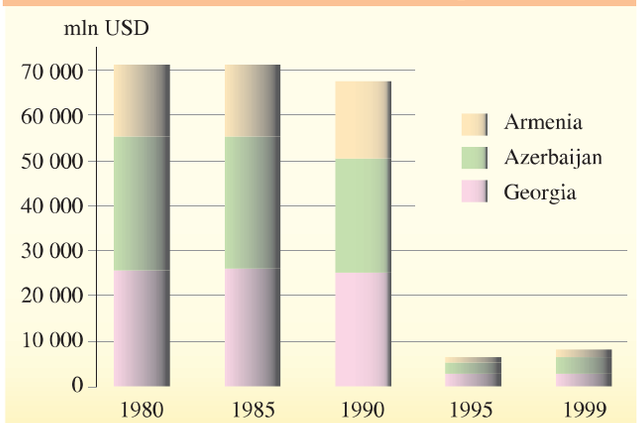
CHAPTER 1.
REGIONAL TREND OVERVIEW

1.1 General Information

During the Soviet era, the Caucasus economy was centrally-planned by the Soviet super-state. Management served more to strengthen the economic and political goals of the state rather than meet market demand. All natural resources and means of production were state-owned. The centralized system played the role of stable guarantor of economic relations between the republics, but the economy of the republics was dependent on Russia.

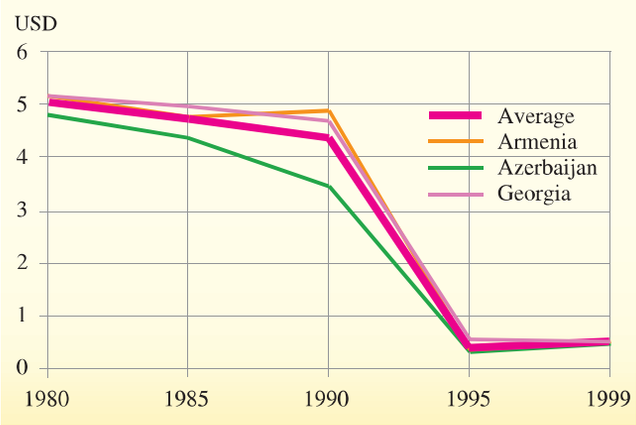
Before the break-up of the Soviet Union, the Caucasus was referred as two economic regions: the North Caucasus (including Rostov region) and the Trans-Caucasus. The latter involved three republics: Armenia, Azerbaijan and Georgia. These economic regions were specialised in several sectors. The tourism sector was also well-developed especially the Black Sea resorts from Anapa to Batumi and the Caucasus Mineralnye Vody (mineral water resorts). In the past, a steady flow of tourists came to the Caucasus, but that flow has been drastically reduced in recent years.

GDP in the South Caucasus in current prices, 1980-99



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000

GDP per capita in the South Caucasus, 1980-99



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000

The Soviet economy was more-or-less stable under the conditions of a planned economy, with growing industrial production and intensive agriculture. A relatively high economic growth rate and standard of living were achieved in the 1970s and 80s, along with a steady growth in GDP. The peak of growth was reached in the late 1980s. The early 1990s, however, were marked by downward trends, explained by overall economic decline. In the South Caucasus, for example, GDP fell to its lowest level in 1992 (1.1 billion USD)[5].

Recently, a slight growth of GDP has been observed. However, the growth rate is far below 1970s figures and is unsteady. GDP growth is largely due to the growth in the service, communications and trade sectors. In other sectors an increase has taken place in mining and oil production. Agriculture is still the most important economic sector for entire region, employing a majority of the adult population. It is noteworthy, that the North Caucasus economy significantly overweighs that of the South Caucasus. By the year 1998, its share of total Caucasus GDP was 77.7%. It was also higher than that the South Caucasus in the 1970s and 80s.

After the collapse of the Soviet Union, economic ties among the republics were broken, resulting in sharp reductions in production, imports and exports. Trade with other former Soviet republics was suspended. The economies of the newly independent states (NIS) could not compete in western markets. The region was most damaged by its high degree of economic specialisation. Industrial and agricultural production failed to meet the demand for basic consumer goods.

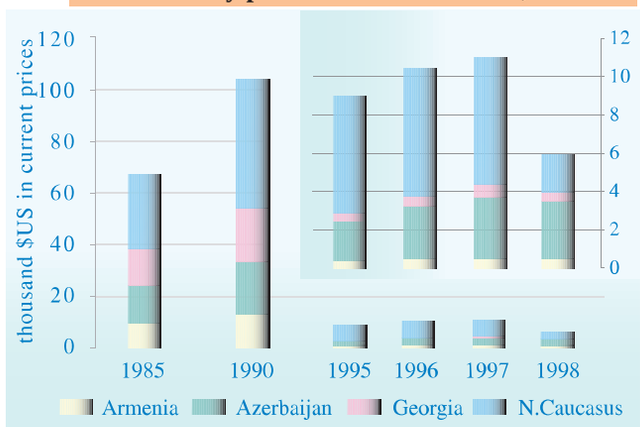
The severe economic crisis of the early 1990s affected nearly all economic sectors. Industrial enterprises stopped functioning and agricultural

5 GDP figures expressed in current rates do not reflect the real situation. The Soviet Union practiced "imaginary" dollar rate, or saying more precisely, there were several currency rates running at the same time. Therefore it is very difficult compare data of different periods. It is clear that data on the Soviet period is artificially lifted up and data on last half of the 1990s in turn is lowered. Therefore, economic decline is even more obvious.

output declined. Production of fruit, tea, tobacco, cotton and wines declined. Hyperinflation deepened the crisis; as the purchasing power of salaries and pensions declined, the standard of living fell. Political instability aggravated the situation.

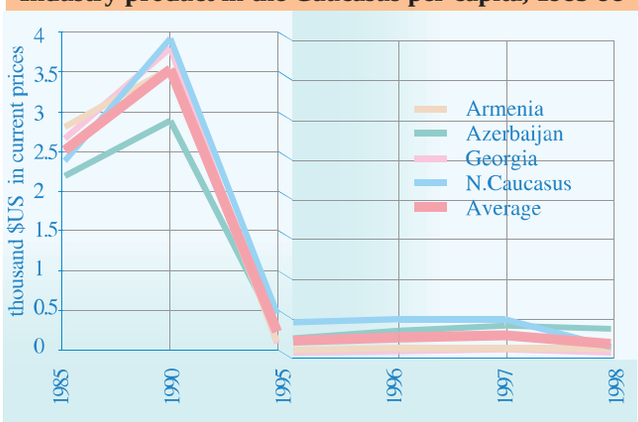
The beginning of the 1990s should be considered a transition from a centralized system to a market economy, but a period of economic destruction. The crisis was followed by some political stabilization, beginning in 1994-95. However, some "hot spots" of political tension still exist in some areas of the Caucasus and continue to impact the region's social and economic life.

Total industry product in the Caucasus, 1985-98



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000
State Committee for Statistics of the Russian Federation, "Regions of Russian Federation"-2000

Industry product in the Caucasus per capita, 1985-98



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000
State Committee for Statistics of the Russian Federation, "Regions of Russian Federation"-2000

1.2 Socio-Economic Driving Forces

1.2.1 Economic Driving Forces

1.2.1.1 Industry

General. In the 1970s and 1980s, industry in the Caucasus was well-developed. The major industrial sectors were: oil and gas, chemicals and machinery industries, ferrous and non-ferrous metallurgy, cement, fertilizer, light manufacturing and food processing.

