

**Joint OSCE/UNEP Environmental Assessment
Mission to Georgia
29 September – 3 October 2008**

Section I. Introduction

Further to the letter addressed on 20 August 2008 by Ambassador Viktor Dolidze, Permanent Representative of Georgia to the Organization for Security and Co-operation in Europe (OSCE), to Ambassador Marc Perrin de Brichambaut, Secretary General of OSCE, and to the request of H.E. Mrs. Ekaterina Tkeshelashvili, Minister of Foreign Affairs of Georgia, to the OSCE Permanent Council on 28 August 2008, and the official requests to the Executive Director of the United Nations Environment Programme from the Minister of Environment, Mr. Irakli Ghvaladze, the OSCE organized with the United Nations Environmental Programme (UNEP) a joint technical mission to assess the environmental impact of the recent conflict in Georgia.

The Joint OSCE/UNEP Mission took place from 29 September to 3 October 2008 and was led by the Co-ordinator of OSCE Economic and Environmental Activities (CO/EEA) Bernard Snoy and the Director of the UNEP Regional Office for Europe Christophe Bouvier. Under their leadership, the Mission has aimed at listening to the widest possible range of views on the environmental impact of the conflict and at providing recommendations for remediation of identified environmental issues, including possible confidence-building measures. The Mission benefited from the strong political and logistical support of the OSCE Mission to Georgia and is particularly grateful to Ambassador Terhi Hakala in that respect. The list of the members of the Mission is provided in Annex I.

The Joint Mission assessed in particular the damage caused by forest fire in the Borjomi area. It visited several zones that were affected by the recent conflict, particularly the areas adjacent to South Ossetia. However, the Mission was not given access to South Ossetia and could not assess the extent of environmental damage there.

The mission included meetings with a wide range of stakeholders:

- High-level Georgian government representatives, including Prime Minister Vladimir Gurgenzidze, Minister of Environment Irakli Ghvaladze, State Minister of Reintegration Temur Iakobashvili, Deputy State Minister for Euro-Atlantic Co-operation Tamar Beruchashvili;
- Technical experts from a number of Georgian Government Ministries;
- Members of the Parliament of Georgia, in particular Mr. Akaki Bobokhidze and Mr. Zaal Gamtsemlidze, respectively Chairman and First Deputy Chairman of the Committee on Environmental Protection and Natural Resources;
- The Governor of the Shida Kartli region (around Gori), Mr. Lado Vardzelashvili;
- The Head of the Borjomi-Kharagauli National Park and officials of the national forest administration in the Borjomi area;
- Representatives of NGOs, Academic and Business communities;
- Inhabitants from the Gugutiant-Kari and Nikozi villages in the areas adjacent to South Ossetia;
- Internally Displaced Persons (IDPs) in the area of Gori; and
- Representatives from international organisations active in Georgia (United Nations, European Union, World Bank, EBRD, etc).

A full list of the persons met by the Mission is provided in Annex II.

The Mission has been building upon the findings of and avoided duplication with the recent Joint Needs Assessment (JNA) conducted by the United Nations and the World Bank.¹ The JNA report, which will provide the basis for the Donors Conference scheduled to take place in Brussels on 22 October 2008, concentrated on the economic impact of the conflict. It includes also, however, a section reviewing “the key environmental impacts that were reported to relate to the conflict”. The Joint OSCE/UNEP Mission endorses the key conclusion of the JNA report as concerns the environment and natural resources in Georgia, which was formulated as follows: “Environmental damage was found to be of concern, but localized in nature. Environmental damage is variable in its extent and scale, but comprises of damage to forests; damage to habitats and infrastructure in several protected areas; coastal and marine pollution; pollution from several terrestrial oil spills; and hazardous waste issues associated with infrastructure damage. However, possibly significant future environmental damage can be expected if various mitigating actions are not put in place quickly. In the medium term, as Georgia moves into a post-conflict recovery period, economic growth will be enhanced by adopting a robust framework for environmental regulation and pollution control... Further, increased clarity is needed in the forestry sector, to enable the sector to meet its full potential.”

The Joint OSCE/UNEP Assessment Mission has sought to bring added value to the review of environmental impacts carried out by the JNA, particularly in the following areas:

- By assessing more in depth the environmental damage associated with forest fires in the Borjomi area and formulating more detailed recommendations for damage mitigation and rehabilitation, drawing on the expertise of Professor Dr. Johann Georg Goldammer, Director of the Global Fire Monitoring Centre and Co-ordinator of the UN-International Strategy for Disaster Reduction (ISDR) of the Global Wildland Fire Network. This is the object of Section II of this report.
- By assessing environmental issues that have arisen in the areas adjacent to South Ossetia, relating mostly to access to and quality of water, availability of firewood or other sources of energy ahead of the winter season, waste disposal and other environment and security issues and by formulating proposals for measures, projects or programmes addressing these issues, including confidence building measures and measures requiring co-operation across the lines of conflict. This is the object of Section III of this report prepared by the UNEP.

Section II. Forest Fires

1. Background

During the armed conflict in Georgia in August 2008 a number of forest fires occurred as a consequence of military activities in several sites of the country. According to reports by government authorities and non-government organizations the fires burned between 13 August and end of August 2008. Starting on 13 August 2008 two forest sites in the Ateni Gorge (Ateni and Ormotsi compartments of the Inner Kartli Regional Forest District) affected around 60 ha of forests. Fires affected approximately 950 ha in the Borjomi Gorge in Samtskhe-Javakheti Region, thereof approximately 150 ha of the Borjomi area burned in the buffer zone of the Nedzvi Nature Sanctuary. Several fires affected also two national parks and one nature reserve. Three fires burned within the Borjomi-Kharaguali National Park covering approximately 10 ha.

According to a report of the Caucasus Environmental NGO Network (CENN), air raids on 16 August started fires in the forests of the Kaspi region and near Surami village (Khashuri

¹ The JNA was supported by the Asian Development Bank, the European Bank for Reconstruction and Development, the European Commission, the European Investment Bank and the International Finance Corporation. UNEP contributed to the environment section of the assessment (ref. JNA Report Annex XIV “Environment and Natural Resources”).

district, Shida Kartli Region). A number of small forest fires were also reported in Kharagauli (Imereti Region), Kojori (Kvemo Kartli Region) and near the village Khaishi (Mestia District, Samegrelo-Zemo Svaneti Region).

2. Verification / assessment of fire damages

Medium-resolution satellite imagery provided by UNOSAT and the European Commission Joint Research Centre (JRC) confirmed active fires burning during the time period indicated. Satellite imagery and video materials provided by Georgian sources were accessible near real time on the website of the Global Fire Monitoring Center (www.gfmc.org) in August 2008. During the mission the Environmental Damage Assessment Team accessed the burned areas in Borjomi Gorge and noted that additional areas had burned along the main corridors of combat activities (roads between South Ossetia and Gori Region). Fire damages inside Borjomi National Park and Ateni Gorge were not accessed due to the remoteness of the burned terrain. However, aerial photographs of Ateni Gorge provided by the Ministry of Environment were evaluated and confirmed the reported damages.

