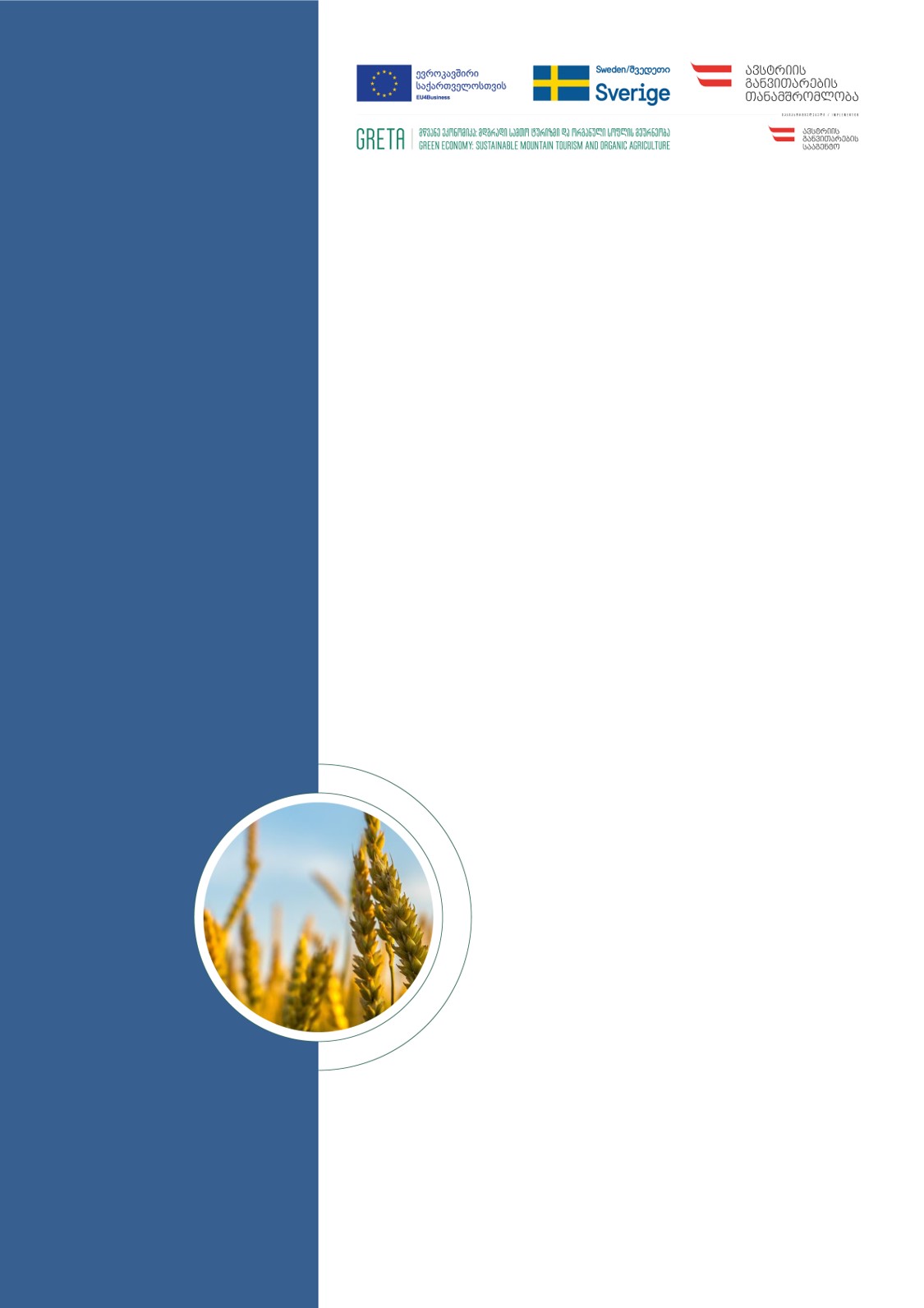
**ANNEX 3**

**EGSIA STUDY – PRELIMINARY FINDINGS AND RECOMMENDATIONS**



The following elaborations are a summary from the draft EGSIA (Environmental, Gender, Social Impact Analysis) report submitted end of August 2019 to the GRETA project. The description of the project area is based on the newest data obtained from the most up-to-date sources. The technical analysis also shows the heavy involvement of GRETA and ADA staff in establishing a baseline in order to measure project success at the end of the project.

List of Abbreviations

|  |  |
| --- | --- |
| ACT | Analysis and Consulting Team |
| ADA | Austrian Development Agency |
| APA | Agency of Protected Areas |
| CAPI/PAPI | Computer Assisted/Paper Based (Paper and Pencil) Interview |
| CCRA | Climate Change Risk Analysis |
| CEDAW | Convention on the Elimination of All Forms of Discrimination Against Women |
| CENN | Caucasus Environmental NGO Network |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CRPD | Convention on the Rights of Persons with Disabilities |
| CRPD | Convention on the Rights of Persons with Disabilities |
| DMOs | Destination Management Organization |
| DRR | Disaster Risk Reduction |
| EGSIA | Environmental Gender and Social Impact Assessment |
| EGSIM | Manual Environmental, Gender and Social Impact Management |
| ENPARD | European Neighborhood Program for Agriculture and Rural Development |
| FG | Focus Group Discussion |
| GeoStat | National Statistics Office of Georgia |
| GFA | Georgian Farmers Association |
| GHG | Greenhouse gases |
| GNTA | Georgian National Tourism Administration |
| GRETA | Green Economy - Mountain Tourism and Organic Agriculture |
| ICCAMGR | Institutionalization of Climate Change Adaptation and Mitigation in Georgian Regions |
| ILO | International Labor Organization |
| LEPL | Legal Entity of Public Law |
| MEA | Multilateral Environmental Agreements |
| MEPA | Ministry of Environment Protection and Agriculture |
| MRDC | Mountain Resorts Development Company |
| NACHPG | National Agency for Cultural Heritage Preservation of Georgia |
| NALAG | National Association of Local Authorities of Georgia |
| NAP | National Forestry Concept |
| NEA | National Environmental Agency |
| RA | Risk Assessment |
| RMSP | Risk Management and Sustainability Plan |
| SDGs | Sustainable Development Goals |
| SDGs | UN Sustainable Development Goals |
| T&Q | Themes & Quality Unit of ADA |
| TIC | Tourist Information Centers |
| UNFCCC | The United Nations Framework Convention on Climate |
| WTO | World Tourism Organization |

Environmental Gender and Social Risk and Impact Assessment

Assessment of the environmental, gender and social risks and impacts associated with the GRETA project ***aims*** to enhance the environmental outcomes of the projects, ensure gender mainstreaming and facilitate inclusion of the vulnerable groups; the outcomes should also contribute to the achievements of the Sustainable Development Goals (SDGs); avoid negative environmental, gender and social impacts; minimize and mitigate negative impacts where avoidance is not possible; and strengthen the capacities to manage risks and adverse impacts. The assessment takes into the consideration the following ***overarching policies*** and principles:

* ADA is committed to contribute to the SDGs and explicitly endorses a policy in favour of the poor, marginalized and vulnerable;
* interventions funded by the ADA must, above all, be in line with national development policies and strategies of the countries they take place in.
* a set of the following basic ***principles and quality criteria*** of ADA in the course of the design and planning stage of a programme or project: ownership; do no harm; equity, equality and non-discrimination; Inclusive participation and equal representation of all stakeholders; accountability and transparency; empowerment; and sustainability.

***Environmental sustainability***: Austria’s response to the challenges of environmental and climate issues for development cooperation is based on the specific principles set out in the Austrian Strategy for Environment and Development and the commitments made under the declarations of international accords, agreements, frameworks and the Rio Conventions. The environmental and climate policies and principles that ADA commits to are as per the below:

* harnessing synergies between environmental protection and poverty reduction;
* preventing adverse and maximizing beneficial environmental impacts, climate adaptation and mitigation measures;
* adopting integrated, multi-sectoral approaches, wherever possible;
* promoting local ownership and management of natural resources;
* advocating the integration of environmental protection and climate action in national development plans;
* helping raise awareness and develop capacity in environmental protection and climate action;
* promoting a holistic approach to environmental goods and equitable sharing of the benefits of environmental protection and climate action;
* engaging in international cooperation and contributing to implementing environmental and climate conventions;
* drawing on experience and know-how in Austria.

The environmental assessment considers the following ***project-level standards defined by ADA to mainstream environmental sustainability***: Biodiversity Conservation and Sustainable Natural Resource Management; Climate Action; Resource Efficiency and Pollution Prevention Management; and Community Health, Safety and Working Conditions.

***Gender Equality and Empowerment of Women and Girls:*** The promotion of gender equality and the empowerment of women and girls are central to the work of the ADA. This includes advocating for women’s and girls’ human rights, combating discriminatory practices, strengthening women’s voices and roles in decision making, reducing gender inequalities in access to and control over resources, challenging the roles and stereotypes that create inequalities and exclusion. The ADA adheres to the following policies and principles for Gender Equality and Empowerment of Women and Girls:

* do not discriminate against women or girls and do not reinforce gender-based discrimination and inequalities;
* are based on the principle of equal opportunity and fair treatment;
* are gender-responsive and incorporate a gender analysis;
* integrate women’s/girls’ and men’s/boys’ voices and opinions equally into planning, implementation and evaluation;
* identify potential gender-related risks and aim to avoid, minimize and mitigate these risks;
* collect sex-disaggregated data and formulate gender-sensitive indicators for results frameworks;
* fully integrate gender in evaluations and report on gender-related impacts.

***Human Rights:*** Austria recognizes the centrality of human rights to sustainable development, and principles and standards derived from international human rights treaties. The ADA consequently applies a human rights-based approach to development cooperation. ADA’s guiding human rights policies and principles are as per the below:

* all programs and projects of the ADA strengthen the realization of human rights;
* human rights standards and principles guide the ADA in all phases of the programming process and in all sectors;
* the ADA contributes to the development of the capacities of ‘duty-bearers’ to meet their obligations and of ‘rights-holders’ to claim their rights.

**Assessment processes: The two-stage assessment** process of GRETA projects involved: **The first stage** included the screening and categorisation of potential environmental, gender and social risks of GRETA project as **moderate**. **The second stage** of the assessment, proceeding from the risk categorisation contains: an independent EGSIA carried out for the projects of moderate potential risks and development of a Risk Management and Sustainability Plan (RMSP). (Proposed monitoring of the implementation of risk mitigation measures will include the review of project progress reports and/or, if applicable, progress reports on RMSP implementation; and T&Q undertaking special monitoring missions.)

The assessment and management of risks and impacts is based on ***two pillars***: (i) the ***precautionary approach*** and (ii) the application of a ***mitigation hierarchy*** as per ADA Manual Environmental, Gender and Social Impact Management (June, 2018).

The environmental assessment comprises the following:

* Relevant ***baseline data*** for the characterization and identification of risks and impacts as well as mitigation measures;
* Consideration of all ***relevant framework*** conditions related to the GRETA project;
* Evaluation of the projects potential environmental, gender and social ***risks and impacts***;
* Examination of ***alternatives***, identification of ***possibilities for improving*** project implementation and to seek opportunities to enhance positive impacts;
* Assessment of the ***feasibility of mitigating adverse risks and impacts***, required investments, their suitability under local conditions, and the institutional, training and monitoring requirements associated with them.

Alignment to International and National Policies and Legislation

Present environmental, gender and social impact assessment has been developed in full accordance with the National policies and legal framework, as well as with the international obligations of Georgia, namely:

*International agreements:*

* EU-Georgia’s association agreement of 2014. The AA sets goals to be achieved within a clearly defined timeframe for the following areas: (i) environmental governance; (ii) air quality; (iii) water quality and resource management (including the marine environment); (iv) waste management; (v) biodiversity protection; (vi) industrial pollution and industrial hazards; (vii) chemical management; and (viii) climate action.
* UN Sustainable Development Goals (SDGs) which is an important document framing the national environmental policy. The SDGs set 169 targets that are to be achieved by 2030, including environmental aspects.
* International treaties of Georgia, such as Convention on Access to Information and the Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), the Convention on Biological diversity, United Nations Framework Convention on Climate Change (UNFCCC), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Long-range Transboundary Air Pollution, United Nations Convention to Combat Desertification etc.
* Georgia’s Intended Nationally Determined Contribution Submission to the UNFCCC, 2015

*National strategic documents:*

* The Socio-economic Development Strategy of Georgia “Georgia 2020” (2014) which ensures environmental safety and sustainability through the prevention of natural disasters and the rational use of natural resources.
* The Strategy for Agricultural Development in Georgia 2015-2020 (Decree of the Georgian Government N167, 11/11/2015), which has identified environmental protection and the sustainable management of natural resources as one of the priority areas.
* The Rural Development Strategy for 2017-2020, that sets three priority directions, one of which is environmental protection and the sustainable use of natural resource.
* Climate Change National Adaptation Plan for Georgia’s Agriculture Sector, MEPA 2017
* State energy policy: Main directions of the state energy policy, (Resolution of Georgian parliament N3758-IIს, June 24, 2015), Energy sector development strategy of Georgia 2016-2025 – electricity; (DRAFT), Energy sector development strategy of Georgia 2017-2026 – Natural gas; (DRAFT)).
* SDG targets of Georgia:The Government of Georgia (GoG) started nationalizing SDGs in 2015 and undertook important steps in this direction. Georgia currently has all 17 goals, 99 targets and more than 200 indicators nationalized. The GoG aims to nationalize all 169 targets till 2030.

*Specific sectoral environmental policy and strategic documents adopted by the Government or the Parliament of Georgia:*

* National Biodiversity Strategy and the Action Plan 2014–2020(resolution N343 of May 8, 2014 of the Government of Georgia).
* NEAP 3 National Environmental Action Programme of Georgia (Decree N1124 of the Government of Georgia, May 22, 2018).
* National Forest Concept of Georgia (Resolution of the Parliament of Georgia on “National Forest Concept of Georgia” (No-1742-Is, 26/12/2013).
* National Action Program to Combat Desertification 2014-2022 (Decree No. 742, of December 19, 2014 of the Government of Georgia).
* National Waste Management Strategy of 2016-2030 and the National Waste Management Action Plan of 2016-2020 (Resolution N160 of April 1, 2016 of the Government of Georgia).

*Specific laws:*

* The Law on Environmental Protection (1996).
* Georgia’s Forest Code (N 2124-IIs, 22/06/1999), The Resolution of Georgian Government on Approval of the Rules on Forest Use (No 242, 20 August 2010).
* Georgian Law on “Protected Areas System” (No-136-IIs, 07 March, 1996).
* Waste code of Georgia (2994-რს, 26/12/2014).
* Water legislation: Law on water (N936, 16/10/1997),National standard for drinking water (Decree of Georgian Government N58, January 15, 2014).

*Regional development plans:*

Decree of Georgian government N1287 on approval of a regional development strategy for Imereti region, 2016-2021, 01 July 2016

Decree of Georgian government N1374 on approval of a regional development strategy for Racha-Lechkhumi Lower Svaneti region, 2014-2021, 19 September 2013

* Decree of Georgian government N1372 on approval of a regional development strategy for Samegrelo-Upper Svaneti region, 2014-2021.18 September 2013

Current Environmental Conditions

Terrain, landscapes and hydrology

**Chiatura municipality.**The territory of Chiatura municipality covers that part of the north-western extension of the Upper Imereti (Dzirula) massif – the Chiatura plateau, where the Kvirila river and its tributaries: Buja, Katskhura, Rganistskali, Nekrisa, Jruchula, Itkhvisistskali, Shukuretistskali, Sadzeliskhevi, etc. flow. The length of the Kvirila river within the limits of the municipality is 16 km dividing its territory into two almost equal parts. The municipality also covers the ridge zone of the Racha mountain range at the section of the Satsalike peak (1996 m) and its south faced slope.

The Chiatura plateau is built of Jurassic, Cretaceous and Tertiary quartz porphyritic rocks, porphyrites, limestones and hardened clayey-sandy layers. The surface of the plateau is located at 600-800 m above sea level. It is dissected by canyon like gorges of the mentioned rivers. The depth of these eroded gorges varies within 70-200 m. The canyon like gorges divide the plateau into flattened hilly sections – so-called highlands (Darkveti, Mgvimevi, Itkhvisi, Zeda Rgani and other highlands). Caves, karstic funnels and other karstic forms are developed on these highlands and the walls of canyon like gorges. The traces of prehistoric human presence in the caves have been captured and studied.

The Katskhi pillar – a 40 m high natural limestone monolith, located within the low later divide of the Katskhura and Gvitori rivers is noteworthy. The upper platform of the pillar has been used as a place of stay of monophysite hermits since early middle ages.

The south faced slope of the Racha range and its ridge zone within the limits of Chiatura municipality are built of limestone. The slope covers the source areas of the Buja and Jruchura rivers. The height of the peaks (Satsalike, Veltkevi, etc.) towering up from the ridge zone reaches 1800-2000 m. The slope is intensively dissected by the gorge of the rivers Jruchura and Buja and their tributaries. The slope is characterized by karstic funnels, wells, caves and underground tunnels.

The *hydrological* network of the municipality consists mainly of rivers. Strong flash floods occur rarely. The presence of vauclusian springs (Grudo, Monastris Tsiskvili, Lejubani, etc.) is noteworthy.

*Main landscapes*. Natural landscapes of oak, oak-hornbeam and oak-beech forests that were characteristic for the Chiatura plateu in the past have been almost completely destroyed and replaced by cultural landscapes. The landscape of secondary forests formed by beech, oak, hornbeam and other broadleaved tree species is developed on the southern slope of the Racha range and certain section bordering the Upper Imereti massif.

**Sachkhere municipality** is located at 450-2400 m above sea level on average. It is characterized by mountain hilly relief and is built of manly Jurassic, Crustaceous and Tertiary clay-shale, porphyrite, quartzite, limestone and hardened clayey sand.

Main *orographic* units include: the ridge and the south faced slope of the Racha mountain range in the middle and upstream areas of the basins of the Kvirila river and its rights tributaries: Jruchula, Chikhura and Khakhietistskali. The height of peaks (Khikhata, Tsiteli Klde, Pkhoni, etc.) towering up on the ridge varies within 2240-2360 m. The slope is heavily dissected by the deep eroded gorges of the rivers Jruchula, Chikhura and Khakhietistskali and their tributaries, which also are characterized by canyon like sections. There are lateral plateaus (Sashvi, Orgul-Bajiti, Pepeleti, etc.) between the gorges. The eastern section of the Racha range, built of limestone is characterized by karstic relief (karstic funnels, wells, caves, etc.).

The territory of the municipality adjoining to the Upper Imereti highland is characterized by gently sloping sections. By its geological structure and geomorphological features, the mentioned area is a part of the Upper Imereti (Dzirula) massif. Within its limits the 500-800 m high Korbouli plain is located. Its surface is gently inclined and dissected by deep eroded gorges. Along with eroded forms, karstic forms are also found. The west faced slope of the Likhi range which is heavily dissected by deep eroded gorges is located south-eastward of the Korbouli plain. The slope, along with eroded forms is characterized by stepped flat surfaces.

The Kvirilia depression is located within the limits of the municipality. The depression covers the Kvirila river gorge from the village Chala to Sachkhere town and is characterized by a quite wide bottom. The bottom of the gorge is surrounded with gentle slopes of hills and hillocks. On these slopes landslides are developed at certain locations (villages: Chorvila, Sairkhe, Savana, etc.).

The density of the *hydrographical* network of Sackhere municipality is relatively low. It consists of the middle section of the Kvirila river gorge and the right tributaries of this river (Jruchula, Chikhura, etc.) flowing from the south faced slopes of the Racha mountain range. The Dzirula river flows in the south-eastern part of the municipality. Local rivers are characterized by strong flash floods occurring periodically, which damage human settlements and infrastructure located on riverside areas.

The major portion of the territory of the municipality is occupied by the cultural and anthropogenic *landscapes* which are heavily altered as a result of the human economic activity. Fragments of secondary landscapes formed by oak and oak-oriental hornbeam forests are still found in foothills. On the slopes of low and medium mountains the secondary beech-hornbeam and beech forests grow which at higher elevations, starting from 1800-1900 m above sea level are replaced by subalpine forest-meadow landscape formed by park and crook-stem tree species.

**Tkibuli municipality**. The municipality is located in the northern part of the northern Imereti, which is historically known as Okriba. The municipality is bordered by the western section of the Racha range, the ridge and the steep southern slope of the mount Nakerala on the north, the northern hilly and hillocky slope of the Okriba-Argveti hillock on the south, the low hilly surface located on the right side of the Dzusa river (Kvirila river watershed) on the east and the hillocky belt located on the right side of the Rioni river in the environs of the city of Kutaisi on the west.

The central part of the municipality, located at 400-800 m above sea level on average, is built of Jurassic porphyritic rocks and clay-shale, which are overlaid by a layer of continental sandstones. The Tkibuli coal deposit is associated with this layer. Magmatic rocks – teschenites, used for construction purposes as a high-quality facing material are exposed south-westward. The central part of the municipality is occupied by Tkibuli, Akhalsopeli, Gelati and Tsutskhvati depressions, which are characterized by gently sloping surfaces of tectonic erosion origin. Within the limits of these depressions mainly hilly relief is developed. In some places quite deeply, dissected terrain is found (in the bottom of the Gelati depression the Tskaltsitela river has developed a 140-160 m deep canyon type gorge in porphyritic rocks).

Among karstic landforms of the local relief, the Maghara crosscutting multistory cave located in the Tsutskhvati depression in noteworthy. The traces of presence of humans of Paleolithic and Bronze Age are captured in its bottom sediments. A perforated typical karstic “polje” developed in the bottom of the Akhalsopeli depression shall be also noted. Currently the bottom of this depression is occupied by the Tkibuli water reservoir.

Both modern landslides and old gravitational formations in the form of slipped down limestone and stone boulders (Dzirovana landslide near the city of Tkibuli, etc.), are developed on the south faced slope of the Nakerala range. Landslide processes are observed also in the upper part of the Tskaltsitela river gorge.

The density of the hydrological network of the municipality is low. It consists mainly of the upper course of the Tskaltsitela river and the rivers Tkibula, Chishura and Shabata Gele. Certain sections of Tkibula Chishura rivers flow through karstic gorges, while Shabata Gele river flows through the Maghara crosscutting multistory cave.

Natural landscape. The natural landscape of the municipality is heavily altered as a result of human economic activity. Cultural landscapes are developed on the bottoms of the Tkibuli, Akhalsopeli, Gelati and Tsutskhvati depressions. The adjacent hilly foothills are characterized by a heavily degraded landscape of beech-chestnut-hornbeam forests. On limestone slopes located up to 800-900 m above sea level a modified landscape of oak-hornbeam forests dominates. In the upper area a landscape of beech forests with fragmented participation of spruce and fir is developed.

**Ambrolauri municipality** is characterized by mountain-hilly relief, lowland and mountain humid subtropical climate and mesophilic forest-meadow vegetation. Main *orographic* units include: the north faced slope of the Racha mountain range from the Mount Khikhata (2235 m) westward up to the Tvishi ravine. The distance in a straight line is 55-57 km, maximum elevation – 1996 m (mount Satsalike), built of Cretaceous limestone. The surface is gently sloping and dissected by the gorges, mainly by narrow and canyon type ravines of the rivers Shareula, Khoteura, Veleura, Kvabptkari, etc. There are many gently sloping and flat depressions of tectonic-karst-erosion origin on the slope. The largest among them is the Shaori depression which is currently occupied by the Shaori water reservoir (7 km long, 2.7 wide and 14 m deep (max.)).

The north faced slope of the Racha range within the limits of the municipality is one of the largest areas of the intensive development of mountain karst in Georgia. The large areas are occupied by karstic funnels and wells. Tens of caves are developed in limestone rocks. Among these caves, the Skhvavi glacial cave, described by Vakhushti Bagrationi in the 18th century is noteworthy.

2. The south faced slope of the Lechkhumi range. Within the limits of Ambrolauri municipality the slope is stretched between the gorges of right tributaries of the Rioni river – Askis Tskali and Lukhuni. It is built of Jurassic clay-share, porphyrite and Cretaceous limestone. Cliffy massifs, exceeding 3000 m are towered up from the ridge zone of the slope (Lelashkha – 3162 m, Chutkharo – 3562 m, etc.). The south faced slope of the Lechkhumi range within the limits of Ambrolauri municipality is quite wide (18-20 m) and heavily dissected by erosional gorges of the rivers Askilistskali, Ritseula, Lukhuni and their numerous tributaries. Between these gorges, Tarigoni, Svanebistskali, Kekhitekhia, Tsatsminda, Poria, Tkhiszurgi and Saelio water divide ranged are located.

The south faced slope of the Lechkhumi range is characterized by erosional relief with steep and often canyon type gorges. In the upper part of the range, from 1600-1700 m above sea level, old glacial formations – trough gorges, circuses and kars along with erosional landforms play an important role.

3. Rioni river gorge. The territory of the municipality covers about 40 km section of the Rioni river gorge which starts from the confluence of its right tributary - Lukhuni river and extends up to the Tvishi ravine. The bottom of the gorge is mostly 0.5-1.5 km wide. Along the river channel a surface of the first river terrace which is intensively used by humans and small fragments of flood plain are located. The exception is the upper, about 7 km long canyon type section located between the villages Tsesi and Kvatskhuti, known as Khidikaris Kldekari. Tens and hundred years old terrace steps located up to 380 m from the bottom of the gorge at different relative elevations are well described and studied.

*Hydrographical network* consists mainly of rivers (glaciers and wetlands are lacking). There are only a few lakes on the territory of the municipality.

Tributaries of the Rioni river: Krikhula, Shareula, Askistskali, Ritseuli, Lukhuni, etc. are characterized by a high elevation drop determining the high gradient of river channels. High gradient of a river along with abundant precipitation increases the magnitude of floods, flash floods and mudflows and therefore contributes to the development of erosion, landslides and other gravitational processes on the bottom of gorges and their slopes. Landslide processes of different intensity are observed in the environs of the villages Mukhli, Khimshi, Sadmeli, Saketsia, Abanoeti, Bugeuli and Baji.

Strong flash floods inundate flood plains of the Rioni river and its tributaries and scour certain areas of riverside sections of the first terraces above floodplains which are actively used by humans for economic purposes.

*Natural landscape*. Natural landscape of the municipality is mostly modified to different extents as a result of human economic activity. Up to 900-1100 m above sea level, a low mountain landscape of oak-hornbeam forests, which was characteristic for this area in the past, has survived with a heavily modified structure. Such areas of the natural landscape are found on steep slopes which are less suitable for agricultural activities. Within this vertical zone mostly a cultural landscape is developed (human settlements, arable lands, gardens and vineyards, infrastructure). In the upper zone, up to 1800-1900 m above sea level, relatively well-preserved landscapes of beech and beech-dark coniferous (spruce, fir) forests are found. Karts relief is developed on the north faced slope of the Racha range.

Landscapes of subalpine forest-meadows and Alpine meadows dominate above 1800-2000 m on the south faced slope of the Lechkhumi range and on the slopes of mountains that are located in front of the south faced slope of the Lechkhumi mountain range.

**Oni municipality.**The municipality is located in upstream areas of the Rioni river at 700-4400 m above sea level. Main *orographic* units include:

1. The ridge zone of the Greater Caucasus built of Precambrian and Paleozoic granites, gneiss and crystalline schist between the mount Pasi (3727 m) and Mamisoni pass (2829) and the associated south faced slope built of Jurassic clay-shale, sandstones and porphyrites. The majority of peaks located in the ridge zone exceed 4000 meters above sea level (Laboda – 4319 m; Buba – 4418 m; Chanchakhi – 4456 m. etc.). The ridge zone is characterized by cliffy relief and mostly covered by permafrost and glaciers.

The south faced slope of the Greater Caucasus is heavily dissected with deep and steep gorges of the Rioni river and its tributaries (Sakaura, Chanchakhi, Shodura, Jejora, etc.). Between the gorges there are relatively short and quite high branch mountain ranges (Bodu­ra­shi, Dombistsveri, Didveli, Kedela, etc.) associated with the ridge zone. The relief is formed mainly by trough and eroded gorges of old glacial and river erosion origin with steep slopes and several canyon-like sections.

2. The east faced slope of the Lechkhumi range and the orographically associated Shoda range built of Jurassic and Lower Cretaceous clay-shale, sandstone, porphyrite and carbonate flysch. The peaks: Lukhunistsveri (3185 m), Shoda (3609 m), Dolomisistsveri (3266 m), etc. are located within the ridge zones of these mountain ranges. Branch mountain ranges: Kvatsikhe, Kupra, Sakao, etc. towering up south and south-westward are associated with the Lechkhumi and Shoda mountain ranges. Modern glaciation process is insignificant. The traces of old glaciation in the form of short trough gorges, circuses and kars are still found. A mountain-gorge eroded relief with rock-cliffy forms at certain locations dominates.

3. North faced slope of the Racha mountain range. The eastern section of the slope is built of Jurassic porphyrites, partially of clay-shale and sandstones, while its western section is built of Crustaceous limestone. Within the limits of the municipality, the north faced slope of the Racha mountain range stretches from the mount Dagverila (2726 m) up to the bottom of the west faced slope of the Khikhata mountain massif. The eastern section of the slope is relatively narrow, steep and dissected by eroded gorges of the tributaries of Rioni and Jejora rivers (Kheori, Claliskhevi, Chordiskhevi, etc.). Within the Khikhata and Potskhverevi mountain massifs a karstic-eroded relief dominates (Shkmeri karstic depression and limestone cliffs towering up from its edges, Usholta cave, karst tunnel developed by Kheori river within the limestone layer, Kvagakhetkila vauclusian spring, etc.).

4. The gorges of the Rioni river and its tributaries. The Rioni river gorge starts on the slope of the mount Pasi at 2960 m above sea level. About 30 km long section of the river gorge from this point is narrow, deep and steep sloped, while at certain locations its bottom is characterized by relatively wide flood plains and a branching river channel. The next, 10 km long section of the river gorge starting from the village Glola (1260 m), known as Chidrota ravine, is deep and narrow. From the village Utsera (1050 m) the river gorge is widening and characterized by relatively gentle terraced slopes across much of its length. Within this section of the river gorge (from the village Utsera up to the confluence of the Lukhuni river) the fragments of 8 terraces of different age located at 380-400 m from the river channel are observed.

Above 1400-1500 m, the tributaries of the Rioni river flow through trough gorges developed as a result of influence of old glaciers. Downstream the gorges are eroded, without terraces, deep, steep slopes and canyon like sections at certain locations.

Landslide processes are observed on the slopes of the river gorges adjacent to the villages Somitso, Komandori, Seva, Parakheti, Kveda Bari.

The *Rioni river* and its tributaries are characterized by high elevation drop varying within 1900-2200 m and determining the high gradient of river channels. High gradient of a river channel increases the magnitude of floods and flash floods and contributes to the development of stone-muddy and stone-water torrents. Almost all tributaries of the Rioni river within the limits of Oni municipality are characterized by mudflows, which damage settlements and infrastructure located on riverside areas.

The natural *landscape*, specifically one of its main components – vegetation, follows the pattern of vertical zoning. Up to 700-1000 m above sea level, on the less developed territories, an oak-hornbeam forest landscape is found. The landscape is modified to different extents as a result of human economic activity. The cultural landscape (settlements, arable lands, pastures, infrastructure) plays an important role in this vertical zone. At up to 1900-2400 m above sea level, subalpine forest-meadows and meadow-shrubbery are developed. At 3400 m above sea level Alpine meadows are found, which at higher altitudes are replaced by the subnival and nival belts.

**Lentekhi municipality**. Lentekhi municipality is located at 700-4546 m above sea level (peak Ailama). The territory of the municipality is characterized mainly by erosional mountain-gorge terrain. Old glacial relief is developed at certain areas above 1400-1500 m. Main *orographic* units include: 1. South faced slope of the Svaneti range built of Jurassic shale and sandstone. The slope extends over 80 km from the peak Koruldashi (3085 m) westward up to the Kheledula pass (2564 m). The slope is gentle and quite heavily dissected by the massifs (Kheledula, Atsalami, Goldashi, Dadiashi, Airashi) towering up from the ridge zone of the Svaneti range southward and exceeding 3000 m in height and the narrow and often canyon type gorges of the rivers Kheledula, Skilari, Laskadura, Mukhra, Ashkhashuri, Koruldashi. Old glacial relief in still found in the form of 5-6 km long trough gorges, circuses and kars in the gorges of the rivers Skilari and Laskadura at a height of 1500 m and above.

