



Heat wave adaption plan for Batumi city

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As known Batumi is identified as one of the affected regions by Heat Waves, which is why that was very important to elaborate LCCAP for the city with particular focus on HWs. In the framework of the project working together with representatives of the National Environmental Agency, local authorities and community members was elaborated the draft Local Climate Change Adaptation Plan for HWs for Batumi. This plan was initiated for better adaptation for the tourists and local community to the extreme high temperature specially during the touristic season. This plan is based on the survey of the local population, desk research results and calculation of threshold temperature. In this study, there is recommendation for local authorities to develop a local adaptation action plan towards heat waves, providing information to health professionals on managing diseases caused by high temperature, education of medical staff and awareness and education on the rules of behaviour during heat waves of the general public and target groups.

1. Batumi, as a self-governing city, a general overview

Batumi is an administrative center of the Autonomous Republic of Adjara. Since 2006 it is self-governing city. Its territory compiles 6494,31 hectares. In recent years, the territory of municipality has increased significantly. According to the Georgian government April 14, 2010, N 24 ordinance, about ten villages of Khelvachaurimunicipality and municipality's administrative center - borough Khelvachauri was given to the city of Batumi.

Batumi is located on the Black Sea coast, at an altitude of 2-5 m, on the Kakhberi lowland and has a crescent shape.

Demographics. Population of Batumi, according to the results of the 2014 year census, is 152.839 people in total, out of which 72.757 are men and are 80,082 women. The population density on 1 square kilometer is 7,293.8 man.

Economy. Batumi is one of the Georgia's important industrial center. The main industries include oil processing, mechanical engineering, pharmaco-chemical, light and food industry. Production of construction materials and timber processing are also developed.

Health and social protection. There are acting the Republican Clinical Hospital of Batumi, medical centers, clinics and polyclinics (up to 30 medical institutions), pharmacies and emergency medical center of Batumi. In year 2016, Municipality Health and Social Protection Services are implementing 28 program.

Tourism. In recent years Batumi has become one of the most required tourist destinations in Georgia. It is popular not only in the country but as well in the region. Large flow of tourists is from Europe and America too. In August 2009 year the tourist's record rate were fixed - 400 thousand people

2. Climate of Batumi and the scenarios of current and future climate changes

With its climate, Batumi belongs to the maritimesubtropical humid district (humid climate zone with warm, mild winters and hot summers), according to Batumi-airport weather station the average annual temperature in this area is 14.3 ° C (1961-1990 years), the most coldest month (January) average is + 6.8 ° C, while the average temperature of hottest month (August) is + 22.3 ° C

Based upon the scenario of future climate change in Georgia, for the 2050 year, temperature will continue increasing on entire territory of Georgia and will be placed within the 1.0-1.5⁰ C. The exception is the region of Adjara, where the temperature is expected to rise by 1.5-2.0⁰C.

At the end of the century on the the whole territory of Georgia the warming is expected with 3-4 degrees, largest increase in temperature is right in Batumi and it reaches 4.2⁰ C.

So, as in the modern period, as well as in future, process will take acute character especially in the summer season.

3. Trend of heat waves in Batumi

A heat wave in the context of health is treated as a period with sustained heat load or excessively hot weather, which leads to heat-related health damaging with one or several outcomes, including mortality, morbidity and severe health problems.

By definition of US National Ocean and Atmospheric Issues national Administration (NOAA), a heat wave is "a period with abnormal hot and unusually humid weather... As a rule, the heat wave continues for two or more days."

Intense heat waves affect a number of sectors are;

The impact may be direct or indirect, including:

- Increased rates of morbidity and mortality, especially in the elderly and the disabled;
- increased workload of open space workers;
- increased risk of forest fires;
- animal stress;
- damage if seeding and vegetation;
- Increased energy demand, for example. on Air conditioning;
- Loading of infrastructure energy supply ;
- Increased demand for water, for example, on drinking water from the population, for cooling electric power stations, living and working environment;
- changes in the priorities of tourism because of high temperature; And
- increased risk of sports activities and outdoor air leisure .

Till today there was no quantitative indicator for a heat wave, which can be used for different climate zone. Nowadays new indices was developed by the World Meteorological Organization Expert Team on Climate Risk and Sector-specific Climate Indices (WMO CCI ET-CRSCI).