The on-ground and aerial photography assessment of the two main fire sites in Borjomi and Ateni Gorges confirmed the report of the Joint World Bank / UNEP Report “Georgia Post Conflict Needs Assessment Environment and Natural Resources“ and the reports of government and non-government sources. A total of approximately 300 to 400 ha of forest („core burned areas“) were affected by extremely severe fires. Extremely dry and windy weather conditions during August 2008 had provided conditions for easy ignition and spread of fires. While the mixed coniferous-broadleaved mountain forests in both regions during average weather conditions are not susceptible to fire, the extremely dry weather allowed the development of severe fires that in the core areas consumed the herb-grass layer as well as the duff (humus) layer completely. Furthermore, in the core areas of the two sites the fires resulted in complete mortality of the coniferous trees and penetrated in many cases the underground (root) layers. At the edges of the burned sites, shaped by topography and less flammable broadleaved tree species, many trees were only partially damaged (weakened). This will have implications on the follow-up measures to be taken.

The consequences of the complete exposure of soils on the prevailing steep slopes of both gorges were already visible at the visit of the assessment mission team. Surface runoff of water and erosion can be seen along the slopes. The loose, unprotected soil is extremely unstable and may lead to massive surface runoff and land- or mudslides during extreme precipitation events.

The assessment team was made available ground photography documentation of sites burned by fires of similar severity in Abustemani in 2006 and Tusheti mountains in 2000. On both sites no rehabilitation / reforestation measures were taken. However, both sites show a stable ground cover of the herb-grass layer and first appearance of natural regeneration of trees.

Annex III of this Report provides relevant maps and visual impressions of the Mission.

3. Short- to medium-term consequences of the fires

3.1 Forest Ecosystem Health and Productivity

The immediate consequences of the fires on mortality of timber resources have been assessed by the earlier JNA. These findings and some of the recommendations are herewith agreed and confirmed in principle. The degree of fire damage on the affected sites varies considerably. Fire behavior and severities, which determine fire impacts, have been influenced by a number of factors such as forest type, topography and weather. Thus, fire damages are

ranging from severely burned site with complete mortality of tree stands, to sites where trees were partially damaged. Since these mountain forest ecosystems are not adapted to natural or human-caused fires, all types of fire effects are considered as damaging.

However, in the past the forests have been already affected by human activities, particularly by uncontrolled illegal logging. This kind of forest use, although illegal, has been an important part of livelihood (notably provision of firewood) and source of income for local people (small illegal sawmills producing materials for construction, etc.). In the recent years, however, illegal logging seems to have slowed down as a consequence of law enforcement (on-site information given by forestry officials).

All options of post-fire forest utilization schemes (either illegal, or in the frame of sustainable forest management) and post-fire management scenarios (salvage logging either permitted, or not allowed), the delivery of forest produce from the burned sites will differ and risks will be involved.

Immediate salvage logging may involve the following opportunities as well as major risks:

- Salvage logging could provide valuable timber and fuelwood supply
- In any case, if decided to do so, low-impact logging would be imperative (cable cranes, logging on compact snow cover in winter only)
- However, as the deeply burned soils are currently extremely instable any forestry operation on these fragile, steep-slope sites will involve the risk of further site deterioration and destabilization
- The local population could get the impression that after (setting) a fire legal cutting would be allowed. Consequently intentionally set fires could be expected in the coming years (as is the case in many countries that allow salvage logging of burned forests instead of regular logging schemes).

Natural restoration / rehabilitation of fire-damaged forests would also involve opportunities as well as major risks:

- For the stabilization of fire-denuded soils the recovery of the herb-grass layer is most important
- In addition, during winter time (on compact snow cover, which would protect the exposed soil surface) measures could be taken to utilize fire-damaged trees for constructing erosion barriers, i.e. felling trees and positioning the logs parallel (horizontally) on the slope, anchored between tree stumps, to create anti-run off / erosion barriers
- On some larger burn (core burn) sites in Borjomi Gorge additional planting should be done if natural regeneration of tree cover would be too slow
- Timber weakened (not killed) by fire and not removed from the site will constitute a risk for infestation by bark beetles and may result in outbreak of mass infestations in the surrounding healthy stands that were not affected by fire (cf. below)
- Non-salvaged timber will collapse within the next years and constitute additional hazard for future forest fires, if precautionary (preventive) measures are not taken.

3.2 Other secondary damages

While timber completely killed by fire will degrade biologically (by wood-boring insects, followed by decay) and will not constitute a major risk for outbreaks of secondary pests, the situation is different in places where trees were only partially damaged by fire. Coniferous trees weakened by environmental stress or fire will attract bark beetles, which find suitable conditions to breed in these trees and produce mass outbreaks of these insects.

Subsequently, larger bark beetle populations would subsequently attack surrounding healthy forests.

Major post-fire risks include the threat of flooding, landslides and mudslides downstream of the areas affected by high-severity fires. Two villages – Daba and Tsagveri – that are located at the bottom of the two burned catchments of Borjomi Gorge, which drain the fire-damaged area, are at potential risk to be affected. Immediate in-depth analysis of specialists should be made to define the measures that should be taken within the coming months (see recommendations below).

The impacts of the fires on ecosystem functioning and biodiversity include the loss of wildlife habitats, especially in the core burned area. However, the overall wildlife populations may not be affected long-term as these may temporarily evade the burned areas and resettle, as the ecosystem will recover naturally. A transient shift in the composition and presence of species will occur, as the open sites created by and the post-fire successional stages fire will offer living spaces that are different from a tall, mature forest.

Emissions of forest fires have a multitude of short- to long-term impacts on the human health and security, as well as on the atmosphere. According to interviews with local residents the forest fire smoke affected the settlements nearby Borjomi Gorge during the whole fire episode. Without having access to detailed data it is assumed that smoke lingering close to the ground has affected people, particularly those having respiratory problems (asthma-suffering and elderly people). There were no reports on accidents on the ground or in the air space as consequence of smoke-related reduced visibility.

The impacts of fire emissions on the atmosphere and on climate are limited. For instance, the fate and impacts of the pulse of emitted carbon dioxide and particles and their potential contribution on global warming will largely depend on the recovery of the forest ecosystem. At medium- to long-term scales, the successful natural regeneration of the forest, supported by reforestation / rehabilitation measures, will take up (capture) the amount of carbon that had been emitted by the fire. Under a scenario of full reconstitution of the forest ecosystem all carbon emitted to the atmosphere by fire will be back at the forest ecosystem.

Other collateral damages include a possible impact on the local drinking water industry. Concerns have been expressed that high quality mineral and spring water, which is collected and bottled in Borjomi, could be affected by the fires. While the mineral water is less likely to be affected, as it is collected from deep bedrock layers, the close-to-surface spring water may become affected if drained from the catchment impacted by the fires. The mission could not identify the spring water draining points and their potential threat by chemical composition of ash and soils eroded by the fires.

4. Recommended follow-up action

4.1 Immediate action (2008)

Immediate action is required in (a) taking first steps to prevent secondary consequences of the wildfires, and (b) to build capacity in fire management in preparation of the fire season 2009.

(a) Immediate measures to prevent secondary consequences of the wildfires

Together with the OSCE Office in Tbilisi, it is proposed and currently prepared to dispatch an expert to Borjomi region to assess the threats to villages / settlements by floods, landslides and mudslides downstream of the severely fire-affected areas. The expert (engineer

with experience in erosion control and landslide prevention) should propose immediate technical measures to be taken. In a second step local services / agencies and communities would be trained / involved to construct relevant protection barriers i.a.w. the expert recommendations.