2. The north faced slope of the Lechkhumi range. Within the limits of the municipality the slope extends from the Vatsistsveri pass (2910 m) westward to Lentekhi. It is built of Jurassic clay-share, sandstone and porphyrite. The slope is not high (4-12 km). It is steeply inclined towards the bottom of the Tskhenistskali river gorge. Peaks (Tetnari, Lelashkha, Chutkharo, Shushara, etc.) towering up from the ridge zone of the Lechkhumi range are exceeding 3500 m. The bottom of the Tskhenistskali river gorge is located at 700-1800 m above sea level.

The north faced slope of the Lechkhumi rangelacks major branches and is heavily dissected by narrow and deep and often canyon type gorges of left tributaries of the Tskhenistkali river: Shkhivisgele, Nashalisgele, Gobishuri, Tskhenshuri, Leeshuri and Khopuri rivers which are characterized by steeply inclined channels. From 1600-1800 m above sea level, along with erosional landforms, old glacial formations – mainly short trough gorges and circuses are also found. At certain locations (at the source of the Gobishuri river and in the area of the Lankori pass), flattened as a result of old glacial exaration, small sized degraded lakes are found.

3. The gorges of the Tskhenistskali river and its right tributary – Kheledula river. The municipality covers the upstream areas of the Tskhenistskali river basin. The river takes its rise on south-west faced slope of the mount Pisi (3787) at 2700 m above sea level. Above 1500-1600 m, the gorges of its right and left tributaries are of old glacial-erosion origin, where the lower sections of the bottom of the gorges are eroded, while the upper sections are characterized by a trough (old glacial) morphology. Above 1500-1700 m old glacial circuses and kars are developed.

From the confluence of the Koruldashi river (1300-1400 m) the gorge of the Tskhenistskali river runs westward and extends up to Lentekhi (700 m above sea level). At this section the gorge is eroded, where narrow, canyon type sections alternate with relatively wide depressions (Lentekhi depression, etc.). The fragments of Tertiary terrace steps are still observed on the slopes of depressions.

The Kheledula river gorge starts on the Egrisi gorge – on the north-east faced slope of the mount Tekhurishdudi (3002 m), at 2760 m above sea level. It runs eastward up to Lentekhi (700 m). The bottom of the gorge together with adjacent slopes is built mainly of Jurassic clay-shale and porphyrite and is characterized by erosional formations (quite wide erosional-accumulation bottom and narrow and deep erosional gorges of the tributaries flowing on this slope). Above 1600-1700 m, old glacial formations (through gorges, circuses and kars), along with erosional landforms are found in some places.

The *hydrographical network* consists mainly of rivers. Glaciers are developed in the ridge zone of the Greater Caucasus – on south faced slopes of the peaks Ailama, Tsurungali (4249 m) and Pasismta. Several small lakes are found on the norther slope of the Lechkhumi mountain range.

Within the limits of the municipality, the Tskhenistskali river and its tributaries are characterized by a high elevation drop (1200-2100 m) determining the high gradient of river channels and increasing the intensity of morphodynamic processes. The rivers are characterized by periodical occurrence of strong flash floods accompanied with stone-muddy and stone-water torrents.

Various economic activities (construction of roads, bridges, etc.) implemented within river basins in the fifties of the 20th century without carrying out adequate reclamation measures have resulted in increased intensity of flash floods, activated mudflow processes, increased amounts of large sized materials in river sediments (stones, boulders) and intensified landslides and other gravitational processes on slopes. These factors damage and affect buildings and infrastructure (roads, bridges, residential houses, farmlands). The administrative center of the municipality –Lentekhi and adjacent settlements are most affected.

*Natural landscape*. On the territory of the municipality the natural landscape is found in the form of mountain forests and mountain meadows which are degraded to different extents. Up to 1000-1200 m above sea level mainly the landscape of beech forests with participation of chestnut, oak and hornbeam is developed. Due to the high density of settlements and intense use of lands for economic purposes, the mentioned landscape is heavily degraded. In the upper zone, up to 1700 m above sea level, a landscape of beech forests which is modified to a lesser extent dominates. Up to 1900-2000 m this landscape is replaced by a landscape comprised of beech-dark coniferous forests and the fragments of spruce-fir forests. Up to 2000-2500 m above sea level a landscape of subalpine forest meadows and meadow-shrubbery is developed. Up to 3000 m this landscape is replaced by Alpine meadows.

**Tsageri municipality**. The territory of the municipality is notable for a complex *orography*. The northern part of the municipality covers the easternmost end of the Egrisi (Samegrelo) mountain range comprised of the Tsekuri (3179 m), Sazamtro and Sakeria rocky massifs that are built of Jurassic porpyrites. The northern part of the municipality also covers the south faced slope of the Lechkhumi mountain range built of Jurassic porpyrites. The slope characterized by a mountain-gorge relief is divided into two almost equal parts by the Gumuristavi branch mountain range (water divide of the rivers Tskhenistskali and Lajanuri). The slope of the Lechkhumi range is dissected by narrow and relatively shallow gorges of the Lajanuri river and its tributaries and water divide ridges located between them.

The western part of the municipality covers high rocky-cliffy walls of the Askhi limestone massif, towering up from the right side of the Jonouli river (right tributary of the Tskhenistskali river) and spreading along several kilometers.

The Khvamli limestone massif (2002 m) is located in the southern part of the municipality. The south faced slope of the massif is a vertical almost 300 m high wall. The massif is characterized by a karstic relief (karstic funnels, wells with vertical walls, caves and deep cracks). Some cracks and caves contain masses of ice for most of the year.

The major part of the municipality is occupied by tectonic erosive depressions. The largest among them are Tsageri and Orbeli depressions. The Tsageri depression is located between the Muri and Saretskela ravines at 400-500 m above sea level. It is 9 km long and 1.5-2 km wide. On the bottom of the depression the Tskhenistskali river has developed a 80-120 m wide channel.

Within the limits of the depression, its western slope is occupied by a 500-900 m high hilly strip located between the villages Gveso, Kveda Lukhvano, Bardnala, Larchavali. Lanslides are developed on the slopes located on the both sides of the depression.

The Tsageri depression and the Orbeli depression are separated by the Shua Lechkumi hillock. The hillock is built of Tertiary clays and marls and characterized by intensive landslide processes. The Orbeli depression is surrounded by hillocks built of Cretaceous limestone. A large portion of its bottom is occupied by a water reservoir (3.2 km long and 1 km wide) of the Lajanuri HPP. Southward, up to the confluence with the Rioni river, the Lajanuri river flows through a 4 km long and 600-800 m high canyon type narrow gorge.

Along the south-eastern edge of the Orbeli depression, in the place of an old exotectonic landslide, some tens of meters tall towerlike pillars (so-called Sairne pillars) are found. Landslides are developed around the depression, on the east faced slope of the Shua Lechkumi hillock.

*River network*. The local river network is characterized by medium density. The rivers – Lajanuri (tributary of the Rioni river) and Jonouli (tributary of the Tskhenistskali river) and their tributaries are characterized by high elevation drop (1700-2300 m) determining the high gradient of river channels and increasing the intensity of floods, flash floods and mudflows. Since the fifties of the 20th century an intensive accumulation of solid sediments (cobble, pebble) transported by the rivers Tskhenistskali and Lajanuri to the bottom of the Tsageri and Orbeli depressions is taking place. Therefore, the channels of these rivers are elevated resulting in inundation of low laid developed riverside areas during floods.

*Natural landscape*. As a result of human economic activity for a long period of time, the natural landscape of the municipality is mostly heavily modified. Up to 800-900 above sea level a landscape of oak-hornbeam forests which is modified to different extents dominates. Up to 1800-1900 m above sea level a landscape of beech forests and beech-dark coniferous forests which is modified to a lesser extent dominates. Up to 1900-2800 m subalpine forest meadows, meadow-shrubbery and Alpine meadows are developed. Subnival landscape dominates on the cliffy massifs of Tsekuri, Sazamtro and Shakeria.

**Mestia municipality** isthe highest municipality of Georgia, located at 350-5200 m above sea level on a heavily dissected and complex terrain with strong recent glaciation. The municipality is situated between the main range of the Greater Caucasus and its lateral ridge – Svaneti range. Main *orographic* units include:

1. The ridge zone of the Greater Caucasus built of Precambrian and Paleozoic granites, gneiss and crystalline schist, very steep, with vertical walls at certain locations and mountain peaks exceeding 4000 m (Shkhara – 5202 m; Janga – 5080 m; Ushba – 4696 m; Distola – 4960 m, etc.). As well as its south faced slope, built mainly of Jurassic rocks and heavily dissected with Shtavleri, Tsalgmili, Ushba, Gvalda, Tsirniashi, Kareta and other branch ridges of the main mountain range and deep and steep gorges of the rivers (Nenskra, Nakra, Dogra, Murkhra, Mestiachala, Khaldechala, etc.) flowing between these mountains. The northern part of the Kodori range – Moguakhshira mountain massif (3850 m) is located on the western extension of the south faced slope of the main range of the Greater Caucasus within the limits of Mestia municipality. The mountain massif is characterized by a dense network of old glacial and erosion gorges and the development of modern glaciers.

2. The north faced slope of the branch ridge (max. elevation 4002 m – peak Lasili) of the Svaneti range, relatively steep and heavily dissected with the narrow and often canyon type gorges of the left tributaries of the Enguri river (Mushuristskali, Koshra, Lasili, Khumpreri, Khaishura, etc.) and mountain ridges (Tekrashi, Abakuri, Mepkashi, Mushuri, etc.) located between these rivers. The north faced slope of the Egrisi (Samegrelo) range is a westward extension of the Svaneti range within the limits of the municipality. The slope is characterized by heavily dissected relief with peaks exceeding 3000 m (Lakumurash Dudi, Otepuri, etc.).

3. Enguri river gorge built of mainly Jurassic clay-shale, sandstones and partially of Paleozoic metamorphic schists and quartzites. The gorge is characterized by the alteration of lateral wide and narrow, canyon like and deep sections. The fragments of river terrace steps are still found at 200-250 m from the bottom of the gorge. Along with erosion forms, old glacial relief (in the form of trough gorges, moraines, circuses, kars) is developed from 1300-1500 m above sea level.

*Hydrographical network***.**Glaciers and rivers are the main elements of the local hydrological network. Thick mountain-valley type glaciers are developed in the central part of the main range of the Greater Caucasus and Svaneti range and adjacent slopes. River network is dense. Enguri river and its tributaries are characterized by high elevation drops (1200-1400 m), which contribute to the development of erosion, landslides and other gravitational processes in the bottom and slopes of their gorges. Strong and often catastrophic flash floods accompanied with stone-muddy and stone-water torrents occur during heavy rains and rapid snow melt. Flash floods that occurred on the Nenska river (environs of the village Khaishi) in 2018 and in the Mestiachala river gorge in 2019 have led to catastrophic consequences.

*Main landscapes***:** At 1900-2000 m above sea level a low and medium mountainous beech-hornbeam, been and beech-dark coniferous (spruce, fir) landscape is developed. Major portion of this type of a landscape is modified to different extents as a result of human economic activity. At 3100-3200 m above sea level, landscapes of subalpine forest-shrubbery, meadow-shrubbery and Alpine meadows are developed. At 3300-3400 m above sea level they are replaced by the glacial landscape of subnival and nival belts.

Climate and Climate Change Trends

The report includes both current and predicted climate change data. For instance, current climate change on the territory of Upper Svaneti is discussed for the period of 1961-2010, which is divided into two equals 25-year periods to compare averaged values of climatic parameters of these two periods. In periods where a break series occurs, temperature and precipitation series are retrieved by methods that are used in climatology. Climate change scenarios are provided for the periods of 2021-2050 and 2071-2100[[1]](#footnote-1).

Projections of climate change are based on the Regional Climate Model RegCM4.0, and a Global Climate Model EH5OM (MPI, Hamburg), properly downscaled and compiled for Georgia (and the Caucasus region), within the spatial extent of N 40º30‘-47º; W 39º25‘-44º and time period of 1959-2100, as performed for the Georgia’s Third National Communication to the UNFCCC. The Data from the Georgia’s Second National Communication to the UNFCCC and projections developed by National Association of Local Authorities of Georgia (NALAG) in the framework of the program “Institutionalization of Climate Change Adaptation and Mitigation in Georgian Regions (ICCAMGR)” have been also used.

**Upper Imereti region (Chiatura, Sachkhere, Tkibuli):** The study region is located within the humid subtropical zone of western Georgia. Upper Imereti is situated in the eastern periphery of the mentioned zone and therefore typical characteristics of humid subtropical climate are not prominent. Climate is relatively continental, the level of precipitation is lower, annual and diurnal temperature amplitudes are higher, breezes do not occur. In low mountainous zone summer is relatively dry. Location of the study region within the subtropical zone and moderate cloudiness determine increased period and intensity of sunlight during all seasons. Annual temperature amplitude in Upper Imereti varies within 19-20°C. The following climate zones are distinguished (Kordzakhia, 1959):

* Average annual air temperature in Upper Imereti up to 400 m above sea level is 13,9-14°C, average temperature in January - - 3,7°C, average temperature in August - +23,9°C; absolute maximum temperature reaches +42°C, while absolute minimum temperature drops to -20°C, annual precipitation is 1000-1200 mm.
* The second climate zone spreads up to 700 m above sea level. This zone is characterized by moderately cold winter and hot, dry summer. Average annual air temperature is 10-12°C, average temperature in January varies within 0,3-2,4°C. Air temperature in warmest month is 20-22°C, absolute maximum temperature reaches 37-40°C, while absolute minimum temperature drops to -28-31°C. Annual precipitation varies within 800-1200 mm.
* The third climate zone spreads up to 1200 m above sea level. This zone is characterized by moderately cold climate. Average annual air temperature varies within 6,3-8°C. Average temperature in January is -2,4-3,9°C. Air temperature in the warmest month is 16,2-18,2°C, absolute maximum temperature reaches +32°C. Annual precipitation varies within 1200-1400 mm.
* The fourth climate zone spreads on the area within 1800-2000 m above sea level and is characterized by cold humid weather, moderately warm summer and cold long winter. Average annual air temperature is 6°C, average temperature in January varies within - 5-7°C, and average temperature in July is 13-15 ° C. Annual precipitation varies within 1400-1600 mm.
* Alpine zone starts from 2000-2300 m above sea level. Average temperature in July is below 10°C, average temperature in January is up to -10-12°C.

The climate change scenario for Imereti regions has been developed based on “The Georgian Road Map on Climate Change Adaptation”[[2]](#footnote-2):

* In 2021-2050 the average annual temperature in Upper Imereti will rise presumably by 1.51°C -1.52°C as compared to 1961-1990 baseline period. In 20172-2100 the average annual temperature change will vary within 3.8°C-3.9°C as compared to 1961-1990 baseline period.
* In 2021-2050 the average spring temperature will rise by 1.23°C- 1.29C° as compared to 1961-1990, while in 2071-2100 the increment of average spring temperature will reach 3.2-3.4°C as compared to 1961-1990 baseline period. The annual number of hot days will increase about 2.5 times more than in the previous projected period (2021-2050).
* The heating period, or when the average temperature is below +8°C and the population needs additional heating resources, tends to decrease throughout the territory of Upper Imereti. The trend is particularly notable in mountain zones, where the heating period decreases by 15 days on average.
* The number of frost days in 2021-2050 will decrease throughout the territory of Upper Imereti as compared to the baseline period 1961-1990. This decrease is of special importance for mountain regions, where the number of frost days will decrease by 36 days per annum on average.

**Racha-Lechkhumi and Lower Svaneti (Ambrolauri, Oni, Lentekhi and Tsageri municipalities)** Lower Svaneti: For the moment of preparation of the Second National Communication to UNFCCC mountainous region of Lower Svaneti had been identified as an ecosystem vulnerable to various disastrous weather events, significantly enhanced by global warming. As a result of the increased frequency and intensity of these phenomena (floods, landslides and mud torrents), land erosion has intensified and greatly damaged agriculture, forests, roads and communications. As a result of the intensification of landslides and floods, the population of the Lentekhi region has decreased by 40% since 1986.

The average annual air temperature and level of precipitation in this region have increased by 0.40C and 106 mm (8%) respectively, for the past 50 years.

Analysis of observation data on floods for the period of 1967–1989 has demonstrated that in the second half of the period the recurrence of floods grew by more than two-fold, and the maximum discharge has increased by 9%. At the same time, the duration of floods has decreased by 25%, which could explain the rise in intensity and severity of floods.

Since 1980, the number of landslides has increased by 43%, reaching a total of 117 at present. This especially steep rise in the number of landslides was provoked by the abundant snowfall in the winter of 1986-1987. The increase in heavy precipitation for the last two decades in Lower Svaneti has also caused an almost two-fold growth in the frequency of mudflows.

Despite sufficient provisions of precipitation in the Lentekhi region, its territory is affected by drought from time to time, the duration and recurrence of which have increased from 34 to 47 days (38%) respectively since 1991, compared with the 1956-1972 period. However, droughts do not create serious problems due to abundance of surface waters.

As for expected climate change, the rate of temperature rise in Lower Svaneti is 0.3°C per 10 years, while rainfall increases by 10 mm.

Racha-Lechkhumi: Average annual air temperature in Ambrolauri municipality is +5.50C (11.20C), in winter -3.10C (1.10C) and in summer +15.40C (20.60C). Absolute minimum is -21.50C and absolute maximum +39.20C. Annual precipitation is 1,288 mm; maximum rainfall is recorded in winter and fall – 329 mm.

The number of hot days is 43 on average, the number of frost days equals to 87. The number of days with heavy precipitation is 16 on average. Average snow cover duration in Ambrolauri municipality is 60 days.

According to the climate change scenario[[3]](#footnote-3) for 2021-2050 and 2071-2100, the climate prediction for Ambrolauri municipality is as follows:

* Average annual air temperature will rise by 1.20C. Maximum increase of temperature is expected in fall (by 1.80C). Absolute minimum will rise by 0.60C, absolute maximum – by 0.90C. By this period, annual precipitation will decrease about 4%. Sharp decrease of precipitation (12%) will be observed in spring, during other season the rate of reduction of rainfall will be lower (2%). The level of precipitation during all seasons, except summer, will be almost equal. The number of hot days will increase by about 16, while the number of frost days will decrease by 20. The number of days with heavy rainfall in the municipality will increase by 1.3. The thickness of snow cover will increase too, however snow cover duration will decrease.
* By 2071-2100, average annual air temperature will rise by additional +3.40C. Highest rates of temperature increase (by 4.60C) is expected in summer. During this season absolute minimum and absolute maximum temperatures, especially absolute minimum temperature (by 4.6-4.40C) will rise considerably. Annual precipitation will decrease by 10%. Seasonal sums of precipitation will decrease during all seasons, especially in summer (28%). For other seasons this index varies within 8-15%. These changes will lead to the change of annual distribution of rainfall, maximum precipitation will be recorded in winter and its share in annual rainfall will increase. The number of hot days will increase by about 44, and the number of frost days will decrease by 51. The occurrence of heavy rains during this period will decrease by 2.2. The thickness and duration of snow cover will decrease considerably.

As for Oni municipality:

* In 2021-2050 the average annual temperature will rise presumably by 1.49°C-1.50°C as compared to 1961-1990 baseline period. The number of hot days, i.e. days when maximum temperature exceeds 250C, in 2021-205 is increasing throughout Georgia as compared to 1961-1990. This process will be less observable on the slopes of the Greater Caucasus. In particular, the number of such days in Oni municipality increases from 0.3 to 5 days. The annual number of frost days by 2021-2050 in Oni municipality will be increased by 22 days on average as compared to 1961-1990 period.
* The change of average temperature in 2071-2100 will vary within 3.92°C-3.97°C as compared to 1961-1990 baseline period. In 2071-2100 the annual number of hot days will increase about 2.5 times more than in the previous projected period 2021-2050 according almost to the same pattern.

**Samegrelo-Upper Svaneti (Mestia municipality)**[[4]](#footnote-4): Climate of Mestia municipality is humid with cold winter and long cool summer. Based on observation data for 1936-1960, average annual air temperature in Mestia municipality was +5.70C, temperature in the coldest month (January) -6.00C, while temperature in the hottest month (July) +16.40C, absolute minimum -35 0C, absolute maximum +350C. The sum of active temperatures (above +100C) was 20390C, annual relative humidity 75%, annual precipitation - 918 mm. Maximum average monthly rainfall was recorded in October and amounted to 95 mm, minimum rainfall – in February (61 mm). Average annual wind speed was 1.1 m/sec. Prevailing wind directions - mainly north and south-west.

The analysis of the change of climate elements in 1961-1985 and 1986-2010 periods shows, that the average annual air temperature in the middle zone of Mestia municipality has increased by 0.30C. Warming mainly occurs in summer (+0.70C) and fall (+0.50C), while in winter slight cooling (-0.10C) and in spring slight warming (+0.10C) was recorded. Average maximums of air temperatures have slightly increased (+0.20C), while average minimums increased considerably (+0.50C). Annual precipitation has increased by 97 mm (10%). During the last 25 years, winter in the mentioned zone of Mestia municipality has become colder. Average annual temperature slightly decreased (-0.10C). The seasonal number of frost days has increased by 7 on average, increasing the risk of icing. There was almost no difference between average and average minimal temperatures of these two periods in spring (±0.10C), however average summer temperature has increased significantly (+0.70C). Therefore, summer in Mestia became significantly hotter and relatively dry. Fall became warmer. Average temperature has increased by 0.50C, absolute maximum has increased by 3.40C, while absolute minimum has decreased by 1.60C. Seasonal precipitation has increased by 10%, hence fall in Mestia became warmer and rainy. Reoccurrence of heavy rains has been also changed. In 1986-2010 the number of days with heavy rainfall (≥50 mm) has decreased nearly by two times as compared to 1961-1985. This change is the most noticeable in summer. It means that in this zone, which belongs to mudflow and avalanche hazard zones, the risk of occurrence of mudflows is reduced in summer, while the risk of occurrence of snow avalanches is increased in winter.

In the middle zone of the municipality the occurrence of almost all temporary droughts has decreased in the second period (1986-2010), therefore local agriculture does not suffer from the shortage of precipitation.

Expected climate change in Upper Svaneti for the periods of 2021-2050 and 2071–2100 has been evaluated against baseline period of 1961-1990. Future climate change scenario has been constructed based on RegCM4, using Global Climate Model EH5OM and A1B scenario. Calculations have been made based on the data of 2 meteorological stations: Mestia and Khaishi located in Upper Svaneti where observations were started in 1933, as well as the data from Zugdidi meteorological station (1929).

The Table below contains predicted values of temperature and precipitation.

Table 1 - Multi-model ensemble’s prediction of climate parameters for Mestia municipality[[5]](#footnote-5)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Season | Temperature 0C | | | | | Precipitation, mm | | | | |
| Temperature in baseline period 1961-1990 | Increment from baseline period 2021-2050 | Increment from baseline period 2071-2100 | Temperature 2021-2050 | Temperature 2071-2100 | Precipitation in baseline period 1961-1990 | Increment from baseline period 2021-2050 | Increment from baseline period 2071-2100 | Precipitation 2021-2050 | Precipitation 2071-2100 |
| Winter | -4.3 | 1.2 | 3.6 | -3.1 | -0.7 | 185 | 29.7 | 16.2 | 240 | 215 |
| Spring | 5.5 | 0.9 | 3.2 | 6.4 | 8.7 | 236 | -0.8 | 6.4 | 234 | 251 |
| Summer | 15.2 | 1.7 | 4.8 | 16.9 | 20.0 | 296 | 19.2 | 6.1 | 353 | 314 |
| Fall | 6.7 | 2.0 | 4.6 | 8.7 | 11.3 | 247 | 1.6 | -13.0 | 251 | 215 |
| **Year** | **5.8** | **1.5** | **4.0** | **7.3** | **9.8** | **9.64** | **11.8** | **3.2** | **1078** | **995** |
|  |  |  |  |  |  |  |  |  |  |  |

The Table shows, that by 2050, 1.50C rise in temperature as compared to 1961-1990 baseline period is expected on the whole territory of Upper Svaneti. By 2021-2050 annual precipitation will increase by 11.8%.

Mineral Resources

The following mineral resources are found in the target municipalities of the region:

*Tkibuli municipality* is rich in minerals such as coal and [teschenite](https://ka.wikipedia.org/w/index.php?title=%E1%83%A2%E1%83%94%E1%83%A8%E1%83%94%E1%83%9C%E1%83%98%E1%83%A2%E1%83%98&action=edit&redlink=1) and facing stones. Coal is mined in [Tkibuli](https://ka.wikipedia.org/wiki/%E1%83%A2%E1%83%A7%E1%83%98%E1%83%91%E1%83%A3%E1%83%9A%E1%83%98). Teschenite is mined in the villages [Kursebi](https://ka.wikipedia.org/wiki/%E1%83%99%E1%83%A3%E1%83%A0%E1%83%A1%E1%83%94%E1%83%91%E1%83%98), [Okhomira](https://ka.wikipedia.org/wiki/%E1%83%9D%E1%83%AE%E1%83%9D%E1%83%9B%E1%83%98%E1%83%A0%E1%83%90), [Koka](https://ka.wikipedia.org/wiki/%E1%83%99%E1%83%9D%E1%83%99%E1%83%90_(%E1%83%A2%E1%83%A7%E1%83%98%E1%83%91%E1%83%A3%E1%83%9A%E1%83%98%E1%83%A1_%E1%83%9B%E1%83%A3%E1%83%9C%E1%83%98%E1%83%AA%E1%83%98%E1%83%9E%E1%83%90%E1%83%9A%E1%83%98%E1%83%A2%E1%83%94%E1%83%A2%E1%83%98)), [Bueti](https://ka.wikipedia.org/wiki/%E1%83%91%E1%83%A3%E1%83%94%E1%83%97%E1%83%98) and [Tsutskhvati](https://ka.wikipedia.org/wiki/%E1%83%AA%E1%83%A3%E1%83%AA%E1%83%AE%E1%83%95%E1%83%90%E1%83%97%E1%83%98). A large factory manufacturing teschenite facing slabs is located in the village Kursebi.

Diptolitic and carbonaceous shale, [chalcedony](https://ka.wikipedia.org/w/index.php?title=%E1%83%A5%E1%83%90%E1%83%9A%E1%83%AA%E1%83%94%E1%83%93%E1%83%9D%E1%83%9C%E1%83%98&action=edit&redlink=1), [barite](https://ka.wikipedia.org/w/index.php?title=%E1%83%91%E1%83%90%E1%83%A0%E1%83%98%E1%83%A2%E1%83%98&action=edit&redlink=1), quartz sands, [marl](https://ka.wikipedia.org/wiki/%E1%83%9B%E1%83%90%E1%83%A0%E1%83%9B%E1%83%90%E1%83%A0%E1%83%98%E1%83%9A%E1%83%9D), [basalt](https://ka.wikipedia.org/wiki/%E1%83%91%E1%83%90%E1%83%96%E1%83%90%E1%83%9A%E1%83%A2%E1%83%98), [jet coal](https://ka.wikipedia.org/wiki/%E1%83%92%E1%83%98%E1%83%A8%E1%83%94%E1%83%A0%E1%83%98), fireproof and cement clays are also mined.

There are also healing balneological (villages Kursebi, Bueti, Sochkebi, Manchiori, Mukhura and Legva) and drinking waters (villages Legva, Manchiori, Urgebi, Tsutskhvati, Dzirovani, etc.).

[*Chiatura* municipality](https://ka.wikipedia.org/wiki/%E1%83%AD%E1%83%98%E1%83%90%E1%83%97%E1%83%A3%E1%83%A0%E1%83%98%E1%83%A1_%E1%83%9B%E1%83%A3%E1%83%9C%E1%83%98%E1%83%AA%E1%83%98%E1%83%9E%E1%83%90%E1%83%9A%E1%83%98%E1%83%A2%E1%83%94%E1%83%A2%E1%83%98): In Chiatura the reserve of the manganese deposits amount to 215 mio. t. According to expert evaluation, Georgian manganese deposits are characterized by high quality ores, large reserves and convenient geographical location. The Chiatura manganese deposit has been exploited from 1879.

Quarts sands mine and [mineral waters](https://ka.wikipedia.org/wiki/%E1%83%9B%E1%83%98%E1%83%9C%E1%83%94%E1%83%A0%E1%83%90%E1%83%9A%E1%83%A3%E1%83%A0%E1%83%98_%E1%83%AC%E1%83%A7%E1%83%9A%E1%83%94%E1%83%91%E1%83%98) are found in the village Zodi.

*Sachkhere* *municipality*: quartz sand, [jet coal](https://ka.wikipedia.org/wiki/%E1%83%92%E1%83%98%E1%83%A8%E1%83%94%E1%83%A0%E1%83%98) and [coal,](https://ka.wikipedia.org/wiki/%E1%83%A5%E1%83%95%E1%83%90%E1%83%9C%E1%83%90%E1%83%AE%E1%83%A8%E1%83%98%E1%83%A0%E1%83%98)[pumice](https://ka.wikipedia.org/wiki/%E1%83%9E%E1%83%94%E1%83%9B%E1%83%96%E1%83%90), [marble](https://ka.wikipedia.org/wiki/%E1%83%9B%E1%83%90%E1%83%A0%E1%83%9B%E1%83%90%E1%83%A0%E1%83%98%E1%83%9A%E1%83%9D).

*Ambrolauri municipality*: arsenic, antimony, manganese, iron, limestone, magmatic rocks (basalt), cobble, chalk-stone, brick clay, gypsum,

*Oni municipality* is rich in rare minerals: manganese, barite, gold, molybdenum, wolfram, copper, zinc and lead, antimony, mercury, facing stones, construction sand and pebble. It shall be noted that most of these mineral resources are difficult to access and their reserves are limited. Therefore, the demand on these mineral resources, with the exception of gold, is low. The important deposits of mineral resources of Oni municipality are:

* Chordi barite deposit with the reserve of 1817 thousand tons of ore; and
* Gebi gold deposit with an estimated reserve of up to 18 tons of gold from three veins.

It shall be noted that the Gebi gold deposit contains 60 veins which are not yet explored and may have an economic significance. The majority of deposits of mineral resources of Oni municipality are concentrated in upstream areas of the river Rioni gorge and on the territory of the villages Gebi, Chiora and Goni, where the deposits of the following mineral resources are found: molybdenum, antimony, wolfram, mercury, gold, copper, quartz, diabase, limestone, red stone.

Healing mineral water “Utsera” - a sodium bicarbonate type of water containing boric acid, with annual discharge of about 600 tons, is to be mentioned in Oni municipality along with up to 20 other different types of healing, drinking and spa mineral waters.

*Tsageri municipality*: limestone, sand and gravel for constructions.

*Lentekhi municipality’s* important mineral resources include arsenic (Tsana deposit), marble and quartzite. The municipality is rich in mineral waters. These are:

* Tskhumaldi sodium-calcium bicarbonate type of water;
* **Koja Moreli** –several springs with mineral waters of calcium-magnesium bicarbonate type with dissolved carbon dioxide. Local population uses mineral water for healing purposes.
* **Lanakiri** calcium-magnesium bicarbonate type water with low mineralization.
* **Khopuri** is a Borjomi type sodium-calcium bicarbonate water. The spring is widely used by local communities.
* **Muashi** two springs of mineral waters: 1. Muashi - sodium-calcium bicarbonate type of water containing dissolved carbon dioxide, which is used only for drinking; 2. Tsernashi (Tsrnashi) – iron-manganese bicarbonate type of water containing dissolved carbon dioxide, which is used for balneological purposes.
* **Kherias Sgimi** sodium bicarbonate type of water with low mineralization.
* **Chikhareshi** sodium-manganese bicarbonate water.
* **Koruldashi** two springs of water containing dissolved carbon dioxide and iron.

These springs are not economically viable.

