="list-style-type: none"> <li>• Jeyranbatan water reservoir is strictly protected as one of the</li> </ul>

<ul style="list-style-type: none"> <li>• Climate change impact on the water scarcity</li> <li>• Okhchuchay river: heavy metal pollution there. There are plants that pollute the river with heavy metals. Riverside farms and quarries cause pollution. There are 2 large factories on the river, they are polluting the river.</li> <li>• Azerbaijani scholars and researchers have had no access for over 40 years to study acute issues in Okhchuchay river.</li> <li>• Degradation of the whole water ecosystem.</li> <li>• Significant water waste issues in agriculture sector.</li> <li>• Lack of regional cooperation and partnership.</li> </ul>	<ul style="list-style-type: none"> <li>• A commission has been established for the building of water reservoir (first phase is to be completed).</li> </ul> <p><b>Necessity:</b></p> <ul style="list-style-type: none"> <li>• To build new water reservoirs.</li> <li>• To develop new immediate water treatment plans.</li> </ul> <p><b>Opportunity:</b></p> <ul style="list-style-type: none"> <li>• New liberated lands including huge water resources.</li> <li>• Works are done on reuse of technical water for irrigation.</li> </ul> <p><b>Challenge:</b></p> <ul style="list-style-type: none"> <li>• Capacity to clean those new reservoirs.</li> <li>• Short-term financial support from international organization.</li> </ul>	<p>particular emphasis on those coming from Armenia.</p> <ul style="list-style-type: none"> <li>• Membership of Armenia and Georgia with Environmental Convention (Azerbaijan is a member).</li> <li>• Formation of water supply according to the need for water supply of agricultural fields.</li> <li>• Due to climate change and its impact on water resources, need for research on water saving technologies/use of alternative waters.</li> <li>• Need for experts on regulating collector waters and their use in irrigation.</li> <li>• Assessment of underground and surface water (preparation of electronic water map).</li> <li>• Research on water monitoring, mainly transboundary water treatment and use of melting glaciers.</li> </ul>	<p>utmost important waters resource.</p> <ul style="list-style-type: none"> <li>• Establishment of melioration-irrigation system in Karabakh region.</li> <li>• Installation of quality sensors on polluted rivers (Okhchuchay, Basitchay, Bargushadcat rivers).</li> <li>• Automatic station on Okhchuchay river (radioecological monitoring).</li> </ul>
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**Table 10:** Technologies, technological challenges, and support mechanisms.

Water cleaning systems and technologies	Source of technologies, need for German technologies	Need for regulations to facilitate the technology sourcing
<p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• For experts in building of water reservoirs, and maintenance, as well as related technologies.</li> <li>• Water cleaning technologies.</li> <li>• Cleaning of wastewater and usage as technical water (use of technical water is not specified in the Law).</li> </ul>	<p>- <b>Different sources:</b></p> <ul style="list-style-type: none"> <li>• Japanese technology financed by KfW Bank, JICA.</li> <li>• Korean technology.</li> <li>• American equipment (based on farmer's own will).</li> <li>• Finland technologies in meteorology.</li> </ul>	<ul style="list-style-type: none"> <li>• Absence of a regulatory document on re-production of wastewater.</li> <li>• New water standard is under the confirmation of Standardization Institute and Ministry of Health.</li> <li>• New water law under the confirmation.</li> <li>• Important of National strategy to identify the priorities of key</li> </ul>

- Ministry of Ecology can be a focal point in terms of the use of technical water (watering green grass, etc.).
- Senior experts in reuse practice.

- German, Austrian and US technologies in hydrology.

#### **Sources of technologies purchased and installed by the government**

- Turkish companies (affordable in terms of logistics and price).

#### **Need for German technologies::**

- There are great opportunities for and need for German technology for drinking water clarification and irrigation, even if the logistics could be relatively expensive. These technologies could relate to water saving, wastewater treatment, water quality testing (sensory) and water reuse.

#### **Existing German companies in the water sector in Azerbaijan:**

- **Hach Lange GmbH** – in laboratory field.
- Hydrometeorological equipment from **OTT Hydromed company**.