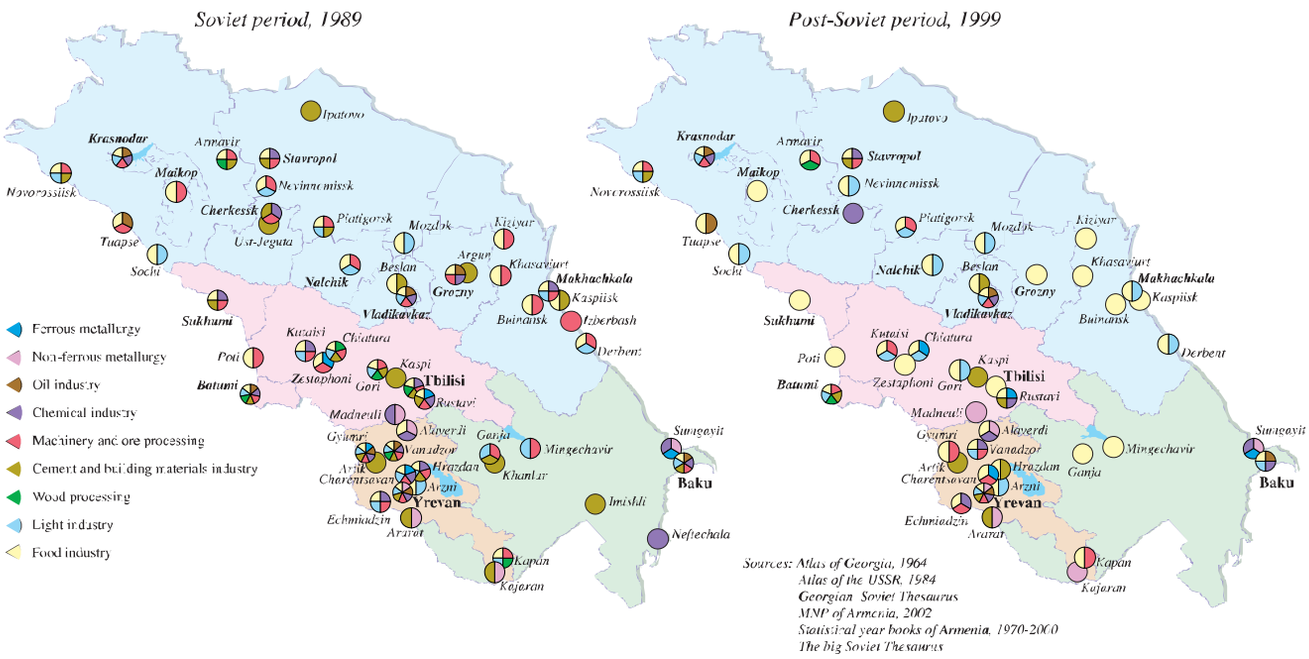
In the Soviet period, rapid industrial development resulted in increased environmental pressures. From 1970 to 1990 overall production, for example, increased three times in the South Caucasus. However, the level of industrial development was still less the union average value. After the USSR was dismantled, industrial production sharply declined in the Caucasus region, as a result of the energy crisis and the break of economic ties between the former republics. Recently, some signs of industrial revival have appeared. However, the growth rate is still insignificant.

In general, industrial activities are not equally distributed across the region. Most industrial centres are located in lowland zones along the railways, concentrated in large cities.

Manufacturing Sector. Some of the most important environmental problems in the Soviet period were connected with manufacturing industries. The Caucasus was not as heavily industrialised as European Russia, and suffered less environmental pollution, but the impact of industry on the environment was not unimportant. Of the heavy industries, oil processing, chemical, metallurgical, machinery and cement manufacturing plants were built, which created some of the most significant centres of pollution. Beginning from the 1970s until the disintegration of the USSR, the increasing trend of impact on the environment from stationary sources was observed, in spite of the fact that a number of environmental legal acts were adopted and Soviet standards were among the strictest in the world. However, the lack of law enforcement from the government side and pollution controls from industry side contributed significantly to increased emissions into all environmental media. High pressures on environment from industry were traditionally due to extensive power and raw material consumption. Explanations for these can be attributed to many causes, the basic among them being the political-economic arrangement of the Soviet Union.

In general, the major focus was on economic growth and rapid industrialization, without proper consideration of environmental issues. In centrally planned socialist systems, all means of

Major industries in the Caucasus



production were owned by the state. Practically no attention was paid to the efficiency implications of pricing. State planners set minimal or no prices on inputs in order to promote industrial development. As a result, the Soviet economy was extremely resource-intensive with economic sectors, including industry, over-utilising natural resources and polluting all environmental media.

Industrial production was significantly reduced in the 1990s. At present, some industrial sectors of industry are not functioning or are in severe crisis (working at 20-25% or less capacity). The fall of industrial production has resulted in some reduction in water and air discharges and industrial waste generation from stationary sources. Nevertheless, the reduction of environmental pressures from industry was not followed by major improvement in the state of the environment. "Old" sources of pollution, toxic industrial wastes, heavy metals accumulated in the ground, obsolete technologies and pollution control equipment still remain important factors contributing to environmental pollution and degradation.

Mining Sector. An important factor influencing the environment, both during the Soviet period and today is open-pit mining operations (non-ferrous metals, manganese, coal, gravel, sands, quartz sand extraction), which are common in the Caucasus. Prospects for future development of extensive mining are likely. Therefore, the mining sector will remain an important factor impacting the environment. In many places, open mines are located on household plots and agricultural lands, causing land degradation, creation of badlands and development of geodynamic processes. Some of the mines are situated at relatively high altitudes, and impose a direct threat to fragile mountain ecosystems, and also affect lowland habitats downstream from such mines. There are few land reclamation works, but where they occasionally are, they yield no results in mountainous areas.

Of particular concern are tailings from extractive and processing operations. There is a high risk that pollutants from these tailings may leach into water systems. This often occurs in the regions where ores are being extracted. Oil and gas-prospecting companies in the Baku-Sumgayit area and the North Caucasus (Krasnodar, Grozny and Maikop) form important centres of pollution as well. Since the mining sector experienced a lower decline than the manufacturing sector in the 1990s, it is a proportionally larger force in the economy.

- Oil has been of greatest importance for Azerbaijan all through its history. Evidences of oil extraction on the Absheron peninsula have existed since the 5th century A.D. In 1897-1907 the 833 km long Baku-Batumi oil pipeline was built, which was the largest in the world at that time (one of the first oil pipelines in the world was built in Azerbaijan in 1878). In 1901, Absheron was the largest oil producer in the world (it accounted for over 50% of the world's extraction). Before World War II, Azerbaijan was the greatest oil extracting and supplying region of the USSR, with ¾ share of total oil extraction. However, this was not followed by important rise in socio-economic conditions in the republic. Moreover, the state of the environment has become worse. Current levels of oil production in Azerbaijan are far below the 70-s and 80-s levels explained by reduced oil reserves, out-of-date technologies, inadequate investments, etc. It is noteworthy to mention that Caspian oil has made the Caucasus a strategic regions.