*Mestia municipality:* Barite, gold, stibium, wolfram, [marble](https://ka.wikipedia.org/wiki/%E1%83%9B%E1%83%90%E1%83%A0%E1%83%9B%E1%83%90%E1%83%A0%E1%83%98%E1%83%9A%E1%83%9D), [lead](https://ka.wikipedia.org/wiki/%E1%83%A2%E1%83%A7%E1%83%95%E1%83%98%E1%83%90)-[zinc](https://ka.wikipedia.org/wiki/%E1%83%97%E1%83%A3%E1%83%97%E1%83%98%E1%83%90),  travertine, limestone, gabbro diabase, antimony, [mineral waters](https://ka.wikipedia.org/wiki/%E1%83%9B%E1%83%98%E1%83%9C%E1%83%94%E1%83%A0%E1%83%90%E1%83%9A%E1%83%A3%E1%83%A0%E1%83%98_%E1%83%AC%E1%83%A7%E1%83%9A%E1%83%94%E1%83%91%E1%83%98) of local importance are available in *Mestia municipality*. Number of licenses has been issued for minerals extraction and exploration for precious metals in Mestia municipality.[[6]](#footnote-6)

Detailed information on existing mineral and thermal resources is available at the web-page of the National Agency of Mines.[[7]](#footnote-7)

Soil Types

The soil cover in the ***Imereti*** region is very diverse. Mostly widespread soils are chernozems, alluvial soils, subtropical yellow podzols, red soils, raw humus calcareous soils and cinnamomic soils. In the mountainous regions an open brown forest podzols can be also found. Yellow soils and thin layer of red soils are used for cultivation of tea and other subtropical cultures. Red and yellow soils occupy hilly areas in West Georgia. The Red podzolic soils are found on a comparatively fewer sharp slopes and on the wide ridgelines of the hillocks. The main type of mountain-forest soils – cinnamomic soils, occupies the vast territory in Upper Imereti. Finally, on some slopes of Sachkhere municipality the heavy loam soils can be found.

Soil types Characteristic:

* **Humus-calcareous**- The vineyard and orchards are established on this type of soil. These soils arealso widely used for field crops cultivation.
* **Alluvial -** wheat, barley, corn, melons and gourds and vegetables are cultivated. Onsome part of these type of soils few fruit trees are established here and there.
* **Subtropical Yellow Podzols -** Tea and citrus plants in small numbers are cultivated on this type of soil. Corn and other annual cultures are also cultivated mainly on yellow podzolic soils.
* **Red Soils** - there is a subtropical cultures and tea cultivated. The soil is characterized withacid reaction.
* **Cinnamonic Soils** - This type of soil is found in Upper Imereti. Cinnamonic soils is appropriate forperennial plants and in such areas the vineyard is cultivated.
* **Meadow-calcareous**- This type of soil is widespread in Upper Imereti. This type of soils is used for cultivationof vineyard, corn, laurel, field crops.[[8]](#footnote-8)

The diversity of the relief of ***Samegrelo-Upper Svaneti region***, its geological structure, and its varying climate have led to different types of soil. This region contains swampy and podzolic lowland, red soil and yellow soils of the foothill, and mountain forest and mountain meadow soil zones. As most of the region’s territory is in the subtropical climate area, the soils are mostly red, yellow, and podzolic types. Red soil is usually found on either sloped or gently sloped terrain. Tea, citruses, candlenut trees, and other subtropical plants are most commonly found there. Podzolic soils (subtropical podzolic soils) are formed on sedimentary rocks. The granulometry of the parent material as well as the production level of podzolic soil formation have an effect on the mechanical composition of these types of soil. Due to this, soils with sandy, loamy and podzolic composition are common in nature. These types of soil hold a large part of the territory of the lowlands of the region’s subtropical zone. Strong leaching and podzolization are typical of these types of soil.

In the high mountain zone, the mountain-forest and cinnamonic-forest soils are replaced by meadow soils, which contain the subalpine and alpine soils. The natural significance of these soils is determined by the herbaceous plants that grow on it, which are used for grassland pastures. Glaciers have an important part in the formation of soils. Alluvial soils are common on river terraces. Agriculturally, these types of soils are most important to the population of Upper Svaneti. According to the mechanical composition, there are different types of alluvial soils: loamy, sandy, and rocky soils.[[9]](#footnote-9)

Soil Type Characteristics:

* **Swampy Soils** – The swampy subtropical soils create lots of opportunities for the development of subtropical agriculture.
* **Podzolic and Subtropical Podzolic Soils -** These types of soil are characterized by different levels of podzolization, Ornstein and generally dense alluvial horizon, which are waterproof, and assist in waterlogging the soil. These soils are moderately fertile. Subtropical and subtropical-technical cultures, fruit trees, and annual crops grow on this soil. The vast majority of the territory is used for growing hazelnut.
* **Red and Yellow Soils -** These soils are used for subtropical cultures, fruit trees, and annual cultures. In order to maintain and then improve the fertility of these types of soils, it is necessary to create a deep cultured layer and fertilization. On sloped areas, it is necessary to take measures against erosion according to the degree of the slope.
* **Humus-Calcareous Soils** - The formation of this type of soils is associated with limestone, marlstone, and other carbonate rocks. It is rich with humus. Its mechanical composition consists of heavy loam and clay soil. In Samegrelo and Upper Svaneti, vineyard, subtropical fruit trees gardens, subtropical technical cultures, and also various annual cultures are grown on these type soil.
* **Mountain Forest and Brown Forest Soils** - Mountain forest and brown forest soils are especially common in the upper and lower belts of the forest zone. These types of soils border subtropical podzolic soils, red and yellow soils, where signs of transitioning towards these types of soil are common. Quite a large portion of brown forest soils are located under massive forests, but the lower belt of mountain forest zones, 900 meters above sea level; vineyards, and fruit tree gardens are established on these types of soils. While cultivation of brown forest soil, particular attention should be paid to the complex of anti-erosion measures.
* **Subalpine and Alpine Soils -** The natural significance of these soils is determined by the herbaceous plants that grow on it, which are used as pastures for livestock, and for relocation of bees in beekeeping.
* **Alluvial Soils -** Alluvial soil is characterized by the tendency of becoming swampy to varying degrees. In terms of mechanical composition, in alluvial soil we find sand, sandy soil, loamy soil, clay, as well as skeletal and non-skeletal varieties of soils.

There are 10 types of soils in ***Racha-Lechkhumi and Lower Svaneti*** region. Most of the territory, almost half of it, is covered with the raw humus calcareous soils, which are developed on a variety of calcareous rocks (limestone, diluvial lime layers, marl, calcareous sandstones and others).

The contiguous area of the raw humus calcareous soils begins from Lukhvano (Lechkhumi) settlement, and extends to Tsesi (Racha) village, and from the southern part of the region – from Zubi (Lechkhumi) village to the village Znakva (Racha). All of the above-mentioned soils are important for vine cultures. Exactly on these types of soils the best vineyards of Racha-Lechkhumi are established, and where the internationally famous semi-sweet wine of "Khvanchkara" is produced, as well as the wines of the best flavouring properties – "Usakhelouri", “Tsolikouri" of Tvishi and Orbelian "Ojaleshi". The relatively large area of the region is covered with cinnamonic, alluvial and mountain-meadow soils. Small patches of podzolic soils, humid mountain-meadow sward soils and glaciers can also be found in this region.[[10]](#footnote-10)

Biodiversity (flora, fauna)

**Flora**

Based on the geobotanical zoning of Georgia, the target municipalities are grouped in the following manner[[11]](#footnote-11):

**a) Sachkhere and Chiatura municipalities** belong to the geobotanical district of Upper Imereti plateau, the vegetation of which is the poorest variation of Colchic flora. Due to the high population density and economic activity, the natural vegetation of the Plateau has been almost completely destroyed in many areas and can be found only within certain river gorges. The natural vegetation is preserved to some extent on the Likhi range and Dzirula-Chkhirimela watershed divide.

Forest vegetation is comprised of mixed deciduous (linden, chestnut, hornbeam, maple, ash tree, Georgian oak) and beech forests. Georgian oak is a dominant species in the forests that grow on south-facing slopes up to 800-900 meters, temporary alder cenosis is often developed on abandoned lands. At relatively high altitudes (above 800-900 meters) the forests with beech as a dominant species are widespread. Beech forests occupy large areas, while coniferous forests, mainly pine stands, are rare. Colchic underwood (cherry laurel, rhododendron, yellow azalea, ilex, etc.) is rarely found in mixed deciduous and beech forests. Fescue (*Festuca drymeja*), sweet woodruff (*Asperula odorata*), motley grass and ferny forests are widespread. In oak stands, especially on limestone soils, oriental hornbeam and xeromesophilic shrubbery is found. Deforested areas are occupied by secondary oriental hornbeam stands and meadows. The vegetation of the geobotanical district and its dynamics require detailed geobotanical research.

**b) Tkibuli municipality** belongs to the Imereti geobotanical district which covers the northern slope of the Meskheti range within the Imereti region, excluding its westernmost section.

The geobotanical district is characterized by rugged topography. The terrain is heavily dissected with river gorges. The impact of the Black Sea on the territory of this geobotanical district is low and therefore the local climate is characterized by less humidity. Annual precipitation varies within 900-1600 mm. Summers often are accompanied with droughts.

The vegetation of the district is relict (Colchic). 3 sub-belts can be clearly distinguished within the forest belt: mixed deciduous forests, beech forests and dark coniferous forests.

* **The sub-belt of mixed deciduous forests** occupies the zone between 900-1000 above sea level. Dominant species are: chestnut, beech, hornbeam, alder, maple. Oak forests grow on south-faced slopes, while oak-hornbeam and ok-beech forests – on shaded slopes covered with thin soils. Colchic relict underwood (cherry laurel, rhododendron, ilex, Persian ivy, Caucasian whortleberry, yellow azalea, etc.) is developed in these forests. Due to uncontrolled forest harvesting, the areas under secondary shrubbery and meadows are increased. Large areas are occupied by ferns.
* **The sub-belt of beech forests** covers homogenous beech stands growing at an altitude from 900-1000 m up to 1500 m above sea level. Major areas are occupied by chestnut-beech, hornbeam-beech and spruce-beech forests. Beech and spruce forests are characterized by limited distribution. Pine stands are rare.
* **The sub-belt of dark coniferous forests** spreads within 1400-1850 m above sea level. Spruce, fir, spruce-fir, beech-spruce-fir stands dominate. Pine stands are found locally. At certain locations a narrow strip of pure beech forest is developed above coniferous forests. The forests with relict Colchic underwood are characterized by limited distribution. **Subalpine forests are found within 1850-2500 m above sea level**. The vegetation cover is comprised of subalpine forests, shrubbery and meadows.

**c) Mestia and Lentekhi belong to the Svaneti geobotanical district.**

Svaneti geobotanical district covers Upper and Lower Svaneti, depressions of the rivers Enguri and Tskhenistskali. The geobotanical region is surrounded by high mountain ranges. The local climate is impacted by marine climate; therefore, it is rather mild and humid. On mountain slopes precipitation increases with the increase of elevation.

Vegetation of the Svaneti geobotanical district is rich and diverse. Due to mild climate in its western part and continental climate in eastern part, the vegetation of these two parts of the geobotanical district differs from each other significantly.

Forest vegetation of the western part of Svaneti has a mesophilic-like character and appearance and resembles the neighboring Samegrelo geobotanical district.

Forest vegetation of the eastern part of Svaneti is comprised mainly of oriental spruce (*Picea orientalis*) and Sosnowsky pine (*Pinus sosnowskyi*) stands. Georgian oak (*Quercus iberica*) is widespread on southern-faced slopes up to 1500 m. On clear-cut areas silver birch (*Betula pendula*) and aspen (*Populus tremula*) are found.

Subalpine thin and crook-stem beech stands are found in the subalpine belt at 1800-2500 m above sea level. There are also subalpine fir, subalpine spruce, subalpine birch and subalpine maple forests. Forests with Colchic underwood (cherry laurel, rhododendron, yellow azalea, Caucasian whortleberry) are common. Subalpine high grasses are widespread in the subalpine belt of Svaneti. Rhododendrom is the most widespread subalpine shrub species. Yellow azalea, whortleberry and willow occupy smaller areas.

**d) Oni, Ambrolauri and Tsageri municipalities belong to the Racha-Lechkhumi geobotanical district.** This geobotanical district covers the Caucasus mountainous area within the historical parts of Racha and Lechkhumi and the northern part of Imereti. The eastern boundary of the geobotanical district coincides with the limits of the western Georgia.

The climate of the geobotanical region is continental due to its remoteness from the Black Sea and orographic characteristics. Annual precipitation is 900-1500 mm. Distribution of precipitation on the surface is not even.

Vegetation of this geobotanical district is diverse. Due to relatively dry and continental climate, major areas are occupied by xeroplilic plants – oak and pine stands.

The forest belt is spread up to 1859 m and consists of two sub-belts:

* **The belt of mixed broadleaved and oak forests.** This belt spreadsup to 1000-1100 m and is comprised of chestnut, beech, hornbeam, lime tree, maple, acer.
* **The sub-belt of beech and dark coniferous forests.** This sub-belt spreads from 1000-1100 m up to 1850 m where beech and spruce stands dominate. There are both pure beech stands as well as beech forests mixed with hornbeam, spruce and fir. In the upper part of the sub-belt, within 1300-1700 m, the share of fir, spruce, fir-spruce and beech-fir forests increases.

In this region the relict stands are rare.

Subalpine forests (1850-2500 m above sea level) are comprised of birch, Caucasian oak, maple, beech, fir and pine stands. Subalpine forests are covered with tall grasses. Rhododendron stands are widespread in subalpine forests. Junipers, whortleberry and willows occupy smaller areas.

This geobotanical district includes subnival belt as well (R. Kvachakidze – Geobotanical Zoning of Georgia).

**Fauna**

Mestia*[[12]](#footnote-12)*: Intensive human economic activity caused considerable change of local wildlife. As a result of filed surveys of 2006-2007 the following species have been identified:

Mammal species: European hedgehog (*Erinaceus europaeus*), greater white-toothed shrew (*Crocidura russula*), European hare (*Lepus europaeus*), brown rat (*Rattus norvegicus*), wood mouse (*Apodemus sylvaticus*), Caucasian shrew (*Sorex caucasicus*), whiskered bat (*Myotis mystacinus*), parti-coloured bat (*Vespertilio murinus*), Caucasian mole  (*Talpa Caucasica*), Caucasian squirrel (*Sciurus anomalus*, VU), European pine marten (*Martes martes*), fox (*Vilpes vilpes*), European badger (*Meles meles*), brown bear (*Ursus arqtos*, EN).

Bird species: Georgian Red List species golden eagle (*Aquila chrysaetos*, VU), bearded vulture (*Gypaetus barbatus*, VU),  long-legged buzzard (*Buteo rufinus*, VU), white-winged redstart (*Phoenicurus erythrogasterus* VU), great rosefinch  (*Carpodacus rubicilla*, VU), common cuckoo (*Cuculus canorus*), common wood pigeon (*Columba palumbus*), mistle thrush (*Turdus viscivorus*), Eurasian jay  (*Garrulus glandarius*), little owl (*Athene noctua*), brown owl (*Strix aluco*), green woodpecker, great spotted woodpecker (*Dendrocopos major*), lesser spotted woodpecker  (*Dendrocoros minor*), tree pipit (*Anthus trivialis*), common redstart  (*Phoenicurus phoenicurus*), goldcrest  (*Regulus regulus*), Eurasian golden oriole (*Oriolus oriolus*), common chaffinch (*Fringilla coelebs*), red-breasted flycatcher (*Ficedula parva*), red crossbill (*Loxia curvirostra*).

*Racha-Lechkhumi – Lower Svaneti[[13]](#footnote-13):*Fauna of Racha-Lechkhumi is not well studied. Information on invertebrates is limited. Around 51 mammal and 152 bird species are widespread in this area.

Mammal species include: chamois (*Rupicapra*, EN), brown bear (*Ursus arctos* EN), lynx (*Lynx lynx* CR), Mediterranean horseshoe bat (*Rhinolophus Euryale* VU), long-clawed mole vole (*Prometheomys schaposchnikowi*, VU), Caucasian squirrel (*Sciurus anomalus* VU), East Caucasian tur  (*Capra cylindricornis* VU), West Caucasian tur  (*Carpa caucasica* EN), European pine marten (*Martes martes*), European badger (*Meles meles*), fox (*Vulpes*), wildcat (*Felis silvestris*), roe deer (*Capreolus*), wolf (*Canis lupus*).

Birds: bearded vulture (*Gypaetus barbatus*, VU), golden eagle (*Aquila crysaetus*, VU), Caucasian grouse (*Tetrao mlokosiewiczi* VU), Caucasian snowcock (*Tetraogallus caucasicus*), mountain chiffchaff (*Phylloscopus lorenzii*), white-winged redstart (*Phoenicurus erythrogaster*), rosefinch (*Carpodacus rubicilla*, VU), griffon vulture (*Gyps fulvus* EN), boreal owl (*Aegolius funereus* VU), long-legged buzzard (*Buteo rufinus* VU) and Egyptian vulture (*Neophron percnopterus* VU).

*Fauna of Imereti*[[14]](#footnote-14)

Mammals: European badger (*Meles meles*), wolf (*Canis lupus*), jackal (*Canis aureus*), brown bear (*Ursus arctos* EN), European pine marten (*Martes martes*), lynx (*Lynx lynx* CR), mole (*Talpidae*), Caucasian squirrel (*Sciurus anomalus*) and red squirrel (*Sciurus vulgaris*), red deer (*Cervus elaphus*, CR), European roe deer (*Capreolus capreolus*), Eurasian otter (*Lutra lutra* VU)

Birds: northern goshawk (*Accipiter gentilis*), Eurasian sparrowhawk (*Accipiter nisus*), meadow pipit (*Anthus pratensis*), tree pipit (*Anthus trivialis*), great white heron, grey heron (Ardea cinerea**)**, great spotted woodpecker (Dendrocopos major) and black woodpecker (Dryocopus martius), Eurasian hoopoe *(Upupa epops*), booted eagle (*Hieraaetus pennatus*), Eurasian wren (*Troglodytes*), common blackbird (*Turdus merula*) and ring ouzel (*Turdus torquatus*), black kite (*Milvus migrans*), etc.

Forests and Protected Areas

The ***forests*** of the target regions belong to Colchis forest-vegetation region (the territory of Georgia is divided into forest-vegetation 7 regions) (Acad. V. Gulisashvili). This region is surrounded by the black sea on the west, main Caucasus range on the north, Surami (Likhi) range of the east and Adjara-Imereti range on the south. Climate varies vertically. Annual precipitation at different locations varies within 1200-4000 mm. The forests of the target regions belong to the following 4 vertical belts out of 5 vertical belts of the Colchis region[[15]](#footnote-15):

* **The belt of chestnut forests (within 500-1000 m above sea level).** Dominant species in this belt is chestnut (during recent years chestnut trees have been intensely harvested due to valuable timber). Along with chestnut trees, the following tree species are also found: Strandzha oak, lime tree (Tilia caucasica), Norway maple (Acer platanoides), alder (Alnus barbata), Oriental beech (Fagus orientalis), Georgian oak (Quercus iberica) growing on limy soils, etc. Underwood is comprised mainly of box tree, cherry laurel, buckthorn (Rhamnus imeretina), rhododendron, Colchis bladdernut (Staphylea colchica). Evergreen underwood in thinned forests is almost impassable.
* **The belt of beech forests (within 1000-1600 m above sea level).** The belt is characterized by high productive beech forests mixed up with individual or small amounts of lime tree, elm (Ulmus glabra), hornbeam, alder, Norway maple (Acer laetum), fir trees. Underwood is characterized by evergreen shrubbery. Due to the intensive growth of forests or the presence of evergreen underwood, grass cover is almost lacking. Therefore, these forests are often called dead covered forests. Underwood is also characterized by the presence of Caucasian whortleberry (Vaccinium arctostaphylos).
* **The belt of spruce and fir forests (within 1600-2000 m above sea level).** For this belt spruce-fir (Oriental spruce - Picea orientalis, fir - Abies nordmanniana) forests often mixed up with beech are characteristic. At the upper limit of the forests warty birch (Betula werrucosa) is found. Evergreen underwood is well developed. In these forests’ fir trees grow to huge sizes – up to 50-55 m in height and up to 1,5-2 m in diameter (200-400 years aged).
* **The belt of subalpine thin and crook stem forests (from 1900-2000 m up to 2200 m above sea level).** This belt is characterized by lower height, low productivity forests often with creek stem trees. The following tree species are found: Caucasian maple tree (Acer trautvetteri), beech, mountain ash (Sorbus boissieri), Litwinow Birch (Betula litwinowii), Medwedew birch (Betula medwedewii), Megrelian birch (Betula megrelica), Pontine oak (Quercus pontica). Pontine oak and Medwedew birch are often found at lower elevations within the spruce and fir forest belt. Medwedew birch, Megrelian birch and Pontine oak are characteristic species for this belt. There species are not found in other forests of the South Caucasus. Subalpine tall grasses, comprised of quite high (1,5-3 m high) grasses are well developed in this belt. These grasses prefer limestone soils, where pontic rhododendron and rhododendron (Rhododendron caucasica) can nit grow. Those sections of the subalpine belt, which are not characterized by limestone soils and border with subalpine meadows, are often covered with pontic rhododendron and rhododendron.

Below is given the distribution of dominant tree species by forest districts of the target regions based on the recent (2004) forest inventory data, obtained from the National Forestry Agency of Georgia:

Table 2 -Dominant tree species by forest districts In Oni and Ambrolauri

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Oni forest district** | | | **Ambrolauri forest district** | |
|  | Dominant tree species | Area (ha) | % of total area | Area (ha) | % of total area |
| 1 | Fir | 1338 | 3 | 8408 | 14.29 |
| 2 | Spruce | 826 | 1.19 | 834 | 1.41 |
| 3 | Pine | 2171 | 4.9 | 2711 | 4.6 |
| 4 | Beech | 21284 | 47.8 | 24430 | 41.53 |
| 5 | Beech developed from shoots | 2098 | 4.7 | 2099 | 3.56 |
| 6 | Oak | 6766 | 15.3 | 8002 | 13.6 |
| 7 | Oak developed from shoots | 937 | 2.1 | 3457 | 5.87 |
| 8 | Hornbeam | 4198 | 9.5 | 3272 | 5.56 |
| 9 | Hornbeam developed from shoots | 825 | 1.9 | 943 | 1.6 |
| 10 | Chestnut developed from seeds and chestnut developed from shoots | 183 | 0.4 | 1222 | 2.07 |
| 11 | Maple developed from seeds and maple developed from shoots | 1242 | 2.8 | 600 | 1.02 |
| 12 | Alder developed from seeds and alder developed from shoots | 1580 | 3.5 | 603 | 1.02 |
| 13 | Birch | 416 | 0.9 | 6 | 0.01 |
| 14 | Other (poplar, lime tree, willow, ilex, rhododendron, pontic rhododendron) | 1170 | 1.2 | 2224 | 3.78 |
| 15 | Total | **45 034** | 100 | **58 811** | 100 |

Table 3 - Dominant tree species by forest districts In Lentekhi and Tsageri

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Lentekhi forest district** | | | **Tsageri forest district** | |
|  | Dominant tree species | Area (ha) | % of total area | Area (ha) | % of total area |
| 1 | Fir | 9243 | 11.6 | 1090 | 2.39 |
| 2 | Spruce | 4741 | 5.95 | 423 | 0.92 |
| 3 | Pine | 199 | 0.24 | 614 | 1.34 |
| 4 | Beech | 37141 | 46.64 | 26597 | 58.33 |
| 5 | Beech developed from shoots | 0 | 0 | 622 | 1.36 |
| 6 | Oak | 4317 | 5.42 | 2257 | 4.95 |
| 7 | Oak developed from shoots | 0 | 0 | 1456 | 3.19 |
| 8 | Hornbeam | 3543 | 4.44 | 3467 | 7.6 |
| 9 | Hornbeam developed from shoots | 513 | 0.64 | 3778 | 8.28 |
| 10 | Chestnut developed from seeds and chestnut developed from shoots | 538 | 0.67 | 2037 | 4.46 |
| 11 | Maple developed from seeds and maple developed from shoots | 1649 | 2.07 | 32 | 0.07 |
| 12 | Alder developed from seeds and alder developed from shoots | 1601 | 2.01 | 1629 | 3.57 |
| 13 | Birch | 9041 | 11.35 | 56 | 0.12 |
| 14 | Other (poplar, lime tree, willow, ilex, rhododendron, pontic rhododendron) | 3628 | 9.58 | 1537 | 3.37 |
| 15 | Total | **79619** | 100 | **45595** | 100 |

Table 4 - Dominant tree species by forest districts In Sachkhere and Chiatura

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Sachkhere forest district** | | | **Chiatura forest district** | |
|  | Dominant tree species | Area (ha) | % of total area | Area (ha) | % of total area |
| 1 | Fir | 0 | 0 | 24 | 0.1 |
| 2 | Spruce | 60 | 0.09 | 25 | 0.1 |
| 3 | Pine | 1244 | 1.98 | 468 | 2.01 |
| 4 | Beech | 44212 | 70 | 6674 | 28.73 |
| 5 | Beech developed from shoots | 163 | 0.25 | 144 | 0.61 |
| 6 | Oak | 4411 | 7.02 | 5598 | 24.1 |
| 7 | Oak developed from shoots | 839 | 1.33 | 980 | 4.21 |
| 8 | Hornbeam | 4055 | 6.45 | 2980 | 12.82 |
| 9 | Hornbeam developed from shoots | 1341 | 2.13 | 551 | 2.37 |
| 10 | Chestnut developed from seeds and chestnut developed from shoots | 4628 | 7.37 | 4081 | 17.57 |
| 11 | Maple developed from seeds and maple developed from shoots | 49 | 0.07 | 0 | 0 |
| 12 | Alder developed from seeds and alder developed from shoots | 619 | 0.98 | 1132 | 4.87 |
| 13 | Birch | 11 | 0.01 | 0 | 0 |
| 14 | Other (poplar, lime tree, willow, ilex, rhododendron, pontic rhododendron) | 1145 | 1.82 | 560 | 2.41 |
| 15 | Total | **62777** | 100 | **23227** | 100 |

Table 5 - Dominant tree species by forest districts In Tkibuli and Mestia

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Tkibuli forest district** | | | **Mestia forest district** | |
|  | Dominant tree species | Area (ha) | % of total area | Area (ha) | % of total area |
| 1 | Fir | 14 | 0.04 | 50857 | 40.05 |
| 2 | Spruce | 106 | 0.34 | 9604 | 7.56 |
| 3 | Pine | 560 | 1.82 | 10391 | 8.18 |
| 4 | Beech | 5125 | 16.74 | 29572 | 23.29 |
| 5 | Beech developed from shoots | 81 | 0.26 | 0 | 0 |
| 6 | Oak | 1010 | 3.29 | 4029 | 3.17 |
| 7 | Oak developed from shoots | 85 | 0.27 | 0 | 0 |
| 8 | Hornbeam | 5179 | 16.92 | 2580 | 2.03 |
| 9 | Hornbeam developed from shoots | 3182 | 10.39 | 0 | 0 |
| 10 | Chestnut developed from seeds and chestnut developed from shoots | 8635 | 28.21 | 528 | 0.41 |
| 11 | Maple developed from seeds and maple developed from shoots | 0 | 0 | 426 | 0.33 |
| 12 | Alder developed from seeds and alder developed from shoots | 5423 | 17.71 | 739 | 0.58 |
| 13 | Birch | 0 | 0 | 15604 | 12.29 |
| 14 | Other (poplar, lime tree, willow, ilex, rhododendron, pontic rhododendron) | 1208 | 3.9 | 2624 | 2.06 |
| 15 | Total | **30608** | 100 | **126954** | 100 |

Area of Forest Fund territories of the target regions as of 2019:

Table 6 - Forest Fund Territories in target Municipalities

|  |  |  |
| --- | --- | --- |
| N | Municipality | Area  ha |
| 1 | Oni | 73629 |
| 2 | Ambrolauri | 80880 |
| 3 | Lentekhi | 76309 |
| 4 | Tsageri | 50854 |
| 5 | Sachkhere | 49108 |
| 6 | Chiatura | 24783 |
| 7 | Tkibuli | 29908 |
| 8 | Mestia | 129 022 |
|  | **total** | **385471** |

***Ecosystem services of forests in target regions:***

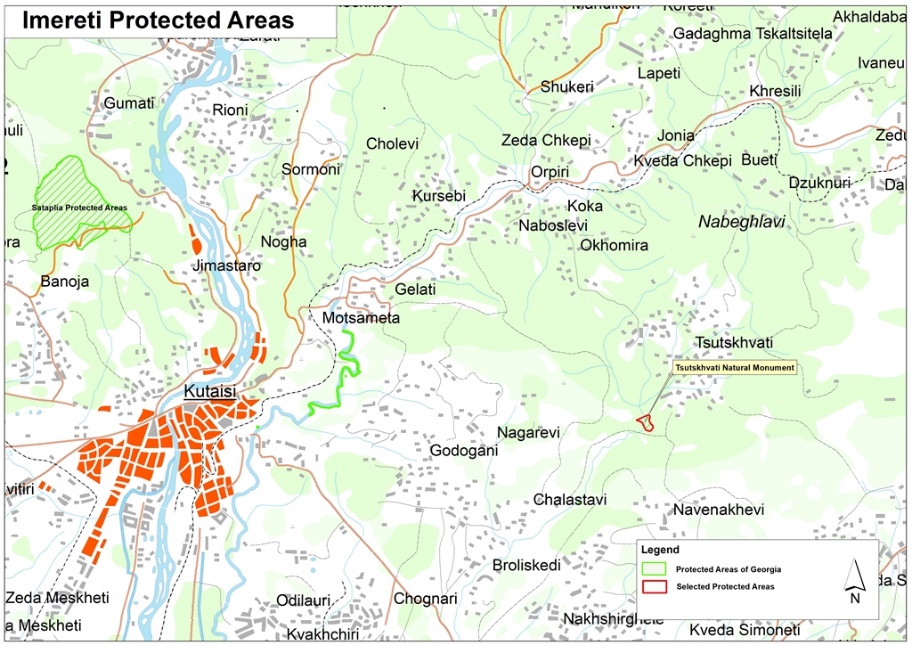
1. **Provisioning services.** Provisioning serviced of forests in mountainous regions include: provision of food (plants, fruits, berries, fish, bird, etc.) to humans and animals; provision of drinking water and timber (both heating and construction timber) to local communities, as well as provision of genetic resources for the use in medicine.
2. **Regulation services**. Forest provides number of ecosystem services related to protection of the environment. They have the following functions: soil protection and water regulation, regulation of climate and water regime, prevention of natural disasters (floods), water retention and purification. Old-growth mountain forests as global carbon sinks have a special role in global climate change mitigation. Conservation of mature and over-mature forests is economically feasible from the perspective of reduction of GHG emissions. Young forests growing on relatively flat terrain contribute to oxygen generation.
3. **Habitat services.** Services that require conservation of old-growth forests and biodiversity shall be underlined. In mountain forests relict and endemic species of characteristic flora and fauna are conserved. Natural streams that play a vital role for many species of fauna during important stages of their lifecycle shall be emphasized.
4. **Cultural services.** Forests of the target areas belong to the unique ecosystems of the world. They have an exceptional scientific and educational value. From the perspective of archaeological and ecotourism services, archaeological sites of Bronze age, located on the territory of Imereti, Svanetian towers and spiritual destinations shall be emphasized.

***Use of non-timber forest resources:*** Detailed data on the amounts of harvested medicinal plants, wild fruits and berries, beekeeping products, mushrooms, plants and the use of pastures of the State Forest Fund is not available.

Non-timber resources of the target regions (mushrooms, medicinal and technical materials and other grasses, shrubs and trees and their resources) have been traditionally used by local communities for different purposes. Currently the demand on these resources has increased both at local and international markets. Only few processing enterprises operate in the target regions. They try to use ecologically clean resources that grow in wild nature. Prior to the use, these resources shall be inventoried and evaluated. 40 years ago, the export of fir cones (50 tons a year) from Racha region was started. Currently the amounts of exported fir cones are increased. In 2007 a long-term license on collection of fir cones (640 tons a year) was issued. Fir cones are collected in Tlugi and Nikortsminda forest districts (Racha region). Due to intensive collection of fir cones during last decades, natural regeneration of fir trees does not occur putting this species on the verge of extinction.[[16]](#footnote-16)

Notwithstanding of many efforts, the use of non-timber forest resources in Georgia is not regulated by the law. In a scientific paper, included in Newsletter of the Academy of Agriculture, a standard for the use of non-timber forest resources is proposed, namely, non-timber resources of perennial and annual plants shall be obtained in a sustainable manner. Fruits of perennials and mushrooms can be collected annually, while fruits and flowers on annual plants – biennially, other aboveground parts, like sprouts and buds – once in 3-4 years. Underground parts can be collected only once in 8-10 years. These are general recommendations and may vary depending on reserves of a specific plant in the nature. In this regard, those plants that are being cultivated, as well as those, the reserves of which exceed the demand on them. Collection of rare and endangered species, that are included in the Red List is not allowed by the law.[[17]](#footnote-17)

In the target regions ***protected areas*** are established only in the Tkibuli municipality, namely Tsutskhvati Cave Natural Monument which occupies 8.53 ha and managed by the Imereti Caves Protected Areas Administration.