The threat of insect infestations in the partially damaged forests must be closely monitored and necessary steps be taken. The personnel of Borjomi National Park is familiar with the use of pheromone traps for monitoring and catching bark beetles, a biotechnological and environment-friendly method. Both the Park Service and the Forestry Service, which is in charge of the larger areas in Borjomi and Ateni Gorges, should be provided with the necessary expertise and purchased materials (pheromone substances, traps).

(b) Capacity building in fire management in preparation of the 2009 fire season

The fire incidences of 2008 have been occurring at time of war and are not representative for future similar incidences during peacetime. However, statistical data and reports of the last decade indicate that the problem of forest fires is quite common, although not at large scale comparable to the neighbouring region in the Balkans or Southern Europe. Forest fires have occurred in Georgia during the last years that have prompted the government to request foreign firefighting assistance, e.g. in 2004 and 2006, when Turkish aircraft were dispatched to Georgia to assist in aerial firefighting.² Statistical data provided by the Ministry for Interior indicate that 1586 ha of forests have been affected by fires in 2006 and 688 ha in 2007.

The responsibility for fire prevention and first response is with the local forest service personnel and park management. The local fire services, operating under the Ministry for Interior, are providing major equipment and personnel for firefighting. All services mentioned do not have adequate fire suppression equipment that is needed to combat fire in forests and other wildlands. The traditional fire trucks available at municipal fire stations are designed for structural firefighting and are not suitable for accessing mountainous terrain and low-quality forest roads. Equipment needed for forest fire suppression includes hand tools that are suitable for use by ground personnel or by firefighters deployed by helicopters in those terrains that are difficult or impossible to access by vehicles. Most important is the availability of Personal Protective Equipment (PPE) for safeguarding firefighters against injury by flames, heat and smoke.

The use of this equipment requires special training on basics in fire behavior, fire safety and suppression techniques.

Provisions have been made by the Caucasus Protected Areas Fund (CPAF), in cooperation with the German Development Bank (KfW) to provide an equipment package for Borjomi National Park. This € 100,000 package will include hand tools, PPE, and several off-road vehicles with “slip-on units” (fire suppression equipment with water tank, pump, hoses, etc.) to be used for transport of firefighters and for use in fire suppression.

Along with this package a set of hand tools and PPE donated by the US Department of Interior will be used to provide a complete set of equipment for personnel of the Borjomi National Park. Four off-road vehicles (quad bikes), which have been donated by the Bank of Georgia, will be used outside the National Park.

² http://www.fire.uni-freiburg.de/media/2004/news_20041011_geo.htm
http://www.fire.uni-freiburg.de/media/2006/08/news_20060818_ge.htm

In spring 2009 the personnel of Borjomi National Park and the Forestry Department personnel should be trained in basics of fire behavior, firefighting and safety. The Global Fire Monitoring Center (GFMC) and the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network are offering to implement the training component.

4.2 Medium-term measures: Rehabilitation of fire-damaged forests (2008-2010)

Medium-term measures are required to ensure the rehabilitation of forests affected by wildfires. The report of the JNA (ref. Draft Sector Annex XIV “Environment and Natural Resources”) proposed integrated rehabilitation measures with a proposed budget of \$US 5.1 Million. While the joint OSCE/UNEP assessment mission does not recommend to do any salvage logging without carefully investigating the risks involved, it is confirmed that the proposed budget for rehabilitation and pest management is reasonable and should be allotted for this purpose with detailed decisions to be made within the coming 12 months.

4.3 Strategic approach to enhance national and international fire management capability (2008-2011)

The overall intent of the strategic long-term follow up, with first steps to be initiated in 2008, is aiming at (a) building / improving national capacity in forest fire management, (b) enhance international cooperation in fire management, notably within the Southeast European / Southern Caucasus region, and (c) development of a cohesive national strategy in sustainable forest management and forest protection.

(a) Capacity building in fire management at national level

At medium term some steps should be initiated immediately to enhance fire management capacity building at national level. Using the first investments and training implemented in Borjomi National Park and surroundings as prototype / demonstration project, similar investments should be done in other fire-prone regions of the country.

It is advisable to do this in a well-planned and coordinated way in which various agencies with their sectoral responsibilities would be involved, e.g. Ministry for Environment, Ministries for Interior, Agriculture, Education and Science of Georgia, Defense, Foreign Affairs, and the National Security Council, as well as civil society organizations (NGOs like CENN, national WWF chapter, and others). For this purpose a National Inter-Agency Fire Management Committee should be established that would coordinate and prepare the development of a national fire management policy and an action-oriented implementation strategy.

The Global Fire Monitoring Center (GFMC) and the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network have relevant regional expertise of facilitating such a process and are available for providing scientific and technical support.

(b) Enhancing international cooperation in fire management

Since 2004, including during the forest fire crisis in August 2008, Georgia has repeatedly requested international assistance for (aerial) firefighting. On the one side these requests are reflecting limited national fire management capacities. On the other side, international cooperation in fire management is becoming increasingly important throughout the world. The Global Wildland Fire Network through the GFMC is promoting the development of bilateral and multilateral cooperation agreements to share resources for joint capacity building, training & exercises and mutual fire suppression assistance during large fire emergencies. A number of such agreements are in place within and between region, e.g. within

North America or between North American and Australasian countries.³ Within the EU mechanisms are in place to broker requests for and offers of assistance (through the Monitoring and Information Center – MIC).

The UNISDR Regional Southeast European / Caucasus Wildland Fire Network in 2007 included the South Caucasus countries Armenia, Azerbaijan and Georgia into the network and drafted jointly a “Strategy on International Cooperation in Wildland Fire Management in the Regional South East European / Caucasus Wildland Fire Network”.⁴ It is recommended that Georgia should actively follow up and contribute to this regional cooperation process. The GFMC and the regional network are currently planning a regional consultation to be held in the former Yugoslav Republic of Macedonia, 5 December 2008. The OSCE representation in Georgia is currently considering supporting the participation of a Georgian delegation in that meeting.

(c) Development of cohesive and coordinated national strategies in sustainable forest management, forest protection and natural disaster risk reduction

The JNA states that “sectoral reforms of the past five years have significantly reduced Government’s capacity to provide essential public services related to forest management, such as pest management, seedling production and nursery management, and soil erosion control. These types of constraints are seriously preventing the sector from reaching its full economic potential. High-quality private investment in the forest sector is dependent on Government’s ability to mitigate risk by providing critical public services in these areas.”

Besides the mentioned public services the capacity in forest fire management is essential and must be considered a key public service to be provided by government authorities. Fire management is not only essential to safeguard the economic potential of forestry. Forest protection capability is also key for ensuring the obligations and commitments of international conventions and protocols signed by Georgia.⁵ Thus, besides the establishment of a coordinated national fire management platform (cf. section 4.3a), an overall cohesive strategy (alternatively, a coordinated set of sectoral strategies) should address the pressing issues that are related to the degradation of environment and human security in the context of global and regional changes of society, climate and environment. Besides the obligations of the signatory parties to international agreements, there are also opportunities to involve Georgia’s forestry sector in carbon sequestration programmes and seek funding through the Clean Development Mechanism (CDM).

