



# TEACHING DISASTER RISK REDUCTION WITH INTERACTIVE METHODS

Book for Head of Class Teachers

Grades V – IX



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(Grades V – IX)



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**Discussions with children on disaster risk reduction  
and related life-skills:  
disaster preparedness, preventive measures, behavior  
during and after a disaster**

Tbilisi, 2011

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# 1 PREFACE

Over the past decades, the frequency of natural disasters and the scale of the associated human and material loss have significantly increased around the world. The situation has become more aggravated owing to increased population density, environmental degradation and global warming. Most of all, the effects of natural disasters have been made worse by the low level of public awareness regarding these issues and the fact that many lack the skills necessary to develop resilience to these often-deadly phenomena.

Georgia, where the frequency of natural disasters and the level of subsequent damages are significant, is not an exception to this rule. Children represent the most vulnerable category during a disaster. They often times do not have access to information and therefore lack the appropriate knowledge and skills that would enable them to protect themselves by making correct decisions during an environmental crisis situation.

Prevention starts from the dissemination of information. Achieving increased awareness facilitates the first step made towards positive actions. Taking into account that schools play an important role in the formation of values, students and teachers can make a significant contribution in establishing a prevention culture.

This textbook was developed within the framework of the “Supporting Disaster Risk Reduction amongst Vulnerable Communities and Institutions in Southern Caucasus” project and is intended for use by the heads of class for grades V-IX of secondary schools of Georgia.

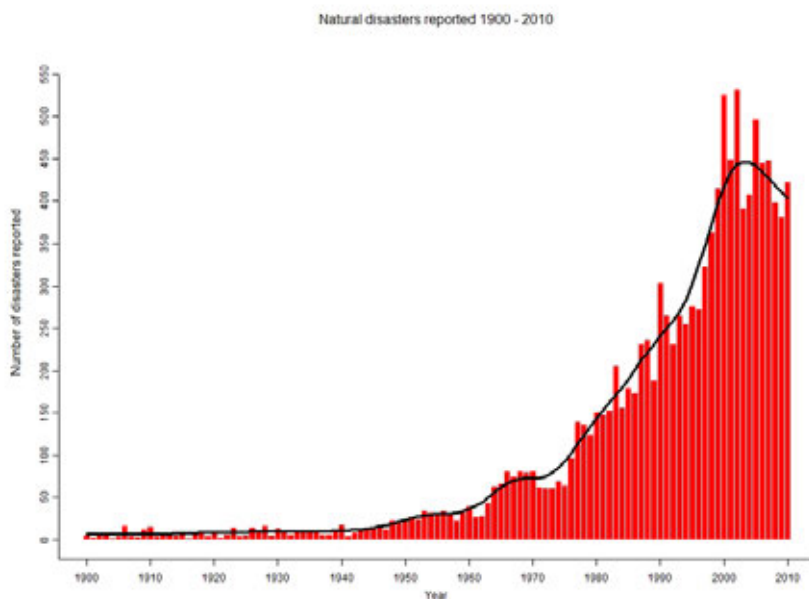
This textbook will help teachers provide students and their families’ valuable information about natural disasters and the reduction of their associated risks.

Issues reviewed in the textbook include the important role the education system plays in disaster risk reduction, the methodological instructions necessary for proper use of the textbook, interactive teaching methods, and sixteen thematic modules which we hope will provide students an opportunity to improve their knowledge. This textbook will also help them to develop a sustainable behavioral culture and the skills necessary to prevent natural disasters and to better prepare for them.

## 2 INTRODUCTION: GLOBAL DISASTER TRENDS

At present, the risk of natural disasters is reaching an increasingly global nature. The formation and occurrence of such a risk in one region may easily impact another region and vice-versa. Unplanned urbanization, environmental degradation, global climatic changes and a deficit of resources may endanger the world’s future economy, population and the sustainable progress of developing countries.