Based on this methodology heat wave threshold temperatures have been computed for Batumi (table 1), as well trends of heat wave number (HWN), duration (HWD), frequency (HWF), amplitude (HWA) and magnitude (HWM) have been assessed using Batumi meteorological station records for the periods 1961-1985 1986-2010 and future scenarios has been developed for the period 2020-2049 (table 2).

Table 1. Threshold temperatures for heat wave onset, Batumi¹

Month	Temperature ⁰ C		
	1961-1985	1986-2010	2020-2049
May	27.8	27.0	25.6
June	27.2	27.5	28.5
July	28.8	30.0	30.1
August	28.8	30.0	30.0

¹ Data provided by the National Environmental Agency of Georgia.

September	28.1	29.2	29.0
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Table 2. Heat waves number and duration in the different periods, Batumi²

Period	Average number heat waves(HWN)	Maximum duration of heat waves(HWD)
1961-1985	1.8	10
1986-2010	1.6	22
2020-2049	1.5	26
Difference $\Delta 21$	-0.2	12
Difference $\Delta 32$	-0.1	4

Results show that heat wave onset temperatures rised by 0.5-1.0 degrees. On the background of reveiled warming HWD is increased in current period, as well according to future scenarious. At the same time, average number of heat waves is decreased indicating that longer and severe heat waves are becoming more frequent.

Especially negative impact on health haveheat waves, with unusually high temperatures accompanied by high humidity.

During the survey was studied the population's attitude, knowledge and skills about heat waves. A special questionnaire was developed, which was spread basically among the risk and vulnerable groups (chronically sick, the elderly, refugees and other).

The majority of respondents noted that they are not sufficiently aware of the negative impact of heat waves on human health.

During the survey was revealed that in Batumi recently occuredthe extremely high ambient temperatures, which has a negative impact on the work of cardiovascular and respiratory systems.

At the same time with the climate warming and rises of temperature and humidity, compared to last years was increased such infectious diseases, as Leptospirosis and Lyme.

In Adjara continues to be acutely problematic infectious disease of tuberculosis, which is caused by several species of bacteria.

Analysis of risk and problems

Problems and risks related to Heat wave in Batumi

Problems	Causes	Risks
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²Data provided by the National Environmental Agency of Georgia

Poverty and unemployment In Batumi 21% of the population is registered in allowance petitioners base	Acute shortage of jobs, Worker's low qualifications and low pay, underdevelopment of small businesses	Strengthening of climate change, heat waves impact on health of population living in poverty and beyond
In residential houses, hospitals and shelters for old people are Unsatisfactory living environment	An important part of Resident houses, hospitals and shelters for elderly people is depreciated and needs refurbishment and repairs	Rise of heat illnesses, tuberculosis, Leptospirosis and Lyme viral infected cases
Poor sanitary - hygienic conditions in the food network	Low hygiene culture of personnel and low awareness of the relevant authorities	During the hot weather, and activation of heat waves, spreading infectious diseases of the gastro tract
Lack of awareness and knowledge of population, mostly vulnerable groups about climate-dependent diseases and their prevention.	Deficiency of Information and education activities and less provision of involvement of vulnerable groups	Inability of population adaption and lack of knowledge towards the Heat wave attacks
Climate change results are intensified due to urbanization by so-called "island effect"	construction boom of high-rise apartment buildings and hotels on the strip coast	Creation of favorable conditions of heat waves frequency and prolonging, with related results
potential growth of devastating effect of Intense heat waves	According to the forecast in the future increasing trend of more prolonged and severe heat waves will be stronger	Increase of the morbidity and mortality in the most vulnerable groups, forest fires, damage of flora and fauna, shortage of drinking water and electricity, reloading of infrastructure and reduction of tourism, failing to provide population with adequate medical care by the health authorities

4. Recommendations

In the Local Climate Change Adaptation Plan in Batumi on Heat Waves (HWs) were developed recommendations, it seems that the "heat waves" marked negative impact especially in big cities. Accordingly, it is necessary to reduce risks associated to "heat waves". Climate change-related health care issues are not, or are very indirectly reflected in the country and the region's health care legislation and policy documents.