#### **Disadvantage:**

- Absence of service (without service, cannot serve in the market, especially for installation).
- No experience with German companies/experts (amount of rainfall is different in Europe and Azerbaijan, therefore, expertise and interests do not coincide with European countries).

#### **Opportunity:**

- Positive about future inquiries of German agencies/companies regarding the irrigation (need for international best practices).

stakeholders, directions of investments and activities in a long run.



*Table 11: Role of private sector in water sector, partnerships.*

Financial and institutional support to water research	Partnership with the government/ministries in projects
<ul style="list-style-type: none"> <li>• Public sector is the key implementor, inclusion of private sector must be approved.</li> <li>• Inclusion of private sector can enhance diversification of financing, increase quality and speed.</li> <li>• Long-term financial support from government to be provided to measure results of projects</li> </ul> <p><b>Opportunity:</b></p> <ul style="list-style-type: none"> <li>• Existence of research institutions (even within the entities – “Azersu”, Ministry of Ecology), monitoring laboratories of Ministry of Ecology about the monitoring of rivers, and drinkable water.</li> <li>• The MOU between the Ministry of Ecology and Natural Resources of Azerbaijan and The Ministry of Environment, Nature Protection and Nuclear Safety of Germany on implementation of clean development mechanism, signed in 2007.</li> <li>• Partnership with German Development Bank on the creation of first biosphere reserve.</li> <li>• Establishment of Samur-Yalama National park with the financial support of German Federal Government within the framework of “Caucasus Initiative” program.</li> </ul> <p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• Collaborative scientific research.</li> <li>• Government support to Azerbaijani researchers to increase impact scores.</li> </ul>	<ul style="list-style-type: none"> <li>• 2020-2022 Activities Plan is in place in accordance with the President’s decree.</li> <li>• A commission has been established in order for the building of water reservoir (first phase is to be completed).</li> <li>• Monitoring Okhchucay river (no settlement in Karabakh region, and therefore no massive projects).</li> </ul> <p><b>Necessity:</b></p> <ul style="list-style-type: none"> <li>• To build new water reservoirs</li> </ul> <p><b>Opportunity:</b></p> <ul style="list-style-type: none"> <li>• New liberated lands including huge water resources</li> </ul> <p><b>Challenge:</b></p> <ul style="list-style-type: none"> <li>• Capacity to clean those new reservoirs.</li> </ul>

## 5.2. Key Statements from the Stakeholders, Azerbaijan

### Ministry of Agriculture



*“As it is known, every 1000 cubic meters of water is sold for 0.50 Manats (0.27€) by Melioration Farming OJSC. But during sewage and sewage treatment, 1000 cubic meters of water costs more than 300 US Dollars. This is not profitable in terms of economic efficiency. The degree to which these waters are purified is a more important issue in terms of food safety. “*

### Azerbaijan Amelioration and Water Farm OJSC



*„We have many existing problems, but we are trying to make the system more modern as much as possible and use new technologies. Many internal rivers in Azerbaijan are also drying up, so there are many problems. In this field, we have international cooperation with many countries. Together with the FAO we organize some awareness projects, together with JAICA we start our 2-year mission from March. Israeli and Turkish companies often apply to us.“*

*„Companies related to irrigation technologies inquire to us. But the point is that we cannot put pressure on the farmers to forcefully apply a specific technology.“*

*„Everything is done through open tender as you know. Companies participate in tenders, the winning company works with us, that is, we do not deal directly with anyone. (tender.gov.az).“*

In the next 2-5 years, Melioration Committee aims to (1) Upgrade the water system; (2) Raise awareness of farmers (water scarcity and economic use of water).



