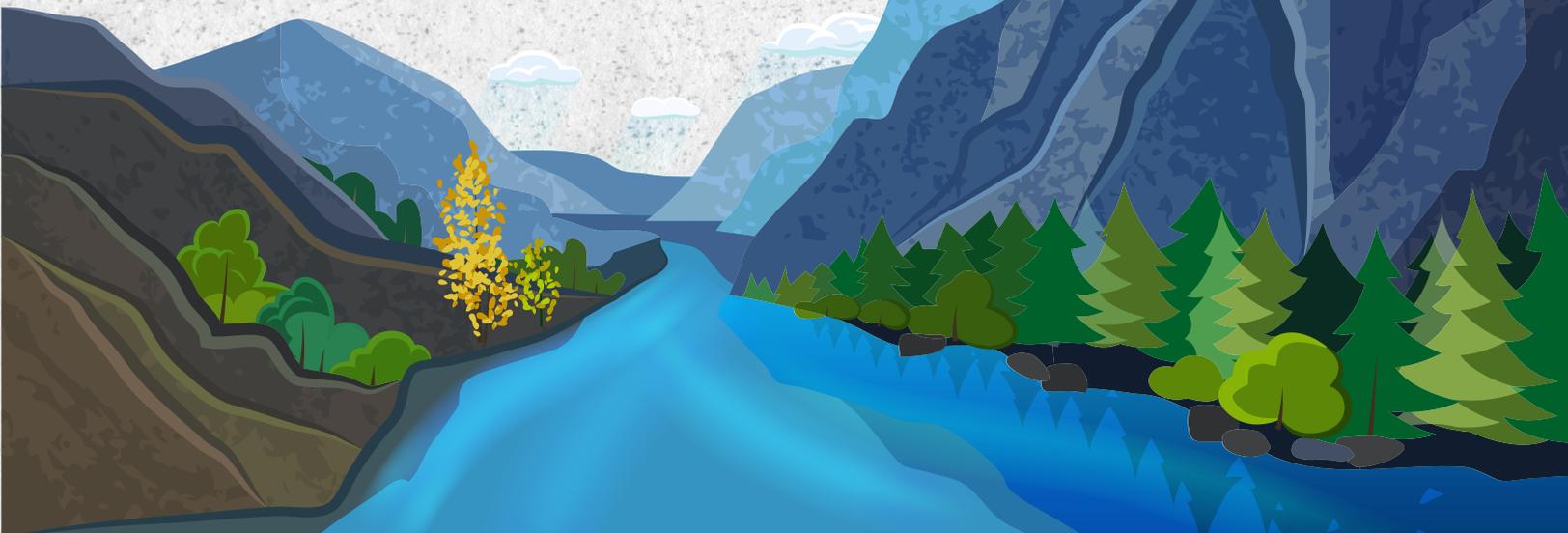


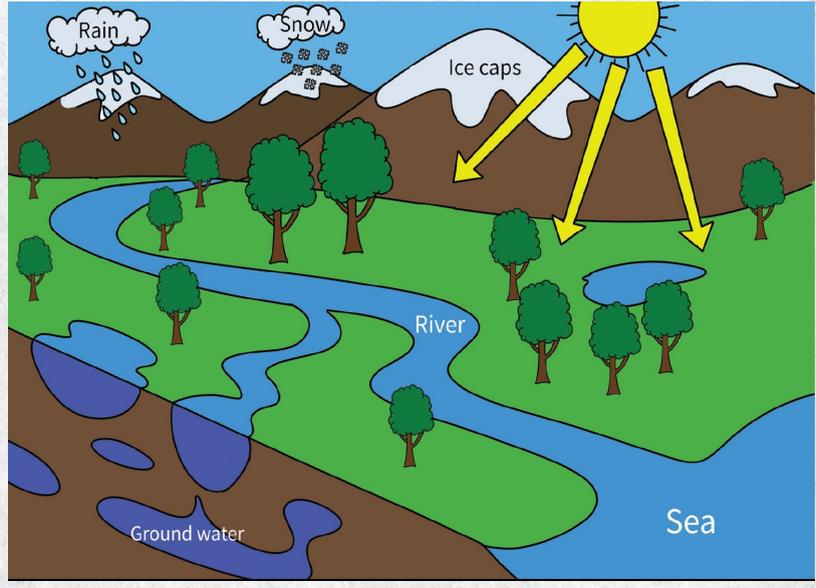
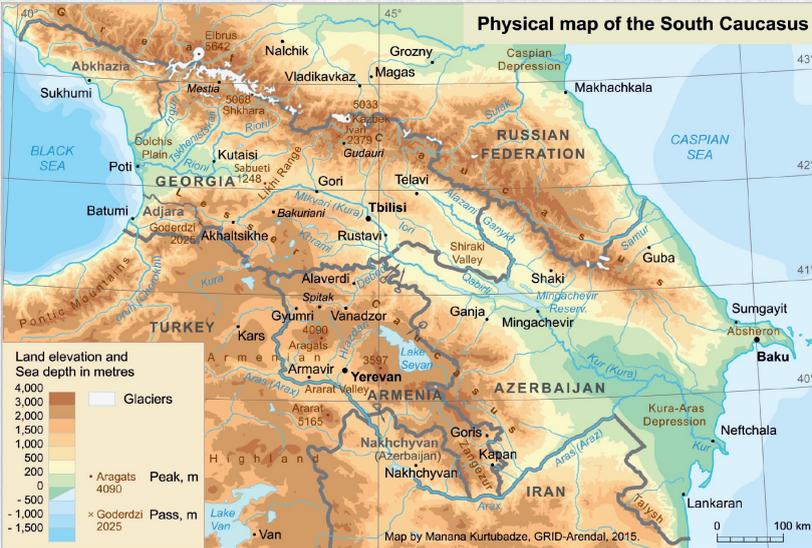


Geography of river basins

IX-XI Grades



Physical map of the South Caucasus



In ordinary life we often come across the term “river basin”, which differs in substance from a river. Let’s understand the differences between them. A river is a stream of water that flows down from higher ground (mountains) and empties into seas/oceans/lakes/wetlands. Usually, rivers are fed by rainfall, glaciers and underground waters. All of these waters flow together, gathering at the lowest point on adjacent land as runoff (water streaming into a river channel), the volume of which differs by seasons (measured in $m^3/second$). A river basin is formed by the portion of land where precipitation falls and is collected before draining into a specific river channel. As a rule, a big river basin consists of several sub-basins, or tributaries. For instance, there are several sub-basins in the Kura River basin, including the Alazani, the Ksani, Ganikh, Aras, and the Iori.

As you know, water is in constant motion on the earth. It transforms from one physical state into another (liquid, gas, and solid). This motion is driven by the energy of the sun. When naturally transforming from one state into another, water completes a process known as the “watercycle”. It is a never-ending, continuous progression from one physical state to another.



The water cycle consists of several stages. It begins with evaporation, when the sun causes bodies of water (seas, rivers, oceans, and lakes) to become vapor, or evaporate. Since water vapor is lighter when compared with water, it rises into the atmosphere. Unlike seawater, water vapor does not contain salts and is essentially the same as distilled water.

When atmospheric temperature drops, water vapor condenses into ice crystals or into water droplets, which collectively make up clouds. Clouds travel for long distances pushed along by winds. When the particle density of a cloud increases so much that air cannot hold the extra weight of the cloud, the condensed water droplets fall onto the ground as well as the surface of water in the form of rain, snow, or hail.

Precipitation that falls onto land drains into the ground (ground water) or creates a water stream on the surface of land and flows into rivers, lakes and seas. Precipitation in the form of snow melts seasonally or remains frozen and can create glaciers over a long period of time.

Some of the precipitation that falls on land seeps into the ground and is absorbed by the root systems of plants. From their leaves it evaporates back into the atmosphere. This process is called transpiration. The term evapotranspiration is used when the process of both transpiration from leaves and evaporation from land is described together.