Figure 1 - Imereti Caves protected areas

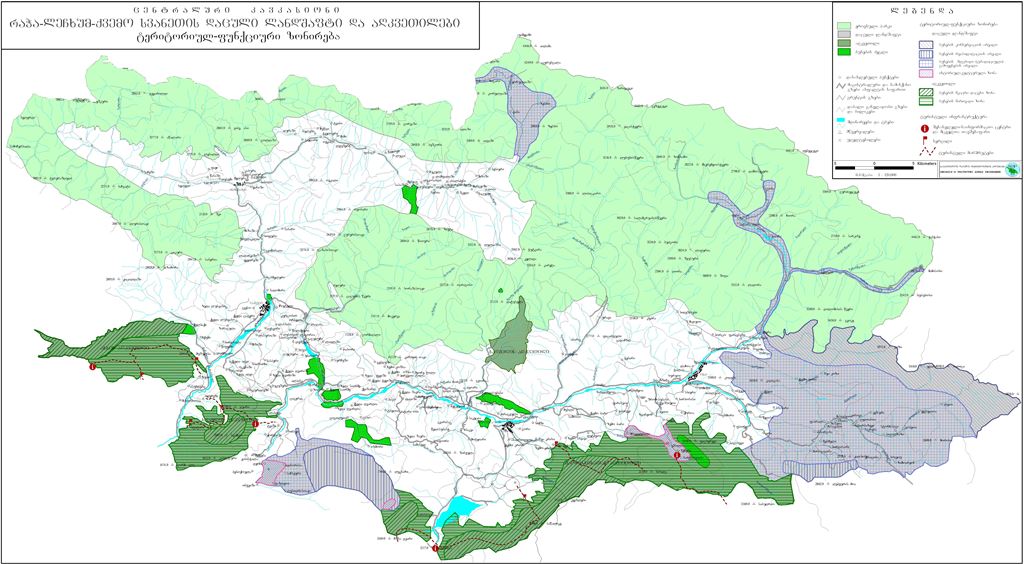
*Source: Agency of Protected Areas of Georgia*

As of 2019, two draft laws on designation of the new protected areas have been developed:

a) *Draft Law on Creation and Management of Central Caucasus Protected Areas*, which will regulate the following categories of protected areas:

1. Racha-Lechkhumi – Kvemo Svaneti National Park, occupying 186 245 ha on the territory of Oni, Ambrolauri and Lentekhi municipalities.
2. Sasashi Forest Natural Monument, occupying 2 503 ha on the territory of Lentekhi municipality
3. King Tamar Forests Natural Monument, occupying 445.9 ha on the territory of Oni municipality.
4. Glola Boulders Natural Monument, occupying 5.39 ha on the territory of Oni municipality.
5. Skhvavi Iced Cave Natural Monument, occupying 3.38 ha on the territory of Ambrolauri municipality.
6. Kvabtkari Natural Monument, occupying 138.54 ha on the territory of Ambrolauri municipality.
7. Saelio Range, Sakudeli and Khidikari Natural Monument, occupying 560.08 ha on the territory of Ambrolauri municipality.
8. Ghvardia Narrow Gorges and Sairme Rocks Natural Monument, occupying 166.7 ha on the territory of Ambrolauri and Tsageri municipalities.
9. Shareula Canyon Natural Monument, occupying 665.15 ha on the territory of Ambrolauri municipality.
10. Lajanuri Canyon Natural Monument, occupying 508.64 ha on the territory of Tsageri municipality.
11. Jonjoula Boulders Natural Monument, occupying 142.03 ha on the territory of Tsageri municipality.
12. Muri Rocks Natural Monument, occupying 67.2 ha on the territory of Tsageri and Lentekhi municipalities.
13. Askhi Plateau Managed Reserve, occupying 3 237 ha on the territory of Tsageri municipality.
14. Khvamli Massif Managed Reserve, occupying 5 554 ha on the territory of Tsageri municipality.
15. Shaori-Khikhata Managed Reserve, occupying 20 426.9 ha on the territory of Oni and Amrolauri municipalities.
16. Sadmeli Managed Reserve, occupying 3 948 ha on the territory of Ambrolauri municipality.
17. Akhalchala Managed Reserve, occupying 884 ha on the territory of Tsageri municipality.
18. Racha-Lechkhumi – Kvemo Svaneti Protected Landscape, occupying 4 772.6 on the territory of Oni, Ambrolauri and Tsageri municipalities.

Figure 2 -Planned Central Caucasus Protected Areas

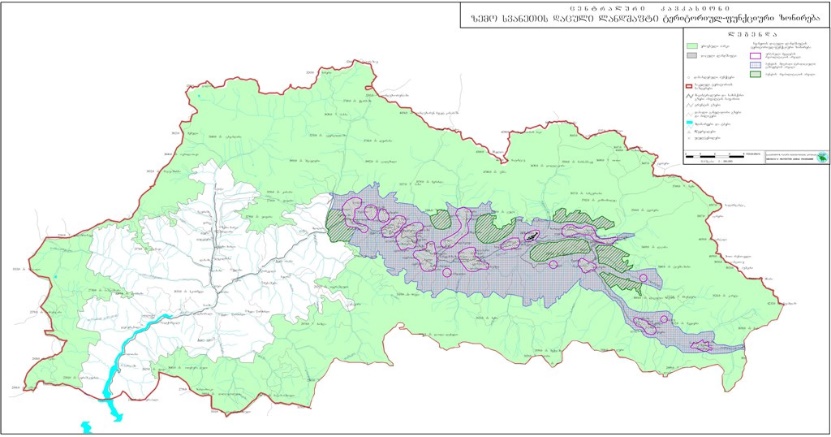


*Source: Agency of Protected Areas of Georgia*

The planned protected area includes known locations of red list plant species. The globally threatened Western Caucasian tur (*Capra caucasica*) and globally near-threatened Eastern Caucasian tur (*C. cylindricornis*) occur in the upper part of Oni municipality together with brown bear (*Ursus Arctos*), European lynx (*Lynx lynx*) and chamois (*Rupicapra rupicapra*) - also on the Red List. It is likely that bear breeds on parts of the Svaneti and Lechkhumi ranges and chamois on parts of the Svaneti range. Western tur may breed on parts of the Svaneti range.[[18]](#footnote-18) Designation of a protected area could be justified on one hand as interventions to sustain threatened biodiversity; on the other hand, designation of a protected landscape (among others) will help in harmonious of human and nature development.

b) *Draft Law on Creation and Management of Upper Svaneti Glacier National Park*, which will regulate the establishment of the Upper Svaneti Glacier National Park. The National Park with 46122.5 ha total area is located on the territory of Mestia municipality.

Figure 3 -Planned Upper Svaneti Glacier National Park

******

*Source: Agency of Protected Areas of Georgia*

The reason for designation of the PA is protection of (i) unique and endangered, untouched nival ecosystems permanently covered by ice, alpine meadows and subalpine forest ecosystems and High Mountain deciduous and coniferous forest ecosystems, that are either untouched or less damaged; (ii) Animal species included in Georgian Red List are present, e.g. turn, chamois, brown bear, lynx etc.that are present in the territory of the planned protected areas. The high mountain Oak tree (Georgian Red List) is also present in the target area.[[19]](#footnote-19)

Land Use Types

The total agricultural land in the municipality amounts to 24,177 out of which 7,108 ha is arable land, 1,465 ha perennial crops, 388 ha - meadow and 15,216 ha pasture.[[20]](#footnote-20)

Figure 4 -Distribution of the Agricultural land in Chiatura

Source: The Information Consultation center in Chiatura

According to the information from the Information Consultation centers in Sachkhere municipality, the total agricultural land in the municipality amounts to 15,517 haout of which 7,277ha is arable land, 1,109 ha perennial plantation, 393 ha meadow and 6,778 ha pasture.

Figure 5 -Distribution of the Agricultural land in Sachkhere

The total agricultural land in Tkibuli Municipality amounts to 17,385 ha, out of which 8,498 is arable land. The smallest agricultural land from the target municipalities is in Tkibuli and is 12,495 out of which 3,593 is an arable land, 21 hameadow, ha 6,527 pasture and 2,354 ha perennial crop.[[21]](#footnote-21)

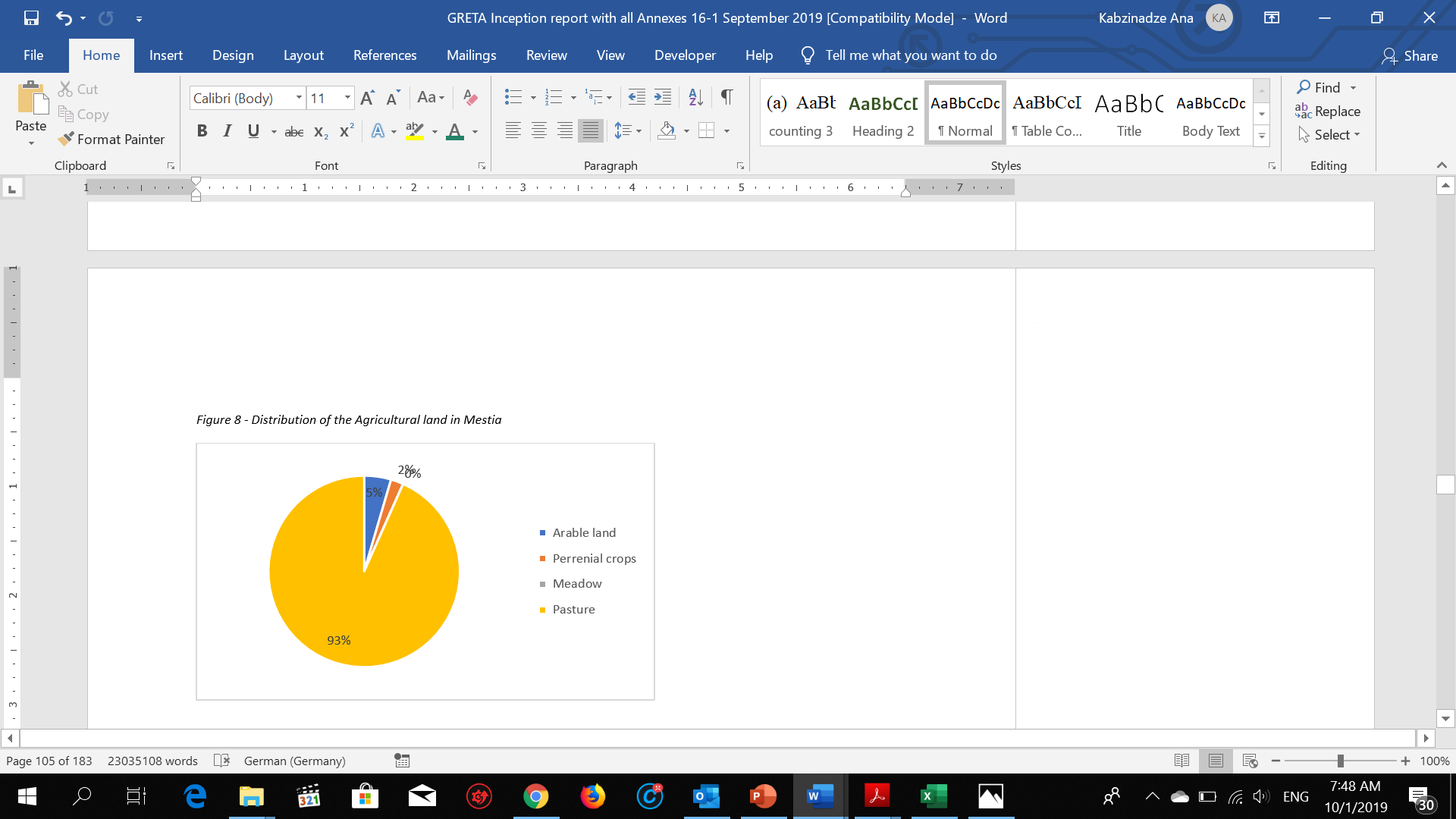
Figure 6 - Distribution of the agricultural land in Tkibuli municipality

*Source: The Information Consultation centers in Tkibuli*

As the Figure 3 shows, the project areas in Imereti region (Tkibuli, Chiatura and Sachkhere municipalities) have the smallest agricultural land and the average land size owned by agri holdings in the projects are is below the region’s average. The arable plot seizes accounts in Chiatura 0.35 ha, in Sachkhere 0.32 ha and Tkibuli 0.45 ha. the average size in Imereti region for the arable land is 0.46 ha owned by agricultural holdings which are divided into 2-3 separate plots.

Figure 7 - Arable land area operated by agricultural holdings and its structure (ha)

86% of households of the ***Mestia*** municipalityown agricultural lands and average land size is 0.7 ha. Few households (6%) rent lands. According to the information from the Information Consultation centers in Mestia municipality, the total agricultural land in the municipality amounts to 94,279 haout of which 4,410ha is arable land, 2,077 ha - meadow and 93% of the total agricultural land (90,804 ha) is ha pasture.

Figure 8 - Distribution of the Agricultural land in Mestia

The region's soil and climatic conditions are favourable for the development of organic fruit farming. The largest part of the region is in the subtropical area. Therefore, the leading priorities in the fruit farming are the subtropical crops. The most common fruits in the region are feijoa, kiwi, subtropical persimmon, citrus, as well as pears, apples, plums, peaches etc.

Besides the tourism sector, the agriculture is another important part of the rural economy in general for the region as well as for Mestia municipality. The majority of the population in Mestia, is engaged in small scale subsistence-oriented agriculture.

Agriculture is one of the most important activities in ***Racha-Lechkhumi and LowerSvaneti region***, employing more than half the local population, including those who are self-employed. Agriculture is not adequately modernized and is mostly concentrated on household consumption rather than commercial aims.

According to the information from the Information Consultation centers in Racha Lechkhumi and Lower Svanei, the total agricultural land in the region amounts to 88,860 haout of which 5,713ha is arable land, 1,698 ha perennial plantation, 24,533 ha meadow and 56,916 ha pasture.

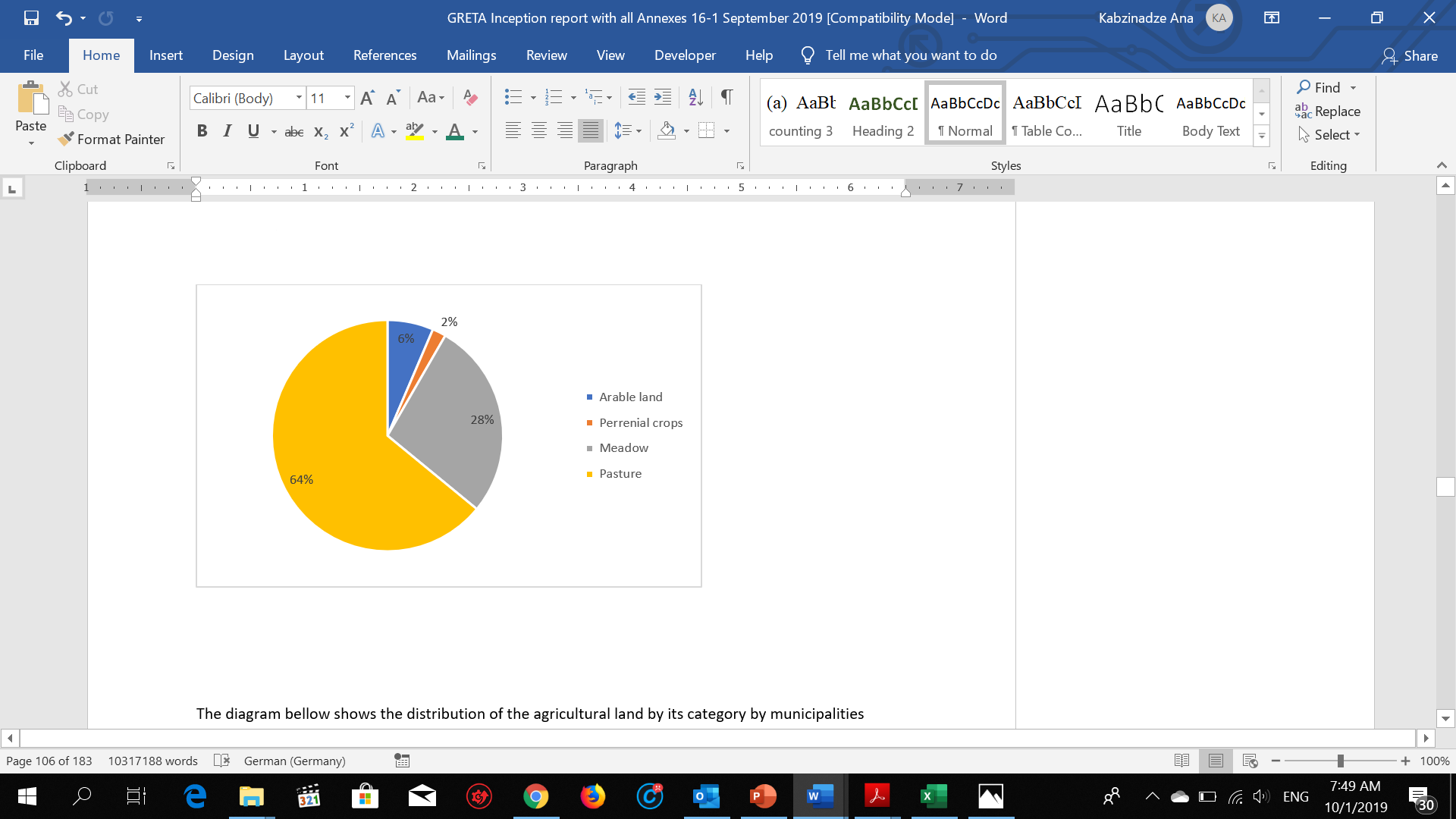
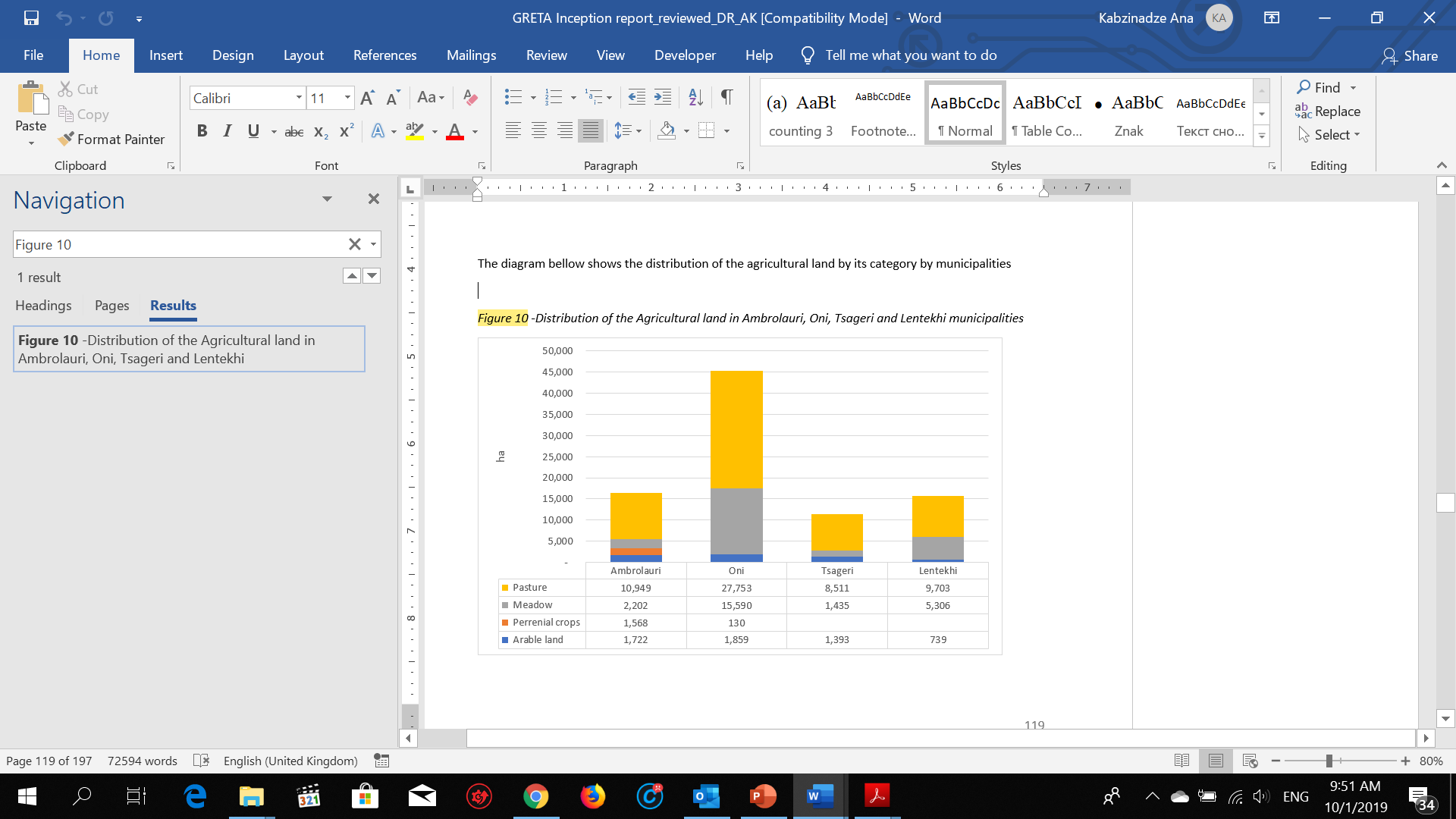


Figure 9 - Distribution of the Agricultural land in Racha-Lechumi Lower Svaneti

The diagram bellow shows the distribution of the agricultural land by its category by municipalities

Figure 10 -Distribution of the Agricultural land in Ambrolauri, Oni, Tsageri and Lentekhi municipalities



The vast majority of households own around 1.25 ha of land, mainly used for pastures or hay meadows. One of the region’s major problems is unused land, mainly state-owned land.

Figure 11 - Arable land area operated by agricultural holdings and its structure (ha)

Due to climatic conditions and agricultural land specification, there are no irrigation systems in the region. During summer, locals mainly use drinking water systems and natural sources for irrigation, creating seasonal water supply problems.

Water Provision and Waste Waters

The two main rivers of the Imereti region are the river Rioni and the river Kvirila. Water supply and sewage systems are a big challenge for the region.

The sewage systems are out of order in the towns of the Imereti municipalities and absent in the majority of the villages of the region. There are no treatment plants for sewage waters. The untreated waste water from residential areas incompletely treated waste water from the hospitals or industries, and the waters from landfills or agricultural lands discharge directly into the rivers causing serious problems for the environment and social safety.

Imereti region authorties actively work on improving water supply and sewage systems. The works for rehabilitation of the existing sewage systems and construction of new water treatment plants are ongoing in Chiatura municipality.

The water pollution is especially severe in Chiatura municipality. Large quantities of solid particles and manganese compounds causing severe water pollution are directly discharged by the mining industries into the river Kvirila along with the other industrial waters.

Another source of pollution is use of pesticides and organic and inorganic fertilizers in agricultural sector. According to the deputy-Mayor of Chiatura municipality, the situation with water pollution is quite complex. At present, a project aiming at supplying with water all registered households in Chiatura town is ongoing. The water supply infrastructure of Chiatura was built in 70th and is already outdated. The water quality is not controlled. The Chiatura town is supplied with technical water from water pumps owned by the Georgian Manganese, which does not meet drinking quality requirements. The water is being pumped from River Kvirila, while the supply pumps are damaged and drinking water is mixed with the polluted ground water. As for the villages, there are two types of water supply schemes there: some villages are supplied with water from the water headwork facilities/reservoirs that the villagers built with their own forces; others are receiving drinking water through the pumping stations registered under Georgian Manganese. These are auxiliary pumping stations, that are damaged but operational and do not meet the quality requirements for water provision, set in the national standard for water provision[[22]](#footnote-22).

Sewage infrastructure in Chiatura town is from 50th-60thof the last century and need total rehabilitation. As local villages are not located close to the rivers, no systematic scheme for waste water is available.[[23]](#footnote-23)

Town Sachkhere is fully provided with waterwith an updated water supply infrastructure. Drinking water supplied to Sachkhere town meets quality requirements of the national standard for water provision. The works are ongoing to supply all villages with drinking water. The town Sachkhere has no problem with sewage water, as there is a septic tank, which helps to prevent river and groundwater pollution.[[24]](#footnote-24)

The water provision is ensured in the whole Tkibuli municipality, but the water supply infrastructure is old and needs renovation. The 47 villages of the municipality are grouped in 9 territorial units. All of them have old water supply pipes. A laboratory analysis proved that drinking water in the villages meets quality requirements of the national standard for water provision. However, the sewage system infrastructure is outdated and needs rehabilitation. It is planned to build a water treatment plant (projected activities will take place already in 2019).[[25]](#footnote-25)

The River Rioni is the main artery of other target region of the project - Racha-Lechkhumi and Lower Svaneti (in Ambrolauri and Oni municipalities). The second important river is Tskhenistskhali that flows south west and then west towards the town of Lentekhi. Other important rivers are Kheledula and Laskadula. The main industry linked to water resources is hydropower sector. There are two reservoirs in the Racha-Lechkhumi region: Shaori reservoir with the 90 mio. m3 (among them useful 87 mio. m3) regulating seasonal water flow for Shaori Hydro Power Plant (hereafter HPP), and Lajanuri reservoir with water volume of 20 mio. m3 (useful 17 mio. m3), providing water to Lajanuri HPP.

Sewage systems in Racha-Lechkhumi and Lower Svaneti region exist only in the municipality centers: the cities of Ambrolaury (60%), Lentekhi (97%), Oni (100%), and Tsageri (50%). There are no water treatment plants in the region.

Samegrelo-Upper Svaneti is also rich with water resources. The River Enguri (length 213 km) originates from the Shkhara mountain and Enguri glacier above the community of Ushguli and flows for about 100 km through Upper Svaneti to Samegrelo from where it continues to the Black Sea.[[26]](#footnote-26) There are 2.4 thousand big and small rivers listed in the Samegrelo-Upper Svaneti region. The other rivers are Khobistskali, Tekhuri, and Abashistskali.

The potable water in Mestia Municipality (Upper Svaneti) is collected from the natural springs originating from the glacier. According to the local population, normally, water is clean but has poor mineralization. There is an unsustainable pattern of using fresh water resources in the winter: due to the fact that the temperature in winter is very low, the population keeps water taps open and water running to avoid freezing the water in the pipes. This results in a big loss of fresh water resources annually.[[27]](#footnote-27)

Sewage systems do not exist in Mestia municipality. There are 4 locations, where untreated waste waters discharge directly into the river.

Solid Waste Generation and Management

Annually, in **Imereti** region approximately 490,000 m3 of household waste is produced[[28]](#footnote-28). Tourism is one of the fastest growing sectors in the region, thus above mentioned amount of waste is going to be increased in the future.

Figure 12 - Number of Tourists in Imereti region and Kutaisi, 2013-2015.

Table 7 - Forecast of produced wastes in Kutaisi[[29]](#footnote-29).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Amount of Produced waste in Tones** | | | | | | |
| **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** |
| 54738 | 55833 | 56950 | 58089 | 59250 | 60436 | 61644 |

In Imereti region, similar to other parts of Georgia, there is no regular studes made on waste composition. According to the estimates, the main part of the produced waste is organic fraction (47%). The rest is the plastic (14%), paper (10%), metal (3%) and glass (2%). There are seasonal variations of waste generation amounts. The amount of organic waste increases during the summer and autumn seasons due to the increased number of visitors and the wastes coming from the agricultural sector. Municipal Services of the region are responsible for municipal waste collection. Based on waste management legislation municipal waste because of its nature or composition, is similar to household waste[[30]](#footnote-30) and is produced from commercial or industrial individuals that contains about 50 types of different waste including hazardous wastes as well (For example: batteries and accumulators, paints, chemicals, electronic devices, fluorescent lamps, medical and animal wastes cosmetics, pesticides and their packaging, asbestos and etc.). There are 2 types of waste collection systems: “through Containers” (discharge of public waste containers through waste collector tracks) and “with so called Ring/ Call method” (Periodically waste collector tracks enter public yards and take the waste and bring it to the landfills).

At present, there are 9 landfills in Imereti Region, out of them 4 are closed and 5 are operational. Landfills are under the LTD “Solid Waste Management Company” ownership. So called Nikea dumpsite[[31]](#footnote-31), that started functioning in 1957 was considered as one of the most problematic sites not only in Imereti region but in the whole Georgia. For years, waste had been dumped in this area in inappropriate ways that negatively affected nearby population and environment.

Photo.1. Nikea Landifll

Visual observation shows that waste was disposed without any pre-treatment operations. As a result, the whole dumpsite area (150,096 m2) is covered with waste layer that in some places reaches the height of 12-15 meters. The “ring-road” along the dumpsite perimeter was also covered with waste. As it had no proper water supply system, there were several cases of fire.

At the present time, the first regional waste landfill construction process is ongoing. It is the most important initial step for the Imereti region to meet modern waste management requirements and standards (in accordance with the National Waste Management Strategy, that sets obligations for the year 2023, every old municipal landfill should be closed down and replaced with the new regional landfill).

First regional landfill construction will be organized within the scope of the project “Integrated Solid waste Management Kutaisi”. The project will be implemented by Georgian-German Financial Cooperation: German Reconstruction Credit Bank (KFW), EU-NIFF grant of the EU Neighbourhood Investment Fund and also with local contribution with total cost of 26 million Euro. The landfill will serve not only the Imereti region but Racha-Lechkhumi and Lower Svaneti regions as well. Project encompasses the investments in the following actions: Closure of Nikea dumpsite and improvement of waste management system for municipalities’ including arrangement of waste transfer stations.

A huge problem is associated with hazardous waste of diverse origins. Very challenging is historically accumulated asbestos containing waste from materials that were widely used in sewage systems and construction.

In recent years, management of medical waste that is coming from medical facilities and clinics has been greatly improved. But collections of the medical waste generated from household that goes to landfills or to the environment through illegal dumpsites, remains the problem. Moreover, there are complex issues and challenges with Tkibuli Coal Mining operational waste disposal, Chiatura Manganese Mine with its Gurgumela Sludge Reservoir and Kutaisi Lithopone factory waste.

The management of waste from agricultural activities and agro-industrial zones is also an issue that is to be addressed.

Thus, due to the fact that Imereti region has a good tourism potential rural development has to consider and plan for addressing the potential negative impacts of increased amount of waste generation.

Uncontrolled dumpsites and historically accumulated hazardous wastes are the biggest issues of the **Racha-Lechkhumi and Lower Svaneti Region**. The existing controlled 3 landfills are under the LTD “Solid Waste Management Company” ownership. But in each municipality, there can be found number of illegal dumpsites that do not met any legislative requirements or environmental standards. During the rainy seasons and floods, the waste from these areas is discharged into rivers. Landfills in the region cover more than 1.3 hectares and the amount of annually produced municipal waste exceeds 10133 m3.

There are no studies and observations made on waste composition in the region; e.g. in Tsageri municipality[[32]](#footnote-32) majority of produced waste is organic waste (60%); then Green Waste (20%), plastic (5%), paper (5%), metal (1%) and glass (2%); other organic or inorganic waste (7%). It is also worth to consider the seasonal variations of waste generation amounts and types. Municipal Services of the region are responsible for municipal waste collection. There are 2 types of waste collection systems: “through Containers” (discharge of public waste containers through waste collector tracks) and “with so called Ring/ Call method” (Periodically waste collector tracks are entering public yards and taking produced waste and bring to landfills).

Management of medical waste that is coming from medical facilities and clinics has been greatly improved during past years. But the problem remains with the medical waste from household that goes to landfills or illegally into the environment.

**Mestia** is the main centre of tourism for the Svaneti region. There are several major construction activities including new roads, old town center renovations and different kinds of hotels. Also, Mestia is served by the Queen Tamar Airport. In the whole municipality polluted areas are about 20,173 m2 and volume of waste - 784m3.[[33]](#footnote-33) However, no specific studies are made on waste composition.

According to the data of the tourism center in Mestia, in 2017 there were registered almost twice more (22 348) visitors, than in 2014.

"Mestia Cleaning Service" is responsible for municipal waste collection that covers about 60% of the municipal settlements and collects about 7 300m3 of waste per year. There is no official landfill in Mestia, only the waste transfer station that is under the ownership of LTD “Solid Waste Management Company”. There are still the problems with illegal dumpsites. However, local authorities closed down 9 illegal dumpsites with the help of local population.