### **Ministry of Ecology and Natural Resources**

*„Of course, the Azerbaijani Government is interested in the participation of companies from other foreign countries, but I am not yet familiar with such a fact in our field. “*

*„It would be great to organize meetings with experts from Germany on evaluation issues. There will be enough questions in those meetings and our experts may have questions. Questions arise during the execution of the work, and we need experts to answer these questions.“*

*„The representatives of the German Bundestag and the Greens were invited to draw attention to the activities of the “Zangazur Copper Molybdenum Plant”, which operates the Gajaran mine, in which the German company “Kronimet Holding” is the main shareholder, which poses a serious threat to the environment and human health.“*



### **Baku State University, Department of Hydrology**

*„There is a need for research on water monitoring, mainly transboundary water treatment. At the same time, we can use melting glaciers and groundwater as a water source. There is a need for research in this regard. “*

*„It would be exciting to ask about water storage methods and technologies in this regard, increasing the amount of water. It would be great to be interested in more efficient water use methods, especially in agriculture. Water consumption during agriculture is excessive, and a system should be created. Expert advice [from German companies] on making this system would be beneficial for us. “*

*„Financial support for conducting research in Azerbaijan is fragile. Financial support mainly comes from international organizations such as the EU and UNDP. They provide the very short-term financial support needed to see the research results. Only research is*

*conducted, but no financial support is provided for its consequences.*  
“

### 5.3. Results of Interviews. Georgia

Overall, 3 interviews were conducted in Georgia. The key stakeholders involved in the interviews and their roles in the national water sector are following (see Table 12):

*Table 12: Key stakeholders involved in interviews in Georgia.*

National Environmental Agency	KfW Development Bank	GIZ Georgia
<ul style="list-style-type: none"> <li>• Environmental monitoring (quality of air, water and soil)</li> <li>• Environmental assessment</li> <li>• Environmental education and outreach</li> <li>• Policy development</li> <li>• Pollution control</li> </ul>	<ul style="list-style-type: none"> <li>• Bank and development institution with financing expertise</li> <li>• Financing and supporting programmes and projects in public sector</li> <li>• Major focus on developing countries and emerging economies</li> <li>• Support from conception and execution to monitoring of projects</li> </ul>	<ul style="list-style-type: none"> <li>• Management of regional programmes implemented in Georgia and also in Azerbaijan and Armenia</li> <li>• Major focus on sustainable development, civic society and public administration, environmental policy, conservation and sustainable use of natural resources</li> </ul>

The key findings from the interviews are given in Tables 13, 14 and 15 on pages 41, 42 and 43:

*Table 13: Ecological problems, research & solutions, and prevention against water pollution.*

Ecological problems	Solutions & additional steps to address the ecological problems	Ecological (water) research	Prevention plans against water pollution
<ul style="list-style-type: none"> <li>• Inferiority of wastewater network (only 10-12 significant cities having proper wastewater system &amp;</li> </ul>	<p><b>Opportunity:</b></p> <ul style="list-style-type: none"> <li>• Transborder partnership with Azerbaijan within the EU projects and</li> </ul>	<p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• Regional working group of researchers on water-related issues.</li> </ul>	<p><b>Necessity/need:</b></p> <ul style="list-style-type: none"> <li>• Ensure effective system for preventing existing environmental challenges,</li> </ul>

<p>wastewater treatment plants).</p> <ul style="list-style-type: none"> <li>• Intensification of agriculture that leads to contamination of water resources e.g. rivers.</li> <li>• Discharge of waste into rivers e.g. medical waste produced by hospitals.</li> <li>• <b>Wastewater flow to the rivers.</b></li> </ul>	<p>national governmental institutions.</p> <p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• Establishment of permanent secretariat or a working group on assessing the situation in Kura River basin.</li> <li>• Financial support.</li> <li>• An incentive to change behavior of upstream countries (using reward/punishment systems).</li> <li>• Building efficient irrigation systems like strip irrigation to reduce water loss.</li> </ul>	<ul style="list-style-type: none"> <li>• Scientific institutions to produce scientific articles.</li> </ul>	<p>emphasizing water treatment plants.</p> <ul style="list-style-type: none"> <li>• Watershed management across borders.</li> <li>• Establishment of effective water treatment plants.</li> </ul>
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**Table 14:** Technologies, technological challenges, and support mechanisms.