In the wider context, Georgia is also encouraged to strengthen the national capacities in disaster risk reduction within the concept of the UN International Strategy for Disaster Reduction and the Hyogo Framework for Action (HFA).⁶ The recent initiative of the foundation of the Georgian National Committee of Disaster Risk Reduction and Environmentally Sustainable Development under the initiative of the Director of the European

³ http://www.fire.uni-freiburg.de/iffn/iffn_29/content29.htm

⁴ This process was supported by OSCE ENVSEC by providing funding of participation of regional delegates at a consultation in Bulgaria (April 2007) and the 4th International Wildland Fire Conference in Spain (May 2007), see: <http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/RSEECWFN-Consultation-Bulgaria-Tech-Report-23-April-2007.pdf> and <http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/RSEECWFN-Consultation-Bulgaria-Conclusions-22-April-2007.pdf>

⁵ Most relevant concerning impacts of forest fires are the three Rio Conventions United Nations Framework Convention on Climate Change (UNFCCC, including the Kyoto Protocol), the UN Convention on Biological Diversity (UNCBD), and the Convention to Combat Desertification (UNCCD). In the frame of the Europe and North Asia Forest Law Enforcement and Governance (ENAFLEG) process Georgia attended the 2005 St. Petersburg Ministerial Conference and signed the ENAFLEG Declaration.

⁶ <http://www.unisdr.org/eng/hfa/hfa.htm>

Centre "Geodynamical Hazards of High Dams" (a centre associated with the European and Mediterranean Major Hazards Agreement (EUR-OPA), Network of Specialized Euro-Mediterranean Centers, is promising and should be further pursued.⁷

Section III. Assessment in the Areas Adjacent to South Ossetia

1. Background

The recent conflict in Georgia resulted in environmental damage directly related to military activities, especially in the Gori/Tskhinvali corridor and in South Ossetia where much of the fighting took place. The Joint OSCE-UNEP Environmental Assessment Mission originally proposed to perform a detailed assessment of the whole area affected by the conflict, including areas in South Ossetia, in order to provide a comprehensive assessment of all the environmental damage in the region. However it was unable to gain access to South Ossetia.

Subsequently the Mission focused on an assessment of the areas adjacent to South Ossetia, the area directly North of Gori and adjacent to South Ossetia. Previously, the Joint Needs Assessment Team, consisting of experts from the UN and the World Bank, had been unable to gain access to this area and therefore the environmental damages to this area remained unverified. In addition, the Mission also visited Gori in order to properly assess the regional environmental impacts of the conflict.

It is also important to note that due to the security situation related to unexploded ordinance, especially those related to cluster munitions, the Mission was unable to perform an in-depth ground assessment of the environmental impacts of the conflict. The Mission therefore visited a number of villages and observed direct damages firsthand and spoke at length with the local population remaining in the area to understand the issues. It was also able to use information from the OSCE-led Needs Assessment Study, previously performed by the OSCE Mission to Georgia as part of the Economic Rehabilitation Programme, as a source of background data.

2. Verification/Assessment of Damage

On 2 October the delegation first met in Gori with the Governor of Shida Kartli and received a briefing on the current situation in the region. The Mission then proceeded into the areas adjacent to South Ossetia along two routes starting from Gori and moving to the North. The first route went through the villages of Karaleti -Tkviavi-Mereti- Koshka and Gugutiant-Kari. The second route went through villages of Variani-Shindisi-Pkhvenisi and Kvemo Nikozi. In general the area appeared to be almost deserted and those remaining consisted mostly of elderly people unable or unwilling to leave their villages. Generally, the destruction of buildings and infrastructure appeared to be light. However, many of the villagers interviewed reported that many structures had been partly burnt or destroyed since the beginning of the conflict.

Following the visit to those areas, the Mission travelled back to Gori to examine the local landfill site in order to assess its condition and capacity. The Mission also visited an Internally Displaced Persons (IDP) camp in Gori to conduct interviews with people from the affected region.

⁷ http://www.coe.int/t/dg4/majorhazards/Default_en.asp

On the basis of visual inspection and various interviews, it can be concluded that the key post conflict environmental concerns are 1) access to irrigation and drinking water; 2) waste management; 3) fuel-wood; and 4) land contamination.

2.1 Water

The areas adjacent to South Ossetia are covered by different water sub-basins including those of the rivers Liakhvi, Mejuda, Ksani. All these rivers sub-basins are part of the big Kura River basin. Due to the hydrological nature of the basin, many of the villages in those areas rely on and tightly linked to water resources which originate to the North in South Ossetia.

Consequently, thousands of people inhabiting the areas are dependent on the South Ossetian drinking water plant in Vanati. Many villagers interviewed, especially in those villages directly adjacent to South Ossetia such as Koshka, indicated that they were experiencing cuts in drinking water supplies as a result of the conflict. Drinking water problems were also highlighted by the Governor of Shida Kartli, who noted that this was occurring to many villages in the areas adjacent to South Ossetia and indicated that the Georgian authorities were planning to drill new wells in the concerned villages in order to ensure adequate water supplies.

Villagers also indicated during interviews that water for irrigation purposes was also being cut off, which was threatening current and future agricultural activities, the main livelihood for the local population in this area. The lowlands of the Gori, Kaspi and Akhalkagori districts are highly utilized for agriculture purposes (in particular field crop cultivation and fruit cultivation) and irrigated primarily with waters from the Big and the Small Liakhvi rivers. Supply of irrigation water here highly depends on the Tiriphoni, Saltivi and Kekhvi irrigation system, with headworks located in South Ossetia. The Tiriphoni irrigation system is one of the most important in Georgia and, according to the OSCE led Needs Assessment Study, it is used to irrigate about 28,390 hectares. The water supply in this system is channelled through the Karbi headwork located in the Karbi village of the Gori district. The purpose of this station is to deliver additional water from the Small Liakhvi River to Gori. Due to time constraints, the Karbi headworks were not visited.

2.2. Waste management

The Mission also visited the disposal site of Gori, located at the South-Eastern edge of the city and measuring approximately 1,5 hectares. The disposal site was evaluated as unmanaged and therefore poses a threat to nearby tributaries of the Kura river and related aquifers of the region. As a result of the conflict, the amount of waste has been increased by demolition and construction waste, hazardous waste and scrap metal. In addition, the disposal site will receive additional waste from recently established IDP camps and new villages that the Georgian government is establishing.

Waste disposal is an issue throughout Georgia, as stressed by the Prime Minister during his meeting with the Mission. There is a need to create a comprehensive waste management system that would be able to cope with all different waste streams in order to provide adequate service to the population in an environmentally sustainable manner.

2.3 Fuel-wood

The living standards of many groups of the population in this region are below the poverty level; therefore, most of them are dependent on natural resources that can provide basic needs such as fuel wood for heating especially for the winter. Prior to the conflict, the Government had attempted to provide fuel-wood to the local population on a sustainable basis

from surrounding communities. However, due to the conflict, the local population may now be forced to cut down trees in order to provide fuel-wood for the upcoming winter. The Government informed the Mission that it intends to provide the area with alternative fuel-wood stocks from other regions in Georgia in an attempt to prevent an increase in deforestation in the region. This arrangement, while adequate to help address the local population's immediate heating requirements as they face the forthcoming winter, is difficult, however, to implement now and to sustain in the long term.

2.4 Land contamination

Following the cessation of military activities, several international organizations including the Halo Trust, are comprehensively assessing the extent to which the region has been impacted by landmines and unexploded ordinance. Cluster munitions were used extensively during the conflict and remain a threat to the population. Moreover, grenades, rockets, and other ordinance were abandoned or left throughout the areas adjacent to South Ossetia as a result of the conflict. This left-over munitions negatively impact upon the ability of the local population to access their traditional agricultural land, forest and water resources for their livelihoods. In addition, this situation poses a specific threat to women and children as they perform their traditional role of harvesting crops, gathering fire wood, and collecting water.