Photo 2. Cleaning-up of illegal dumpsites

Management of medical waste that is coming from medical facilities and clinics has been greatly improved during the past years. But the problem remains with the medical waste from household that goes to landfills or illegally into the environment.

Thus, due to the fact that Mestia municipality has a good tourism potential rural development has to consider and plan for addressing the potential negative impacts of increased amount of waste generation.

Areas of Historic Contamination with Arsenic Waste

Historic pollution with accumulated arsenic waste[[34]](#footnote-34) in Tsana village (Lentekhi Municipality) and in Village Uravi (Ambrolauri Municipality) is still to be addressed. These are the locations with the deposits of arsenic containing waste from the operation of an arsenic extraction and enrichment facilities.

During 1933-1944, 2 arsenic and one chemical factory were functioning in the village Uravi and the areas surrounding it. Arsenic was extracted from north of Uravi in subalpine and alpine Kadjiani deposits. Over the years arsenic extraction places have been covered by industrial wastes and ruins of old buildings. This whole area is contaminated with arsenic and its ash.

In order to solve the problem Government of Georgia with the help of Government of Netherlands co-financed the project “Arsenic Containing Mining waste in Georgia” and developed the action plan for existed hazardous wastes safe disposal. In addition, it is planned to build 2 sarcophaguses for arsenic containing waste (Uravi 1 and Uravi 3) and for Soil and inert waste contaminated with Arsenic also 2 sarcophaguses (Uravi 1,3,4).

In Lentekhi, in the gorge of the river Tskenistskali 3 sites of waste disposal are identified: (i) The first (Tsana 1) is located 5 km away from the village Mele (Dzugareshi); (ii) the second site (Tsana 2) is 0.5 km away from the first site (here wastes are abandoned in metal barrels under the open air, which partly is covered with shrubs and soil); and (ii) the third site (Tsana 3) 20 km awayfrom Tsana 1 site (near Koruldashi) next to origins of river Tskenistskali. Extreme hydro-meteorological event on 27.09.2013 caused flooding of Tskhenistskali River and the change of the riverbed, which in its turn caused damage to the former metallurgical plant’s dam in Lentekhi and subsequent leakage of arsenic waste material stored in steel barrels on the site (Tsana 1). As a result, 8-10 pieces of damaged arsenic containing barrels fell into the river and created danger of water pollution. Additional provisional resistance dam was built and the river Tskhenistskali was returned to its natural riverbed in order to avoid additional risks in case of extreme weather events. Furthermore, bank fortification works have been planned alongside the mentioned river area. The situation for the moment is stabilized and laboratory tests confirmed that concentration of harmful substances in both the river and reservoirs did not exceed the permissible limit. Nevertheless, the risk of pollution of the Tskhenistskali and Rioni rivers, which are part of the Black Sea basin, as well as the drinking water supply, remains rather high.

Energy Sector

**Main directions of the state energy policy** approved by Georgian parliament set two key directions among others:

* Diversification of energy provision through diversification of sources of provision of oil, electricity, and natural gas and effective utilization of local energy sources;
* Utilization of renewables for addressing Climate Change and provision of clean energy.[[35]](#footnote-35)

**Electricity** consumption is growing faster than generation in Georgia. Consumption has grown at a 5% CAGR over the past six years to 12.6 TWh in 2018, while generation increased at a 3.8% CAGR to 12.1 TWh. The hike in electricity demand has resulted in higher net imports, which grew 13% y-o-y in 2018 to 0.9 TWh. Lack of water resources decreased generation to 6.2 TWh in 1H 2019, down by 2.1% y-o-y, leading to increased net imports of 0.4 TWh, up by 185% in the same period.[[36]](#footnote-36)

The hydro resources of Georgia are not equally distributed – 72% of them are located in western Georgia and 28% in Eastern Georgia. The key rivers having hydro energy importance are Enguri, Rioni and Mtkvari. Majority of the existing hydro power plants (HPP) are located in these river basins.[[37]](#footnote-37) Methodology of calculation of ecological flow has not been approved by Government of Georgia yet, the general practices are to calculate 10% of water discharge as ecological flow.

Main arteries of water in *Imereti* region are the river Rioni and the river Kvirila. There are 5 Hydro Power Plants currently in the region: Rionhesi, Gumathesi, Vartsikhehesi, Dzevrulhesi and Shaorihesi, generating 1400-1500 mio. kwh annually[[38]](#footnote-38). According to the deputy-mayor of Sachkhere municipality, a study has been carried out on potential of wind energy development in Sachkhere municipality. Organization of 7 wind farms is planned on the territory of Korbouli village. The project is being implemented by “Unlimited Energy” Ltd. The land for the project has been privatized by the company.[[39]](#footnote-39)In *Racha-Lechkhumi Lower Svaneti* region there are two reservoirs: Shaori reservoir with the 90 mio. m3 (among them useful 87 mio. m3) regulating seasonal water flow for Shaori HPP, and Lajanuri reservoir with water volume of 20 mio. m3 (useful 17 mio. m3), providing water to Lajanuri HPP.[[40]](#footnote-40) The majority of energy of Georgia is generated in the *Samegrelo-Upper Svaneti* region. Svaneti has become important region for development of hydro energy. According to the Ministry of Economy, there are several MoUs signed on construction of HPPs in Svaneti.[[41]](#footnote-41)

All three project regions are fully provided with electricity.

**The Natural Gas** sector is one of the dynamically developing sectors, especially along with the gasification process in country. Almost 100% of demand on natural gas is met with the imported resources, only 0.5% is provided from local resources. In 2016 the use of natural gas was as follows: households 39%, commercial use - 38%, thermal power stations- 23%.[[42]](#footnote-42)

The data on gasification and gas provision in the GRETA target municipalities is provided in table below.

Table 8 -Gasification and gas consumption in the GRETA target municipalities (as per 2016)[[43]](#footnote-43)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Municipality | Gasified households | N of consumer households of Natural Gas | | |
| <30 | 30-50 | >50 |
| Chiatura | 6,092 | 2,252 | 1,009 | 1,531 |
| Sachkhere | 17,451 | 8,305 | 1,733 | 3,116 |
| Tkibuli | 904 | 430 | 90 | 161 |
| Ambrolauri | 742 | 427 | 42 | 73 |
| Oni | - | - | - | - |
| Lentekhi | - | - | - | - |
| Tsageri | - | - | - | - |
| Mestia | - | - | - | - |

Georgia’s energy strategy (draft) provides general information on **other energy sources** in Georgia[[44]](#footnote-44):

* Georgia has a significant potential of wind energy. High mountainous regions, southern Georgia and southern part of the Black Sea region are the most favorable areas. The total duration of workable wind speed varies from 1400 to 7100 hours. However, the wind potential has not been fully used.
* Due to the geographic location, there is quite high and effective radiation in Georgia. In most of the regions of the country total duration of sunlight equals to 1900-2200 hours (10-15% in winter, 30-35% in summer).
* Biomass is a key energy source in Georgia, especially considering the forest coverage. 33% of forests are of medium age, while 35% are old forests. About 44% of forests are located on 30° and above slopes, which created difficulties to cut trees. It has to be emphasized that only 15-20% of total annual increment can be utilized for energy purposes. Based on some assumptions, energy potential of Georgian forests amounts 0.8 billion kWh.

In order to obtain detailed information on energy potential (including in target municipalities) additional studies are necessary.

In 2016 a survey related to firewood consumption and firewood production in Georgia has been carried out. The survey provides overall picture on energy consumption in Georgia. According to the survey, firewood is the main source of heating in Georgia - its share as a fuel source ranges from 75-96% by region. The amount of firewood legally provided to the population of Georgia has decreased to a critical point. Presently, the National Forestry Agency (following the NFA) allocates approximately 600,000 m3 of firewood annually.

The project aimed at defining the need of heating sources in Georgia, and the share of firewood in total energy consumption. For this, one of the key objectives of the survey was to determine the number of wintering households, especially taking into consideration internal migration patterns from rural to urban areas during the winter period. For this, the data on electricity consumption from the energy-companies was used: based on information from energy distribution companies, a total of 832,052 households were registered as energy consumers. However, the number of households consuming over 3 GEL per month of electricity (wintering households) was only 577,695. This number includes households consuming firewood as a source for heating, as well as households using gas and nutshell for heating.

The number of wintering households in target municipalities of GRETA project was as follows (for 2016):

* **Imereti**: Chiatura – 13,429; Tkibuli -9,455; Sachkhere – 10,894;
* **Mestia** – 682 (all registered households consumed electricity for heating);
* **Racha-Lechkhumi-Lower Svaneti**: Ambrolauri – 4,952; Oni – 2,479; Tsageri-lentekhi – 5,565;[[45]](#footnote-45)

In order to calculate current data on energy need, the detailed survey of target municipalities has to take place. The National Forestry Agency provided the data on the provision of local municipalities with firewood:

Table 9 - Firewood Provision in target municipalities:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| N | Municipality | households  (m3) | | Budgetary organizations  (m3) | |
| 2017 | 2018 | 2017 | 2018 |
| 1 | Chiatura | 4,834.0 | 4,280.5 | 111.0 |  |
| 2 | Sachkhere | 12,910.2 | 10,630.8 |  |  |
| 3 | Tkibuli | 3,097.5 | 2,161.5 | 546.0 |  |
| 4 | Ambrolauri | 11,194.9 | 10,475.0 | 2,728.5 | 1,486.8 |
| 5 | Oni | 5,098.6 | 4,775.7 | 285.3 | 230.0 |
| 6 | Tsageri | 7,382.6 | 6,772.0 | 223.0 |  |
| 7 | Lentekhi | 2,860.5 | 3,121.0 | 137.0 |  |
| 8 | Mestia | 396.2 | 409.9 | 280.0 |  |
|  |  | **47,774.5** | **42,626.3** | **4,310.8** | **1716.8** |

DRR and Climate Change

Geology and DRR

The territory of **Chiatura** municipality includes the Upper Imereti plateau and its north-western part called Chiatura Structural Plateau located at 600-700m.a.s.l. Plateau is constructed by slightly dislocated mezzo-Cenozoic sedimentary rocks, embedded limestones, carbonate mergels, manganese-containing sandstones, limestone sandstones and inter-layers of manganese. The volcanic basaltic lacolite-extrusion of Quaternary age also forms cone hills within the plateau.

Among the micro formations of the plateau karst forms should be mentioned - the caves, Sinkholes, Polie (villages: Mgvimevi, Darkveti, Nigozeti, Sveri, MAndaeti, Gundaeti, Shukruti et. al), different size landslide forms, often distinctly circled (in the village of Makhaturi Area), which is covered by Miocenic 20-25mm and 3-4km long limestones. The geomorphology and genesis of the 40 m high "Katskhi Pillar" should be emphasized, with two churches built in V-VI centuries on the flat surface of the pillar. Katskhi column is the seismo-tectonic block displaced in the tectonic fracture zone of the "RganiZegani”, which is then processed by denudative processes. The surface of the Chiatura Plateau Relief is especially modified by the technological processes of mountain-processing quarries. Due to this, more than 70% of landslide-gravitational processes and debris flow originated in the transformed area of the plateau are associated with anthropogenic factors.

The risks to the population and infrastructure in the Chiaturamunicipality are related to landslide-gravitational phenomena, rockfall, rock avalanche, river bank erosion, flooding, and technogenic debris/mudflow events, which are mainly related to human technological activities (especially, in the areas of ​​mining-quarry processing). In the information bulletins prepared by the Department of Geology of the National Environmental Agency, 43(70%) out of 61 settlements of Chiatura municipality are in the geological disaster zone - 11% in the high risk zone, and 15% in the medium risk zone. The biggest threat to Chiatura is "Sashevardno rock” and its adjacent streets (Rustaveli Street and etc.), where periodically the processes of the rockfall/rock avalanche have their negative consequences.[[46]](#footnote-46)

**Sachkhere** municipality belongs to the central part of Upper Imereti Plateau and includes upper and middle territories of the riv. Kvirila and the riv. Dzirula basins, with very moderately mild climate and vegetation of deciduous forest and secondary meadows. The relief is quite noticeable plateau, which is fragmented by the rivers Kvirila and Dzirulavalley and their tributaries. The relief of this part of the Imereti Plateau by its geological aggression is influenced by the tectonic structure and relieving exogenous processes, and is characterized by vale-terraced and mountain-raising and complicated by landslide events that characterize the low-middle mountain zone in the ridge of the Racha Ridge. Territory is constructed by Neogene marine molasse (clays, sandstones, conglomerates, limestone sandstones), the Oligocene-lower Miocene (carbonate and gypsum clays, conglomerates layers, Quarz-arcozicsandstones), Upper Jurassic laguna continental facies (gypsum clays, argillites, sandstones, breccia conglomerates, limestone dolomites stacks), middle Jurasic igneous suite and Palaeozoic crystalline bedrocks. Within the municipality there are also cones hill of the volcanic origin. Upper part of riv. Kvirilais produced in the substrate of the lower Cretaceous carbonate sediments. All these sediments are very complicated with tectonic faults and are characterized by distinguishing characteristics of one of the denunciations-erosion processes. Depression zone of riv. Kvirila is filled with strong alluvial sediments of the Quaternary age.

Sachkhere municipality is characterized withmulti-spectral natural geodynamic processes, but the population and infrastructure facilities can pose a particularly dangerous with respect to the different processing landslides and river bank erosion and related floods, partly constantly updated gravitational rock-falls and small scale debris flow processes. Periodical blow up of such processes not only cause the huge economic losses, but sometimes people (sometimes whole villages) are forced to move to a new place of residence. According to the information bulletins developed by the National Environment Agency, 75% of Sachkhere populated areas are in the hazard zone, 11% in high and 35% in average hazard zones.[[47]](#footnote-47)

**Tkibuli** municipality is located at the foothills of the north of Imereti. Geomorphologically predominantly occupies the hill zone of the inner Okribaridge, whose geological structure dominates the Baiose porphyrician structure, built on the density-gravitational processes of the various rocks that form high-steep and rocky shapes. More gentle relief is characterizing for the magmatic teshenite rocks (so-called 'KursebiTeshenite”) that are widely distributed in the village Kursebiand adjacent territories. The turbulent space is distinguished by the mild morphology and landslide shapes of the terrain, built by middle Jurassic Batian lacustrine sediments, presented with grauvakian sandstones, clay-shales, argilites, clays, tuffs, sandy limestone, conglomerates and the layers of coal layers. Akhalsofeli Karst relief is located in the southern part of the Tkibuli, which is a tectonic relief – “Polie”. Currently Tkibuli reservoir is located in this area. The interior of the inner square is surrounded by the carbonate sediments of the Jurassic and the Cretaceous suite. Nakerala asymmetric ridge, with a high voltage rocky skull that is complicated by the large volume and tecto-seismogravitational landslides (DzirovanaTkibuli, Tavshavi – right part of riv. Lekhidariet.al).

By the risk to the population and infrastructure objects of Geological Hazards Tkibuli Municipality is in average risk area. Geological disasters dominantly are threats from landslides, which are developed in hilly-hillock zone, built by middle and surface laguna formation sediments, disposed to landslide-prone-erosion processes. The surrounding volcanogenic carbonate rocks built on a slope, the terrain surfaces, are complicated with constantly updated gravitational processes and rock-avalanche. According to the information provided by the National Environmental Agency, 33 settlements and their infrastructure are in the geological disaster hazard (70%). Out of these 3 (6%) are in high and 11 (23%) in average risk. All these indicate that despite the fact that the dynamic regime of landslide processes has occurred in individual years, the whole municipality remains in the medium risk zone of the geological disaster.[[48]](#footnote-48)

**Ambrolauri** Municipality occupies territories in middle part of the Rioni Basin. The area is characterized by very tense tectonic conditions. The tectonic movements, which are still going on, have laid down the seismicity of the territories. The epicenter of the earthquake in the region is located within the study area. Earthquakes facilitate the development of dangerous geodynamic processes in the study area. It is a temporary contributing factor for large and small size landslides and rock fall/rock avalanches.[[49]](#footnote-49)

Ambrolauri municipality is a high geodynamic potential that is due to: large inclination of slopes (25-400 and sometimes more), with frequency of river network, with a large depth of erosive intersection, 5-20 m and sometimes more quaternary sediments. This leads to the frequency of the development of dangerous geological processes and their scope. Nearly all of the dangerous geological processes characterized by mountain regions are characterized by more or less spread in the territory of Ambrolauri municipality, including the highest damage: landslides, debris/mudflows, rocks and erosive processes.

According to the data of 2018 totally 69% of settlements of Ambrolauri municipality are located in the risk zone of the geological disaster out of which 11 (16%) are in a high risk, and 25 (36%) in average risk zone[[50]](#footnote-50).

The relief of **Oni** municipality is mountainous and is characterized by great diversity. The southern slopes of the Caucasus Range and the Lechkhumi Range belong to the mountainous alpine and subalpine landscape and the elevated parts of the Racha Range are subalpine landscapes. Hypsometricaly low area occupies the riv. Rioni and its tributaries. The northern mountainous area of ​​the area is characterized by glacial-nival and erosive-glacial relief, which is strongly fragmented, with a depth of erosive intrusion exceeding 1000 m, inclination of slopes 40-600. Absolute height of the main ridge of the Caucasus and Shoda-Kedela reaches 3500-4000.

The northern part of the region includes erosional - denudational relief of high mountainous and deep gorges on the substrate of the Jurassic system sediments.

Denudational relief of medium mountain range with predominant development of erosive and landslide processes is common in the central and southern part of the region. It represents the immediate orientation of the Racha-Lechkhumi syncline depression. This type of relief is developed on the Carbonate rock substrate of upper Jurassic, Cretaceous and Tertiary age. In the region there is a wide range of reliefs and modern active landslides. This kind of relief is developed on the riv. Rioni, Jejora and their tributaries.

The central and southern part of the area, which belongs to the median zone, is characterized by vertical erosive divisions within the range of 300-600 m. Slope inclinations are 30-450. The relief of the medium-sized part together with erosive processes carries the trace of karst processes. Karst relief developed on the substrate of the carbonate rocks of the Cretaceous and Tertiary age. In the area of ​​carbonate sediments spread in the region tertiary age, karst formations are formed in the form of caves and karst sinkholes. The karstic formations developed on the carbonate substrate of the lower Cretaceous age range are extensive in the extreme east part of the northern slope of the Racha Ridge.[[51]](#footnote-51)

Upper Racha - Oni municipality relief is a high geodynamic potential that is responsible for: with the steep slopes (30-450) and sometimes even with hydrographic network frequency; With a large depth of erosive intrusion, high sensitivity to rocks, geological processes and climatic-meteorological factors, with large capacity of quaternary sediments (8-25 m) and others. This leads to the development of large scale dangerous geological processes. Natural disasters that threaten the population, destroy agricultural land, infrastructural facilities need particular attention in the municipality, such as landslides and gravitational processes (rockfalls, rock avalanches), mudflows, water erosion, flashfloods, floods and snow avalanches.

The economic damage caused by periodic activation of these processes is colossal, and the most commonly human fatalities. During the 20th century, several villages were destroyed as a result of periodic activation of natural disasters and more than 100 people were killed.

According to the data of 2018, 71% of Oni municipality settlements are in the risk zone of the geological disaster, 16 (25%) in High risk zones and 22 (34%) in average risk zone.[[52]](#footnote-52)

**Lentekhi** municipality is located on the southern slopes of the Caucasus Range and is one of the highest mountain regions in Georgia. The region is bordered by Lechkhumi Ridge, Egrisi ridge in the southwest, Kodori Ridge to the west and the main watershed of the Caucasus in the north. The main hydrographic unit of Lentekhi municipality is riv. Tskhenistskali. In Lentekhi, it joins the riv. Kheledula and Laskadura, after which the river Tskhenistskali comes from Lower Svaneti. Then it is known by the name of the Rtskhmeluri Gorge, which connects the Lower Svaneti and Tsageri villages, it has a submeraldic direction and continues from Lentekhi to Tsageri around 16km.

The Lentekhi municipality is bounded by Svaneti and Lechkhumi ridges and includes zones from highland to mountainous Alpine-Nival, its relief is characterized by typical mountain-gorges, intensely fragmented by riv. Tskhenistskali tributaries, deeply cut narrow gorges, the upper part of which is typical glacier look and their lower part is troge-erosion. Riv. Tskhenistskali Basin and its tributaries have been developed in intensely stratified and tectonically high lower Jurassic shale suite, Middle Jurassic volcanogenic and Cretaceous carbotanic rocks, which are strongly different from their firmness, resistance to erosion-denudation and gravitational processes.[[53]](#footnote-53)

In Lentekhi municipality Almost, all of the dangerous geological processes are distributed: erosive, landslide, rock avalanche and Debris/mudflows. Dangerous geological processes in the region, the areas of their distribution, character and dynamic peculiarities in itself coincide with certain geological-geomorphological conditions. In addition to the natural conditions, which determine the development of dangerous geological processes, anthropogenic factors are becoming increasingly important: civil and industrial construction, exploitation of forests and others.

The main factor in the creation and activation of processes is the dominance of high-sensitivity rocks with high sensitivity, high energy potential of relief, strong pressing of climatic and time-consuming climatic factors, human activities and earthquakes. According to the Informational Bulletin developed by Department of Geology of the National Environmental Agency, out of 60 settlements, 48 settlements (69%) are in geological hazard risk zone, from here 16% is in high-risk zone and 36% is in medium hazard risk zone.[[54]](#footnote-54)

**Tsageri** municipality is located on the southern slopes of the Greater Caucasus. The western boundary of the municipality runs along the eastern slopes of the Askhi massive, southern border – riv. Rioni Gorge, East - Villages Sairme, KvedaChkvishi, Tabori and Gendushi on the watershed ridge, and the northern border in the lower slope of the Lechkhumi ridge.

The complex geological structure and tectonics, climate, and human economic activity create the Lechkhumi terrain and the geomorphological peculiarities. Based on the tectonic regime, geological structure of the rocks of the lithological and structural characteristics and denudation processes, the following have been geological and geomorphological areas and terrain types: Letchkhumi ridge high and medium terrain type, developed in the middle Jurassic Porphyritic sediments, Erosive-Karst medium mountain relief of Askhi and Khvamli massifs developed Limestone substrates of Cretaceous and upper Jurassic age; Erosive-Accumulative relief of Zubi-Okureshi district; Racha-Lechkhumi Syncline area, with erosive-accumulative relief developed on Tertiary age substrate.

Tsageri municipality is one of the first in the country due to the loss of natural geological processes and the damage inflicted for infrastructural objects. Here are the following dangerous geological processes developed: landslides, debris/mudflows, rockfalls, rock avalanches, river bank erosion, karst and Suffosion processes[[55]](#footnote-55).

The development and activation of natural geological processes in Tsageri municipality has always been in the historical period. During the observation period, 8-12 years cycle of extreme activation of processes is observed. The frequency of activation of processes has been violated and their extreme exposure is almost every year. One of the main reasons for this is the anthropogenic impact on the geological environment alongside the relief complexity, geological structures and climatic peculiarities.

According to the data of 2018, 92% of the settlements of Tsageri municipality are under geological disaster risk zone, out of which 24 (41%) are in a high risk zone and 21 (36%) in average risk zone[[56]](#footnote-56).

**Mestia** municipality geographically occupies the highest mountain range of Central Caucasus. It is located in the Upper Enguri Basin. Almost entire territory (96%) is situated higher than 1000 m above sea level. The altitude of the 65.8% of Mestia municipality’s territory is more than 2000 m above sea level.

Mestia municipality is outstanding among Georgian regions in terms of geological processes. This is determined by the riv. Enguri watershed basin - a strong fragmented relief with a complex geological structure, climatic-meteorological conditions and the growing magnitude of anthropogenic impact on the geological environment.[[57]](#footnote-57)

The territory of Mestia municipality is characterized with high risk of natural disasters. The most dangerous types of disasters are the debris/mudflows and associated flashfloods, landslides and snow avalanches, which can create an emergency situation in every period of the year. As for the rock avalanches and rock falls, more than 60% of the entire territory, including motor roads, is in hazard risk zones. 65% of all settlements are lcoated in the geological hazard zones. Among them 49%[[58]](#footnote-58) are located at medium and high risk zones.

Mestia municipality is an area of frequent extreme activation of natural geological processes, accompanied by destruction / damage of infrastructural facilities, degradation and destruction of agricultural lands, human fatalities and large number of eco-migrants.

Over the last decade of the 20th century, activation of background disaster processes was observed almost every year. Extreme trends of landslide-debris/mudflows and snow avalanches are associated with climatic events.

The population and infrastructure of Mestia Municipality are constantly experiencing periodic geological disasters, including debris/mudflows and associated flashfloods and inundation, landslides and snow avalanches linked also with global climate change. To mitigate the negative consequences caused by them it is necessary to enhance geological monitoring.

The following settlements are under the risk of geological hazards: Chvabiani, Tsaldasho, Zhabeshi, Upper Luha, Doli, Ieli, Latali, Mulakhi, Becho, Etseri, where the following types of prophylactic measures can be done - strengthening the coastline with gabions, boulders, surface water regulation, arrangement of drainage channels, construction of slope protective walls, phyto-melioration fastening with deep-fruiting system.

The “ShaviGhele” area on Zugdidi-Mestia road is permanently deformed by landslide/debrisflow processes. It is a deep and complex tecto-seismogenic landslide and application of fundamental measures on it do not give a substantial results/outcome. Therefore, it is needed to find alternatives at this location (e.g. bridge, tunnel).

There are periodic hazards of mudflow processes in: Mestia, Lakhamula, Zhabeshi, Chvabiani, Cholashi, Zhamushi, Ieli, Marghi, Nakra, Latali, Mulakhi, Adishi, Lenjeri, Becho, Pari, Tsanashi, Ushkhvanari etc. The following measures are usually planned in such cases: cleaning and deepening gorges in some locations, arranging coastal protective measures, arrangement mudflow conductor, construction of bare berths and more.

Climate Change Risk Assessment and Adaptation Measures

**Climate Change Impacts and Risks**

*Organic agriculture and climate change:* Agricultural sector is closely associated with climate change. The agricultural sector of Georgia, as the source of greenhouse gases, includes the following four subcategories:

1. animal enteric fermentation (including sheep breeding);
2. management of organic fertilizers (manure);
3. agricultural soils; and
4. field burning of agricultural residues.

In 2013 emissions from agriculture amounted to 2.732 Gg CO2equivalent, accounting for 16% of national GHG country emissions[[59]](#footnote-59). GHG emissions from the subcategory of enteric fermentation (livestock breeding, including sheep breeding) accounted for 49% GHG emissions from the agricultural sector, while GHG emissions from the subcategory of agricultural soils – about 40%.

Organic agriculture has a potential to reduce emission of GHG from this sector, increase carbon storage capacity of soils and reduce the area of degraded soils.[[60]](#footnote-60)

Current and expected impacts of climate change on the agricultural sector is Georgia are shown mainly as:

* Change of the vegetation periods of plants;
* Shifting of agro-climatic zones;
* The necessity of the introduction of climate change resilient species and the reduction of productivity of current crops (due to increased droughts, strong winds, irregular precipitation, hail, heat waves and evapotranspiration);
* Increased areas of irrigated lands and increased demand on irrigation water;
* Decreased productivity of agricultural lands and increased degradation of soils, which often are accelerated by extreme climate events (drought or abundant and intensive rainfall) occurring due to climate change and associated natural disasters (landslides, mudflows, floods, flash floods, etc.);
* Increased harvest losses due to frequent extreme climate events (hail, frost, etc.).

Expected impact of climate change on beekeeping is still being debated, especially among researchers. Although there are a number of key challenges to be faced by beekeepers as a result of climate change.

Beekeepers relocate their traditional beehives to different climate zones on a seasonal basis. However, current and expected climate change, namely, earlier onset of spring and reduced flowering season, may complicate sustainable beekeeping management. As a result of frequent extreme climate events, considerable portion of bee families may be lost.

*Sustainable development of mountain tourism and climate change***:** According to the Third National Communication of Georgia to UNFCCC, due to global warming tourism climate conditions have been changed in the three regions of Georgia (Adjara, Kakheti, Upper Svaneti). The assessment has been carried out using Tourism Climate Index (TCI). TCI and its change have been studied based on the analysis of the data of Mestia meteorological station. TCI values were calculated for the period of 1961-2010. Only summer tourism has been evaluated, since TCI parameters are not sufficient for the evaluation of winter tourism climate conditions. TCI calculation demonstrated that in so called “middle zone” of Upper Svaneti June, July, August and September had “very good” TCI values, May – “good”, April and October had “pleasant”, March and November – “marginal”, while winter months December, January and February – “unfavorable”. For the assessment of ski tourism climate conditions different indices and parameters shall be used.

Table below provides information on impacts of Climate Change on project activities:

Table 10 -Impact of climate change on project activities

|  |  |  |
| --- | --- | --- |
| **Climate change parameter** | **Ecotourism** | **Organic farming** |
| Extreme air temperatures |  |  |
| Abundant precipitation |  |  |
| Mean air temperature |  |  |
| Mean precipitation |  |  |
| Winds |  |  |
| Drought |  |  |
| Air humidity |  |  |
| Atmospheric pressure |  |  |
| Hail |  |  |
| Thunderstorm |  |  |
| Soil humidity |  |  |

*Note: red – high, orange – medium, yellow – low, green – no impact*

**Climate Change Vulnerability and Adaptation Measures**

*Mountain tourism*

The assessment of the impact of climate change on mountain tourism and planning relevant measures are especially important for the regions with tourist-recreational potential.

Among target municipalities, Oni and Mestia municipalities are distinguished for high vulnerability to climate change, while other municipalities are characterized by low vulnerability[[61]](#footnote-61).

Vulnerability of mountain tourism to climate parameters has been assessed. Specifically, according to „Assessment of climate response in Georgia to global warming”[[62]](#footnote-62) the sector has been identified as highly vulnerable to extreme air temperatures (strong frosts and heats), abundant precipitation and associated floods and mudflows (damage of relevant infrastructure), as well as snow cover, the parameters of which play an important role in operation of ski resorts. The sector is characterized by medium vulnerability to mean air temperatures and precipitation, air humidity and pressure (impact on health), wind, cloudiness, droughts, while by low vulnerability – to hail and thunderstorm. The sector is resilient only to soil humidity; however, this factor also affects provision of tourists and visitors with local agricultural products.

The Georgian Road Map on Climate Change Adaptation, developed by National Association of Local Authorities of Georgia (NALAG) with the financial assistance of USAID describes different levels of vulnerability of tourism activity to climate change in various municipalities of Georgia. According to the report, in our case, only two municipalities – Oni and Mestia among the municipalities of selected three regions are distinguished for high vulnerability to climate change; other municipalities are characterized by the low level of vulnerability.

Within the framework of the Georgia’s Third National Communication to the UNFCCC, Upper Svaneti Adaptation Strategy has been prepared, which considers the implementation of the following measures in support of mountain tourism:

* Local weather forecast services should be established, which will have the potential to provide information on a timely manner and ensure the safety of tourists. Local meteorological service should have information about risks which are associated with winter tourism (e.g., on snow cover, anticipated avalanches, increasing temperature and humidity, etc.);
* Risks on existing and new tourist routes that are determined by climate change must be examined to the maximum extent;
* Knowledge of the local population and climbers should be reviewed and applied to the maximum extent in the risk assessment process;
* Safety rules for the movement on the tourist routes must be developed. They should be available for tourists upon arrival in hotels and tourist service centers;
* Establishment of the special medical service and equipping it with the modern equipment in order to enable its prompt arrival to the scene of accident and provision of the assistance if required;
* Protection of historical monuments which are attractive for tourists from the negative impact of climate change and preservation of local identity.