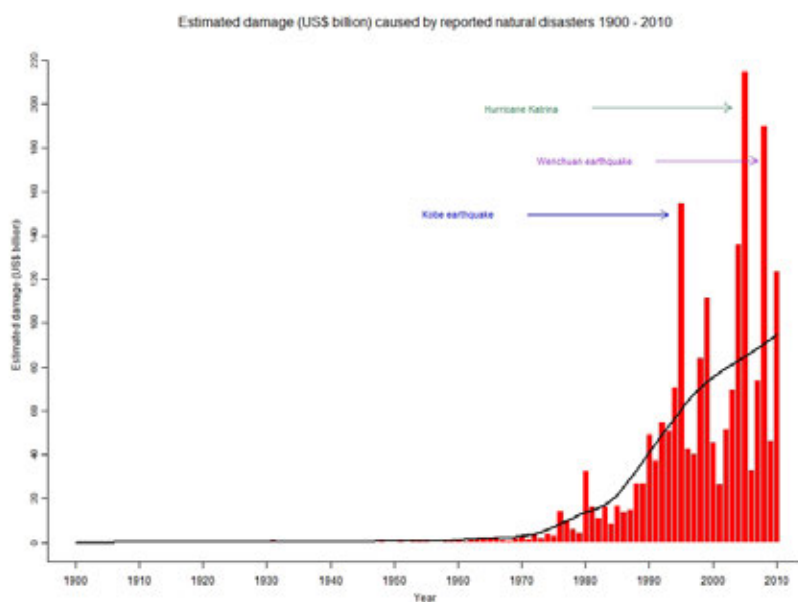
**Table 1: The Number of Natural Disasters recorded Worldwide in 1900-2010**



Source: The OFDA/CRED International Disaster Database, University of Louvain, Belgium <http://www.emdat.be/natural-disasters-trends>

Statistical data shows that during the last decade, about 240 million people suffered from natural disasters annually. The economic damages that resulted from these disasters have reached US \$ 90 billion and the economic losses caused by these natural disasters have tripled over the last 30 years.

**Table 2: Economic Damage caused by Natural Disasters in 1900-2010 (in billion USD)**



Source: The OFDA/CRED International Disaster Database, University of Louvain, Belgium <http://www.emdat.be/natural-disasters-trends>

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A natural disaster risk arises when hydro- meteorological, geological and other dangers impact physical, social, economic, and environmental vulnerability factors. It has been established that nine-tenths of the natural disasters that occur on earth belong to the following four categories: floods (40%), tropical cyclones (20%), earthquakes (15%), and droughts (15%).

Disasters are classified based on two main features:

1. Causes
2. Scale of propagation and damages

Disasters may be caused by natural phenomena – climate conditions, geological processes, soil, relief or by anthropogenic factors such as human activities.

The main negative consequences of disasters of any type are:

- Loss of human lives
- Mass resettlement of populations (eco-emigration)
- Collapse of mountain slopes
- Block-up of canyons;
- Reduction of useful land area
- Epidemics
- Death of cattle
- Destruction of crops
- Contamination of soil, water and air
- Increase of underground water level
- Destruction of communications
- Destruction of residential houses and other buildings

The main factors causing natural disasters are:

- Degradation of the environment
- Uneven distribution of the infrastructure
- Global climate changes
- Densely populated territories and territories prone to natural disasters
- Irrational distribution of the economy
- Violation of land use rules
- Lack of information and knowledge
- Construction of cities and big engineering structures
- Development of new territories
- Selection of inappropriate areas for residence
- Unsustainable extraction of mineral resources
- Economic development

In parallel to population growth, scientific/technical achievements and complicated social structure, mankind becomes more and more vulnerable to extreme natural disasters- subsequent damages of which depend not only on their propagation area but also the unexpectedness.

Over the last 50 years, human activity has changed the environment much more than during the whole history of mankind. The primary reason for this is population growth. According to calculations, by 2050, the total number of the world's population will reach 8.9 billion. Naturally, population growth increases the demand for natural resources (food, water, timber, fuel).