It was also reported by NGOs that there was information that land and water in those areas had been purposefully poisoned as a result of the conflict. While the Mission was unable to verify this information, it does however raise concerns that IDPs may be hesitant to return to their villages in the areas if they do not feel secure with their surrounding environment.

3. Recommendations

(a) A further in-depth ground assessment should be undertaken

The assessment was limited to the area close to the road due to security concerns about unexploded ordinance; therefore sampling and visits to many affected sites were not permissible. Subsequently, it will be important to perform a more in-depth assessment that would cover the entire region and assess all the relevant problems. Once this assessment is undertaken, a comprehensive list of activities could be recommended.

Furthermore, once the situation permits, an assessment team should also visit South Ossetia to perform an extensive assessment of the environmental damage in that area.

(b) Water management needs further elaboration

It is recommended to strengthen the existing drinking water supply system in South Ossetia and to seek mechanisms that would ensure the continuity of the supply of potable water to the villages in the areas adjacent to South Ossetia. The Georgian government should reassess the sustainability of drilling new wells in the light of the hydrological characteristics of the region. This undertaking should consider underground water flows that are connected with the irrigation waters coming from upstream. The underground water flow is fed by surface water in the region. Therefore, the ground water level depends on the fluctuation of the surface water and water from irrigation channels and water reservoirs. If there is a disturbance in the irrigation system, the shallow water tables will be affected and might prove to be insufficient to provide the quality and quantity of water required for the wells supplying all of the concerned villages.

In order to allay fears on water quality in those areas, the Mission also recommends to conduct monitoring of surface and ground waters. This monitoring can utilize the experience of the existing South Caucasus River Monitoring Project, which examines water quality and quantity parameters throughout a system of hydro-meteorological stations in Georgia. This monitoring can provide the basis for an intensified surface water monitoring and early warning systems to ensure a safe water supply in the areas adjacent to South Ossetia.

It is also recommended to proceed with urgent rehabilitation works of the irrigation systems in those areas, using the OSCE Economic Rehabilitation Program (ERP) as a framework. Priority action could include renovation of the Karbi headwork and of the siphons in the Tiriphoni and Saltivi irrigation system as well as construction of a dam.

(c) Waste management needs also further elaboration to cope with the emerging stresses that are being placed on the current system

The mission proposes a two-pronged approach to waste management:

- Immediate clean-up of the current waste, with particular attention to proper asbestos disposal both concerning rubble already disposed of, in landfills and other locations, and houses burnt or destroyed in the areas adjacent to South Ossetia. This will require technical advice and supervision. It could also provide temporary employment to local and displaced affected populations.
- Technical support to the Government of Georgia in addressing the issue at the national level through targeted concessions to private contractors, with the Government playing a regulatory role in defining terms, conditions and locations of disposals as well as prices to be charged.

Furthermore, the OSCE and UNEP had already performed a waste assessment mission in Tskhinvali in South Ossetia in June 2008. This assessment mission put together a comprehensive picture of the current waste management regime in Tskhinvali and proposed very specific recommendations to improve the system. These recommendations should be implemented once the situation permits.

(d) An alternative energy strategy should be elaborated for the areas adjacent to South Ossetia

It will be very important to prevent further deforestation of those areas and of South Ossetia in order to prevent natural disasters such as flooding and land degradation. This could be prevented in the short term by providing households with wood for heating purposes in the winter but wood shipped into the areas should originate from sustainable harvested sources. It would be beneficial to also promote alternative energy sources and energy efficiency in the region as a long term solution. This will be especially important as demand for energy is expected to rise and unemployment and poverty are expected to increase.

Section IV. Conclusions

As explained in Sections II and III above, the Mission was able to verify and assess significant impacts that were reported to be related to the August 2008 conflict in Georgia, particularly as concerns the ecological and other consequences of the forest fires that affected 950 hectares in the Borjomi Gorge in the Samtskhe-Javakheti Region and the conflict's impact in the areas adjacent to South Ossetia on availability of drinking water and fuel wood, on the amount and type of waste to be disposed of and on land contamination.

For each of these categories of impacts, the Mission has formulated recommendations aimed at mitigating their negative consequences and at preventing further deterioration:

1. As concerns the areas affected by forest fires, immediate measures are recommended to prevent adverse secondary consequences of the wild fires, e.g. the construction of relevant protection barriers against threats to settlements located downstream by floods, landslides and mudslides. Specific steps are recommended towards capacity building in fire management in preparation of the 2009 fire season including through a training component proposed by the Global Fire Monitoring Centre and the provision of an equipment package for the Borjomi-Kharagauli National Park, which could be funded by the “Caucasus Protected Area Fund”, in co-operation with the German Development Bank (KfW). In the medium term, the Mission endorses the integrated rehabilitation measures proposed in the United Nations and the World Bank JNA report with a proposed budget of USD 5.1 million. In the long-term, the Mission recommends capacity building in fire management at national level, enhancing international co-operation in fire management and development of cohesive and co-ordinated national strategies in sustainable forest management, forest protection and natural disaster risk reduction.
2. As concerns water resources management, the Mission recommends to use the framework of the Economic Rehabilitation Programme (ERP) to strengthen existing drinking water supply systems in South Ossetia, to work out mechanisms that would ensure the continuity of the supply of potable water to the villages in the areas adjacent to South Ossetia and to reassess the merits of the project of drilling new wells in the villages of those areas, in the light of the hydrological characteristics of the region. The Mission further recommends to consider intensified surface water monitoring, establishing early warning systems in the conflict zone to prevent water contamination. Also in the framework of the ERP, the Mission recommends to proceed with the urgent rehabilitation of the irrigation systems in the conflict zone, giving priority to the renovation of the Karbi headworks and of the siphons of the Tiripori and Saltivi irrigation systems.
3. As concerns the availability of fuelwood for the house heating need of the inhabitants of the areas adjacent to South Ossetia ahead of the winter season, the Mission recommends to ensure that fuelwood shipped into these areas originate from sustainable harvested sources and to envisage, with international support if necessary, alternative sources of energy for house heating.
4. As concerns waste disposal in these areas, the Mission recommends immediate clean up of the current disposal sites, with particular attention to proper asbestos disposal. It was suggested that this could become a project in the framework of the Environment and Security (ENVSEC) Initiative, including the possible temporary provision of employment to local and displaced affected populations. Furthermore, at the national level, the Mission recommends that technical support be provided by the UNEP to the Government of Georgia in its endeavour of addressing the waste management issue through targeted concessions to private contractors and of regulating conditions and locations of disposals as well as prices to be charged.
5. On the issue of post-conflict land contamination, the Mission recommends further assessments as necessary in both the areas adjacent to South Ossetia and South Ossetia itself.
6. In all of the impacted areas listed above, the Mission recognizes the significant role that could be played by the civil society organizations and recommends to ensure their active involvement and participation in all mitigation and preventive measures in the areas of forest fires, water resources management, alternative energy resources, waste disposal and land contamination. In this respect, the Mission acknowledges the inclusion of Georgia in OSCE’s

new project on Civic Action for Security and Environment (CASE), which is designed as a small grants programme for NGOs, and recommends to use CASE as a framework for bringing the civil society perspective into the post-conflict capacity building and awareness raising initiatives. Furthermore, the Mission takes note of the achievements of the Aarhus Centre in Tbilisi in reaching out to the NGOs and other stakeholders and facilitating the implementation of the “UNECE Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice”. In this respect, the Mission recommends to use the capacities and the platform offered by the Aarhus Centre to address the current environmental challenges. Furthermore, the Mission recommends to consider the possibility of opening new Aarhus Centres in selected cities in order to address specifically the local environmental challenges.