The water cycle provides a significant benefit: water bodies, such as rivers, lakes, wetlands, etc. are formed as a result of the water cycle on the earth. Glaciers, which contain significant reserves of freshwater, are also formed as a result of water cycle. The water cycle is the most important factor in regulating air temperature and influencing global climate. Water's ability to clean itself is also related to the water cycle.

It Is Interesting

It may take one or thousand years to complete a water cycle. It depends as to how quickly water transforms from one physical state into another.

For instance, rainwater, which falls directly on oceans and rivers, goes through the cycle relatively faster than the water which appears in glaciers or underground. The water accumulated in glaciers will become part of a water cycle only after it defrosts, which may take hundreds of years. The same applies to groundwater. It may take thousands of years before the ground water returns to the surface of the Earth, is exposed to sunlight and re-enters the water cycle.

Some rivers flow through the territory of more than one country. Consequently, their basins are located in different countries.

Such rivers are called transboundary rivers (e.g. the Kura River).

A river basin can be conditionally divided into the downstream and upstream sections of a river. The water users of a river downstream from a particular point, which are towns, villages, and enterprises - depend on the upstream users. It is easy to understand that if the river is polluted in the upper stream, or if water intake is excessive from the river basin, it will negatively affect the downstream users, including those in transboundary river basins. This has often become a reason for conflict among contiguous countries.

At the current stage of mankind's development, the biggest problem is decreased availability of fresh water. The rapid growth of population and intensive agricultural and industrial development over the recent decades has put increased pressure on water resources. Water scarcity has become a crucial problem in many regions of the world. The situation is complicated further by the impact of climate change, which further reduces the amount of available water.

Georgia is not a country with scarce water resources but this is not a reason to be complacent. Water resources are unequally distributed in Georgia, the same as in much of the world. The western part of the country is three times richer in water resources compared to the eastern part of Georgia. In some areas of Georgia lack of water is already a reality. It is also expected that climate change will lead to decreased runoff in the Kura basin. This will further increase the demand for water (for irrigation, potable water and enterprise) and worsen the relatively small problem of water deficit that we encounter today. This will consequently affect the socio-economic circumstances and psychological well being of the people who live in river basins.



As climate warms, the process of evaporation from rivers, lakes, headwaters and the land itself will become more intense. It is important to note that these problems are transboundary in nature. For example, the Kura and Chorokhi Rivers flow into the territory of Georgia from Turkey. In turn, the Kura River flows into the neighboring country of Azerbaijan from Georgia. The transboundary nature of the river aggravates the problem, and makes it international.

A country may have fresh water in sufficient amounts to serve its population but it becomes usable for consumption only after it is delivered to users at an appropriate time, in sufficient amount and with acceptable quality. For this purpose, water infrastructure is arranged, which includes reservoirs, irrigation channels, drainage systems, dams, water supply and discharge networks, pumping stations, treatment facilities for potable water and discharge water, etc. Adequately qualified personnel are also necessary in order to maintain this infrastructure, as well as adequate finances and regulations to provide a sufficient amount and quality of water that is distributed fairly to the population. Relevant institutions to implement these regulations must also be in place. Ultimately, the goal of water resource management is to ensure sufficient water for all water users (including the environmental components), maintain adequate quality of water resources, and provide water in sufficient amount. All this is referred to as the sustainable management of water.

A key precondition of sustainable management of water resources is engagement of all stakeholders and water users, such as local communities, farmers, businesses, local government authorities and environmental services in the water resources management process. If a river basin is transboundary, transboundary cooperation between the stakeholders becomes relevant. Finally, the outcomes of their cooperation will be reflected in the river basin management plan.



Do It Yourself

- 💧 Together with your classmates choose a river basin and discuss who the water users are in this river basin.
- 💧 Identify the stakeholders who should be involved in the water resource management process (take into consideration the transboundary context, when necessary).
- 💧 With the assistance of your teacher distribute the roles of the river basin stakeholders among the class and try to develop a simple plan of river basin resources management based on your discussions and consensus achieved. What components should a river basin management plan have? Make a presentation of the plan you developed.





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