Water cleaning systems and technologies	Source of technologies, need for German technologies	Need for regulations to facilitate water management ts
<ul style="list-style-type: none"> <li>• Wastewater treatment plants being mechanical and biological (&amp; detection options for various chemical).</li> </ul>	<p><b>Awareness (German company):</b></p> <ul style="list-style-type: none"> <li>• Pfeiffer.</li> <li>• Heidelberg (cement).</li> <li>• Knauf.</li> </ul> <p><b>Awareness (Austrian company):</b></p> <ul style="list-style-type: none"> <li>• Strabag (wastewater treatment plants in Batumi city).</li> </ul> <p><b>Competition between Turkish and German companies exists. Turkish materials are also expensive and with high quality.</b></p> <p>German companies are strongly represented in Georgia (especially in the field of agricultural irrigation). Monitoring of water resources also requires special technology. In addition, qualified maintenance of water treatment</p>	<ul style="list-style-type: none"> <li>• Water-relative legislation to establish water management system at a national level.</li> <li>• <b>Water law.</b></li> </ul>

	<p>plants (Batumi and Tbilisi) is required.</p> <p>No existence of Chinese companies.</p>	
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**Table 15:** Role of private sector in water sector, partnerships.

Financial and institutional support to water research	Partnership with the government/ministries in projects
<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>• Existence of ADB, EIB, AFD and World Bank in water sector.</li> </ul>	<p><b>Challenge:</b></p> <ul style="list-style-type: none"> <li>• Less possibility of public-private-partnerships (PPPs).</li> <li>• Profitability and sustainability of partnership for private sector must be tangible.</li> <li>• Political perception/government's decision.</li> <li>• Participating in tenders (Georgian language requirement for required documents and legal disputes).</li> </ul>

## 5.4. Key Statements From The Stakeholders, Georgia

### National Environmental Agency



*"It will be very nice to have some regional working groups of researchers working together on water-related issues and scientific institutions issuing the institutions working together permanently than have a new to give new articles scientific and so on. Yes, I see a deficiency here."*



### KfW Development Bank

*„Regarding the water sector, the Environmental challenge is an inferior Wastewater network, so there are only 10 or 12 most significant cities with a proper Wastewater system and functional wastewater treatment plants. The rest of the Wastewater goes to the rivers until they see results. That is the biggest challenge. “*

*„Pfeiffer was the most significant plant. Operating in Georgia. Pfeiffer is a prominent German Company. But unfortunately, last year, they got bankrupt worldwide. There also is the Austrian Company Strabag. He’s also in charge of our wastewater treatment plants in Batumi. “*

*„When you want quality products, this can be German or Turkish. Good quality Turkish materials and so on are not cheap but also expensive. If you are tender, you must write the correct specifications for good quality products. And yes, European materials are very competitive, but Chine does not exist in our country. I am trying to remember any Chinese company participating in our tenders. “*

## 5.5. Results of Interviews. Armenia

Overall, one interview was held in Armenia. The key stakeholder involved in the interview and its roles in the national water sector are following (see Figure 12):

GIZ Armenia

- Management of regional programmes implemented in Georgia and also in Azerbaijan and Armenia
- Major focus on sustainable development, civic society and public administration, environmental policy, conservation and sustainable use of natural resources

*Figure 12. Key stakeholders involved in interviews in Armenia.*

The key findings from the interviews are given in Table 16:

*Table 16: Ecological problems, research & solutions, and prevention against water pollution.*

Ecological problems	Solutions & additional steps to address the ecological problems	Ecological (water) research	Prevention plans against water pollution
<ul style="list-style-type: none"> <li>• Water scarcity due to the climate change.</li> <li>• Depletion of freshwater groundwater resources in Ararat Valley.</li> <li>• Further deterioration of Lake Sevan water quality due to the lack of wastewater treatment.</li> <li>• Increasing frequency and severity of extreme weather events such as draughts, mudflows, etc. due to the climate change.</li> <li>• Degradation of ecosystems and biodiversity loss caused by mining activities</li> <li>• Poor environmental governance.</li> </ul>	<p><b>Opportunity:</b></p> <ul style="list-style-type: none"> <li>• Partnership with international donor organizations and IFIs to increase technical capacity of government institutions.</li> <li>• Implementation of capital investment and pilot projects.</li> <li>• Adaptation plans and other strategic documents</li> </ul> <p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• Enhancing decision maker capacities for sustainable implementation and maintenance of international project results.</li> </ul>	<p><b>Need:</b></p> <ul style="list-style-type: none"> <li>• In-site measurements for environmental indicators with regard to water quality and quantity, meteorological conditions, and water use.</li> </ul>	<ul style="list-style-type: none"> <li>• Development of hydrometeorological monitoring network.</li> <li>• Wider use of satellite data products.</li> <li>• Information and knowledge sharing between the countries.</li> <li>• Joint studies.</li> </ul>