In the Caspian seashore the extensive extraction of oil has been conducted for more than a century. Therefore its influence on sensitive aquatoria and densely populated area is quite high. In the vicinity of Baku oil has heavily polluted around 10,000 hectares of land. In former USSR the area of Absheron peninsula was considered the region the most polluted by oil products, where pollution was 32 times higher than the background level. In the 1970s the discharge of polluted water into the sea was prohibited, but that brought about no major changes. Wastes, which were neither buried nor utilized, were disposed of on the shore. Therefore during storms they returned to the sea again. This had negative impact on flora and fauna.

- In Chiatura (Georgia) manganese quarries thousands of hectares of agriculture lands have been excavated and become useless. As a result, erosion and landslides have become extensive, comprising a high threat to settlements. Tailings formed as a result of ore enrichment have accumulated in high quantities. Wastewaters with high manganese concentration have been heavily polluting River Kvirila.
- Madneuli (Georgia) non-ferrous metal (copper, lead, zinc and also gold) mine is one of the largest in the Caucasus. It has been exploited since 1970s. The surrounding environment is very degraded and arable lands are useless. Open pit waters of the deposit-based ore processing plant pollute the Kura river tributaries. In 1992 the copper content in the Kazretula river was 220 times higher than legal standard and zinc content was 65 times higher. About 20-30,000 people live in this area. Local agricultural products (mainly vegetables) are supplied to the inhabitants of the city of Tbilisi and its surroundings. Air is also polluted by heavy metals (cobalt, chromium, cadmium, nickel, arsenic, others), where the amount of dust emitted annually amounts to 31 tons.
- In Tyrnyauz (Kabardino-Balkaria, the North Caucasus) tungsten and molybdenum has been extracted and enriched since the Soviet times. After the short break, the industrial activities were renewed here in 1994, although adequate environmental actions were not undertaken. As a result 5,527 t suspended substances, 0.1 t of molybdenum and 0.07 t arsenic flow into the Baksan River annually.

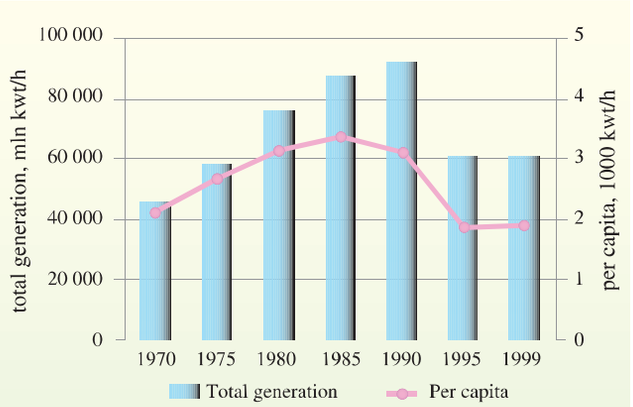
Sources: IUCN, 2000; Tvarlchrelidze A. 1998; MoE Documents; Jaoshvili V. 1996; State Committee on Ecology and Control of Natural Resources Utilization 1998, Baku; State Committee of the USSR on Nature Protection, 1989; G.Info, 1996.

1.2.1.2 Energy

Two major sources are used in the energy sector of the Caucasus: fuel and hydro power resources. They are not distributed equally across the region, one reason for the chronic power shortage in some parts of the region. A major part of the energy resources comes from hydro resources, comparatively less from fossil fuels.

In the Soviet period, the centralised system of electrical power production provided its non-stop delivery to consumers. Thus, in the region there were no real power shortages despite the fact that in some periods energy consumption exceeded production. The deficit was filled by electricity imported from other Union republics. In the 1990s this was more difficult as the centralized system broke-up and fuel prices on the world market were high. Since 1985, power shortages have been a problem for Georgia particularly. It made up in average 2.325-3.64 billion kW/h (Svanidze, 1998).

Power generation in the Caucasus, 1970-99



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000
State Committee for Statistics of the Russian Federation, 1998-2000

Until the end of the 1980s power generation and both industrial and household consumption were steadily increasing. Energy generation increased 2.3 times from 45.9 billion kW/h up to 108.3 billion kW/h. between 1970 and 1990 (Georgia was the only republic where electricity production started to decline from 1985, while its annual consumption increased). At the beginning of the 1990s power generation declined considerably, falling to 75.7-72.2 billion kW/h from 1995-98. The amount of power generated by hydro-electric plants grew in proportion to all power generated. All this indicates that there has been a reduction of air pollution from power plants. However, in recent years, a slight increase in power generation has occurred.

Considerable changes have occurred in the structure of power consumption as well, with increases in household consumption and decreases in the industry, agriculture and transport sectors.

A considerable number of environmental problems are related to the power sector. This is particularly visible in the surroundings of large power plants, although it should be taken into account that natural gas, which causes less pollution of the atmosphere, is used quite widely in the region. Power plants can have environmental impacts over quite long distances. Water used by thermal power plants pollutes transboundary rivers and adjacent areas. Building of hydro-power stations can negatively influence

coastal zones causing soil erosion and destruction of beaches. In this regard, the Black Sea resort zone has experienced significant damage.

Two large nuclear power sources are the Medzamor nuclear plant, in Armenia and the Rostov nuclear power plant, located in the region adjacent to the Caucasus. These plants are important risk factors for the region. Were an accident to occur at the Medzamor plant, for example, the South Caucasus and much of the Middle East would face particular danger. This risk is increased by the fact that the region is a highly active seismic zone.

1.2.1.3 Agriculture

General. During the Soviet era, agriculture was one of the leading sectors of the Caucasus economy. Favourable and diverse climatic conditions and fertile soils promoted the development of comparatively productive agricultural sector there. The Caucasus was an important agricultural region, supplying goods to the entire USSR, including corn, grapes, tobacco, cotton, fruit, tea and citrus. The Caucasus was the only region in the FSU, where tea and citrus were produced. At present agriculture remains the major economic sector in the region, employing a significant amount of the population. Over a certain period, the Caucasus share of the Soviet Union's total output was approximately 20%, while its area was only 2% of the territory of the Soviet Union (WWF, 2001). The abundance of agricultural goods created the basis for developing the food industry (canneries, wine etc).

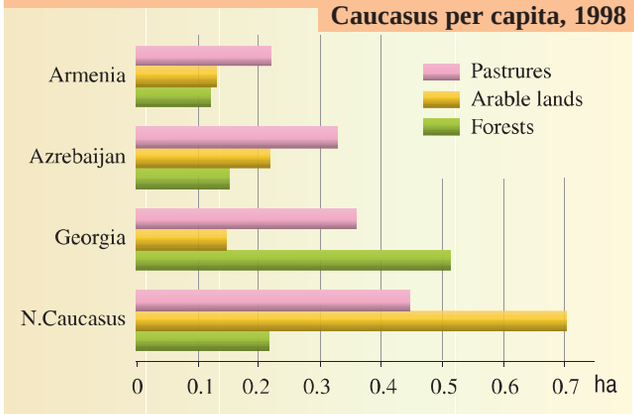
Despite this, agricultural production failed to satisfy the demands of the Caucasian population for many primary products. The main reason for this was the high specialization of agriculture, which emphasized the production of technical raw material as a production base for industry over primary food products. That is why a deficit of numerous food products existed and it was necessary to import these products from other countries.

Overall, Soviet agriculture was highly inefficient and had a poorly equipped infrastructure. Losses in agriculture output were high, while the natural fertility of soils fell in most agriculture regions of the country after 1960. Resources were inefficiently allocated within the sector. Even agriculture branches and regions that were not economically viable were subsidized. According to estimates, environmental pressures were more than twice as high as overall land productivity in the Soviet Union. During the period from 1970 to 1980, a 1% growth in agriculture production was achieved by 4% growth in sector expenditures (Ministry of Nature Protection of Russian Federation, 1994). Thus, over time Soviet agriculture became a resource intensive and inefficient sector, with high pressures on the environment. Caucasus agriculture was not unlike that of the entire Soviet Union.