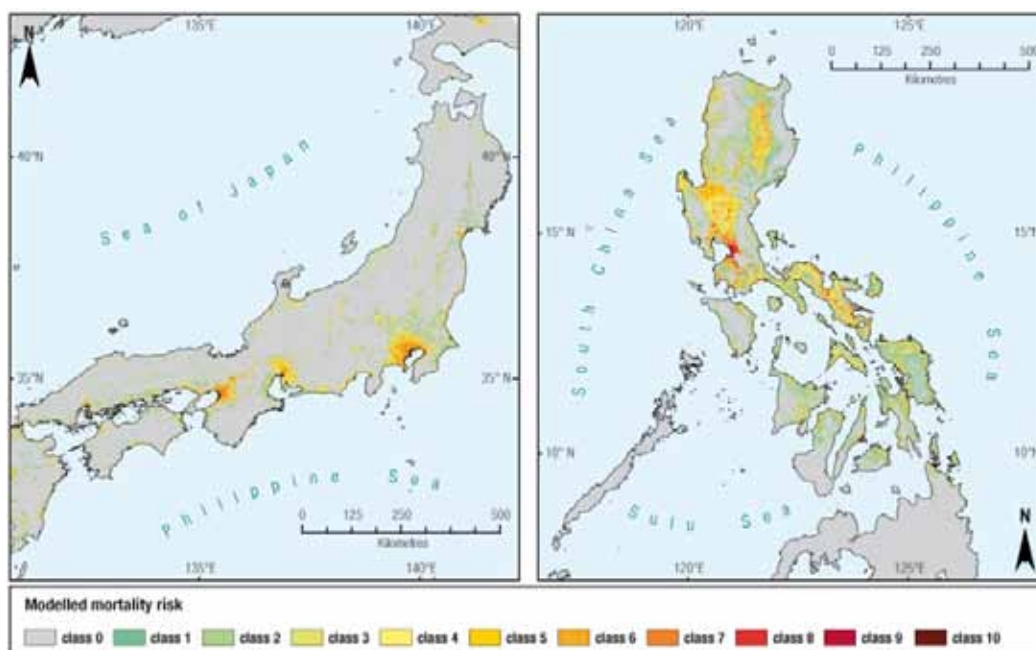
On the one hand, this intensive and often uncontrolled impact on the environment has promoted economic welfare, but on the other hand, it has given start to the degradation of mostly irreversible environmental processes that pose a real threat to people's social and economic welfare.



People living in developing countries are more vulnerable to natural disaster risks and carry the biggest losses in human lives and livelihood. As of today, the number of deaths resulting from natural disasters in developing countries is 13 times higher when compared with developed states.

The fact that a 6.7 point earthquake (on the Richter scale) causes the deaths of 2 people in the United States, while 20,000 people die in India as a result of the same earthquake, demonstrates unequal distribution of the risks and correlation between a country’s development level and its disaster consequences.

**Figure 1: Mortality Risk for Tropical Cyclones in Two Countries with Similar Exposure: Japan and the Philippines**



Source: Analysis of Cartography and Geo-information Systems, UNEP/GRID – Europe, 2009

Unfortunately we cannot fully prevent natural disasters; however we can reduce the effects of them by undertaking relevant mitigation measures. This is why it is important to carryout relevant mitigation measures which significantly reduce natural hazards and their associated damages.

Any person can become a victim of a disaster. Nevertheless, damages and significant economic losses can be avoided with the development and implementation of proper risk reduction measures. For this purpose, the governments of many countries have undertaken the responsibility of reducing disaster risks and have adopted the *Hyogo Framework for Action (2005-2015)*.

The objective of this program is to achieve by the year 2015, a significant reduction of damages caused by natural disasters- namely to reduce considerably the risk of deaths and the destruction of social, economic and environmental resources. Out of the five priority actions contained within the Hyogo Framework for Action, one of the most important ones is the “*Use of knowledge, innovation and education to build a culture of safety and resilience at all levels*” program.