## 5.6. Key Statements from the Stakeholders, Armenia

### GIZ Armenia



*„Major challenges of cooperation prospects are unstable regional political situation, and ongoing conflict between Armenia and Azerbaijan. “*

*„Necessities in assessing transboundary river basins are (1) establishing transboundary cooperation, and (2) initiating dialogue between countries and building constructive relationships.”*



*„Regarding the joining projects in Armenia and Germany or upcoming joint ventures/activities, EU4Sevan, SEVAMOD2, and future bilateral German/Armenian bilateral portfolio in the sectors of energy, decentralization/governance, private sector development and vocational education/training can be emphasized.”*

## 6. Recommendations

### 6.1. Needs for Development

Azerbaijan, Armenia, and Georgia have been making significant efforts to modernize its water infrastructure in recent years. The country faces various water management challenges due to its geography, climate, and hydrological characteristics. Some of the key issues include water scarcity, water quality, inadequate infrastructure, and inefficient water use.

To address these challenges, the two countries have been implementing a range of measures aimed at modernizing its water infrastructure. These include:

- **Construction of new water supply and distribution systems:** The government has been investing in the construction of new water supply and distribution systems to ensure that water reaches all parts of the country. This includes the construction of new water treatment plants, reservoirs, and pipelines.
- **Rehabilitation of existing infrastructure:** The government has also been rehabilitating existing water infrastructure to improve its efficiency and effectiveness. This includes the rehabilitation of old water treatment plants and pipelines.
- **Introduction of new technologies:** South Caucasus countries has been introducing new technologies such as water metering, leak detection systems, and remote monitoring to improve the efficiency of water use and reduce losses. These systems are designed to remove impurities and contaminants from the water supply, ensuring that it is safe and clean for consumption. This technology helps to improve the overall quality of the water supply and reduce the risk of waterborne diseases. Azerbaijan has implemented advanced water treatment and filtration systems in several cities, including Baku and Ganja. These systems have improved the quality of the water supply and reduced the risk of waterborne diseases. made significant strides in implementing smart water management systems. Former Azersu OJSC (currently merged under State Water Resources Agency) launched to install advanced sensors and analytics in its water distribution network to monitor water usage and detect leaks. This will assist to reduce water losses and improve the efficiency of the system. National Hydrometeorological Services highlighted that