After the USSR's collapse, basic changes took place in the structure of agriculture. The Caucasian republics, which traditionally produced excess agricultural output, began to experience shortages. Numerous plantations, and orchards gave way to pastures, arable lands and cornfields.

Agriculture Lands. In the Soviet period, arid lands were irrigated and marshy places drained in order to transform them into agricultural lands. Despite these efforts, there has been a decrease in the amount of arable land, caused basically by unsustainable land use practices. At the same time, pastures increased at the expense of arable lands. This has not had a uniform impact on the region's economy. In the regions rich in winter pastures, for example in the North Caucasus, the food base for livestock increased.

Arable lands, pastures and forest covered areas in the Caucasus per capita, 1998



Source: State statistica services of Armenia, Azerbaijan, Georgia and RF, Year Books, 1998

Land resources are not distributed equally in the Caucasus. At present, the total area of arable land is 12.4 million hectares. Current reduction in the amount of arable land is connected with different factors (land erosion, land salinization and secondary bogging, etc.). This tendency is particularly evident in the North Caucasus. However, the North Caucasus share in the total

area of the Caucasus arable lands is 83.1%. Armenia and Georgia experience a lack of arable lands.

Highland summer pastures are the major source of fodder in the region, and they cover vast areas in the Greater and Lesser Caucasus. Summer pastures are particularly abundant in the North Caucasus (Kizlyar pastures in Dagestan and Chechen-Ingushetia) and Azerbaijan (Kura-Araks lowland). Relatively small areas are found in Georgia (Yeldar lowland, Kvemo (Lower) Kartli plain). Hence, the problem of overgrazing is not uncommon to the region. The problem is very acute in sub-alpine and alpine zones, which are affected by intensive erosion processes and have lower bio-productivity.

Overall, extensive land cultivation over recent decades has resulted in reduced land productivity and erosion, and has led to the abandonment of some areas on hillsides. Over the last 30 years, there has been increased conversion of semi-desert, steppe and wetland habitats for cultivation, resulting in the loss of some important sites, and increased threats to species. For example, the amphibians and reptiles of the Araks Valley are now threatened as a result of habitat loss, and the diversity and populations of breeding birds has been reduced as their food sources have decreased. (UNEP/MNP of Armenia, 2000).

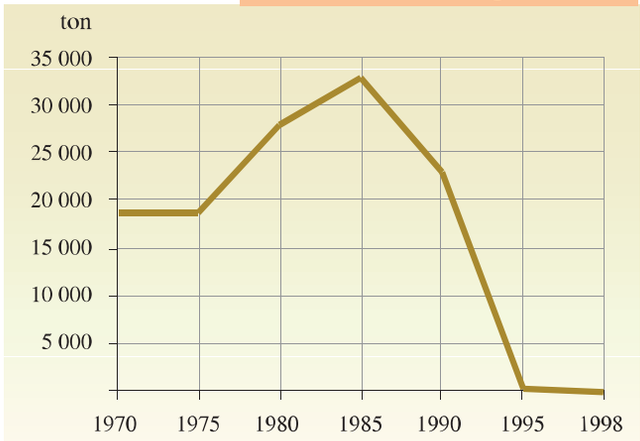
Irrigation and Drainage Systems. Irrigation and drainage systems are essential for Caucasus agriculture. Without agricultural irrigation, it is impossible to grow the main agriculture crops in the East Caucasus: Azerbaijan, East Georgia, and the Ararat Valley. It is precisely here that a significant amount of arable lands exist. Cotton, cereals, rice etc. are grown on irrigated lands.

Irrigation and drainage systems have been used in the Caucasus since historical times. The intensive development of such systems began in 1920-30s and as a result, a large network was built.

Environmental pressures are high from irrigation systems. On the one hand, irrigation is one of the major water users in the region. Since losses in the systems are high, water resources are both inefficiently used, and over-utilized. On the other hand, unsustainable irrigation practices in the region are leading to a rise in the water table, erosion processes, secondary bogging or salinization of soils, loss of soil fertility, etc. For example, increased salinity is observed in 42,000 ha of land in the Ararat Valley (UNEP/MNP of Armenia, 2000). Water with high salt content (more than 1g/l) is mainly used in the South Caucasus. Therefore the accumulation of salts and bad soil conditions are frequent. Some arable lands are located on slopes greater than 5 degrees, accelerating the erosion process. This impact is particularly high due to the extensive use of gravitational irrigation and absence of regular canal cleaning.

Use of Fertilizers and Pesticides.
Traditionally, mineral fertilisers and agrochemicals were heavily used in the Caucasus region and reached maximum levels in the 1980s. In Armenia, for example, more than 300,000 tons of fertilizers, with usage reaching a height of 369,600 tons in 1986, and 6,000-7,000 tons of pesticides were used in the 1980s. Average pesticide use was about 9 kg/ha by public farms (UN-ECE/MNP of Armenia, 2000). In Azerbaijan, this figure amounted to about 33 kg/ha by that time (State Committee of Natural Resources Protection, Azerbaijan, 1997). In Georgia, about 250,000 tons (240 kg/ha) of fertilizers and 29-34,000 tons pesticides were used in the late 1980s (WB/MoA of Georgia, 1996; WB, Washington, 1996). In the USSR, the soils most heavily polluted by DDT are found in Azerbaijan and Armenia (State Committee of Nature Protection of the USSR, 1989).

Pesticide use in Georgia, 1970-99



Source: "Sakagroservisi", JSC

In general, the Soviet system for distributing and storing agrochemicals was very inefficient, characterized by high losses, and resulting in water and soil pollution. On the other hand, the system was centralized; hence it was easy to control the distribution and the use of chemicals. There was no specific law to regulate the field. Separate institutions were responsible for

the handling, storage and use of chemicals, provided they met sanitary requirements, norms or rules established by the central authority.

Since the break-up of the Soviet Union, the use of fertilizers and pesticides has dropped dramatically, reducing some of the environmental pressures from agriculture. For example, in Georgia the use of fertilizers has declined from about 240-250 kg/ha in the late 1980s to only10 kg/ha in 1994 (WB/MoA of Georgia, 1996). In Armenia, only 10,000-15,000 tons of mineral fertilizers are used at present, which is less than 3% of previous levels (UN-ECE/MNP of Armenia, 2000). Pesticide use has decreased as well.

Although the use of chemicals has significantly declined, soil pollution, has not significantly lessened as a result. Heavy metals used in agrochemicals are still accumulated in soils in large amounts.

Obsolete fertilizers and pesticides, stored in warehouses not meeting minimal environmental standards, have adverse impacts on soil and water quality. Uncontrolled import and use of chemicals is a common phenomenon for the whole Caucasus (as well as for the entire former Soviet Union). Under such conditions, some chemicals are used (DDT, DDE, etc.) that are banned worldwide. Development of small-scale individual farming has also led to the incorrect use of chemicals. There were cases when the use of unknown pesticides caused destruction of agricultural crops.