The Table below contains main actions and indicators ensuring sustainable development of mountain tourism on the background of climate change

Table 11 - Climate change adaptation measures and performance indicators for mountain tourism

| **Key actions ensuring sustainable development of mountain tourism on the background of climate change** | **Indicators** |
| --- | --- |
| Establishing the monitoring network and  effective early warning system (through modification of the existing ones) | Early warning systems are established for the population residing in the high-risk areas and major infrastructural facilities (mainly on roads) located in the hazard prone areas |
| Implementation of systematic preventive measures in geological hazard prone areas that threaten infrastructure and tourist facilities | Preventive measures are implemented on a regular basis: the population (local authorities and communities) is provided with information on expected hazards and recommendations on preventive measures in a timely manner; geological monitoring studies are being implemented. |
| Effective response to natural processes | * Adequately equipped rescue teams staffed with professionals are established in the regions (one in each) and provided with regular trainings; * Volunteers, as a reserve force in the activities directed at the elimination and minimization of the impact of natural disasters are organized. |
| Training national experts (monument protection specialists and restorers) in modern methods of assessing the vulnerability of monuments to climate change and their adaptation, which should be considered during the restoration. | Training module is developed and training for the relevant personnel is carried out. |
| Permanent monitoring of climate change and its negative impact on tourism and implementation of studies with involvement of different scientific sectors (climatology, biogeography, hydrology, geomorphology, tourism geography). | * Climate observation systems are restored in the regions; * Applied researches are supported; * The experience of developed countries is taken into account. |
| Consideration and supporting alternative forms of mountain tourism in the process of tourism sector development and planning. | * The international experience, including the experience of the Alpine region is taken into account; * Action plan is developed. |

**Organic farming**

The Georgian Road Map on Climate Change Adaptation[[63]](#footnote-63) describes the impact of climate change on agricultural crops considering moisture change by municipalities for the period of 2071-2100. An aggregated index of moisture change impact has been calculated taking into account the sensitivity index and two exposition indicators –– temperature increase in summer months and precipitation change in the same period. Temperature increase is found by comparing the absolute temperature increment of summer months with the average perennial temperature value of summer months of the relative baseline period. Hence, even where the absolute temperature increment is the same, the temperature increase impact for each region and municipality will be different. The precipitation change indicator is defined as the ratio of moisture change resulting from the precipitation change against the rate of water to be applied to the agricultural crop during vegetation period during the baseline period. The average value of climate change impact, considering the moisture change for Georgia will equal 3.94. By selected region, the impact measurements are as follows: Imereti 3.74 (Sachkhere 4.81), Samegrelo – Upper Svaneti 2.69 (Mestia 1.70), Racha-Lechkhumi and Lower Svaneti 3.8 (Ambrolauri 4.27, Lentekhi 2.54 and Oni 3.7).

Therefore, in those municipalities where the impact index exceeds 3.5, the water application rate should be increased to compensate for the precipitation variability. In other municipalities, water shall be applied whenever needed.

In conclusion it can be stated that organic farming implies the introduction of technologies which contribute to the reduction of GHG from the agricultural sector and therefore can be considered as an adaptation measure.

Table 12 - Climate change adaptation measures and performance indicators for organic farming

| **Action** | **Indicators** |
| --- | --- |
| Development of hydrometeorological service and network for planning seasonal farming activities or improvement of agricultural insurance packages | * Hydrometeorological service is developed; * Climate change forecasts are improved. |
| Study of the condition - inventory of soils under agricultural crops taking into account climate change | Soils are studied and their condition is determined. |
| Implementation of specific agrotechnical measures and programs for improvement of soil fertility | Action plan of agrotechnical measures and programs is developed at the municipal level |
| Capacity building of agricultural extension services in climate change adaptation (including climate resilient crops) measures and modern climate-smart agricultural technologies | * The programs for regular retraining of the personnel of agricultural extension services are developed and implemented; * Physical infrastructure of these services is improved; * The process of personnel retraining is ensured |
| Assessment of the impact of climate change on soil degradation (acidification or salination). | * Special studies are undertaken to determine changes in soil fertility; * Measures for improvement of soil fertility are developed. |
| Rehabilitation/maintenance of windbreaks to protect soils from erosion | A document regulating the windbreaks-related issues is developed. |
| Modernization of amelioration systems | * Provision of irrigation water is improved; excess water is removed from flooded and swamped territories; * The area covered by amelioration services is expanded; * Water-air regime required for the growth and development of plants is established in soils. |
| Designation of a structural unit to be responsible for climate change adaptation measures at the municipal level | The structural unit shall ensure communication between national and local authorities on climate change related issues and contribute to the implementation of tasks specified by the Organic Law on the Bodies of Local Self-Governance in the field of agricultural development which will help local authorities in handling climate change induced problems and institutional development. |

Assessment of Environmental Risks and Impacts of the Project Implementation

***The Environment Impact and Risk Associated with the development of sustainable mountain tourism in the Target Regions***

Ecotourism is driven by the need to sustain biodiversity, reduce poverty and generate income for communities in rural and remote areas. However, the movement of people, capital, goods and services has the potential to cause different types of ecosystem changes.

Tourism, especially nature tourism, is closely linked to biodiversity and the attractions created by a rich and varied environment. The quality of the environment, both natural and man-made, is essential to tourism. However, tourism's relationship with the environment is complex and involves many activities that can have adverse environmental effects.

* Environmental impacts of tourism development in the target areas at **the global level** will contribute to:
* **Climate change:** Tourism involves the movement of people from their actual locations to other destinations by air or road transport, which contributes to the increase of GHG concentrations in the atmosphere. Passenger jets with international travelers are the growing source of greenhouse gas emissions.
* **Depletion of the ozone layer:** The direct impacts of tourism industry start with the construction of new infrastructure and continue during daily management and operations. Refrigerators, air conditioners and propellants in aerosol spray cans, amongst others, contain ODSs (Ozone depleting substances) and are widely used in the hotel and tourism industry. Emissions from jet aircraft are also a significant source of ODSs.
* At the local level, the negative impacts of tourism are mainly related to **increased pressure and consumption of natural resource**s:
* **Fresh water:** The tourism industry generally overuses water resources for hotels, swimming pools, sports areas and personal use of water by tourists. This can result in water shortages and degradation of water supplies, as well as generating a greater volume of waste water. Although the issue of water scarcity is not of a particular concern in the target regions, however this can contribute to the depletion of the fresh water resources and pollution of surface and ground waters with untreated waste waters. In the locations where the water comes from wells, overpumping can cause saline intrusion into groundwater.
* **Forest** resources can suffer from the negative impacts of tourism in the form of deforestation caused by fuel wood collection. High demand can be placed upon these resources to meet the expectations of tourists for proper heating, hot water, etc.
* Tourism can create great pressure on **local resources** like energy, food, and other raw materials that may already be in short supply. Greater extraction and transport of these resources exacerbates physical impacts associated with their exploitation. Increased pressure of land resources can cause (or facilitate) soil erosion.
* **Land degradation and change of landscapes:** Increased construction of tourism and recreational facilities has increased pressure on local resources and on scenic landscapes. Direct impact on natural resources, both renewable and non-renewable, in the provision of tourist facilities can be caused by the use of land for accommodation and other infrastructure provision, and the use of building materials.
* **Traditional architecture** may be impacted in case of using of non-traditional construction materials. Buildings without considering traditional architectural style might disturb authentic character of the villages.
* Increased transportation and movement of people, adversely affects the local **air quality** and increases **noise** and **vibration** levels of the surrounding natural environment providing habitat for various wildlife species.
* **Loss or migration of biodiversity** due to disturbance (noise, vibration, movement of people and transport, loss of habitat, hunting, poaching). Loss of biodiversity is usully associated with excessive use of land resources, when impacts on vegetation, wildlife, mountain and water resources exceed their carrying capacity. This loss of biodiversity in fact means loss of tourism potential.
* **Introduction of invasive species:** tourists and suppliers can bring in species (insects, wild and cultivated plants and diseases) that are not native to the local environment and that can cause disruption and even destruction of ecosystems.[[64]](#footnote-64)
* Increased demand for local dairy products can be associated with the increase of uncontrolled **overgrazing of the pastures**; or **burning the pasture lands** to increase productivity (despite the fact that this practice has adverse impacts on the soil and is prohibited by the law).
* The negative impacts of tourism related to ***Protected areas:***
* ***Littering*** in the nature, inaccurately disposed waste and pollution around waste containers due to increased amount of waste generation;
* Increased number of visitors increases the ***risk of the forest fires***, which can affect local biodiversity and destroy infrastructure. Negative impacts of the forest fires are multiple starting from destruction of biodiversity, migration of wildlife. Statistically, only 5% of forest fires are caused by natural processes, the greater majority of the – 95% are due to human negligence.
* ***Distrubance and migration of wildelife*** due to increased number of visitors and their movement in the habitats can happen if the group of tourists are not distributed in different touristic routes.
* The negative impacts of tourism related to ***Waste generation and management***:
* The increase number of tourists (and their service providers) results in **increase of amount of domestic waste** produced in the region. The issues related to waste management and minimization has to be considered for further planning by the local governments.
* ***Only a small part of the local population uses the environment friendly technologies and considers negative consequences of their activity on the environment***. There are no touristic business service providers in the target region currently using the standard of international system of ecological management recognized by the state (ISO14000).
* Most of the threats to the natural environment are related to the ***development of tourism infrastructure*** - construction of roads, guesthouses, and various buildings required for tourist services.
* The project may contribute to the increased construction of different kinds of hotels/guesthouses leads and ***increased amount of inert and construction waste***. According to the legislation, waste producer is responsible for the proper management of generated waste. There is no officially allocated landfill for inert waste disposal. This type of waste is often illegally disposed directly in environment or at the municipal landfill together with the other types of waste.
* Increased number of tourists will ***generate more waste including hazardous waste*** such as: batteries removed from electric devices, cell phones, laptops, children’s toys, shaving equipment’s etc. Unfortunately, this hazardous waste is disposed on landfills or in environment. Chemicals inside batteries vary depending on type but include cadmium, mercury, lead, nickel, lithium etc. As the battery exterior corrodes, those chemicals leach into the soil and make their way into our water supply. There are cases when landfill fires are caused by batteries burning in the ground.
* Increased tourism will boost ***quantity of luminescence lamps*** that currently are widely used instead of traditional light bulbs. Luminescence lamps contain mercury; accidental breaking them and inhaling it can lead to health risks (such as inflammation of the lungs, kidney damage and other diseases). When fluorescent lamp breaks the level of mercury vapour from it turns to liquid droplets that may stick to hard surface and can be easily inhaled. When those bulbs are not properly recycled and end to landfills it can cause significant negative effects on environment and human health. It is persistent environmental pollutant with bioaccumulation in ecosystems.
* Due to increased number of people, in areas with high concentrations of touristic activities, parks, forests, and cultural sites, ***proper waste disposal*** will be the very important. In mountainous areas tourists often leave their garbage. It should be ensured that there are sufficient number of waste collection containers and disposal facilities to cover increased demand for waste management services.
* ***Increased number of tourists will increase demand and production of agricultural goods locally through conventional practices, which involves usage of chemicals and pesticides*** and is linked with contamination of air, soil and water. A widely used practice of putting pesticide containers into the household waste containers or throwing them away directly into the environment is also a huge problem.
* ***Growing agricultural production*** leads to increase the volume of biodegradable organic green waste, which can also create an environmental threat of fire when decomposing in landfills and emitting methane. The increase amount of the methane emission will contribute to the greenhouse gases emissions.
* Development of tourism sector in the target regions can create a risk of the **environmental pollution**:
* Increased amount of the ***waste from touristic*** facilities (including those providing food and beverage) can create sources of pollution from illegal damping sites in the forests or near the water bodies.
* Increase amount of the ***waste waters*** generated from touristic services and lack of water treatment facilities can cause pollution of surface and ground waters (and soil). Expected impact of the GRETA project’s ecotourism activities on water and sanitation in the targeted regions largely depends on the scope and success of implementation of these activities. The targeted locations differ in terms of access and availability to water resources and sewage systems. Therefore, expected impact can be fully estimated only after specific activities in each targeted location will be known and approved.
* Increase demand and production of local agricultural products can increase amount of ***chemicals (pesticides, herbicides and fertilizers) from agricultural land*** and discharge of polluted waters into rivers and other water bodies affecting fish fauna.

Table 13Environmental Impact and Risks Related to the Development of Mountain Tourism and Increasing Number of Tourists in the Target Regions

| **#** | **Potential Impacts and Risks** | **Recommendations on Environmental Safeguards / Mitigation Measures** |
| --- | --- | --- |
|  | ***Changing natural landscapes and destruction of habitat*** due to new constructions for creating new touristic facilities  Likelihood: Moderate to low  Significance: High  Reversibility & duration: Irreversible / Permanent | * Identification of sensitive areas that are likely to be affected by such new developments. * Facilitating elaboration and approval of local development plans (Master Plans) that will regulate new constructions and delineate boundaries of settlements. * Support in planning and implementation of protection actions, including support in the process of designation and management of the planned protected areas.   Timeframe: During project implementation  Urgency: 2  Monitoring required: Yes |
|  | ***Disturbance and /or migration of wildlife*** from their habitat due to too many visitors (noise, vibration, movement)  Likelihood: Moderate to low  Significance: High  Reversibility & duration: during touristic seasons | * Identification highly sensitive areas – local biodiversity hotspots and species. * Training tourist service providers and guides on how to instruct the tourists and plan the tours. * Support in planning and implementation of mitigation measures, such as granting protection status, including designation and management of the planned protected areas.   Timeframe: During project implementation  Urgency: 2  Monitoring required: Yes |
|  | ***Increased risk of the forest fire caused to human negligence*** | * Identification fire risk areas; * Support awareness raising activities among touristic service providers and guides, and tourists on fire related issues; * Support relevant state institutions (forest management institution, emergency services) in planning and implementation of fire prevention and firefighting measures.   Timeframe: During project implementation  Urgency: 2  Monitoring required: Yes |
|  | ***Increased use of forest resources, particularly firewood, by the tourist service providers for heating and cooking purposes.***  Likelihood: Moderate to high  Significance: High  Reversibility & duration: during cold seasons | * Assess the need of heating sources for the project beneficiaries and study alternatives for heating. * Support introduction and usage of alternative heating sources by tourism service suppliers. * Assess the energy efficiency needs of the project beneficiaries and provide support in meeting energy efficiency standard.   Timeframe: During project implementation  Urgency: 4  Monitoring required: Yes |
|  | ***Increased pollution of local air with dust and toxic emissions from intensive use of road transportation***  Likelihood: Moderate to low  Significance: Moderate  Reversibility & duration: during touristic seasons | * Identify the areas at the high risk of air pollution * Support target areas in planning and introducing nature-friendly transportation means. * Encourage car sharing.   Timeframe: During project implementation  Urgency: 4  Monitoring required: Yes |
|  | ***Increased emissions of GHG from air and road transportation*** means used by the tourists and their service providers  Likelihood: Moderate to low  Significance: Moderate to low  Reversibility & duration: during touristic seasons | * Encourage car sharing for local movement. * Support target areas in planning and introducing nature-friendly transportation means.   Timeframe: During project implementation  Urgency: 5  Monitoring required: Yes |
|  | ***Increased generation of waste:***   * Increased amount of ***municipal solid waste*** generated by increased number of tourists and their service providers (including the amount of ***hazardous waste*** e.g. luminescence lamps containing mercury, batteries from electric devices, cell phones, laptops, children’s toys, shaving equipment etc.). * Increased ***littering*** near areas with high concentrations of tourist activities (national parks, forests and cultural areas). * Increased amount of ***inert waste*** from construction and refurbishing activities and disposal of such waste at municipal landfills or directly in environment due to the absence of special permissible landfills (especially in Mestia).   Likelihood: High  Significance: High  Reversibility & duration: Reversible impact during touristic seasons | * Capacity building of tourist service providers in waste management. Training and instruction of the respective personnel in waste management practices and procedures. * Supporting local authorities of the target municipalities in organization of waste management, especially around tourist hubs. * Support target municipalities in implementation and Enforcement of Municipal Waste Management Action Plans (2018-2022) and waste monitoring programs. * Conduct risk assessments of waste management in mountain areas, including potential risk for downstream areas from both large and small-scale waste dumping. * Support establishment of household hazardous waste collection facility in each target municipality and safe recycling of household hazardous waste by a permitted waste handler or an authorized recycling facility. * Support establishment of take-back programs (e.g. while selling new lamps businesses will have to take back and recycle used ones). * Support activities on separation of solid waste materials into hazardous, non-hazardous and reusable waste streams. * Support municipalities in accurate collection of hazardous waste and sending to a licensed operator for proper treatment (recycling and re-usage operations, responsibility of commercial waste generators). * Promotion of more environmentally friendly Li-ion batteries. * Assess the situation regarding inert waste disposal opportunities (especially, in Mestia) and identify location for waste disposal. Support storing the inert waste temporarily on site, in secure facilities. Collection and disposal of all construction waste at designated location.   Timeframe: During project implementation  Urgency: 3  Monitoring required: Yes |
|  | ***Increased generation of waste waters*** from tourist service providers and their facilities and their discharge into the rivers and streams without any treatment and pollution of soil and waters (potentially also affecting fish fauna).  Likelihood: High  Significance: High  Reversibility & duration: Irreversible impact during touristic seasons | * Capacity building of the local authorities and tourist service providers on management of waste waters from guest houses and hotel facilities. * Supporting design, planning and implementation of the waste water treatment facilities in the target regions.   Timeframe: During project implementation  Urgency: 3  Monitoring required: Yes |
|  | ***Increased pressure on land resources*** from more intensive agricultural activities targeted to satisfy the demands for local agricultural produce (including application of chemicals to soil, illegally burning the agricultural land to increase its productivity, overgrazing the pastures) | * Capacity building of local farmers through training and awareness raising on sustainable use of land resources, application of chemicals in agriculture, plot rotation and sustainable pasture management.   Timeframe: During project implementation  Urgency: 3  Monitoring required: No |

***The Environment Impact Associated with the Development of* Organic Agriculture *in the Target Regions***

Organic agriculture aims to produce food while establishing an ecological balance to prevent soil fertility or pest problems. Organic agriculture takes a preventive approach instead of treating problems after they emerge. The crop rotations, inter-cropping, symbiotic associations, cover crops, organic fertilizers and minimum tillage are central to organic practices. These practices ***encourage soil fauna and flora, improve soil formation and structure and play an important role in soil erosion control.***

The pollution of groundwater with synthetic fertilizers and pesticides is mainly caused by agricultural activities. In organic agriculture, those are replaced by organic fertilizers and mechanical measures against pests or use of greater biodiversity, enhancing soil structure and water infiltration. Well managed organic systems with better nutrient retentive abilities, greatly ***reduce the risk of groundwater pollution***.

Organic agriculture contributes to ***mitigating the greenhouse effect*** and global warming through its ability to sequester carbon in the soil. Many management practices used by organic agriculture (e.g. minimum tillage, returning crop residues to the soil, the use of cover crops and rotations, and the greater integration of nitrogen-fixing legumes), ***increase the return of carbon to the soil, raising productivity and favouring carbon storage***. GHG emissions from Georgia’s agriculture sector are associated with the following four categories: (i) digestive fermentation from animal farming (including sheep breeding); (ii) use of organic fertilizers; (iii) emissions from agricultural lands; (iv) emissions from burning agricultural wastes in the fields. In 2013, the share of agriculture sector to total GHG emissions of Georgia was 16% (out of them 49 % from digestive fermentation and 40% - from agricultural lands). Organic agriculture has a potential to reduce GHG from this sector, to increase the carbon sink and sequestration and reduce areas with land degradation.

Over the past decades, adverse social and environmental effects have increased the need for a more sustainable production system. One strategy for such long-term production with minimal effects on the environment is conversion from conventional to organic farming practices. From the environmental perspective, ***organic farming can save energy, preserve biodiversity, mitigating climate change, and sustain the environment, especially in the long*** run. In addition, it can enhance soil fertility and feed nutrients to the soil. Under an organic system, farmers must make efficient use of locally available resources.

The specifics on the planned activities of the project are as follows:

**Beekeeping:** Bees provide numerous benefits to the natural environment and have a critical role in its sustainability. Bees play crucial roles for the pollination of many cultivated crops and for maintaining biodiversity in of non-cultivated areas. Usually a honeybee can visit between 50 to1 000 flowers in one trip, which takes between 30 minutes to 4 hours. A colony with 25 000 forager bees, each making 10 trips a day, is able to pollinate 250 million flowers. Bee can fly over wide areas and thus provide environmental monitoring for such areas. They are biological indicator as it can indicate environment degradation based on several factors (i) bee has a body that is covered in hairs, which makes it particularly suitable to hold materials and substances they come in contact with; toxic and pollutant residues can be found in bee products and in their bodies; (ii) bee is highly sensitive to most plant protection products and have high mortality rates when in contact with pesticides.

Beekeeping is important not for only agriculture and honey production, it does not fit easily into the specific sector as an activity. The impact of beekeeping is important for rural development as it covers forestry, horticulture, agriculture, the natural environment, animal husbandry and entomology without fitting precisely into any one of these sectors. For example, pollination is an important part of horticulture, the beekeeping itself is often considered as an animal production. Similar for classification of bee products because honey is a food, yet beeswax is listed amongst non-food waxes and oils.

Beekeeping requires ***good sanitation in order to avoid spread of infection***. Honey bee colonies are subject to infection or infestation by a range of pests and diseases. These include insects, mites, fungi, viruses, and bacteria. Honey bees are social insects and are at risk of epidemics, so it is essential that beekeepers not only recognize the signs of such pests and diseases, but also know how to reduce their impact in colonies, apiaries and the locality. A key factor in preventing the spread of infection is good sanitation and hygiene.

**Vegetable production** as a relatively small-scale production of fruit and vegetable is especially important for the project’s target regions as the farm sizes in the proposed areas is quite small compared to the countries average. Most market gardens grow and supply fresh produce through the local growing season. Unlike large scale farms, they generally have a wide range of crops and are less industrially intensive, i.e. crops are picked or harvested using manual labour, with gardening rather than intensive farming techniques.

The small-scale gardening enables the households to use climate smart technologies such as conservational agriculture, organic soil cover, raised bed technologies etc. without big investment and pressure on the environment

**Collection of the wild berries from the forest** is widely spread in almost all regions in Georgia especially in the project’s areas, in the target municipalities. However, unsustainable harvesting practice can sometimes lead to the over-harvesting of the products. The development of the collection of wild berries has to be based on the sustainable manner and the users should be aware of the basic guidelines while harvesting non-timber products in the forest.

**Tea production:** Since it is an intensive monoculture, tea cultivation has environmental impacts. Application of pesticides and synthetic fertilizers create environmental hazards. Meanwhile, insecticides often eliminate the fauna of a vast tract of land. Soil degradation is an additional concern because the constant use of fertilizers and herbicides compound soil erosion. Apart from those issues, chemical runoff into bodies can pollute groundwater. Finally, during tea manufacturing, fossil fuel is used to dry the processed leaves, which also increases environmental pollution.

**Sheep farming:** The interaction of livestock with ecosystems is complex and the level of impact depends on several factors such as location, feeding practice, management practices etc. The livestock sector can harm water quality through the release of nitrogen, phosphorus and other nutrients, pathogens and other substances into waterways and groundwater, mainly from manure in intensive livestock operations.

From the other side, livestock can be successfully used for weed control and therefore contribute to the decrease of water pollution by herbicides. The fossil energy that would otherwise be used for making and spreading herbicides is also saved.

The production of sheep is usually extensive; the regulation of the rotational grazing and introducing management plan could even improve the plant population and avoid overgrazing.

Sheep farming requires **proper sanitary-hygienic control measures in order to avoid spread of zoonotic diseases.** Water, sanitation and hygiene (WASH) initiatives can plausibly contribute to control of zoonotic disease given the knowledge about pathogen transmission cycles, through provision of sanitation infrastructure that safely removes human and animal fecal waste from the human environment, provision of clean water sources, and improvement of hygiene practices at the community and household level. Zoonotic pathogens have complex life cycles that commonly include different phases in human hosts, animal hosts and the environment before completion. Overlooking one or more of these three elements facilitates the perpetuation of the cycle, and with it, re-infection.

***Production of natural colorants:*** Dyes derived from natural sources have emerged as an important alternative to synthetic dyes. Consider its impact on the environment. Natural dyes have less environmental impact compared to synthetic dyes. However, the sustainability should be taken into account, since natural dye sources are renewable. Hence it still can be an issue for natural dyes because producing them requires vast areas of land or using non timber resources from forest.

* **Positive effects of organic farming on the biodiversity include:**
* ***Species diversity:*** Organically farmed areas have on average 30% more species and 50% more individuals, than non-organic ones. In particular, birds, predatory species, spiders, soil dwelling organisms and field flora benefit most from the organic management. Pests and indifferent organisms occur in similar quantities on the organic and non-organic areas. The difference is observed in arable and horticultural lands in the lowlands.
* ***Rare and endangered species:*** To preserve a rare and endangered fauna species on the organic farms, additional strategies, such as adapted species protection programmes might be necessary. Rare plant species and ground beetles are proved to be in higher diversity and density on organic farms.
* ***Semi-natural lands*** are higher in organic areas then in non-organic ones, which create favorable condition for preserving biodiversity.
* The organic farming standards and practices enhance not only biodiversity, but ***strengthen natural cycles and improve environmental performance*** that in its turn increases the sustainability of organic farms.
* **Organic farming and Protected Areas:**
* Healthy and competitive agriculture needs a healthy environment and natural resources as provided by Protected Areas. ***Organic and eco-sustainable farming is particularly suited to farms situated within the protected areas.*** Such farms are not subjected to pollution from external sources. Besides, protection from the predatory birds and insects is crucially important for the protection of plants. PAs guarantee such protection by the presence of wild areas providing a natural habitat for those species. Moreover, organic farming does not harm local ecosystems because it does not use pesticides and promotes biodiversity.
* It is scientifically proved that there is a need to expand and develop multifunctional farming in such areas. This will generate income and create employment opportunities, stability and social cohesion, whilst promoting the maintenance and extension of farming practices which preserve and increase landscape and biological diversity and expand the number of recognized local products (and in some cases certified products, especially if organic).
* ***Impact of organic farming on conservation of water resources***
* Organic agricultural practices will keep the water supplies clean by preventing pollution from pesticides and toxic fertilizers. Organic farming will help to conserve water resources as organic farmers, tend to spend time amending soil correctly and using mulch - both of which help conserve water.
* Among the planned agricultural activities of the project, vegetable production and sheep-farming can have the most significant consequences in terms of water and sanitation.
* Vegetable Production and organic gardening has much to offer in terms of water quality and the management of water holding capacity, as it contributes to the preservation and restoration of water quality, protecting downstream users and water habitats that are rich in biodiversity. Farmers have no knowledge and incentives to undertake measures that prevent pesticides from escaping to water sources, thus environmental costs of pesticide pollution are still mainly transferred to the population and the society. Organic standards prohibit the application of synthetic pesticides to protect water bodies. Although the use of manure and slurry still poses risks to water pollution, organic agriculture has not only significantly reduced its nitrate leaching rates, but research shows that organic farming systems have the potential to continue to reduce leaching through sophisticated crop rotations, the use of green manures and the maintenance of catch and cover crops[[65]](#footnote-65). Crop varieties with different root architecture could be another means to maintain and improve soil structure and enhance water infiltration.
* **Impacts of organic agricultural practices on soil of the target municipalities**

Organic farming also demonstrates effective water conservation capabilities. Specifically, organic farming impacts positively on soil structure and enhances the water-holding capacity and hence availability of water. Increased humus content, for instance, allows the soil to absorb more water during periods of heavy rainfall, reducing the runoff of surface water and soil erosion[[66]](#footnote-66). Greater holding capacity means that the soil can then supply plants with sufficient amounts of water in extreme droughts. Moreover, organically-managed crops have demonstrated their superior performance during such events, recording higher yields than their conventional counterparts[[67]](#footnote-67).

* management practices used by organic agriculture such as minimum tillage, organic soil cover, returning crop residues to the soil, the use of rotations, and the integration of nitrogen-fixing legumes increase the return of carbon to the soil, raising productivity and favouring carbon storage;
* Introducing above mention practice will improve soil formation and structure and prevent soil erosion control and will improve soil fertility;
* The project activities can encourage and motivate farmers in the target areas to use uncultivated agricultural plots; and promote changing the land use structure.

The positive environmental impacts resulting from promotion of the organic agriculture activities of the GRETA project can be enhanced and replicated in the other regions of Georgia.

Table 14 Environmental Impact and Risks Related to the Development of Organic Farming in the Target Regions

| **#** | **Potential Impacts and Risks** | **Recommendations on Environmental Safeguards / Mitigation Measures** |
| --- | --- | --- |
|  | Possible change of land use or increase of agricultural land areas due to development of organic farming, which uses more land compared to conventional farming.  Likelihood: Moderate to low  Significance: Low to negligible  Reversibility & duration: Reversible impact | The project team should promote organic agriculture and support it replication in other location.  Timeframe: During project implementation  Urgency: 3  Monitoring required: Yes |
|  | ***Increased amount of biodegradable/ green waste due to growing agricultural activities. Increased methane emissions from increased amount of green waste and manure***, when decomposing at landfills or environment  Likelihood: High to moderate  Significance: Moderate  Reversibility & duration: During touristic seasons | * Support activities related to minimization and disposal of biodegradable waste at the landfills (National Waste Management Strategy 2016-2030) and therefore, contribute to decrease of greenhouse gas emissions. * Support households-beneficiaries in composting of organic materials. * Support introduction of biogas technology as a clean source of energy which will help to reduce greenhouse gas emissions to the atmosphere.   Timeframe: During project implementation  Urgency: 3  Monitoring required: Yes |
|  | Bee keeping may have negative impact on native bees  Likelihood: High  Significance: High  Reversibility & duration: Irreversible impact during touristic seasons | * Prior agreement with the beneficiaries to plant native flowers and to facilitate nesting sites for native species by leaving dead branches and bare dirt accessible. * Awareness raising about the importance of native bee species. * Avoid overpopulation of one area with too many honey bees.   Timeframe: During project implementation  Urgency: 2  Monitoring required: Yes |
|  | More intensive sheep-farming and livestock sector can harm water quality through the release of nitrogen, phosphorus and other nutrients, pathogens and other substances into waterways and groundwater, mainly from manure  Likelihood: Moderate to low  Significance: Moderate to low  Reversibility & duration: Permanent risk after increase of activities | * Support planning and implementation of activities to develop capacities on sanitary standards of animal farming including those related to manure management.   Timeframe: During project implementation  Urgency: 3  Monitoring required: No |
|  | ***Increased risk of spread of zoonotic diseases*** due to more intensive animal farming activities  Likelihood: Low  Significance: Low  Reversibility & duration: Permanent risk after increase of activities | * Support planning and implementation of activities to develop capacities of local actors on undertaking proper sanitary control measures. * Application of *One Health approach* to controlling zoonotic transmission will be required, considering animals, people and the environment in a comprehensive approach to public health;   Timeframe: During project implementation  Urgency: 3  Monitoring required: Yes |
|  | ***Natural colorants*** industry (prepared from wild plants and lichens) can have a considerable impact on the environment - natural dyestuffs require large quantities of water for dyeing, and about 80 % of the dyestuffs stay on the fabric, while the rest go down the drain. | Mitigation measures will be required in case of supporting the large-scale industrial activities related to natural colorants.  Timeframe: During project implementation  Urgency: 3  Monitoring required: Yes |

Current Socio-Economic Conditions

Gender ratio of household members inquired in target municipalities is somewhat similar, while age structure of family members is distributed as follows: 23% is represented by population aged 65 and above, 16% is comprised of citizens within 55-64 age range, 13% - representatives of 25-34 age group, 12% - 35-44 year-old citizens, while number of 7-18 year-old citizens is 13%. It is worth mentioning that groups of 0-6 (7%) and 19-24 (4%) age categories are represented in small quantities.

72% of population living in target regions is not employed. Employment level does not differ significantly by regions, the majority of population claims not to be employed: Imereti – 72%, Racha-Lechkhumi – Kvemo Svaneti – 71%, Samegrelo – Zemo Svaneti – 76%. As reported by focus group participants, major part of population is self-employed in the fields of both tourism and agriculture. Those self-employed in agriculture declare that this activity is mostly for their own consumption, however, some of the products are being sold, including services related to local tourism – supplying guesthouses and shops with products.

In general, when studying financial condition of population, it turned out that almost half of inquired respondents (47%), do not have enough money to buy food, situation is even more severe in Imereti and Racha-Lechkhumi, where 49% and 47% respectively reported on such condition, only 16% of respondents inquired in Samegrelo-Zemo Svaneti reported on not having enough money to buy food[[68]](#footnote-68).

Average monthly income of households including all sources of income is 704 GEL. The highest monthly average income is reported in Samegrelo-Zemo Svaneti (754 GEL) followed by Imereti (725 GEL). While average monthly income of households living in Racha-Lechkhumi and Kvemo Svaneti is 644 GEL.

As declared by 57% of inquired respondents, they have only one source of income, as for first range of sources, this mostly includes pension and other social allowance (70%), as well as salary from public sector (33%) and salary from private sector (27%). According to 89% of respondents, their main sources of income are not seasonal.