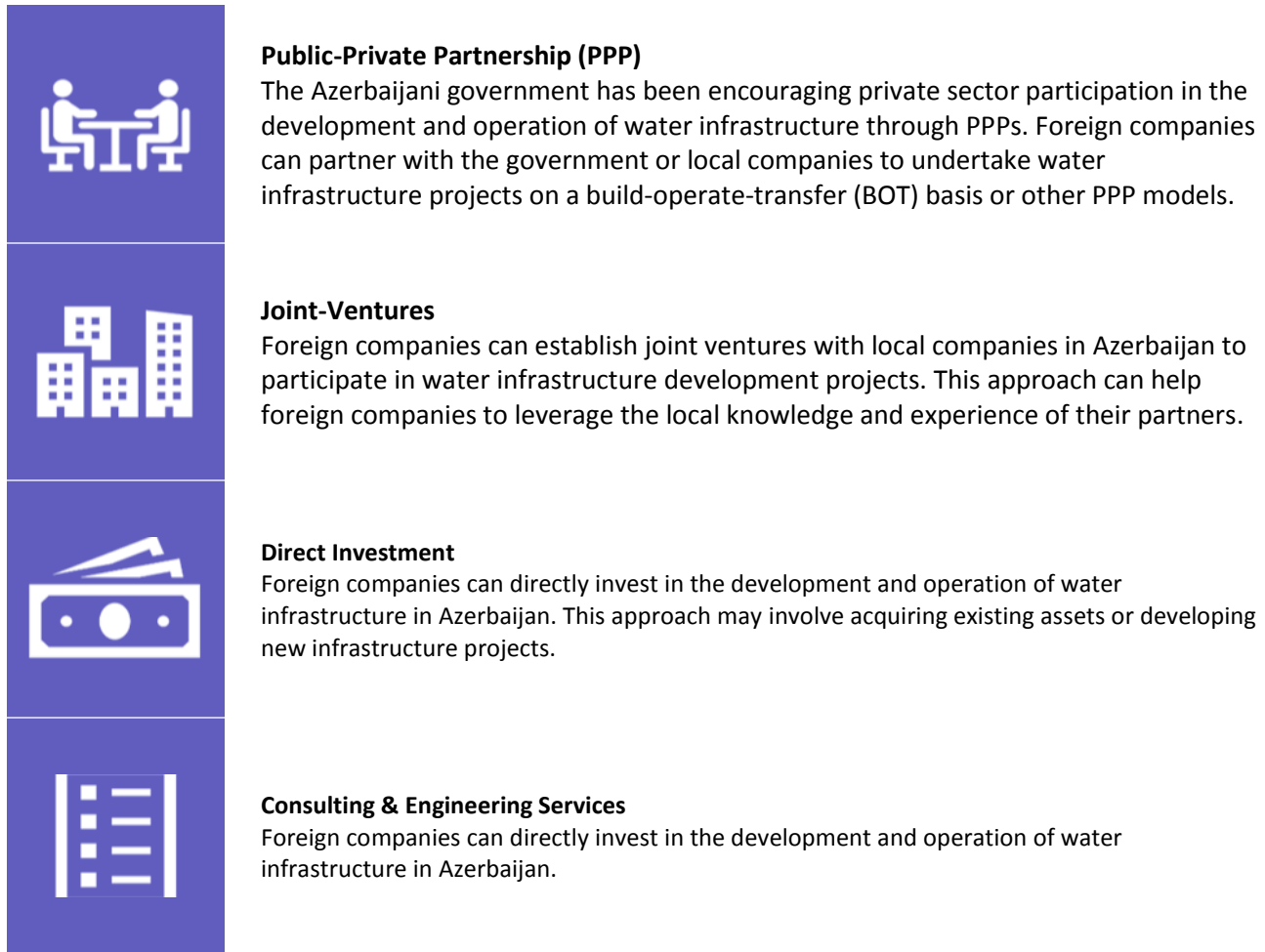
installation of automatic hydrological stations, which are equipped with quality sensors to detect transboundary pollution in rivers entering the country through the mentioned territories, is currently in progress. This process will be completed in the second quarter of the year and will enable online (remote) monitoring of the water quality. Despite new technologies have been introduced, there is still a significant room for improvement, localization and monitoring the success rate of adoption.

- **Implementation of water conservation measures:** The government has been implementing water conservation measures such as promoting water-saving technologies and practices to reduce the demand for water.
- **Strengthening of institutional and regulatory frameworks:** The government has been strengthening its institutional and regulatory frameworks to ensure effective water management and governance. This includes the establishment of water user associations and the development of water pricing policies.

Despite above mentioned measures are helping Azerbaijan to modernize its water infrastructure and address its water management challenges, there is still a long way to go to ensure sustainable water management and to meet the increasing demand for water in the country.

## **6.2. Channels to Tap on Opportunities in Azerbaijan, Armenia, and Georgia**

Therefore, there is a significant need to build long-term partnerships with foreign companies and governments to learn best practices and benefit from the transfer knowledge and experience. Foreign companies interested in entering the modernization of water infrastructure business in the three countries can do so through several channels (see Figure 13 on page 48):



*Figure 13. The most important opportunities in the countries of the South Caucasus.*

It is important for foreign companies to understand the local legal and regulatory framework for water infrastructure development in Azerbaijan. The government has established the State Agency for Water Resources to oversee water management in the country, and foreign companies must comply with its regulations and procedures. Additionally, foreign companies should be aware of the cultural and business practices in Azerbaijan to effectively navigate the local market.