1.2.1.4 Transport

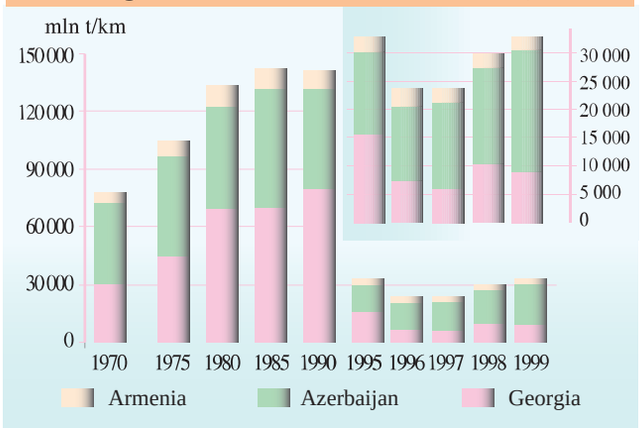
General. From the viewpoint of transport, the Caucasus has strategic location. On the one hand, it is a "bridge" connecting West Europe with Central Asia (east-west direction) and, on the other hand, Russia with Middle East (north-south direction).

The region's favourable transport location is caused by two factors: location between economic fuel "extracting" (Central Asia) and " consuming" (Europe) regions; and its coastal location. The Black Sea connects it with Southern European countries, and the Caspian Sea - with Russia, Central Asia, Iran and Volga-Baltic states through navigation canals.

The development of the proposed TRACECA (Transport Corridor Europe-Caucasus-Asia) route connecting the Black and Caspian Seas would be a basis for future development of the region's economy. This, however, may also have some negative impacts on natural environment.

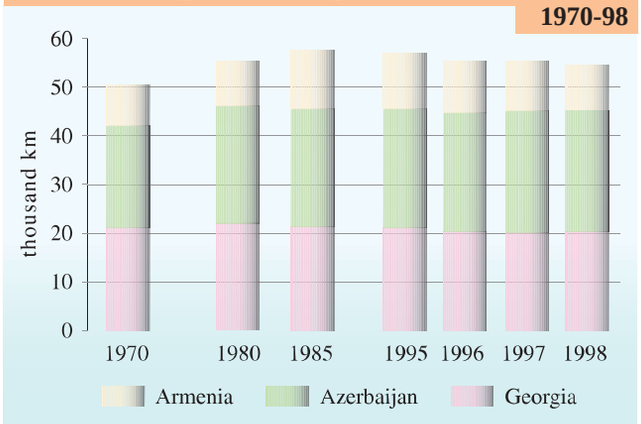
In the Soviet period, the Caucasus was a

Total freight turnover in the South Caucasus, 1970-99



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000

Vehicular transport road length in the South Caucasus 1970-98



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000

peripheral region of the USSR, isolated from the rest of the world. Most transport mainly served cargo and passenger shipments within the country. In the 1970s-80s, economic relations among sister republics were mainly implemented by railway and marine transport, and with foreign countries by sea. The harbours of special importance were Baku, Novorossiisk, Tuapse, Poti, Batumi and Makhachkala. In transportation, the main commodities were oil, oil products, manganese, coal, metals, chemical products, timber, grains etc.

In 1970-88, total freight turnover increased in the entire region. In the South Caucasus, for example, it nearly doubled from 78.2 billion t/km to 154.6 billion t/km. In total value Georgia's specific share was 40-50%. From 1990, in parallel with weakening economic

links, the freight turnover sharply weakened reaching a minimum of 23.6 billion t/km in 1996 in the South Caucasus. However, a tendency of growth in freight turnover has recently been noticed again.

Motor Transport. Similar to other regions of the world, motor transport was an important source of air pollution in the Caucasus over the last decades, and its impact continues to grow. One of the most problematic issues related to transport emissions is ground level ozone, which forms "summer smog." The cities with valley type terrain, poor ventilation and frequent low temperature inversions suffer the most. In the Caucasus, Yerevan, Vanadzor and Tbilisi, etc. are characterized by such natural conditions. However, ground-level ozone problem is not as acute for the Caucasus cities as for large cities of Europe and America.

Passenger cars are the major sources of ambient air pollution in the Caucasus. A significant increase in the amount of passenger cars was observed in the 1980s. The early 1990s were marked by a downward trend, at least for the South Caucasus. Since the mid-1990s, traffic-related pollution has become a more critical issue.

Overall, in the Caucasus, increased pollution from traffic is more related to obsolete car fleet and low quality of fuel used rather than the number of vehicles. Poor vehicle inspection-maintenance systems have led to an increase in "gross polluter" cars.

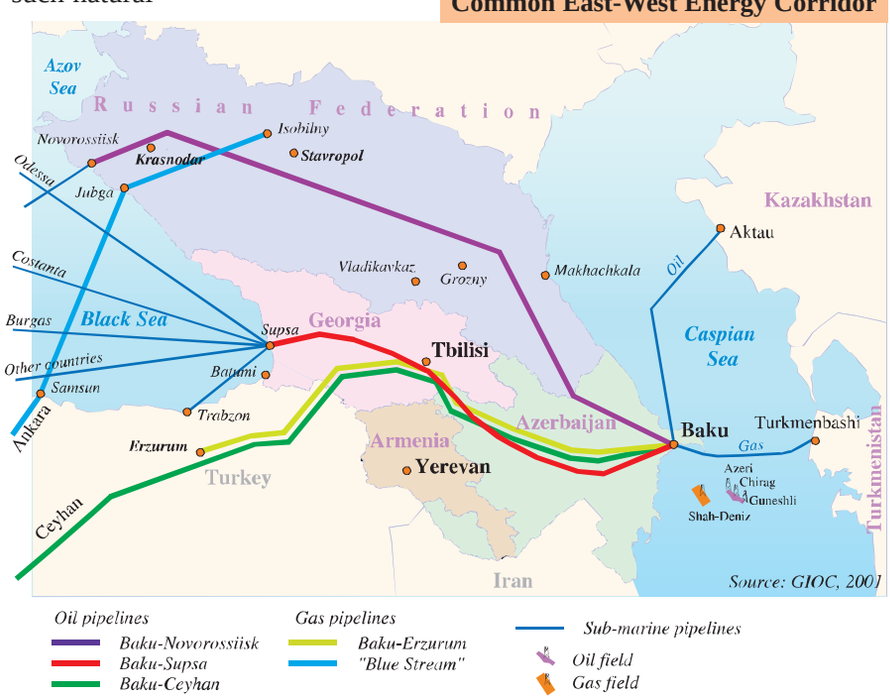
Oil and Gas Transportation. The Caucasus is a significant region not only for fuel extraction, but also in its transportation. Pipeline construction here dates back to the 19th century, when building of oil pipelines began in this region, with gas pipelines starting later. Over recent decades, the total length of pipelines has increased in the region. Growth has been particularly significant since the 1980s. In the 1970s-80s, the pipeline share of total freight turnover has increased gradually. In Georgia, for instance, from 1970 to 1983 its percentage share increased from 10.4% to 30% (Kverenchkliladze, 1986).

The fuel was transported through pipelines from gas and oil producing regions (Azerbaijan and the North Caucasus). Major oil pipeline routes were Baku-Tbilisi-Batumi, Izberbash-Grozny-Krasnodar/Rostov, and gas pipelines Vladikavkaz/Stavropol-Tbilisi-Yerevan.

In the early 1990s, oil and gas transportation declined dramatically. However, an upward trend is observed again at present, which threatens to increases the risk of oil spills and hence, environmental pollution.