43% of respondents have a loan or credit, number of such respondents is higher in Imereti and Racha-Lechkhumi and Kvemo Svaneti (45%-40% respectively), while number of such respondents is 28% in Samegrelo-Zemo Svaneti. Total average amount of credit is 6966 GEL.

Considering socio-economic condition, it is worth noting that self-employment and private business is relatively better developed in Samegrelo-Zemo Svaneti compared to other regions. General financial situation is better in this region, including in terms of average monthly income, but amount of credit is higher too which is presumably connected to paying capacity and better environment for business.

Results of quantitative research also confirm that Samegrelo-Zemo Svaneti is more developed than other regions in terms of doing business.

Major part of population living in three regions: Imereti, Racha-Lechkhumi – Kvemo Svaneti, Samegrelo-Zemo Svaneti is not involved in any kind of production or business (94%). Only 7% plans on expanding the existing business or starting a new one. Despite this, business is the most developed in Samegrelo-Zemo Svaneti and 29% of those citizens who are involved in production or business is a resident of Samegrelo-Zemo Svaneti, in addition, index of expanding or starting a new business is exceptionally high in this region compared to other regions. Imereti (3%) is the least active in terms of business and production.

64% of businesses operating in three regions are registered. Major portion of them are individual entrepreneurs (45%). The most popular type of business is shop / market (2%). It is worth mentioning that segment of tourism business such as renting out rooms / guesthouse is the most developed in Samegrelo-Zemo Svaneti region (18%).

Main consumers of the existing business / production are local residents (97%). Foreign consumers are mostly prevalent in case of businesses that operate in Samegrelo – Zemo Svaneti (63%).

Number of men (27%) managing the existing businesses is almost two times higher than number of female managers (12%). However, average number of permanently employed women (35) is higher than average number of permanently employed men in various businesses (25). In addition, number of women employed on seasonal jobs is slightly (10) but still higher than number of seasonally employed men (7).

As noted by focus group participants, in general, guesthouse business is managed by women, mostly women are employed in service field, it was also noted that women are willing to take more risks when starting a new business than men. Interview with Eco Tourism Association also confirmed that women are active in this field, as mostly housewives are involved in this business, even in terms of agritourism holding the ration between female and males would be 60/40.

None of the respondents inquired in scopes of the quantitative study mentioned offering Guiding services to the tourists. In Georgia no laws or regulations regulate the Guides activities. Anyone can call themselves a guide, even when the certificate is provided the issuer should be a trusted entity, as certificates can be also issued by many entities. It is entirely up to tourist to choose who they would prefer to guide them during their tour, whether this will be a person without specific knowledge of the standards or the first aid skills. The mountain guide is the highest qualification as per Mountain Guides Association as it requires number of skills and knowledge. It should be also mentioned, that this activity requires good physical conditions and is mostly considered as male activity.

As evaluated by focus group participants, tourism and agriculture fields have perspective but they need to be supported, which ultimately implies financial support. Focus group participants often point out the example of Mestia where the state assisted development of tourism, promoted it and as a result of this, young people returned to the municipality, they now have a source of income and new opportunities emerged.

Speaking of starting a new business, tourism is the most popular, in some cases tourism activity is related to agriculture which is perceived to be a supporting field of tourism. It is worth mentioning that participants of focus groups in target municipalities rarely recall cases when any special chemicals or other means are used to produce agricultural products. In terms of perception, locally harvested product is equal to organic product. Tourists are highly interested in local products; however, no one requires certificate of organic origin, respectively, relationship of a consumer and a supplier is based on the trust.

Regardless the fact, that part of focus group participants is confident in organic origin of local products, there are cases when locals feel doubtful in terms of compliance with standards. Those who have dealt with certification or have heard from others, that their products did not comply with standards, believe that compliance with standards is not simple. Certification process itself may last for years which requires additional finances and human as well as time resources apart from the labor required by the specific activity itself.

According to certification organization if a person decides to apply for certification, she/he should consider not only trivial things like avoiding pests, etc. also all documentation including financial records should be well established. In case of perennial crops, the valuation period can last up to 3 years and the fee depends on various things, e.g. inspector fee (USD 120 per hour), transportation (USD 0.35). Currently, 50-60% of applicants applying for certification are winemakers, although collection of wild species/herbs (Licorice, Nettle, Blackberry Leaves, Blueberry Leaves, Sea buckthorns, dogrose) can be considered as the most popular currently. Certification of animal husbandry/livestock can be considered as one of the most difficult, as this is connected with feeding and nutrition, disease control, treatment, living conditions, etc.

Situation in terms of agriculture is as follows: 81% of respondents own / use land parcels, there is a slight difference on regional level and land is the most used in Samegrelo-Zemo Svaneti (89%), followed by Racha-Lechkhumi – Kvemo Svaneti (84%) and Imereti (80%). Average total number of owned / used land parcels is 2.5, while average area of owned / used land is 3062 square meters.

After fruit, the largest portion of inquired respondents harvest vegetables (71%), maize (67%), grapes (64%) and beans (51%). Equal number of respondents living in three regions harvest vegetables, frequency of harvesting above-mentioned other crops, as well as amount of yield, differ by region.

Figure 13 – Harvested Crops and Cultures

Cases of using pesticides for cultivation of products were not reported in Samegrelo – Zemo Svaneti, inquired residents cultivate crops except for maize without using pesticides, in case of maize, 7% of respondents reported on using pesticides. Speaking of fruit, only 1% of residents living in Racha-Lechkhumi and Kvemo Svaneti use it, while portion of such respondents is 6% in Imereti. Practice of using pesticides in case of vegetables and maize is relatively higher in these two regions, but the rate is particularly high in Imereti in case of potato (48%).

One third (36%) of respondents do not own any domestic animals. Half of inquired respondents (50%) own poultry, 44% - cow, 14% - pig, while 6% own bees. Frequency of naming other domestic animals is insignificant and does not exceed 1%, including sheep. Frequency of owning poultry is the highest in Racha-Lechkhumi and Kvemo Svaneti (54%), cows are mostly owned in Samegrelo – Zemo Svaneti (56%). More respondents have pig and bees in Racha-Lechkhumi and Kvemo Svaneti than in other two regions.

As one of the sources of income in future is perceived to be guesthouses, it is important to analyze data related to utility services and use of these services.

Absolute majority of respondents (100%) are provided with electricity supply. 59% of respondents have natural gas supply, 34% - have gas tanks. Gas is the most frequently used (80%) for cooking, however, differences by regions are significant – 89% and 70% of respondents living in Imereti and Racha-Lechkhumi – Kvemo Svaneti use gas for cooking, while only one fifth (21%) of respondents use this source for cooking in Samegrelo – Zemo Svaneti. In contrary, respondents living in Samegrelo – Zemo Svaneti most frequently use (74%) electricity for cooking, while frequency of using electricity is significantly lower in Imereti and Racha-Lechkhumi and equals 7% and 25% respectively. As for heating, the most frequently used source in all three regions is firewood and in total, 82% of inquired respondents reported on using this source. 22% of respondents use gas. 26% of respondents in Samegrelo – Zemo Svaneti use electricity as a source of heating. Electricity is free in target municipalities of Samegrelo – Zemo Svaneti and accordingly, this source is highly used there.

Table 15 -Sources of energy used for cooking and heating

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | **Imereti**  **(N=275)** | **Racha-Lechkhumi and Kvemo Svaneti**  **(N=260)** | **Samegrelo- Zemo Svaneti (N=65)** | **Total**  **(N=600)** |
| **Cooking** | Electricity | 7% | 25% | 74% | 16% |
| Gas | 89% | 70% | 21% | 80% |
| Coal / charcoal | 1% | 0% | 0% | 1% |
| Firewood | 32% | 69% | 99% | 45% |
| Gas tank | 3% | 9% | 0% | 4% |
| **Heating** | Electricity | 2% | 2% | 26% | 3% |
| Gas | 30% | 4% | 0% | 22% |
| Firewood | 74% | 96% | 100% | 82% |

Main source of drinking water is reported to be centralized water supply tap water from inside the house (28%), one fourth (25%) of inquired residents use spring water, 17% - tap water. No significant differences have been reported by regions.

Figure 14 - Main source of drinking water

One fourth (25%) of inquired respondents assess quality of water used for household purposes as bad, the quality is satisfactory for 27% and good for 38%. In this case too, the highest level of disappointment was reported in Imereti region, where 42% of respondents described water as very bad/ bad, while level of dissatisfaction is 20% in Racha Lechkhumi and Kvemo Svaneti and 8% in Samegrelo.

39% of inquired respondents believe that turbidity of water during rain is a problem which is related to water, another problem related to water is supply of unfiltered of water. As declared by focus group participants, residents of village type settlements have their own reservoir which supplies people with water by means of pipes, reservoir needs to be cleaned after water which is managed by residents with their own resources.

59% of inquired residents have pit latrine, 53% of them have flush toilet. Pit latrine is more prevalent in Samegrelo – Zemo Svaneti (71%). 69% of inquired respondents are not connected to sewage system.

85% of inquired respondents declare that they throw their waste on special designated areas and in trash cans, however, it is also worth mentioning that 13% of respondents throw their waste on self-arranged areas. This practice is mostly prevalent in Racha-Lechkhumi and Kvemo Svaneti (23%). As it turns out during conversation with municipalities, all three municipalities have approved waste management plan and the respective agency, which is responsible for waste collection and management. However, it is worth mentioning waste management vehicle removes waste only alongside asphalt roads of municipalities while secondary village roads do not have asphalt surface. As noted by focus group participants, if a trash bin is located in the entrance of the village and a person lives at the other end of the village, he will not bring trash to the bin, but will throw it in the ravine or river.

Infrastructural underdevelopment has been named as a barrier for tourism by numerous respondents. Infrastructure was mentioned in several aspects starting from accessibility of locations, lack of shelters and camping areas in high mountainous areas, equipment required for tourism activities. Even though the hiking tracks are now available the tour operators see the problem of their maintenance.

Tour operator inquired in scopes the study mentioned that the number of the tourists in Mestia is rising from year to year and it is the fastest developing municipality out of all target municipalities, although it should be mentioned that it falls back in terms of infrastructure. The tourists are requesting higher standards of the hotels than it is available on the market. As the customers of the tour operator are mainly from Europe, the caring for the environment is their one of the top priorities, if the guesthouses and hotels do more harm to the environment in terms of sanitation, they refuse to use their services. Mestia has a choice, even though not many can comply with the standards, whereas other regions physically have no choice and it is even harder to accommodate tourists there. The same applies to restaurants, the operator has done some checks and only 3 out of 10 seemed to be in compliance with their standard.

One of the guesthouse owners while speaking of the comments and recommendations received from the tourists visiting him and whether these comments are being considered, mentioned that the tourists will come back any way, no need to invest more money. On the other hand, tour operator is very attentive towards the requirements of its customers and thus limits the number of the offered hotels to minimum. Considering the unstable attitude of the guesthouse owners towards the services, they had to quit using the services of some of them.

In winter time the tourism activity can be higher although it is currently impossible, since due to weather conditions the roads are often blocked. Even though two airports in Mestia and Ambroaluri are operational, the tour operator does not consider them as a means of transportation. The schedule of the flights is often unknown and the flights are being cancelled very often.

According to the Ecotourism Association, nor the infrastructure neither the locals in all target municipalities will be ready to serve increase number of the tourists, thus when speaking of the tourism development it should be tied to minimal infrastructural development as well.

In terms of vocational education related to tourism and agriculture: currently, the vocational college located in Mestia Municipality does not offer any programs in agriculture, although there is a wish to initiate such programs. The college territory provides an opportunity to have a practical teaching related to beekeeping in its own yard. The college is also considering to start the dual programs and has already discussed the possibility of dual program with the local farmer starting up an animal farm. Finding a land for various purposes seems to be problematic in Mestia Municipality. The college wanted to establish a campus although land has its historical owners, government tried to negotiate this land although at the end they gave up in order to avoid the conflict with the locals. The similar problem was faced by Mountain Resort Development Agency when initiating the adventurous tourism park project on Tetnuldi or Hatsvaldi, the land is owned by private owners and it is very difficult to acquire land currently.

In terms of tourism, the college has programs for cultural guides, cooks, restaurant and hotel management. From September 2019 mountain guide program short and full will be available in the college as well. Certified mountain guides course is also being offered by Mountain Guides Association and according to the college representative, the collaboration between these two is possible.

There is a very high demand on the graduates of the college, although according to the college representative the tourism in Mestia has developed very fast and the college was unable to catch up with the demand of the market. Tourism related courses are interesting for both genders and the employability rate is very high among the graduates. The college has been working with the small groups of people due to the quotas established from the Ministry of Education, although the quotas are expected to get higher from the new academic year.

The college director mentioned having a person with a disability, even though the person has graduated a field not related to tourism it should be mentioned that his integration levels into the society are very poor. “Usually they are very difficult, he is always trying to defend himself and then his relations (with outside world) are complicated. He always thought that he was bullied.” – College Tetnulidi, Director.

6.1 Needs, barriers, problems of vulnerable groups in the target regions

The table below provides distribution of vulnerable groups in the target regions as per 2019 Geostat, IDFI and Ministry of Internally displaced persons from the occupied territory.

Table 16 -Gender, IDPs and minority group distribution in target regions

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Municipalities | | | | | | | | | | |
|  | Imereti | Chiatura | Sachkhere | Tkibuli | Samegrelo-Zemo Svaneti (Mestia) | Racha-Lechkhumi and Kvemo Svaneti | Lentekhi | Ambrolauri | Oni | Tsageri |
| Gender: women/men | 52/48 | 52.3/  47.6 | 51.3/  48.7 | 52.3/  47.7 | 52.3/  47.7 | 52.4/  47.6 | 53/47 | 50.3/  49.7 | 53.3/  46.7 | 53/47 |
| Religious minorities | 0.96 | 0.9 | 1.2 | 0.8 | 0.3 | 0.75 | 1 | 0.5 | 1.3 | 0.2 |
| Ethnic minorities | 1 | 0.4 | 1.2 | 0.9 | 0.2 | 0.52 | 0.1 | 0.3 | 0.9 | 0.8 |
| IDPs | 0.02 | − | − | − | 0.02 | 0.26 | − | − | − | − |
| People with SEN | 0.47 | − | − | − | 0.37 | 0.48 | − | − | − | − |
| Unemployment level | 12.4 | − | − | − | 11.9 | 12.4 | − | − | − | − |

*Source: National Statistic Office of Georgia, 2019; The Institute for Development of Freedom of Information (IDFI), 2015; The Ministry of Internally Displaced Persons from the Occupied Territories, 2014*

The provided distribution shows that gender distribution is equal, percentage of poor population is quite high, while other marginalized groups constitute less than 1%. This creates additional barriers for these groups to bring their voice to decisions and advocate for their rights. The current study collected data with the focus on gender, economically disadvantaged, IDPs, HHs with a person with a disability.

In line with the traditional gender role distribution in a family, where women are responsible for the most of the household tasks, conditions of the everyday life affect women and girls stronger than men and boys. For example, if families reside in high rise buildings with water supply shortage, mostly women carry heavy vessels with water for washing, cooking etc. They have to do it several times a day and, in addition, many such buildings lack elevators. The survey in the target regions found out water supply problems in Imereti region, where only 36% of population reported having 24-hour water supply, the same problem was admitted by population in the other regions, in Samegrelo-Zemo Svaneti – 38%, while in Racha-Lechkhumi and Kvemo Svaneti – 8%. Water supply was also listed among the top 5 problems in the region by 49% of the Imereti region population, and 38% of Samegrelo-Zemo Svaneti population. The survey did not reveal statistically significant difference in satisfaction with the water supply condition, however, a certain tendency can be traced - women are unhappier than men, thinking that water supply condition is always or sometimes bad. Again, this problem is the most acute in Imereti region, with 42% of population complaining about, 20% of population complains about in Racha-Lechkhumi and Kvemo Svaneti and 8% - in Samegrelo-Zemo Svaneti. Statistically significant difference was found in the water quality assessment where more women assess it as bad than men: 40% versus 32%.

Poor economic conditions were listed among top 5 problems in all regions and in all regions problems of not enough income and unemployment are on the top three places in the list, while high interest rates are among top 5. At the same time, the economic conditions in the studied three regions vary, with Samegrelo-Zemo Svaneti being the most advanced and Imereti being the least developed.

In the Imereti region (municipalities of Sachkhere, Tkibuli and Chiatura), agricultural activities are main sources of income for a majority of families, tourism is less developed, unemployment is high, in addition, only about 20% of employed works according to their education, as estimated by the focus group participants. Participants think that men and women have equal chances for employment - men are mostly employed at construction works outside of the region, elsewhere in Georgia as well as abroad, for example in Germany and Turkey. Also, in Tkibuli and Chiatura, men work in mines. The rest of the jobs, like schools, medical facilities, small shops, are mainly staffed by women. At the same time, the income/salaries in construction and mining are 2-3 times higher than in the other sectors, thus, women earn much less than men, however, this is not considered or recognized as pay gaps by the focus group participants. Women have not even thought about a possibility for their husbands to help them and/or do some traditionally women’s tasks, such as cleaning, ironing, washing, cooking. Traditional views are that women should lay the table and even bring a glass of water to men in a family. In terms of tourism, women are mainly involved in hotel services, fulfilling traditional gender roles, also, women serve as museum guides, however, such museums are very few and the salaries are very small. Thus, a traditional horizontal segregation of gender roles is present. In future, when tourism develops, more men would be employed as mountain guides or guides in natural parks.

Participants of focus group discussion in Lentekhi and Tsageri think that men have higher chances for employment not only on construction works, but in public services as well. Women gather wild fruit in forests, or work in orchards and get fruit and greens. Incomes are generally low, some men get 25 GEL per day at constructions, but women get 10 GEL per day for hotel services, like cleaning, cooking, washing. Salary in a library, which is filled up by women, is 70 GEL per month [woman, 49 years, Tsageri]. Tourism sector jobs are seasonal, which decreases annual income. Average daily income for seasonal work is 30 GEL per day for men and 10 GEL per day for women. Women complain about working conditions, for example, business owners of restaurants, cafes, hotels, never pay for overtime work. There are kindergartens in the region, however, they only accept children after 2 years of age, so, women have no other choice than stay home and look after them. At the same time, parental leave is 6 months only, so, there is a clear gap between age of 6 months of a baby until he/she gets 24 months old.

In the region of Samegrelo-Zemo Svaneti (municipality of Mestia), the overall economic situation is different from the other regions, as tourism business is developed, many households are involved in this business either directly, or through selling agriculture products; the same concerns focus group participants. In addition, maintenance fees are covered from the country budget, so, electricity and water supplies are free for them. It is not surprising, therefore, that employment in public sector is considered as less preferable, because of low salaries and women mainly work on low paid jobs “a teacher’s salary is small, not sufficient for anything, no one could live on it, so I have a small business, rent out a room” [woman, 55 years, Mestia]. Relatively high paid public jobs are in small amount and hold by men, for example, police and security jobs are almost exclusively filled out by men and their salaries are much higher. Hence, local men do not want to work on construction business for 30 GEL per day as they consider it a too small income and prefer doing nothing, according to the focus group participants. According to their assessment, regular employment is for about 30% of population, including both public and private sectors. 1000 GEL per month is considered a good salary, in addition, men working in woods earn even more and would not agree to work for even such high salary. In contrast from the other regions, focus group participants think that women have higher chances to be employed as almost all of them is involved in tourist business, no matter what income. Men are involved as mountain guides and transporting goods and people in cars as well as horse riding as entertainment for tourists. Men are more involved in agriculture, than tourist business, the horizontal segregation is widespread here, men’s tasks are to take cattle to winter pastures and cut grass, which is mostly seasonal work, while women work all year. However, focus group participant women admit that men’s work is more appreciated and “visible” than the same or even more effort of women: “it has always been like this, women’s work is invisible” [woman, 46 years, Mestia] “that is why we need to speak out and praise ourselves, still, nobody hears us “[woman, 40 years, Mestia].

Despite the described differences, horizontal and vertical segregation is clear in all target regions, as well as the pay gap, however, these are not recognized by locals, they perceive this situation as normal. Traditional family responsibilities prevent women from work in all three regions - the main obstacle for women to work is small children, in some villages there is a problem of kindergartens, but “husbands do not forbid their wives to work, such thing does not take place here” [woman, 53 years, Mestia]. In Imereti, women admit that in some cases husbands forbid wives to work based on traditional views, “they are scared that women might do something wrong” [woman, 29 years Chiatura village, woman, 20 years, Sachkhere village], meaning that they might have an affair with their male colleagues. Similar to Sachkhere, in some cases husbands or parents in law forbid wives to work based on traditional views, “in Tsageri, for example, a husband does not allow his wife to work at the hotel” [woman, 49 years, Tsageri]. Thus, young women have to stay home either because their husbands do not allow, which can be considered as economic form of domestic violence, or, because they have to look after small children. There are public kindergartens in Sachkhere, so the minimum requirements are fulfilled, children stay there until 6 in the afternoon, however, the participants are not satisfied by the quality of service, especially education of children. They think the way out would be opening private kindergartens.

Those women, who are actively involved in agriculture business, meaning that they produce more than is needed for household consumption and, correspondingly, sell these on the market, are less involved in corresponding trainings - in the Imereti region, women have not been involved in any trainings on agriculture activities, neither have they heard about these, at the same time, they are ready to take part in such trainings. On the contrary, according to focus group participants, women in Mestia are usually informed about trainings by the local government representatives.

About 40% of the respondents own their houses or apartments and out of these, mainly men are the owners – 65%, while women – 31%. Similarly, about 40% of the respondent’s own land plots, 32% are women and 68% are men. This disproportional ownership becomes a serious obstacle for women if they want to get a loan, or if they divorce. In general, voices of women are not heard; however, the situation is different within a family. According to about 60% of the respondents of the survey, decisions are made jointly by husbands and wives, and in all types of family decisions - how to spend money, to get education, how to run business and agriculture related activities - in average, about 5% more wives are sole decision makers, than husbands. These percentages are similar across the regions, with one exception of Mestia, where equal 26% of respondents think that decisions on agriculture related activities are done by either husbands or wives.

Outside of family, women are involved in decision making at their jobs, if these are mainly staffed by women. In the Tsageri school the only men is a director, the rest are women, correspondingly, they participate in decision making processes. But, women are much less involved in local government decision making, for example, in discussions of budgets “I think that the one man only prepares budget document” [woman, 57 years, Tsageri] “women should be involved more in decisions on such a global issue, but here, only a couple of women are active, the rest is under shadow” [woman, 70 years, Lentekhi]. We, women want to contribute to decision making on budget, on main activities at places, however, men do not let us in” [woman, 40 years, Mestia, woman, 52 years, Mestia]. “Only men are present at such meetings, once I sneaked, and I was the only woman… This is a mountain law, women’s opinions are never asked” [woman, 53 years, Mestia,].

Third of the respondents of the household survey report having a disabled person in their family, and situation of some is even harder as their family’s main source of income is pension and living allowance – 86.7% versus 61.6% of those who do not have disabled in their household, and, only 19.3% of those who have disabled in a family have income from private business, versus 31.5% of those who do not have disabled in their family. Correspondingly, more of those who have a disabled in a household consider various living conditions as bad:

Table 17 -Assessment of living conditions by households with disabled members

|  |  |  |
| --- | --- | --- |
|  | having disabled in a family | those who do not have disabled in their family |
| Roads | 31.1% | 18.8% |
| Public transportation | 24.3%, | 14.0% |
| Sewage system | 45.0% | 31.2% |
| Waste management service | 17.2% | 9.3% |
| communication | 13.4% | 5.2% |
| Financial services | 34.5% | 19.9% |
| Local government | 19.4% | 11.3% |
| Recreation zones, sport facilities | 37.5% | 22.5% |
| Entertainment services, movie theatre, theatres clubs, | 33.7% | 63.5% |

These differences point to the fact that the listed services lack accessibility for disabled, ramps, for example, or hearing aids, etc. The highest difference, about 30% is in case of entertainment facilities, most probably, most of these buildings were built many years ago with no consideration of disabled and have not been remodelled according to the principle of reasonable accommodation since then. Logically, enough, among the top 5 problems households with disabled list is health care - 76.4% versus 51.1% of those who do not have disabled in a family, as well as lack of income - 97.4% versus 85.2% of those, who do not have disabled in a family.

Poor people constitute 12% of the population, their source of income is almost exclusively living allowance, hence, they have insufficient money even for food - 67.5%, versus 43.6% of not poor, respectively, they think that their family does not feed adequately – 49.2%, versus 34.7% of not poor, does not pay taxes timely, or not at all – 13.9%, versus 4.5% not poor; have problems with internet supply/wifi – 9.8% versus 26.2% of not poor, washing machine - 58.3%, versus 78. 9% of not poor; pc – 9.8%, versus 27.2% of not poor; refrigerator – 85.4%, versus 93.0% of not poor; car – 9.7%, versus 34.9% of not poor; no gas supply through pipes – 62.4% versus those who are not poor – 33.5%, and complain more about living conditions:

Table 18 - Assessment of living conditions by poor households

|  |  |  |
| --- | --- | --- |
|  | Poor/Beyond the poverty line | Not poor |
| Walls and floors in bad condition | 67.9% | 40.2% |
| Roof in bad condition | 48.7% | 25.2% |
| No sewage | 56.0% | 40.6% |
| high humidity | 59.0% | 42.1% |
| No gas supply | 48.4% | 29.4% |
| No heating | 19.2% | 13.6% |
| Lack of space | 13.6% | 9.1% |

Poor people, logically enough, use forest resources more than not poor, for hay – 17.9%, versus not poor – 9.9%; for firewood - 63.4% versus not poor - 50.0%; and for berries: 8.4% versus 5.8% of not poor. Logically, enough, among the top 5 problems they list is unemployment - 75.8% versus 63.8% of not poor, as well as lack of income 94.5% versus 88.6% of those, who are not poor; housing – 53.2%, versus 23.8% of not poor; public transportation – 16.5%, versus 9.2% of those who are not poor.

About 3% of the respondents report having IDPs in their family and, as expected, they want to change their residential place – 28.6%, versus 6.4% of those, who do not report having IDPs in their families; IDPs want to change this place to be closer to their relatives – 50.0% versus 27.8% of those who do not report having IDPs in their families; and to improve their living conditions – 20.0% versus 5.6% of those who do not report having IDPs in their families. Families with IDPs live mostly in houses - 57.1%, the rest lives in apartments – 28.6%, hotel - 5.7% or hospital buildings – 2.9%. Among the problems with living conditions, they name the following:

Table 19 -Problems with living conditions of households with IDPs

|  |  |  |
| --- | --- | --- |
|  | Households with IDPs | Households without IDPs |
| Walls and floors in bad condition | 51.4% | 41.9% |
| Roof in bad condition | 45.7% | 29.2% |
| High humidity | 51.4% | 42.5% |
| Lack of space | 22.9% | 7.8% |

IDP families, logically enough, use forest resources more than families without IDPs, for firewood - 74.3% versus families without IDPS - 58.8%; and for berries - 11.4% versus families without IDPs - 7.8%.

Trust - Overall, about 60% of the respondent’s trust (strongly and partially) their local governments everywhere except in Mestia, where trust is expressed by about 40% of the respondents. 54% of the respondent’s trust court in Imereti region, 48% - in Racha-Lechkhumi and Kvemo Svaneti and only 21% - in Mestia. Trust in police is reported by 70% of the respondents in Racha-Lechkhumi and Kvemo Svaneti, 75% - in Imereti and 80% - in Mestia. Trust in church is reported by 98% of the respondents in Racha-Lechkhumi and Kvemo Svaneti, 94% - in Imereti and 84% in Mestia. Trust in media is reported by 74% of the respondents in Racha-Lechkhumi and Kvemo Svaneti, 70% - in Imereti and 38% - in Mestia, Trust in NGOs is reported by 49% of the respondents in Racha-Lechkhumi and Kvemo Svaneti, 35% - in Imereti and 37% in Mestia, and international organizations are trusted by 55% of the respondents in Imereti region, 53% - in Racha-Lechkhumi and Kvemo Svaneti and 33% - in Mestia. The survey revealed some statistically meaningful differences in trust of different institutions for those households who have disabled and IDPs, as well as gender differences:

Women distrust political parties by 53.4% versus men - 33.6%, the Parliament by 36%, versus men - 48%; government - by 44.8% versus men - 34.8%; local government by 24% versus men - 36%, media by 14% versus men - 22%, and non-governmental organizations by 27% versus men - 37%.

Households with disabled persons distrust government by 42.8% versus 33.6% of the households who do not have disabled persons, court - 37.4% versus 25.2% of the households who do not have disabled persons, non-governmental organizations - 36.4% versus 25.3% of the households who do not have disabled persons, and international organizations - 27.2% versus 19.2**%** of the households who do not have disabled persons. Households with IDPs distrust government by 48.6% versus 35.8% of the households, who do not have IDPs.

Some vulnerable groups express higher distrust to some institutions, the other values do not differ from the overall data. These data might be used in the future activities planned in the regions, for example, involve representatives of the most trusted institutions in campaigns, and other activities.

6.2 Organizations, responsible for Gender Equality and Social Inclusion problems

According to the Law on Gender Equality, chapter 13, gender equality councils at local governments are created in all municipalities of Georgia, the process was finished in 2018. The next step for these newly established councils would have been development of action plans for years 2019-2020, however, we were able to obtain only 2 such plans from Tkibuli and Ambrolauri municipalities’ websites. In addition, the ones provided lack financial support for the majority of planned activities that raises serious doubts on the possibility of realization of these activities.

The members of gender equality councils are local government and municipality representatives as well as local population. The detailed information about the members of these councils is provided in the table below. Contact information of one member of every council, who, is a secretary, is also provided, with the exception of Ambrolauri. Besides the gender equality councils at local governments, there are gender equality officials in each municipality, at the mayor’s offices. The table contains their information as well:

Table 20 - Gender equality councils and persons, responsible for gender equality issues in the target regions

|  |  |  |  |
| --- | --- | --- | --- |
| ***Municipalities*** | ***Gender Equality Council-***  ***Member Numbers*** | ***Gender Equality Council-***  ***Contact person*** | ***Responsible person on gender equality issues at Mayor’s office*** |
| Mestia | 12 | Khatia Tsiklauri, 595089530; batildisi@gmail.com | Khatia Tsiklauri, 595089530; batildisi@gmail.com |
| Ambrolauri | 17 | Bela Abaishvili | Marika Dvali,  595534004; marikadvali@yahoo.com |
| Oni | 22 | Nino Jmukhadze,  59101 0338; onissakrebulo@gmail.com | Magdana Maisuradze, 591010440; Magdaamaisuradze@gmail.com |
| Tsageri | 16 | Marika Kopaliani, 598186424; [kopaliani.marika@yahoo.com](mailto:kopaliani.marika@yahoo.com) | Makvala Kopaliani,  591956080; 599278968 |
| Lentekhi | 9 | Irine Liparteliani,  599852668 | Mediko Khvistiani,  599852 685; medo-555@mail.ru |
| Tkibuli | 25 | Izolda Nemsadze, 599951280; izonemsadze@gmail.com | Inga Phartskhaladze,  595414730; inga.parcxaladze@mail.ru |
| Chatura | 8 | Ketevan Khvedelidze,  577017877  chiatura.mun@gmail.com; khvedelidze@yahoo.com | Eter Abesadze, 577017836; eabesadze7@gmail.com |
| Sachkhere | 11 | Ia Kiparodze,  558364040; iakiparoidze@yahoo.com | Leila Goshadze, 599100152; Goshadze1969@mail.ru |

*Source: Gender Information network of Sought Caucasus, 2019*

The municipality representatives do not have exact information about gender equality councils’ activities, they know that the councils follow their planned activities. The interviews with members of the gender equality councils admit that their functioning is limited and no specific programs are carried out, they have no budget and correspondingly, very limited resources.

The gender equality machinery at the national level is presented in the table below:

Table 21 - Gender equality institutions on the national level

|  |  |
| --- | --- |
| **State Institutions** | **Chairperson/Minister** |
| Gender Equality Council of the Parliament of Georgia | Tamar Chugoshvili, (32)2281126; tchugoshvili@parliament.ge |
| Inter-agency Commission on Gender Equality, Violence against Women and Domestic Violence | Sopho Japaridze |
| The Ministry of Internally Displaced Persons from the Occupied Territories, Labour, Health and Social Affairs of Georgia | Ekaterine Tikadze, (32)2510026;  info@moh.gov.ge |
| Social Service Agency | George Tsotskolarui, 1505; info@ssa.gov.ge |

Also, on the regional level, at the governors’ administrations, there are officials responsible for gender equality and their corresponding information is provided below:

Table 22 - Officials responsible for gender equality at the governors’ administrations in the target regions

|  |  |
| --- | --- |
| **State Representative-Governor’s Administration** | **Responsible person on gender equality issues** |
| Samegrelo-Zemo Svaneti | Nana Kakachia, 591417715; nanakakachia@gmail.com |
| Imereti | Meri Revishvili, 599030465; meri.revishvili@imereti.gov.ge |
| Racha-Lechkhumi and Kvemo Svaneti | Ilia kenchadze, 599968975; tvitmmartveloba.rls@gmail.com |

*Source: Gender Information network of Sought Caucasus, 2019*

Overall, there is a lack of information about activities of each of these bodies and officials, as well as lack of information about coordination of their activities with each other within a region.