The Mission reiterates its view that environmental issues, such as those described above, including those emerging in a post-conflict situation, ignore all types of borders or territorial separations created by conflicts and are most effectively addressed if all stakeholders, including those who have been involved in a conflict, are willing to co-operate. The OSCE’s Economic Rehabilitation Programme offers a framework for such a co-operation, in which concrete initiatives can be turned into confidence building measures. The Mission expresses the hope that the implementation of some of the above recommendations could indeed pave the way to such a confidence building process.

Annex I

Composition of Joint OSCE/UNEP Assessment Mission

Mr. Bernard Snoy, Co-ordinator of OSCE Economic and Environmental Activities, OSCE Secretariat

Mr. Christophe Bouvier, Director, UNEP Regional Office for Europe

Mr. David Swalley, Economic and Environmental Officer, ENVSEC Regional Desk Officer, OSCE Secretariat

Mr. Johann Georg Goldammer, Director, Global Fire Monitoring Center (GFMC), Coordinator of the UN-ISDR Global Wildland Fire Network and UN-ISDR Wildland Fire Advisory Group

Mr. William Hanlon, Economic and Environmental Officer, OSCE Mission to Georgia

Mr. Zurab Jicharadze, Expert, (Grid-Arendal Georgia)

Ms. Ieva Rucevska, Expert, (UNEP Grid-Arendal)

Government of Georgia

Vladimer Gurgendze, Prime Minister of Georgia
Zurab Eristavi, Foreign Policy Advisor to the Prime Minister

Ministry of Environment and Natural Resources:

Irakli Ghvaladze, Minister of Environment Protection and Natural Resources
David Ioseliani, Deputy Minister, Ministry of Environment Protection and Natural Resources
Giorgi Mamatsashvili, Deputy Minister, Ministry of Environment Protection and Natural Resources
Revaz Enukidze, Head, Department of Sustainable Development, Ministry of Environment Protection and Natural Resources
Giorgi Shonvadze, Head of Department of Protected Area, Ministry of Environment Protection and Natural Resources
Lasha Tchkadua, Head of Forestry Department, Ministry of Environment Protection and Natural Resources
Gocha Gigineishvili, Head of Environmental Protection Inspection, Ministry of Environment Protection and Natural Resources
Giorgi Kolbin, ENVSEC Focal Point, Head of the Division of International Relations, Ministry of Environment Protection and Natural Resources
Vasil Chaladze, Senior Specialist, Forestry Department, Ministry of Environment Protection and Natural Resources
Toma Dekanoidze, Head of the Borjomi-Kharagauli National Park

Ministry of Foreign Affairs:

Grigol Vashadze, Deputy Minister, Ministry of Foreign Affairs
Ilia Imnadze, ENVSEC Focal Point, Counselor of Department of the International Organizations, Ministry of Foreign Affairs

State Ministry of Reintegration:

Temur Iakobashvili, State Minister

State Ministry of Euro-Atlantic Cooperation:

Tamar Beruchashvili, Deputy State Minister of Georgia for Euro-Atlantic Cooperation

Ministry of Internal Affairs:

Natia Gvazava, Head of the International Relations Unit
Fridon Sadunishvili, Head of the Emergency Management Department
Ilia Edilashvili, Senior Inspector of Fire Fighting Administration, Emergency Management Department
Giorgi Karashvili, Police Major, Deputy Head of the Central Rescue Section
Dr. Temuraz Melkadze, Police Lieutenant-Colonel, Head of Analysis and Prognosis Section

Parliamentary Committee of the Environment Protection and Natural Resources

Akaki Bobokhidze, Head of the Parliamentary Committee of the Environment Protection and Natural Resources

Zaal Gamtsemlidze, Deputy Head of the Committee, Former Minister of Environmental Protection

National Security Council

Elene Agladze, Director of the Coordination Department

Local Governance

Lado Vardzelashvili, Governor of Shida Kartli

International Organizations

Terhi Hakala, Head of the OSCE Mission to Georgia

Robert Watkins, UN Resident and Humanitarian Coordinator, UNDP Resident Representative in Georgia

Roy Southworth, Country Manager, World Bank

Per Eklund, Ambassador, Head of EC Delegation

Michael Davey, Director for Caucasus, Moldova, and Belarus, EBRD

Laurence Pfister, International Committee of the Red Cross

Local NGOs:

Irakli Macharashvili, Biodiversity Programme Coordinator, Green Alternative

Nana Janashia, Executive Director, CENN

Lia Todua, Coordinator for Environmental Programme, Centre for Strategic Research and Development

Tamuna Karosanidze, Director, Transparency International

Nugzar Zazanashvili, Director of Bio-Conservation Programme, WWF

Eka Kakabadze, Consultant, IUCN Programme Office for the South Caucasus

Irakli Shvagulidze, Director of Nature Conservation Programme, NACRES

Keti Samadashvili, Environmental Policy and LEAPs Programme Manager, Regional Environmental Center for the Caucasus

Academia:

Professor Tamaz Chelidze, Chairman of Committee Board, Member of Georgian National Academy, Director of European Centre “Geodynamical Hazards of High Dams”, Permanent Correspondent of Georgia in OPA Major Disasters Agreement of Council of Europe

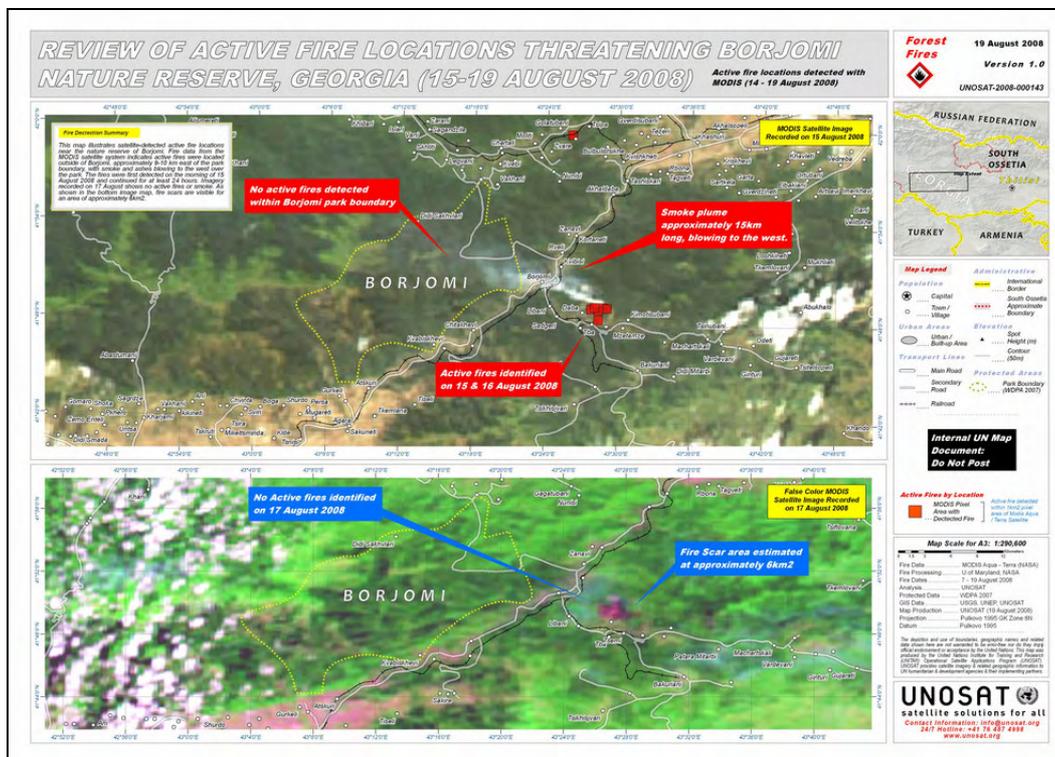
Professor Nodar Tsivtsivadze, Deputy Chairman of Committee Board, Head of Fluid Mechanics & Oceanology Laboratory, Member of CIS countries’ Oceanography Commission.