At present, there are large-scale pipeline projects of international importance planned or being currently constructed in the region to develop a transport route for crude oil from Azerbaijan and Central Asia. These may pose high pressures on the environment. It is projected that by 2020 the daily rate of oil extraction will reach approximately 3-5.5 million barrels in the Caspian region, through projects already developed (Utiashvili, 2000).

Common East-West Energy Corridor



In general, environmental impacts of pipelines during both the construction and operation phases are significant. Some of the pipelines in the Caucasus cross the protected areas, water recharge regions, archeological sites, etc. In terms of environmental pollution, a high risk is imposed to marine ecosystems from oil loading tanks. Significant impacts can also come from cargo ships carrying crude from Kazakstan to the Dubend terminal in Azerbaijan and from the

Supsa Terminal in Georgia to Western countries.

1.2.1.5 Forestry

Destruction of forests in different parts of the Caucasus is connected with human activities. Scientists consider that the deforestation on Javakheti plateau, Shida Kartli plain, northern slopes of the Caucasus and areas between the rivers Zelenchuk and Baksan are due to anthropogenic factors as well as natural ones. Many historical documents indicate that formerly forest-covered areas rich in fauna are now occupied by steppes, shrubs, and degraded and thinned forests or by human settlements.

Destruction of the Caucasian forests became very intensive in the 19th century, when foreign owners exported timber from the region. Extensive logging was particularly noticeable in the first half of the 20th century. In the 1970s-80s, mass woodcuts in the Caucasus were limited due to import of comparatively cheaper timber from Siberia (Russia). That's why mountain forests here remained more or less untouched. Apart from this, most of the Caucasus forests according to adopted forestry codes belonged to the first category forests, where commercial logging was banned. Finally, high attention was also paid to selective cutting and reforestation for forest regeneration purposes.

However, non-sustainable wood cutting methods used at that time did not support the regeneration of Caucasus forests. Felling was conducted by extensive use of heavy machinery. Local ecological peculiarities were rarely taken into consideration.

Commercial logging has dropped significantly following the post-Soviet economic crisis. At the same time, reforestation and selective cutting for forest regeneration purposes have declined as well due severe budget constraints.

At present, the increase in population impact on forestry resources is caused by the socio-economic crisis in the Caucasus. Specifically, the energy crisis and fuel shortage have caused an increase in woodcutting to obtain firewood for heating. Forests are being cut both in rural and urban areas. Parks and dendraria have not escaped destruction, either. Forests are mostly damaged on the outskirts of settlements, cities and along roads. Local people near forested regions have been cutting forests in easily accessible areas. Forests are being destroyed, and streambeds and banks damaged by the transport logs by trailing the brushwood. Branches and barks left after cutting fall into lakes and pools turn them into dead systems full of tannin. High corruption and low capacity of law enforcement bodies also result in illegal cutting, especially valuable wood species. This itself causes an overall decline in forest quality. Finally, grazing and hay production in forest areas is not rare. All these factors contribute to decreased productivity and regeneration rate of forests as well as a change in species composition and accelerated erosion. In these conditions, populations of pest species have been increasing, while many bird and mammal species associated with forests are threatened.

Another factor driving logging is the high price of timber in neighbouring countries. This has influenced Georgia, especially the Adigen-Borjomi and Guria-Ajara regions, where forested areas were considerably damaged during the last decade.

As a result of forest destruction in the Caucasus landslides of catastrophic character have became frequent phenomena since the 1980s. Along with this, the reduction of surface and ground water reserves have been observed in different parts of the Caucasus, which are again connected with intensive wood cutting (UNDP, Georgia, 1996).

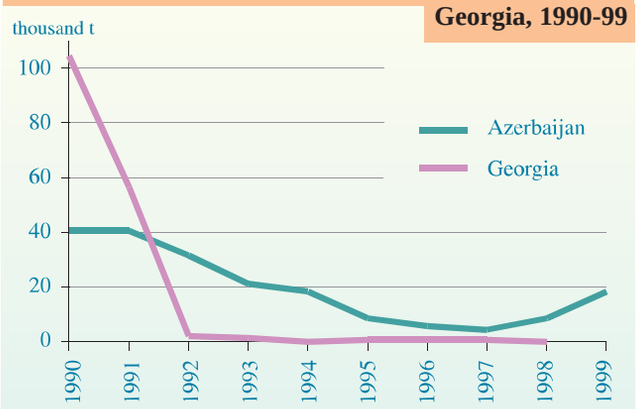
1.2.1.6 Fishery

Over many centuries, humans have fished the Black, Caspian and Azov seas, but this usage was not strong enough to cause the destruction of natural ecosystems. Some thirty years ago, these sea basins were rich in fish stocks. They supplied the Caucasus region, but also Bulgaria, Romania, Ukraine, Turkey, Kazakhstan and Turkmenistan and their food industries. Nevertheless, the situation has changed last decades. High anthropogenic pressures on marine ecosystems have resulted in decreased amounts of commercial fish species and total ichthyic fauna. New settlements, water pollution (with ballast and inflow waters), waste dumpsites located on the coast, building of hydro-technical facilities, over fishing, poaching, etc. have destroyed species habitats, natural breeding grounds and migration routes. Bio-accumulation of chemical substances has been observed among Black Sea fish and mollusks. This itself increased the risks for the food chain and resultant threat to human beings.

The volume of fish catch in the 1970s-80s reached such a big size that this factor significantly affected the water bodies of the region and the ecosystems of the adjacent seas. Deterioration of water quality at the same time caused the reduction of overall volume of bio-organisms and the degradation of ecosystems. Thus, already in the beginning of the 1990s a drastic reduction of commercially exploited fish in the waters of the Caspian, Azov and Black Seas, once very rich in ichtyofauna, was clearly seen. For instance the number of commercial fish in the Black Sea for over past 30-year period was reduced from 24 to 3-4 species by 1990 (G.Info, 1996).

The general economic collapse was followed by a dramatic reduction in the overall volume of fishing. During recent years commercial fishing in the Azov Sea has declined by a factor of 10 times relative to the 1970s and 80s (Grigolia G., 1996). Twenty years ago in coastal area of Dagestan along the Caspian Sea, 20-25 thousand tons of sturgeon were caught every year. For the past twenty years, the sturgeon catch has been reduced by 90% (IUCN, 2000). The situation is similar in Azerbaijan, where in 1991-1996 overall fish catch in the Caspian Sea declined from 39.7 thousand to 6.9 thousand tons (IUCN, 2000). Decline in fish catch was particularly acute in Georgia. In 1992 the overall volume of fishing decreased by a factor of 50 compared to 1990.

Total fish catch in marine waters of Azerbaijan and Georgia, 1990-99



Source: State statistical services of Azerbaijan and Georgia "Georgian Agriculture"-2000, State Department for Statistics of Georgia "Agriculture of the USSR", 1970-1988

Nevertheless, illegal fish catch has significantly increased in many places of the Caucasus, particularly the catch of commercial species like sturgeon, salmon, trout and others. Although the catch of valuable fish species is regulated by existing legislation, actual law enforcement is weak.

Logically, the economic collapse of the 1990s should have led to a reduction of negative impacts on ichtyofauna with more favourable conditions for reproduction of their stocks. Unfortunately, this did not happen, due to pollution from oil and oil products through drilling in the Caspian Sea and transportation via the Black Sea. Chemically contaminated ground water eventually ends up in these waters and thus is still an important factor. Due to the deterioration of social conditions, the impact of the population on water ecosystems has increased. Poaching has become one of the most significant reasons for the reduction of fish stocks. Particular damage to fish stocks is caused by the use of explosives, electric power and chemicals, which are particularly dangerous for young fish, fish spawning grounds and fish-food storehouses.