There is a clear lack of non-governmental organizations working on gender, women’s, or other vulnerable groups’ issues in the target regions; in addition, no activities can be traced through their websites, if any. Trust in NGOs is reported by 49% of population in Racha-Lechkhumi and Kvemo Svaneti, 35% in Imereti and 37% in Mestia. Overall, non-governmental organizations representation in these regions can be assessed as extremely limited. The table below provides the information on these organizations, including relevant national level NGOs:

Table 23 - Non-Governmental organisations on the national level

|  |  |
| --- | --- |
| **Non-Governmental Organizations** | **Manager/Head** |
| Anti-Violence Network of Georgia | Nato Shavlakadze, (322)950679; antiviolence@avng.ge |
| Women’s information Centre | Elene Ruseckaia, (32)2952934; office@ginsc.net |
| Georgian Young Lawyers’ Association | Sulkhan Saladze, s.saladze@gyla.ge |
| Association of young Economists of Georgia | Kakha Daushvili, (32)2922839; kdaushvili@economists.ge |
| Multinational Georgia | Arnold Stepanyan, 595959565; info@pmmg.org.ge |
| Tolerance and Diversity Institute | Eka Chitanava, (32)2912762; tdigeorgia@gmail.com |
| The Caucasus Institute for Peace, Democracy and Development | Avtandil Jokhadze, (32)2355154; info@cipdd.org |
| The Human Rights Education and Monitoring Center | Tamta Mikeladze, (32)2223306; info@emc.org.ge |

Table 24 - Non-Governmental organisations in the target regions

|  |  |  |
| --- | --- | --- |
| **Municipalities** | **Non-Governmental Organizations** | **Manager/Head** |
| Mestia | Women From Mountainous Regions | Rusudan Nakani, 599549142; ruso-nakani@rambler.ru |
| Ambrolauri | Anti-Violence Network of Georgia, Office in Mestia | Nino Sokhadze,  551586207; nana.soxadze@yahoo.com |
| Association - “Zekari” | Manana Bochorishvili,  599930760; manana\_b@list.ru |
| Ruduneba | Sophia Sharabidze,  (239)21504; 599505560; ruduneba@hotmail.com |
| Tkibuli | Developmental Fund of Tkhibuli Municipaliti | Ketevan Gotsiridze,  (0497)221372; 599247508; tdf\_georgia@yahoo.com |
| Women’s Council of Orpiri | Maia Svanidze,  593203518; orpiri@mail.ru |
| Sachkere | Women in Villages | Ketevan Tsaia, (322)103903; 555448767; qalebisoflad@yahoo.com |

Assessment of Gender and Social Risks and Impacts of the Project Implementation

Based on the information considered above, marginalized and vulnerable people in the target regions can be described in terms of their specific needs, access to resources and services, access to information, control of assets, participation in decision-making, capabilities and decision-making powers:

Table 25 -Needs, barriers and accessibility of the vulnerable groups in the target regions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Women and girls | Poor | IDPs | Disabled |
| Specific needs | Access to trainings, information | Access to trainings, information |  | Reasonable accommodation – special arrangement of environment Access to trainings, information |
| Access to resources and services | Limited access to jobs, income | limited access to housing, public transportation, jobs, income, food, internet, home appliances | limited access to housing | limited access to roads, transportation, jobs, income, health care, communication, financial, entertainment, sports facilities and services |
| Access to information | Low access to information on trainings, except Mestia |  |  |  |
| Control of assets | Equal |  |  |  |
| Participation in decision- making  and decision- making powers | Low on village, community, local government level, high in family. |  |  |  |
| Assessment    of    potential    health, security or safety risks of local communities due to potentially increased traffic and transportation (pollution) as well as vulnerability to landslides, other natural catastrophes or extreme weather conditions; | The same as for all |  |  |  |
| The risk of potential exclusion from benefits deriving from the utilization of cultural heritages | Limited access to jobs, income | Limited access to jobs, income | \_\_\_\_ | Limited access to jobs, income |

Opportunities - Development of mountain tourism and increasing number of tourists in the target regions as well as development of agriculture, including organic farming, would lead to development of different businesses linked with hospitality – hotels, recreational and entertainment facilities, museums, cultural heritage sites and correspondingly, employment rates of local population, who will be involved in agricultural, construction, marketing, maintenance and service activities. These, should lead to increased income of local population which, in turn, might lead to such potential benefits as improved housing, health care, education.

Existing risks and barriers - At the same time, vulnerable population that faces barriers caused by their special conditions, risk to underuse the above described opportunities and enjoy corresponding benefits to a lesser extent. All types of marginalized population face a risk to be excluded from being employed, trained/educated, and informed about new developments. In addition, the disabled population faces barriers with transportation, accessibility of various buildings and facilities, communication. The IDP and poor population, who have bad housing conditions, cannot afford rent out for tourists and attract corresponding income, and poor population will be limited in advertising for their potential products through internet. Women, especially those with small children, will not be available for existing job and training opportunities. Also, they do not recognize and admit their structural gender inequality problems and thus, do not advocate for their rights.

The table below provides the main existing risks for marginalized and vulnerable people in the scope of the foreseen intervention:

Table 26 - Impact and Risks Related to the Development of Mountain Tourism, Increasing Number of Tourists and Organic Farming in the Target Regions

| **#** | **Potential Impacts and Risks** | **Recommendations on Environmental Safeguards / Mitigation Measures** |
| --- | --- | --- |
|  | Equal access to information about new opportunities, trainings, etc.  Likelihood: high  Significance: high  Reversibility & duration: Reversible impact | Plan special outreach measures in close cooperation with local government and NGOs, find out where and when to reach these groups and provide the needed information.  Timeframe: At the planning stage of the project  Urgency: 5  Monitoring required: Yes. The project assigns this responsibility to the implementation group member, who regularly informs the team. |
|  | Providing voice in decision making  Likelihood: high  Significance: high  Reversibility & duration: Reversible impact | * Plan special outreach measures in close cooperation with local government and NGOs. * Make a project representative be present at such meetings to encourage these people in expressing their opinion. * Provide training/awareness rising for decision makers.   Timeframe: At the planning stage of the project  Urgency: 5  Monitoring required: Yes. The project assigns this responsibility to the implementation group member, who regularly informs the team. |
|  | Equal Access to new jobs and low paid jobs  Likelihood: high  Significance: high  Reversibility & duration: Reversible impact | * Provide training/awareness rising for business owners * Provide skills trainings for vulnerable groups   Timeframe: At the planning stage of the project  Urgency: 5  Monitoring required: Yes. The project assigns this responsibility to the implementation group member, who regularly informs the team. |
|  | Increase in non-registered Business Activity /Compliance with national regulations  Likelihood: high  Significance: high  Reversibility & duration: Reversible impact | * Provide training/awareness rising for business owners * Provide skills trainings for vulnerable groups   Timeframe: At the planning stage of the project  Urgency: 5  Monitoring required: Yes. The project assigns this responsibility to the implementation group member, who regularly informs the team. |

Indicators for measuring potential environmental, gender and social risks and impacts and for monitoring the effectiveness of their mitigation measures

Identification of the measurable and realistic indicators are of the crucial importance for assessing the anticipated impacts from the project’s activities, as well as for monitoring of the results of the adverse impacts’ mitigation measures. For each component, were the likelihood of the potential unfavourable impact caused by GRETA activities was determined during the environmental, gender, and social impact analyses, the Indicators were identified. The proposed indicators are advised to be used for measuring such risks and impacts as well as for monitoring the effectiveness of their mitigation measures to be implemented by the project. For each indicator, the measurement unit and the means of verification have been proposed and the respective targets to be measured against baseline have been determined. There will be need to further refine many of the recommended indicators as the precise location, nature and scale of the specific activities of the project intervention became known. For some components, were the specific, reliable data was non-existent, additional studies will be required in order to establish specific baseline. The table presented below, suggests the ways of defining and verifying of those indicators. The indicators will be measured against their respective baseline and targets throughout project duration. The proposed indicators and their respective baseline and targets will be used for monitoring and measuring results of the recommended mitigation measures.

Table 27- List of Indicators for measuring environmental, gender and social risks and impacts and their mitigation measures (by components)

| **Component** | **Potential impact/risk** | **Indicator/measuring unit** | **Baseline** | **Target** | **Means of verification** |
| --- | --- | --- | --- | --- | --- |
| Water quality | Increased amount of biodegradable/ green waste due to growing agricultural activities, increased use of manure and slurry in organic agriculture  Increased risk of spread of zoonotic diseases due to more intensive animal farming activities  More intensive sheep-farming and livestock sector can harm water quality through the release of nitrogen, phosphorus and other nutrients, pathogens and other substances into waterways and groundwater, mainly from manure | Quality of drinking water in the project areas - assessed against national drinking water standards  Quality of water used for irrigation - assessed against national irrigation water standards  Level of pollution with synthetic fertilizers and pesticides | Needs to be evaluated for the project specific locations | Enhanced quality of water, decreased level of pollution with synthetic fertilizers and pesticides | Laboratory analyses conducted in project locations |
| Water supply | Increased number of users  Increased demand on water by tourist service providers | Number of households connected to central water supply system | Data available from the baseline chapter | Number of households connected to central water supply system increased | GWP local offices and respective municipalities |
| Waste water | Increased generation of waste waters from tourist service providers and their facilities and their discharge into the rivers and streams | Number of households connected to sewage system  Number of households with septic tanks/pits | Available in the baseline chapter (per municipalities) | Number of households connected to sewage system increased  Number of households with septic tanks/pits increased | Respective municipalities  To be counted by project |
| Solid Waste | More solid waste generated by increased number of tourists and their service providers    Increased amount of hazardous waste e.g. luminescence lamps containing mercury, batteries from electric devices, cell phones, laptops, children’s toys, shaving equipment etc.)  Increased littering near areas with high concentrations of tourist activities (national parks, forests and cultural areas)  Increased amount of inert waste from construction and refurbishing activities and waste disposal at municipal landfills or directly in environment due to the absence of special permissible landfills (especially in Mestia) | Amount of solid waste generated within the municipality (m3)  Waste generated per household/municipality/project specific area (m3)  Plastic waste generated within project sites (m3) and % from total waste  Number of households using the municipal collection service increased  Amount of hazardous waste (kg)  State of littering along roadsides and near tourist activities areas  Number of the illegal dumping sites of construction materials | Available in the baseline chapter (per municipalities)  Available in the baseline chapter (on regional level)  Official data is available from the municipalities but needs to be checked for verification of real accessibility of the collection services  Studies need to be conducted for the establishment of baseline in project location  Evaluation by the project staff  Number of illegal construction waste dumping sites within project location needs to be calculated for the baseline | The increased amount of solid waste is managed sustainably  Decreased amount of solid waste generated per household  Amount and % of plastic waste from total solid waste generated by project beneficiaries decreased measured against average in the municipality  Number of households using the municipal collection service increased  Amount of hazardous wastes disposed on landfills / environment is decreased  Littering near areas with high concentrations of tourist activities decreased  Number of inert wastes disposed on landfills/ environment is decreased  Municipal Waste Management plans address issue of illegal dumping sites and littering | Waste management plans by municipalities  Should be calculated by the project  Studies of waste composition in specific locations to be conducted  Municipal waste management plans and calculations by the project  Studies in project location  Existing situation and trends should be studied by the project trends  Number of illegal construction waste dumping sites within project location needs to be calculated within the project locations |
| Land use | Possible change of land use or increase of agricultural land areas due to development of organic farming, which uses more land compared to conventional farming | Forest cover (ha)  Area of agricultural land (ha)  Cultivated Agricultural (ha)  Pastures (ha) | Available in the baseline chapter (per municipalities) | Land use change avoided  Historic land use pattern safeguarded | National Statistics Office of Georgia  Geostat, National Statistics Office of Georgia |
| Pasture land | Increased pressure on land resources from more intensive sheep farming might lead to deterioration and overgrazing of the pastures | Number of sheep per m2  Condition of the pasture lands in the project area | Data needs to be collected for specific project locations | Number of sheep per m2 corresponds to the sustainable pattern of grazing (carrying capacity of the pastures)  Pasture land degradation avoided, general conditions of pastures enhanced | Information- consultation centers of the municipalities (MEPA) and respected municipalities  Carrying capacity of the pastures needs to be established for project locations |
| Soil nutrient content and pollution | Increased pressure on soil productivity from more intensive agricultural activities targeted to satisfy increased demands for local products | Level of nutrients in soil in project specific sites  Level of soil pollution from agriculture | General information on soil composition is available, but data needs to be collected for specific project locations | Deterioration of Soil conditions avoided, level of soil pollution decreased | Laboratory analyses of soil conditions in specific project locations |
| Protected Areas | Visitation of Tsutskhvati Cave Natural Monument reached unsustainable numbers | Number of tourists visiting Tsutskhvati Cave Natural Monument measured against carrying capacity of the cave | Carrying capacity needs to be calculated baseline information on the number of visitors available from APA | Number of tourists visiting Tsutskhvati Cave Natural Monument corresponds carrying capacity of the cave | Information on number of visitors available from APA |
| Non-timber forest resources | Unsustainable harvest of medicinal plants, wild fruits, berries and mushrooms | Amount of harvested medicinal plants, wild fruits, berries and mushrooms measured against carrying capacity of the forest in project areas | Carrying capacity needs to be calculated  Data available in the baseline chapter. Specific info needs to be collected for the project locations | Quota for sustainable use of non-timber resources established and enforced | Data needs to be collected by the project |
| Timber resources | Increased pressure on timber resources for heating and cooking by increased number of tourist service providers | Usage of firewood for cooking and heating purposes (m3) and % from total energy for cooking and heating | General data is available. Specific data on project location needs to be collected for the baseline | Amount of firewood for cooking and heating purposes (m3) and % from total energy for cooking and heating decreased | Specific data on project location needs to be collected |
| Social inclusion of the vulnerable groups of population | Representatives from vulnerable groups might have non-equal access to information about new opportunities, trainings, etc  Representatives of vulnerable groups might less participate in decision making process | Number of persons from vulnerable groups of population receiving information, participated in the trainings, engaged in the project activities | Results of ACT survey shows unequal assess  Results of ACT survey shows unequal participation in decision making | Representatives from vulnerable groups of population are given equal access to information and equal opportunities to be engaged in project activities and to make decisions | Relevant/segregated data needs to be collected by project staff at all stages of project implementation |
| Fair distribution of project’s benefits | Potential exclusion and non-equal access to new and well-paid jobs for women and other vulnerable groups of population | Number of women and representatives from vulnerable groups of population giving equal access to new and well-paid jobs | General information from GeoStat on the gender wage gap in Georgia  Specific information for baseline needs to be collected by the project | Number of women and representatives from vulnerable groups of population giving equal access to new and well-paid jobs increased | Relevant/segregated data needs to be collected by project staff |
| Compliance with national regulations | Increase in non-registered Business Activity | Number of non-registered businesses in project locations | To be calculated in order to set a baseline    GeoStat provides information only on registered businesses | Number of non-registered businesses in the project locations decreased | To be calculated by the project |

Bibliography

Climate:

The Georgian Road Map on Climate Change Adaptation, USAID/NALAG 2016

Upper Svaneti Adaptation Strategy to the Climate Change, 2014

Georgia’s Second National Communication to the UNFCCC, 2010

Georgia’s Third National Communication to the UNFCCC, 2015

ORGANIC FARMING AND CLIMATE CHANGE, 2008

DRR

* Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Chiatura Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Sachkhere Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Tkibuli Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Ambrolauri municipality), Adaptation Fund, UNDP, 2014;

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Racha-Lechkhum-Lower Svaneti Region, Ambrolauri Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Oni municipality), Adaptation Fund, UNDP, 2014;

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Oni municipality Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Lentekhi municipality), Adaptation Fund, UNDP, 2014;

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Racha-Lechkhum-Lower Svaneti Region, Lentekhi Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

* Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Tsageri municipality), Adaptation Fund, UNDP, 2014;
* Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Racha-Lechkhum-Lower Svaneti Region, Tsageri Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);
* National Environmental Agency - Geological Reports about Landslide, Debris/mudflow, rockfall hazard assessment in Mestia Municipality (2015), Ministry of Environment and Natural Resources Protection, National Environmental Agency, Department of Geology, SDC, Tbilisi, 2015

Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Samegrelo-Upper Svaneti Region, Mestia Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019);

Tourism:

* L.Maruashvili, Georgian Physical Geography, Tbilisi 1964
* Population census, National Office of Statistics, 2014
* Red List of Georgia, Tbilisi, 1982
* K.Kharadze, Natural Monuments of Georgia, 2001
* Z.Tatashidze, K.Tsikarishvili, J.Jishkairiani, Cadaster od Carst Caves of Georgia, Tbilisi 2009
* Resolution of Georgian Government N428 on approval of the status and list of resorts of Georgia, July 3, 2014
* Enterprise Georgia, HOSPITALITY & REAL ESTATE 2019, Tbilisi, 2019

Water and Sanitation

Cascio A, Bosilkovski M, Rodriguez-Morales AJ, Pappas G. (2011) The socio-ecology of zoonotic infections. Clinical Microbiology and Infection. 17(3):336–42. https://doi.org/10.1111/j.1469-0691.2010. 03451.x PMID: 21175957.

Grace D, Gilbert J, Randolph T, Kang’ethe E. (2012) The multiple burdens of zoonotic disease and an Ecohealth approach to their assessment. Tropical animal health and production. 44 Suppl 1:S67– 73.

Kant R. (2012) Textile dyeing industry an environmental hazard. Vol.4, No.1, 22-26; Natural Science http://dx.doi.org/10.4236/ns.2012.41004

Kock R, Kebkiba B, Heinonen R, Bedane B. (2002) Wildlife and pastoral society—shifting paradigms in disease control. Annals of the New York Academy of Sciences. 969:24–33. PMID: 12381559

Manson, P. (2008). Tourism: Impacts, planning and management. 2nd Edition. Butterworth-Heinemann, Oxford, UK

National Bee Unit APHA, National Agri-Food Innovation Campus Sand Hutton, York. YO41 1LZ (2018)

North Caroline Cooperative Extension Service. (2014). Good agricultural practices for the production and handling of strawberry, raspberry, blackberry and blueberry. USDA-CSREES; National Integrated Food Safety Initiative Project Number: 00-51110-9722

NRCC. (2008) Achieving Sustainable Global Capacity for Surveillance and Response to Emerging Diseases of Zoonotic Origin: Workshop Report. Washington: National Academies Press;

Pretty, J. (2008). Agricultural sustainability: concepts, principles and evidence. Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences, 363 (1491), 447-465.

Pimentel, D.; Hepperly, P.; Hanson, J.; Douds, D.; Seidel, R. (2005). Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems. BioScience, 55 (7), 573-582.

Stolze, M.; Piorr, A.; Häring, A.; Dabbert, S. (2000). The environmental impacts of organic farming in Europe. Organic Farming in Europe: Economics and Policy, University of Hohenheim, 6, 127.

Thomas, K. D. (2010) "Ecotourism and Water Quality: Linking Management, Activities and Sustainability Indicators in the Caribbean"

* Thorup-Kristensen, K. (2007). Effect of crop management practices on the sustainability and environmental impact of organic and low input food production systems. 3rd QLIF Congress: Improving Sustainability in Organic and Low Input Food Production Systems, University of Hohenheim, Germany, March 20-23, 2007.
* Toilet Board Coalition. (2018). Sanitation economy in agriculture - sector level opportunities, new toolbox and case study. Collaboration with Ethical Tea Partnership.
* Zeiger, M.; Fohrer, N. (2009). Impact of organic farming systems on runoff formation processes - A long-term sequential rainfall experiment. Soil and Tillage Research, 102 (1), 45-54

Waste management

* Effectiveness Audit of the Solid Waste Management;
* Georgian Law on “Waste Management Code“;
* Imereti Region Development Strategy 2014-2021;
* Inventory and Assessment of Hazardous Waste Hotspots in Georgia: Prioritization of Risks and Actions. 2017 (The study was commissioned by the OSCE in the framework of the Environent and Security (ENVSEC) Initiative Project “Inventory and Assesment of Hazardous Waste Hotspots in Armenia and Georgia”);
* Kutaisi Municipal  Waste Management Plan 2018-2022;
* Lentekhi Municipality Municipal  Waste Management Plan 2018-2022;
* Mestia Municipality Municipal  Waste Management Plan 2018-2022;
* National Waste Management  Strategy (2016-2030) and National Waste Management Action Plan (2016-2020);
* Racha-Lechkhumi and Lower Svaneti Region Development Strategy 2014-2021;
* Sachkhere Municipality Municipal  Waste Management Plan 2018-2022;
* Samegrelo – Upper Svaneti Region Development Strategy 2014-2021;
* Tsageri Municipal  Waste Management Plan 2018-2022;
* Tsalenjikha Municipality Municipal  Waste Management Plan 2018-2022.

Forests, biodiversity and protected areas

R. Kvachakidze, 2010. Geobotanical Zoning of Georgia.

Draft Management Plan of Racha-Lechkhumi Protected Areas.

Draft Management Plan of Svaneti Protected Areas.

Forestry management materials of Oni (2003), Ambrolauri (2003), Sachkhere (1996), Chiatura (1996), Tkibuli (1996) forest districts.

Statistics of Forestry Department (2004)

Tbilisi 2017. Newsletter #28 of the Academy of Agriculture. Scietific paper by Nana Goginashvili, PhD in Agriculture.

Resolution of the Government of Georgia on Creation and Management of Imereti Caves Protected Areas.

Energy sector

Resolution of Georgian parliament N3758-IIსon approval of the main directions of the state energy policy, June 24, 2015

Energy Sector development strategy of Georgia 2016-2025 – electricity; (DRAFT)

Energy Sector development strategy of Georgia 2017-2026 – Natural gas; (DRAFT)

Decree of Georgian government N1287 on approval of a regional development strategy for Imereti region, 2016-2021, 01 July 2016

Decree of Georgian government N1374 on approval of a regional development strategy for Racha-Lechkhumi Lower Svaneti region, 2014-2021, 19 September 2013

* Decree of Georgian government N1372 on approval of a regional development strategy for Samegrelo-Upper Svaneti region, 2014-2021.18 September 2013

Energy sector overview – charging forward, TBC Capital, July 2019

CENN “Assessment of firewood consumption and firewood production in Georgia” ADC/ENPI East FLEG II, 201

1. The Georgian Road Map on Climate Change Adaptation, 2016 [↑](#footnote-ref-1)
2. “Institutionalization of Climate Change Adaptation and Mitigation in Georgian Regions (ICCAMGR)”, National Association of Local Authorities of Georgia (NALAG), USAID, 2016 [↑](#footnote-ref-2)
3. “Institutionalization of Climate Change Adaptation and Mitigation in Georgian Regions (ICCAMGR)”, National Association of Local Authorities of Georgia (NALAG), USAID, 2016 [↑](#footnote-ref-3)
4. Upper Svaneti Adaptation Strategy to the Climate Change, 2014 [↑](#footnote-ref-4)
5. Upper Svaneti Adaptation Strategy to the Climate Change,2014 [↑](#footnote-ref-5)
6. Pre-feasibility Study for a Protected Area Project in Racha, Lechkhumi and Svaneti (Georgia), Michael Garforth and Ketevan Garforth, GFA consulting group, 2015 [↑](#footnote-ref-6)
7. [www.nam.gov.ge](http://www.nam.gov.ge) , [https://drive.google.com/file/d/1lwBzA8h8Bv\_aWLOLsHc3m8vM3QXl0njf/view](https://drive.google.com/file/d/1lwBzA8h8Bv_aWLOLsHc3m8vM3QXl0njf/view?fbclid=IwAR03--QWFkHzq_xJaO843h0j6bjfQtwdKrbiQPAVOo8KR_NUDnKTGVHc660) [↑](#footnote-ref-7)
8. (MEPA 2016) [↑](#footnote-ref-8)
9. (MEPA 2016) [↑](#footnote-ref-9)
10. (MEPA 2016) [↑](#footnote-ref-10)
11. R. Kvachakidze, 2010. Geobotanical Zoning of Georgia. [↑](#footnote-ref-11)
12. Draft Management Plan of Svaneti Protected Areas. [↑](#footnote-ref-12)
13. Draft Management Plan of Racha-Lechkhumi Protected Areas. [↑](#footnote-ref-13)
14. Resolution of Georgian government N79 on approval of Ajameti MR management plan, February 19, 2016 [↑](#footnote-ref-14)
15. Prof. V.Gulisashvili, Forestry, 1973 [↑](#footnote-ref-15)
16. Source: National Environmental Agency, August 2019 [↑](#footnote-ref-16)
17. Tbilisi 2017. Newsletter #28 of the Academy of Agriculture. Scietific paper by Nana Goginashvili, PhD in Agriculture [↑](#footnote-ref-17)
18. Pre-feasibility Study for a Protected Area Project in Racha, Lechkhumi and Svaneti (Georgia), Michael Garforth and Ketevan Garforth, GFA consulting group, 2015 [↑](#footnote-ref-18)
19. Justification for designation of Upper Svaneti Glacier National Park, APA, 2019 [↑](#footnote-ref-19)
20. The Information Consultation centers in Chiatura, July 2019 [↑](#footnote-ref-20)
21. The Information Consultation centers in Tkibuli, July 2019 [↑](#footnote-ref-21)
22. Resolution of Georgian Government N58 on approval of the national standard for drinking water, January 15, 2014 [↑](#footnote-ref-22)
23. Personal communication with the deputy-Mayor of Chiatura municipality, Mr. Davit Bichadze, 19.06.2019 [↑](#footnote-ref-23)
24. Personal communication with the deputy-Mayor of Sachkhere municipality, Mr. Otar Omiadze, 19.06.2019 [↑](#footnote-ref-24)
25. Personal communication with the deputy-Mayor of Tkibuli municipality, Mr. Giorgi Lomtadze, 19.06.2019 [↑](#footnote-ref-25)
26. Pre-feasibility Study for a Protected Area Project in Racha, Lechkhumi and Svaneti (Georgia), Michael Garforth and Ketevan Garforth, GFA consulting group, 2015 [↑](#footnote-ref-26)
27. Interview with the Deputy Mayor of Mestia municipality, 10.06.2019 [↑](#footnote-ref-27)
28. Imereti Region Development Strategy 2014-2021. [↑](#footnote-ref-28)
29. Kutaisi Municipal Waste Management Plan 2018-2022. [↑](#footnote-ref-29)
30. Georgian Law on “Waste Management Code”. [↑](#footnote-ref-30)
31. <http://waste.gov.ge/ka/?p=93&lang=en> [↑](#footnote-ref-31)
32. Tsageri Municipal Waste Management Plan 2018-2022. [↑](#footnote-ref-32)
33. Mestia Municipality Municipal Waste Management Plan 2018-2022. [↑](#footnote-ref-33)
34. Inventory and Assessment of Hazardous Waste Hotspots in Georgia: Prioritization of Risks and Actions. [↑](#footnote-ref-34)
35. Resolution of Georgian parliament N3758-IIს on approval of the main directions of the state energy policy, June 24, 2015 [↑](#footnote-ref-35)
36. Energy sector overview – charging forward, TBC Capital, July 2019 [↑](#footnote-ref-36)
37. Energy Sector development strategy of Georgia 2016-2025 – electricity; (DRAFT) [↑](#footnote-ref-37)
38. Decree of Georgian government N1287 on approval of a regional development strategy for Imereti region, 2016-2021, 01 July 2016 [↑](#footnote-ref-38)
39. Personal communication with the deputy-Mayor of Sachkhere municipality, Mr. OtarOmiadze, 19.06.2019 [↑](#footnote-ref-39)
40. Decree of Georgian government N1374 on approval of a regional development strategy for Racha-Lechkhumi Lower Svaneti region, 2014-2021, 19 September 2013 [↑](#footnote-ref-40)
41. Decree of Georgian government N1372 on approval of a regional development strategy for Samegrelo-Upper Svanetiregion, 2014-2021.18 September 2013 [↑](#footnote-ref-41)
42. Energy Sector development strategy of Georgia 2017-2026 – Natural gas; (DRAFT) [↑](#footnote-ref-42)
43. CENN “Assessment of firewood consumption and firewood production in Georgia” ADC/ENPI East FLEG II, 2016 [↑](#footnote-ref-43)
44. Energy Sector development strategy of Georgia 2016-2025 – electricity; (DRAFT) [↑](#footnote-ref-44)
45. CENN “Assessment of firewood consumption and firewood production in Georgia” ADC/ENPI East FLEG II, 2016 [↑](#footnote-ref-45)
46. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Chiatura Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-46)
47. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Sachkhere Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-47)
48. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Tkibuli Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-48)
49. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Ambrolauri municipality), Adaptation Fund, UNDP, 2014; [↑](#footnote-ref-49)
50. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Racha-Lechkhum-Lower Svaneti Region, Ambrolauri Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-50)
51. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Oni municipality), Adaptation Fund, UNDP, 2014; [↑](#footnote-ref-51)
52. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Imereti Region, Oni municipality Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-52)
53. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Lentekhi municipality), Adaptation Fund, UNDP, 2014; [↑](#footnote-ref-53)
54. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Racha-Lechkhum-Lower Svaneti Region, Lentekhi Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-54)
55. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Kurtsikidze O., Gaprindashvili G., - Geological Report envisaged by the Project on “Development of climate resilient flood and flash flood and geological disaster management practices for Rioni river basin” (Tsageri municipality), Adaptation Fund, UNDP, 2014; [↑](#footnote-ref-55)
56. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Racha-Lechkhum-Lower Svaneti Region, Tsageri Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-56)
57. National Environmental Agency - Geological Reports about Landslide, Debris/mudflow, rockfall hazard assessment in Mestia Municipality (2015), Ministry of Environment and Natural Resources Protection, National Environmental Agency, Department of Geology, SDC, Tbilisi, 2015 [↑](#footnote-ref-57)
58. Tsereteli E., Gaprindashvili M., Kvaratskheli Z., Gaprindashvili G., et. al - Informational bulletin: Condition of development of geological processes in Georgia, results of activation and danger of risk- summarizing geological report (Samegrelo-Upper Svaneti Region, Mestia Municipality), Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency, Department of Geology, Tbilisi (2011-2019); [↑](#footnote-ref-58)
59. Georgia’s Third National Communication to the UNFCCC, 2015 [↑](#footnote-ref-59)
60. Organic Farming and Climate Change, 2008 [↑](#footnote-ref-60)
61. The Georgian Road Map on Climate Change Adaptation, developed by National Association of Local Authorities of Georgia (NALAG) with the financial assistance of USAID [↑](#footnote-ref-61)
62. B. Beritashvili, N. Kapanadze, I. Chogovadze; Tbilisi, 2010 [↑](#footnote-ref-62)
63. National Association of Local Authorities of Georgia (NALAG), 2016 [↑](#footnote-ref-63)
64. Official webpage of the “Sustainable tourism gateway” <http://www.gdrc.org/uem/eco-tour/st-documents.html> [↑](#footnote-ref-64)
65. Thorup-Kristensen, K. (2007). Effect of crop management practices on the sustainability and environmental impact of organic and low input food production systems. 3rd QLIF Congress: Improving Sustainability in Organic and Low Input Food Production Systems, University of Hohenheim, Germany, March 20-23, 2007. [↑](#footnote-ref-65)
66. Zeiger, M.; Fohrer, N. (2009). Impact of organic farming systems on runoff formation processes - A long-term sequential rainfall experiment. Soil and Tillage Research, 102 (1), 45-54 [↑](#footnote-ref-66)
67. Rodale Institute (2011). The Farming Systems Trial: Celebrating 30 years. Kutztown, Pennsylvania

    Pimentel, D.; Hepperly, P.; Hanson, J.; Douds, D.; Seidel, R. (2005). Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems.BioScience, 55 (7), 573-582. [↑](#footnote-ref-67)
68. This is a respondent-based assessment and does not have connection with the social allowance [↑](#footnote-ref-68)