It is important to note that education provides the best instrument for disseminating the information necessary to reduce disaster risks and to facilitate the development of strong social values.

### 3 NATURAL DISASTERS AND THEIR PREVALENCE IN GEORGIA

According to the frequency of natural disasters, the situation is very critical in Georgia. Over the last 10 years, damages caused by natural disasters in Georgia more than three times exceeded the same indexes in Georgia’s neighboring countries (Armenia and Azerbaijan) and have reached USD 552 million. This cause can be attributed to a complicated relief, a high sensitivity and specificity to the geological environment, and the diversity of climate conditions.

**Table 3: Damages Caused by Natural Disasters in the South Caucasus in 1999-2008**

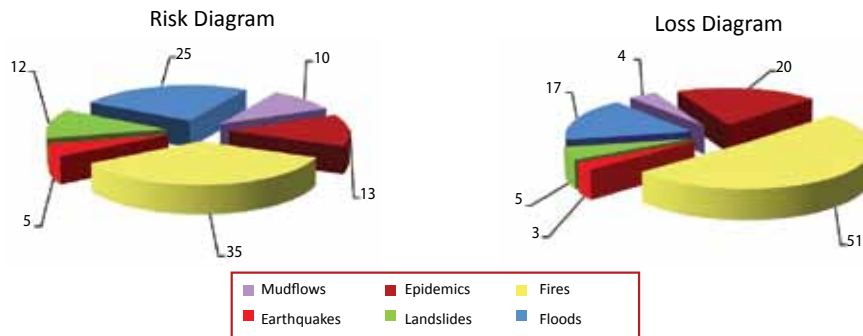
Country	Number of Persons who Suffered from the Natural Disaster	Economic Damages Caused by the Natural Disaster (million USD)
Georgia	719,246	552
Armenia	297,000	100
Azerbaijan	43,964	170

Source: EM-DAT: Caucasian Environmental NGO Network (CENN), Man Made Disasters, 2008

The frequency of disasters has increased recently. This is in large part due to global climate change. Most importantly, it is due to the intensive and often careless actions of humans - wood felling, the damage of pastures, settlement in hazardous areas, the building of roads etc.

Out of all meteorological and geological disasters that take place on Earth these days, the disasters that pose the biggest threat to the population of Georgia and the proper operation of the country’s engineering facilities are earthquakes, landslides, floods, mud-flows, avalanches, erosion processes, hail and drought.

**Table 4: Natural Disasters and Associated Economic Losses**



Source: Emergency Management Department of the Ministry of Internal Affairs

At present, the above natural phenomena threaten up to 70% of the country’s territory and 60% of settlements, including more than 400,000 families. The annual average damages caused by these natural phenomena varies in GEL of between 100-150 million. In extreme cases, the losses sometimes reach several billions, especially when there is a combination of several natural disasters occurring in one year. For example, in 1991-1992 and as a result of earthquakes in combination with severe landslides, mudflows and other gravity-driven processes; economic losses reached USD 10 billion. Over the last 40 years in Georgia, 60, 000 families have become eco-emigrants and had to be resettled on safer territories, while the number of deaths have exceeded 1, 000.

In Georgia, flood hazards are characteristic of big rivers such as the Mtkvari, Rioni, Enguri, Kodori, Alazani and Iori rivers. These floods mostly damage valleys and lowland area.

Hail falls on almost the whole territory of the country, although it is usually most intensive in the east part of Georgia where subsequent damages are also very significant. According to available statistics, the country's economic losses caused by hail exceeded GEL 150 million during the last 14 years, while in 2007-2009 the damages reached GEL 20 million.

Almost 50% of Georgia's territory is within the zone of the avalanche hazard. This natural phenomenon is most severe in the medium and high mountain areas. The avalanche risk is the highest in the west and central Caucasus, as well as the mountainous areas of Achara and Guria. This avalanche intensity has notably increased since 1972. According to incomplete data, damages caused by avalanches have exceeded USD 750 million and have caused the deaths of 176 people.