### **6.3. Transfer of Best Practices and Know-How**

As the key findings of the report stated, there is a significant need for building new water reservoirs in Azerbaijan. The construction of new reservoirs should be planned and implemented employing technology that provides high efficiency and mitigates the risk of environmental and ecological implications. However, expertise existing in the country, from both skills and technology perspectives, does not embrace sustainability

goals. In this sense, firms with relevant experiences and practice can tap on opportunities to offset the existing gaps.

German companies can bring their experience in constructing large dams, reservoirs, and retention basins to Azerbaijan. These companies can also provide expertise in developing reservoirs that are resilient to climate change and extreme weather events. This report recommends that German companies offering following products and services in the field of water reservoir construction to consider business opportunities in Azerbaijani, Armenian, and Georgian markets.

## 6.4. Building New Water Reservoirs



**Roller Compacted Concrete (RCC) Dams:** RCC dams are a popular technology used in Germany for building water reservoirs. This technique involves using a low-slump concrete mixture that is compacted using rollers. RCC dams are quicker to construct than traditional concrete dams, making them a cost-effective option for building water reservoirs<sup>57</sup>.



**Geosynthetics:** Geosynthetics are synthetic materials used to reinforce soil and provide stability to earth structures. They are commonly used in Germany for building dams and retaining walls.<sup>58</sup> By incorporating geosynthetics into the construction of water reservoirs in Azerbaijan, it is possible to reduce the amount of soil needed for construction, which can lower costs and improve sustainability. This particularly recommended to be considered in projects to execute in Karabakh region due to specific soil and earth structure of the land.



**Renewable Energy Integration:** Germany is a leader in integrating renewable energy sources into infrastructure projects. This can be applied to the construction of water reservoirs in Azerbaijan, where renewable energy sources such as solar power and hydropower can be used to power the reservoirs and the surrounding infrastructure. Companies that successfully performed renewable energy integration in reservoir construction should offer consultancy to Azerbaijani and Georgian companies and government agencies with the purpose of capacity-building and exchange of good practices.<sup>59</sup>



**Water Management Systems:** These systems can be used to ensure that water is effectively distributed from the reservoirs to different parts of Azerbaijan. They can also be used to monitor and control the water quality in the reservoirs, ensuring that it meets the necessary standards. Research also revealed that, even though some similar systems and technologies were procured and applied, there has been an issue with service and maintenance. Hence, companies are highly recommended to offer after-sales service and maintenance plans that encompasses skills training for also building local capacities.

<sup>57</sup> Lange B., Hering F. / Schlegel R. / Leyendecker G. / Ortega F., 2012

<sup>58</sup> Arnepalli D.N., Karpurapu R. ResearchGate, 2015

<sup>59</sup> International Trade Administration, 2022

## 6.5. Cleaning Polluted Water Reservoirs and Rivers



**Constructed Wetlands:** Constructed wetlands are artificial wetlands designed to treat wastewater or contaminated water. These wetlands are often planted with vegetation that can absorb and remove pollutants from the water. Germany has developed good practices in designing and constructing constructed wetlands<sup>60</sup>, which can be applied for cleaning up polluted rivers and reservoirs in Azerbaijan.



**Biofiltration Systems:** Biofiltration systems use living organisms to remove pollutants from water. These systems can be used to treat contaminated water from industrial processes, stormwater runoff, or wastewater. German companies that had developed a range of biofiltration systems that can offer solution package for cleaning up polluted rivers and reservoirs in Azerbaijan.



**Dredging:** Dredging involves removing sediment and other materials from rivers and reservoirs to improve water quality and depth. German companies have advanced expertise in dredging technologies, which can be applied for cleaning up polluted rivers and reservoirs in Azerbaijan.