1. Recommendations were developed also for the decision makers

- Develop a strategy for health adaptation to climate change, given the heat wave component in it (national and regional)
- Develop the Action plan for city Batumi reducing the vulnerability to the heat waves, implementation and updating periodically
- Establishment of Early Warning System
- providing support to the regional health sector
- Support for Infrastructure Projects

2. Recommendations were developed for the population:

- Special attention is required to the vulnerable population (the elderly, children, the poor, the chronically ill persons). Raising awareness should include supply of practical information, which will help population during heat wave attacks. For example, information about the Emergency Assistance, which includes practical advice, as well as medical services, including emergency service contact details.
- One way to inform people about how to be protected from extreme heat is to spread the message through the media. Also, informational materials such as brochures and leaflets about prevention of stress caused by heat are effective.
- Implementation of the new possibilities includes the use of modern media, such as text messages, e-mail, radio and mobile applications. Special efforts should be directed to the vulnerable population, and other personal communication through the use of communication methods.
- It is important to cooperate with the local representation of Georgian Red Cross and introducing the rules of booklets about natural disasters (landslides, earthquakes, hurricanes, floods) prepared by the Georgian Red Cross.

Recommendations were developed for medical professionals:

- Supporting the preparation of protocols about climate dependent diseases spreaded in Georgia and supporting the implementation of already approved protocols
- Awareness rising of medical personnel and the tourist service personnel of climate dependent diseases
- Providing information to health professionals on managing diseases caused by high temperature
- Provide medical personnel mobilization activity during heat waves (May-September) in order the tourists and the local population to feel comfortable and to increase the tourism potential
- Develop and improve the insurance system with heat-related disease management component
- Implement monitoring on trends of health disorders caused by the heat and new types of the diseases

Recommendations for civil society

- Civil society, including Georgian Red Cross support local authorities for developing local adaptation and action plans towards heat waves and carry out resources mobilization and implementation of the monitoring.
- Implementation of the campaign directed to decision-makers and vulnerable communities.
- Development and implementation of pilot adaptation projects.
- CSO engagement and mobilization of heat waves attack.
- The involvement of CSOs in information, awareness and education on the rules of behavior during heat waves of the general public and target groups (disadvantaged groups), including school teachers and pupils.
- Plan and organize appropriate trainings.

- To reveal the exact number and location of the most vulnerable groups (women, children, the elderly, chronically ill persons) toward heat waves and to describe and work with them.
- The readiness assessment, capacity building, the provision of necessary medical assistance of health institutions, homes for the elderly and long-term institutional care centers toward heat waves,
- Healthy lifestyle promotion and advocacy, which in turn, will help to improve the health and to reduce the vulnerability to extreme weather, conditions among them to the heat waves.

5. Heat waves action plan (sample)³

Aim of Heat waves action plan is to coordinate its implementation and elaboration of extremely high temperatures response actions evaluation mechanism for Batumi, which will lead to reduction of negative impact of heat waves. The main goal of the plan is warning the most vulnerable risk groups about extreme heat or about its imminent expectation and take appropriate measures.

Heat waves action plan should be based on the following key components:

1. *Develop a strategy, inter-agency coordination and response planning.*
2. *Identification of vulnerable population and determination of specific group health risks.*
3. *Development of protocols for Public Health, Ministry of Health, medical, educational and social institutions.*
4. *Preparing recommendations for the reduction of high-temperature impact for health and social institutions (short-term and medium-term strategies) and development of special protection plans for the most vulnerable groups.*
5. *Activation of the prior notification yearly warning system and determining the exact indicators / indices of heat waves.*
6. *Implementation of informing (communication) plan for the public, health and social sectors, about protection from heat waves, in particular, towards the recommendations issued by the Ministry of Health to medical personnel, population and risk groups.*
7. *Long-term planning of health and social protection readiness, including: staff training, urban planning, creation of green areas, -increase of energy efficiency in hospitals and Reduction of greenhouse gas emissions.*
8. *Real-time monitoring, assessment and regular updating of the action plan.*

³ Example of Tbilisi Heat Action Plan developed in 2016 by Georgian Red Cross Society with financial assistance of AutRC, ADA.

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