Business Community:

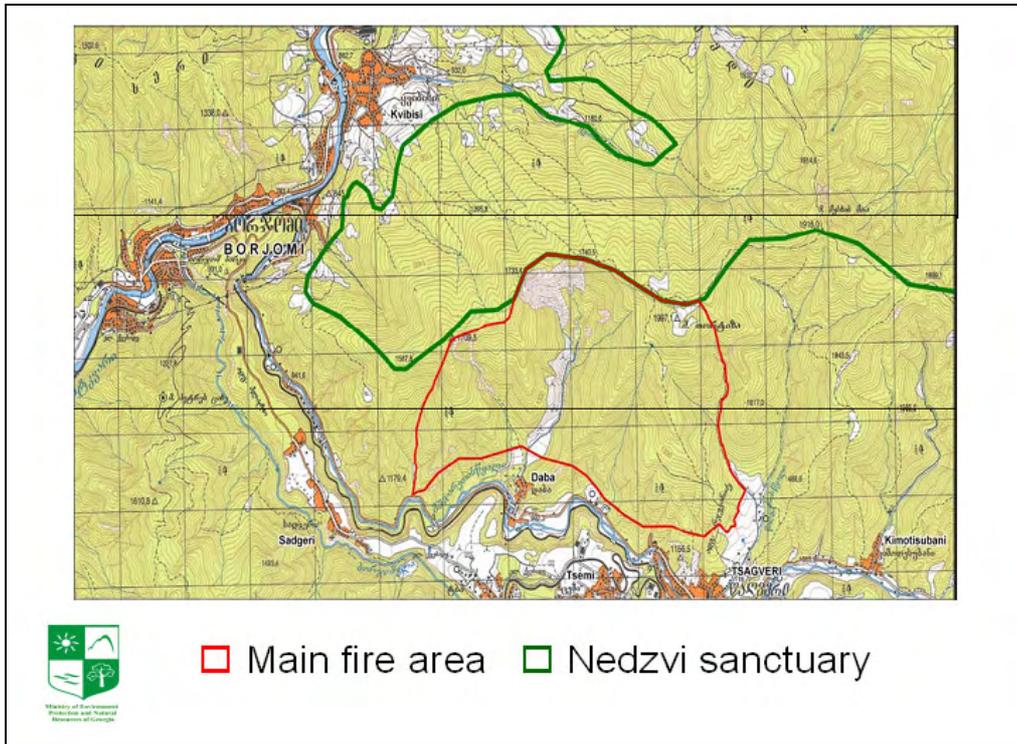
Alexander Ustiashvili, Representative of Voith Siemens, Hydro Power Generation in Georgia



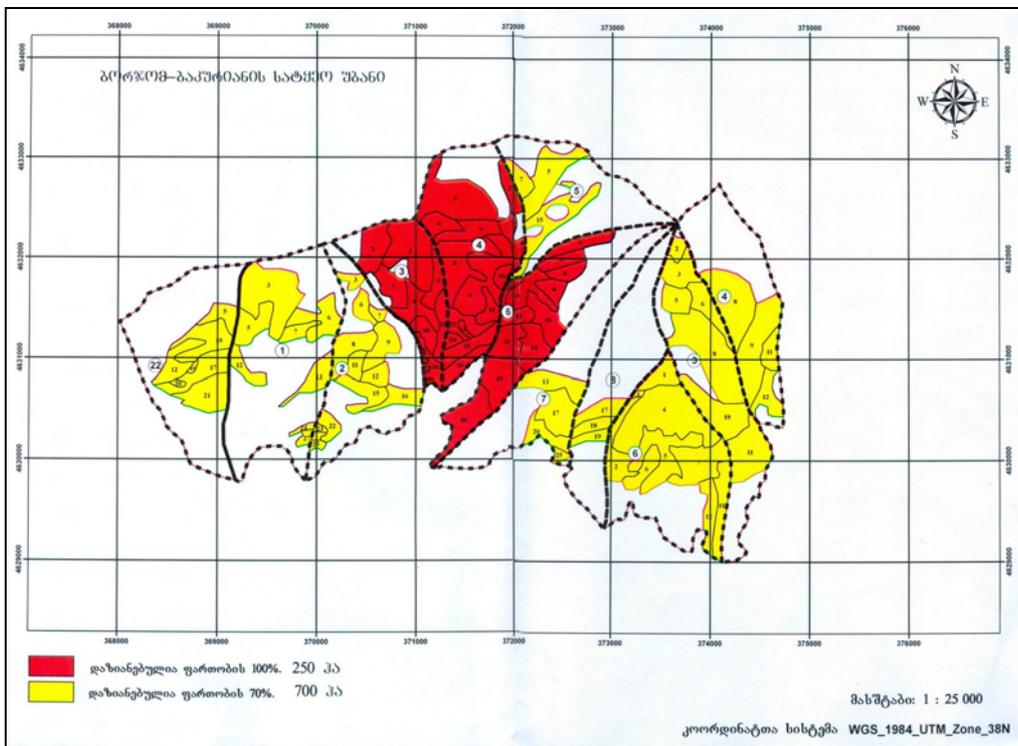
Overview map of the main wildfire locations (East/left: Borjomi Gorge; West/right: Ateni Gorge). Source: Caucasus Environmental NGO Network (CENN).