Aquatic ecosystems, including fish, are also affected by so-called "putting in nets" which are used by poachers. This practice is rather common in the Black Sea. The victims of the nets are frequently big mammals - even dolphins. The problem becomes more severe due to the fact that such nets are very often lost during storms. As a result, fish caught in the net perish and decay. Thus, because of poaching fish stocks have not only declined, but also have lost their quality.

1.2.2 Social Driving Forces

1.2.2.1 Population

Population Size. At present, the population of the Caucasus is over 30 million people. Of this number, 13.32 million live in the North Caucasus and 17.33 million in the South Caucasus. Over the last 30 years, the Caucasus population has been grown steadily, in the beginning of the 1970s being 22.7 million and exceeding 25 million by 1989. By the year 1995, it was already over 30 million.

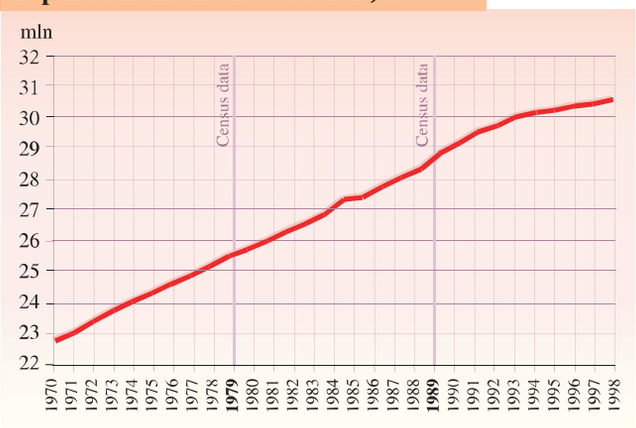
The Caucasus has far lower growth rates than Asian, African and Latin American countries. Recently, the growth rate has been gradually declining. Thus, environmental pressures from population growth are far less in the Caucasus than in the developing world.

Over the last 30 years, the growth rate was higher in regions with Moslem traditions (Azerbaijan and a major part of the North

Caucasus autonomies) and their share of total population size increased from 41% in 1970 to 45% in 2000. In the period under discussion, there has been some population redistribution in each country.

During the first 20 years (1970-90), the increase in population was caused mainly by the dynam-

Population size in the Caucasus, 1970-99

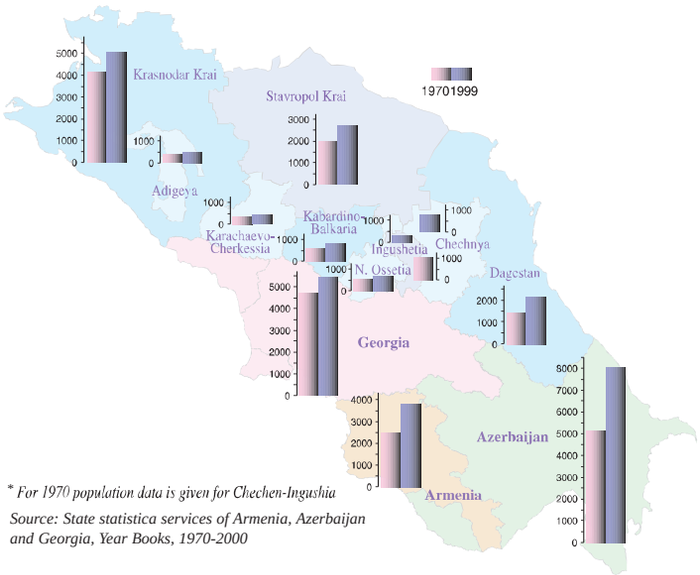


Source: State statistical services of Armenia, Azerbaijan, Georgia and Russia, Year Books, 1970-2000

ics of birth and death rates. For the last 10 years, migration of the population and a stream of refugees from conflict areas have played an important role. Mortality rates in the South Caucasus for the last 30 years have fluctuated between 5-9 persons per 1000. In the North Caucasus, due to the great number of elderly people along with poor social and economic conditions, the mortality increased from 8 to 13 persons, while at the same time, birth rates have

fallen. The mortality rate exceeded the birth rate in this region in the beginning of the 1990s,

Population size in the Caucasus in 1970 and 1999



** For 1970 population data is given for Chechen-Ingushia*

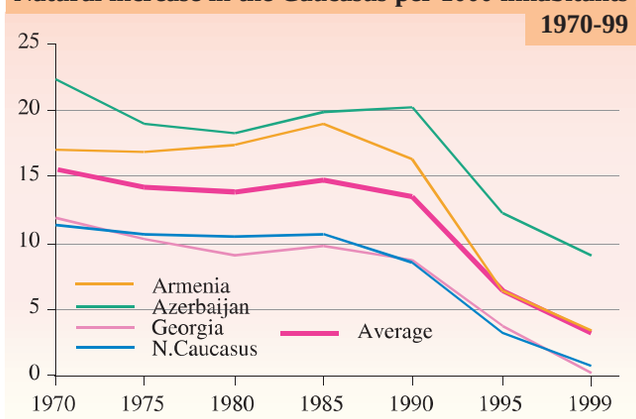
Source: State statistica services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000

leading to a natural population decline.

However, due to an inflow of migrants from the former Soviet Union republics, the population of the North Caucasus keeps growing. From 1990 through 2000 it increased from 12.54 to 13.32 million people. The flow of migrants was the highest in the first half of the 1990s. Over that period, 100 to 200 thousand people were arriving in the North Caucasus each year. Since then, the flow of migrants reduced.

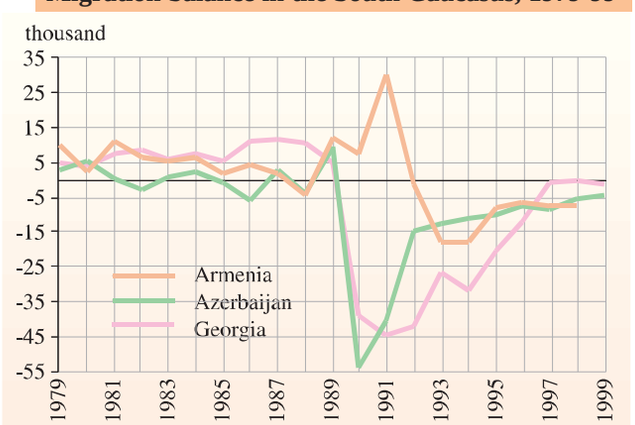
For all three countries of the South Caucasus from 1970 through 1990 the flow of migrants was positive. However, due to dire economic conditions in the 1990s, out-migration of the population occurred, as both native and non-native residents left these countries.