**Advanced Oxidation Processes (AOP):** AOPs are chemical treatment processes that use advanced oxidation techniques to break down organic and inorganic contaminants in water. These processes can be used to treat polluted water from industrial processes, mining, or agriculture. Germany has developed a range of AOPs that can be applied for cleaning up polluted rivers and reservoirs in Azerbaijan. This is particularly to be considered by companies whilst offering solutions for cleaning heavily polluted Okhchuchay river in Zengilan.

## 6.6. Reuse of Wastewater as Technical Water



**Membrane Bioreactors (MBR):** MBRs are advanced wastewater treatment systems that combine biological treatment with membrane filtration. These systems can produce high-quality effluent that can be reused for non-potable purposes. Germany has extensive experience in designing and implementing MBR systems, which can be applied for the treatment of wastewater in across the country.



**Advanced Oxidation Processes (AOP):** There are companies in Germany that developed a range of AOPs that can be applied for the treatment of wastewater to produce high-quality effluent for reuse. Lack of AOP treatment in Azerbaijan and Georgia should be considered by German companies for transferring the know-how and their expansion to new markets.



**Reverse Osmosis (RO):** RO is a membrane filtration technology that can be used to treat wastewater to produce high-quality technical water. Azerbaijan needs to advanced expertise in designing and implementing RO systems for wastewater treatment. Currently this is implemented in a primitive way using obsolete technology and methods, Hence, foreign companies should contemplate this knowledge and technology gap and offer awareness raising on RO systems in Azerbaijan and Georgia.



**Water Reuse Guidelines:** Germany has developed comprehensive guidelines for the reuse of treated wastewater. These guidelines provide a framework for the safe and effective reuse of wastewater for non-potable purposes. By incorporating these guidelines into its water infrastructure planning, Azerbaijan can ensure that its wastewater reuse practices are sustainable and meet the necessary health and safety standards. Incorporating these German practices and technologies into the treatment and reuse of wastewater can help Azerbaijan to meet its water sustainability goals and promote the efficient and effective use of water resources.



## 7. Conclusion

In summary, this research paper has provided a comprehensive analysis of the water infrastructure and management challenges in the South Caucasus countries, shedding light on the major gaps and investment opportunities for German companies.

By addressing these challenges, German firms can play a significant role in promoting sustainable water management and contribute to the achievement of the United Nations' Sustainable Development Goals (SDGs), particularly SDG 6, which aims to ensure the availability and sustainable management of water and sanitation for all.

The South Caucasus region faces a range of environmental issues, including water scarcity, pollution, and inefficient water management. These problems are exacerbated by a lack of robust infrastructure, outdated technology, and inadequate regulatory frameworks. Consequently, efforts to resolve these issues require a multi-faceted approach that includes technological advancements, capacity building, and collaboration between governments, the private sector, and civil society.

German companies possess the expertise and cutting-edge technology required to address these challenges effectively. By investing in the South Caucasus water sector, these firms can help bridge the gaps in infrastructure, provide innovative solutions to reduce water waste and pollution, and support the development of sustainable water management practices. This would not only benefit the local population and environment but also open up new markets and business opportunities for German companies.

Collaboration between German firms and local stakeholders is essential to ensure that the solutions and technologies provided are tailored to the specific needs of the region. By engaging with local communities, governments, and non-governmental organizations, German companies can gain a better understanding of the unique challenges faced by the South Caucasus countries and co-create sustainable solutions that are culturally sensitive and contextually appropriate.

Moreover, German companies can also play a crucial role in capacity building and knowledge transfer. By providing training and education to local professionals, they can help develop a skilled workforce capable of managing and maintaining water

infrastructure systems, thereby ensuring the long-term sustainability of their investments.

In conclusion, the South Caucasus region presents a wealth of opportunities for German companies to contribute to sustainable water management and the achievement of the SDGs. By leveraging their expertise and technology, German firms can help address the major gaps in water infrastructure and management, while also benefiting from new business opportunities and fostering positive relationships with local stakeholders. Ultimately, this collaboration can lead to a more sustainable and prosperous future for both the South Caucasus countries and the German companies involved.

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