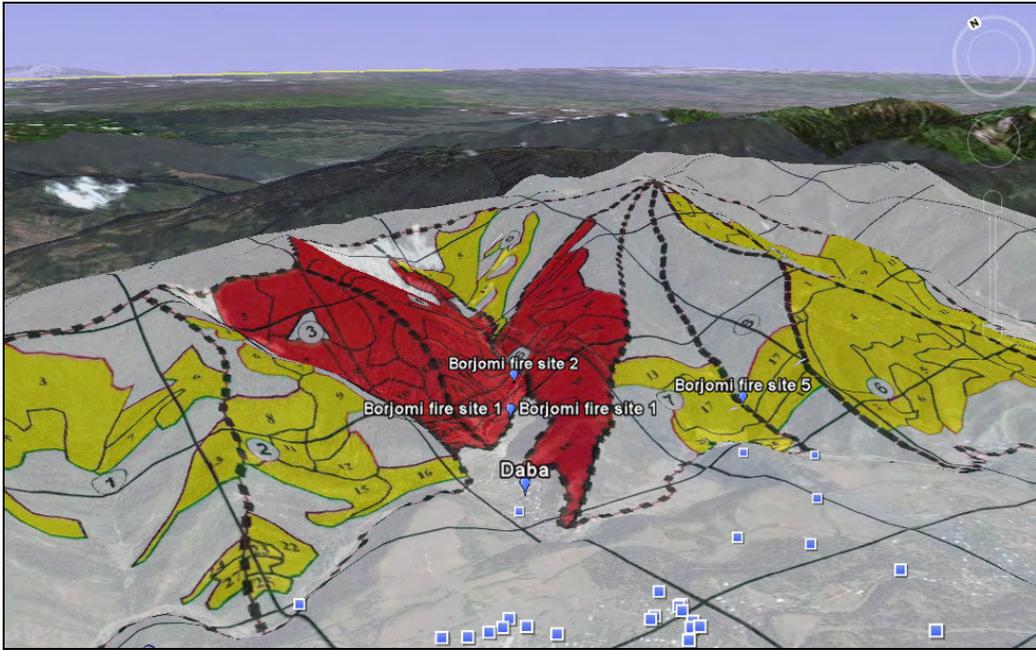
Satellite imagery of Borjomi region during the period 15-19 August 2008. Source: MODIS data, processed by UNITAR / UNOSAT.



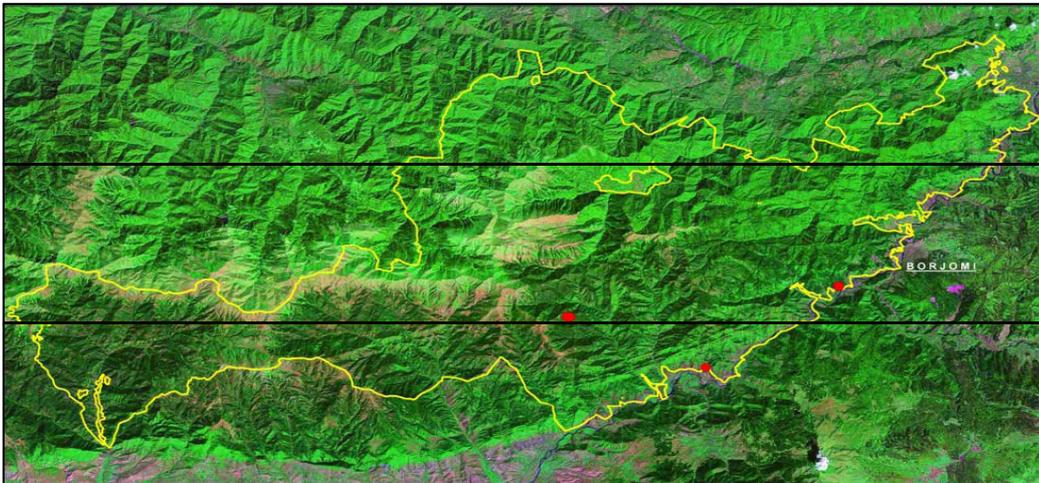
Detailed map with the boundaries of the burned area in Borjomi Gorge south of Nedzvi Sanctuary. Source: Ministry for Environmental Protection and Natural Resources of Georgia (MEPNR).



Detailed forest compartment map of Borjomi Gorge showing the total area burned of approximately 1000 ha, thereof ca. 300 ha severely burned forests (marked red). Source: MEPNR.



Oblique view of the Borjomi Gorge landscape: Map of burned area imported into Google Earth. Source: MEPNR, map imported in Google Earth by the JNA Report “Georgia Post Conflict Needs Assessment Environment and Natural Resources” mission.



The Borjomi-Kharagauli protected areas (Strict Nature Reserve and National Park, and Nedzvi Sanctuary) were affected three wildfires in the sectors Zoreti, Kvabiskhevi and Likani. The yellow line is a borderline of Borjomi-Kharagauli National Park, the red dots show the fire sites. These fires were extinguished swiftly, the total burned covers approximately 10 ha. Source: MEPNR.



Nadir and oblique satellite imagery of the territory of Ateni Gorge and Ormotsi. Source: JNA Report data imported in Google Earth.



Typical view of a fire burning in a mixed coniferous-broadleaved forest on steep slopes in Ateni and Borjomi Gorges in August 2008. The broadleaved tree species include beech (*Fagus orientalis*) and oak (mostly *Quercus iberica*). Most important coniferous species are spruce (*Picea orientalis*), fir (*Abies nordmanniana*) and pine (*Pinus sosnowskyi*). Georgian forests are rich in biodiversity and provide the habitat for more than 4,000 vascular plant species and 573 vertebrates. The forests are extremely sensitive to any kind of fire. Source of photograph: MEPNR.



Severely burned forest in Ateni Gorge (top) and Borjomi Gorge (bottom). Both sites show extreme damages by the fires. The freshly burned sites reveal tree stumps and felled timber – evidence of logging activities, most of them carried out illegally. The habitats of important species such as the Brown Bear (*Ursus arctos*), lynx (*Lynx lynx*), deer (*Cervus elaphus*), chamois (*Repicapra rupicapra*), otter (*Lutra lutra*), whitetail eagle (*Haliaeetus albicilla*), Caucasus cock (*Tetrao mlokosiewiczzi*), Caucasus viper (*Vipera kaznakovi*); Caucasus salamander (*Mertensiella caucassica*), vesper bat (*Myotis bechsteinii*); European bat (*Barbastella barbastellus*) and the Caucasian Squirrel (*Sciurus anomalus*) were affected by the fires. Source of photographs: MEPNR and JNA Mission.



Extreme fire severity resulted in complete consumption of surface fuels (grass-herb layer), duff / humus layer and in many places also tree roots and stumps. Result: Mineral soil exposed to rain, with high risk of erosion, landslides, mudslides, rock falls and flooding. The slopes are very sensitive to post-fire logging. Source of photographs: Joint OSCE/UNEP Environmental Assessment Mission.



Severely damaged forest slopes in Borjomi Gorge (top) may lead to severe consequences downhill / downstream. The village of Daba is at partial risk of being affected by floods and landslides within the next two to three years. The deforested and recently burned slopes directly uphill of the village represent a limited threat to the village. Source of photographs: Joint OSCE/UNEP Environmental Assessment Mission and MEPNR.



Less severely burned forest in Borjomi Gorge. Source of photograph: World Bank / UNEP Mission.



This local farmer from Daba village who repaired a burned fence in Borjomi Gorge reported about the fire outbreaks and fire damages. While his cattle could be saved from the flames a neighbor lost 14 sheep, and a small (illegal) saw mill was destroyed by the fire. Source of photograph: Joint OSCE/UNEP Environmental Assessment Mission.



Wildfires burning in the combat zone between Tbilisi and Gori in August 2008. Source of photographs: National Security Council of Georgia.



Fires occurring in Georgia in previous years accounted to 1586 ha in 2006 and 688 ha in 2007. Some areas have recovered naturally, e.g. the fire-affected Tusheti mountains in 2000 (top) or the forests burned in Abustemani in 2006 (bottom). Source of photographs: Georgian source and JNA Mission.



The photographic documentation by the Ministry for Environmental Protection and Natural Resources of Georgia reveals existing capacity in forest fire suppression that was successfully operational after access to burning sites was possible. However, the assessment by the Mission revealed an overall lack of trained personnel and equipment for fire prevention and control. Source of photographs: MEPNR.