Natural increase in the Caucasus per 1000 inhabitants 1970-99



Source: State statistical services of Armenia, Azerbaijan, Georgia and Russia, Year Books, 1970-2000

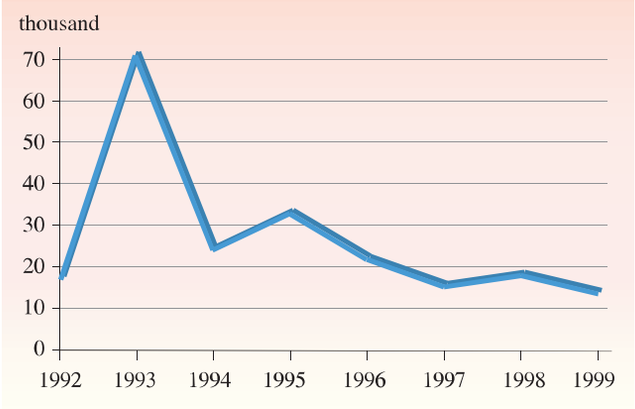
Migration balance in the South Caucasus, 1979-99



Source: State statistical services of Armenia, Azerbaijan and Georgia, Year Books, 1970-2000

Mass-scale migration of the population is a direct consequence of armed conflicts. A significant number of native citizens migrated to foreign countries. For instance, most of the Russian population left Georgia, Azerbaijan, Armenia and the autonomous republics of the

Number of refugees in the North Caucasus, 1992-1999



Source: State Committee for Statistics of the Russian Federation."Regions of Russian Federation"-2000

North Caucasus. According to the rough estimates overall amount of migrants from the Caucasus constitutes 3.5 million people, or about 12% of its population.

Population Density. Population pressures on the Caucasus environment are more related to population distribution rather than to population growth.

As can be seen from this map, there are three major axes of settlements in the Caucasus. The first axis is connected with the Kuban plain and the South Caucasus foothills. The second axis is connected with the intermountain depression

Population density in the Caucasus, 2000

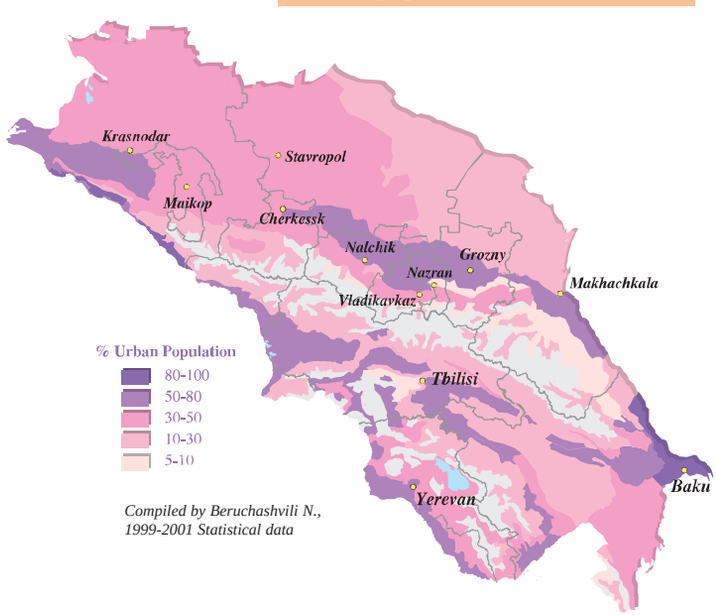
Compiled by Beruchashvili N., 1999-2001 Statistical data

between the Greater and Lesser Caucasus, and the third is connected with the Ararat Valley. In these axes, density of the population exceeds 50/km sq. and in the regions of urban agglomerations and some densely populated rural regions varies from 100-500 and more persons.

The mountainous territories of the Greater and Lesser Caucasus do not have a high population density (10-30/km sq). Some highland landscapes and a many average mountainous and forest landscapes have practically no permanent population.

Urban and Rural Population and Pressures on Environment. The Caucasus region has three "millionaire" cities with the populations of over 1,000,000. These are the capitals of the South Caucasus: Baku (1,700,000), Tbilisi (1,200,000) and Yerevan (1,200,000). In the North Caucasus, only one town, Krasnodar has a population over 500,000 and four towns: Sochi, Makhachkala, Stavropol and Vladikavkaz have populations ranging from 300,000 to 500,000.

Urban population in the Caucasus

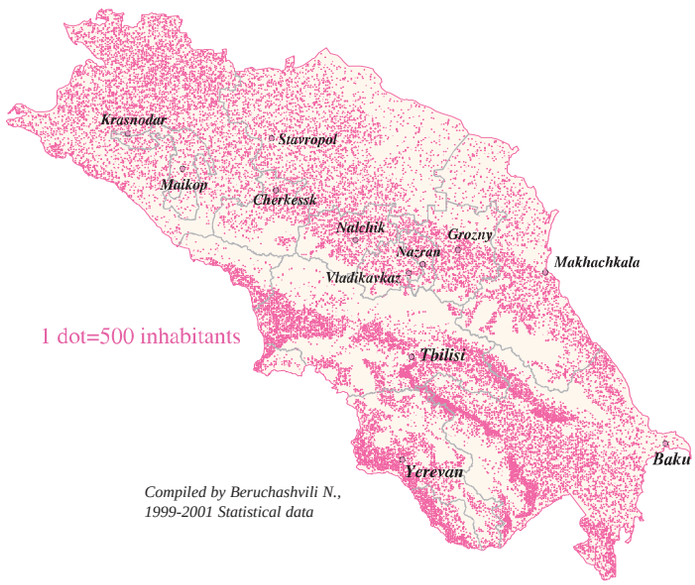


Compiled by Beruchashvili N., 1999-2001 Statistical data

At present, the percentage of urban population in Azerbaijan, Georgia, and the North Caucasus fluctuates between 50-60%. A comparatively high percentage of urbanization is characteristic of Armenia where it equals to 66.8 %. In all the regions of the Caucasus, the percentage of urban population has been growing, but at low rates.

Urban territories do not occupy large areas in the Caucasus. However, a major part of the

Rural population in the Caucasus



population (57.15%) lives in the cities. In this respect, the Caucasus exceeds global average index (41%) and majority of Asian and African countries. However, it is behind West European countries and the USA, which have the highest level of urbanization in the world.

Cities and industrial centres are the main sources of pollution. There, an important source of pollution is formed by motor transport and obsolete municipal infrastructure, low capacity of water treatment facilities or their absence in general. Unorganised location of parking lots causes traffic jams, creating additional noise and pollution. The location of industrial enterprises against prevailing wind patterns is another important factor.

The environment is influenced by rural settlements in the plain zones. In some places, villages and arable lands form continuous alternating patterns. These includes such areas as the Colchian hilly zone, Alazani-Agrichai plain, Mid-Araks plain, North Caucasus foothills, Lenkoran depression, etc. In such places there are intensively polluted surface waters, soils and ground waters. Biota are damaged and biodiversity is reduced.

1.2.2.2 Political Conflicts and Military Actions

Before the break up of the Soviet Union, one never would have imagined that military actions would become significant driving forces for the Caucasus environment. From the end of 1980s they became significant and sometimes determining factors for the state of the environment of the region.

Beginning in 1988 the Caucasus became an arena for ethnic conflicts and wars. Among these, the most well known is the conflict in Chechnya. Military action continues there to the present. The conflicts in Abkhazia, Karabakh, and Former South Ossetia and between Ossets and Ingush have quieted down but were intensive in the beginning of the 1990s.

Ethnic conflicts and military actions had serious impacts on the Caucasus environment. The intensive bombing of Chechen, Karabakh and Abkhazian territories caused the degradation of topsoil there. Explosions followed by fires damaged local forests and vegetation cover. Apart from this, erosion has intensified. Military actions also resulted in environmental pollution. Environmental pollution and noise had high impacts on local flora and fauna, causing the destruction of species habitats and migration routes (See chapter three for more detailed analysis).

Main armed conflicts in the Caucasus, since 1988