Mud floods are typical for almost all mountain rivers and waterways of Georgia. At present, up to 3,000 waterways are characterized by highly intensive transformable mud floods that endanger almost 28% of the country's territory. Mud floods jeopardize more than 40% of the population living in the mountain and upland areas (including the cities of Tbilisi, Telavi, Kvareli, Lagodekhi, Sagarejo, Borjomi, Mestia, Lentekhi, Akhaltsikhe and Oni). They also jeopardize agricultural lands, public roads and expressways, main pipelines, railways and irrigation facilities. Average economic losses caused by mud floods vary within USD 100 million. From 1995 to 2008, damage caused by mud floods exceeded USD 330 million when 43 people died.

Landslides are characteristic of almost all landscapes/geomorphologic zones and geological areas in Georgia. By 2009, 53 areas had been identified as damaged by landslides or comprising a potential landslide danger. 22% of the country's territory containing up to 2,000 settlements is within the landslide risk zone.

The whole Caucasus region, including Georgia, belongs to the earthquake zone of 7-9 magnitude macro-seismic intensity. Information about earthquakes that took place in the Caucasus (specifically on Georgian territory) can be found in ancient historical documents. It must be noted that earthquakes are almost always accompanied by landslides and gravity-driven processes, which further aggravates the situation. For example, the 1991 earthquake that took place in Racha-Imereti, set off landslides and gravity-driven processes in more than 20,000 areas. These events caused almost the same amount of damage as the earthquake itself, while the number of deaths was even higher.

Out of all erosion processes that occur in Georgia, the washing out of sea coasts requires the most attention. By the end of the 20<sup>th</sup> century, 220 km of the Black Sea's total coastline of 320km was subject to terrible destruction. Unique recreational areas were also within the destruction zone. The fact that the solid materials that are necessary for coastal formation today are extracted from the river beds in Abkhazia, will only increase the scale of this process and lead to future ecological disasters.

It is important to make DRR a part of the continuous decision-making process, beginning with teaching children and adults about safe behavioral rules and finishing with safety guaranteed by the state. Each decision we make may affect our vulnerability and safety. Damages caused by disasters can be reduced if the population at large is well-informed about what can be done to increase resilience potential and to reduce risks.

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## 4 THE ROLE OF THE EDUCATION SYSTEM IN DISASTER RISK REDUCTION

The development of DRR skills among children and adults is one of the most urgent challenges of modern society. Children are the most vulnerable members of the population during disaster situations because they often do not have access to information and therefore lack the knowledge and skills that would enable them to protect themselves and make correct decisions during these difficult circumstances. Schools can play an important role in DRR because they often are important centers of community life. Therefore, schools directly impact not only the lives of teachers, students, parents and their relatives, but also the community as a whole. The majority of children spend most of their time at school and the school environment can determine their future destiny.

The best way to avoid disaster risk is to change human behavior through the dissemination of knowledge and the obtainment of the skills necessary for personal and collective safety. This is the most effective DRR tool.

In order to achieve this goal, it is important:

1. to disseminate DRR information at all levels, especially among populations living in the high risk zones;
2. to develop educational programs in DRR;
3. to develop a safe behavior model and skills among students.

Society, as well as schools, has a great moral responsibility to create a safe environment for students and their teachers. The greater the level of self-organization that exists within society, the greater its potential becomes to avoid or mitigate the negative consequences of natural or man-made disasters.

All initiatives targeted to increase the level of safety and disaster-preparedness must be implemented by school administrations, teachers and students in close cooperation with the emergency management authorities.

In addition to introducing DRR teaching programs, it is also necessary to understand the responsibility we have for the students' lives. It is mandatory that we take the initiative in working with them in order to reduce the risks posed to them.

It is true that due to psychological and age-specific features, students are usually passive in seeking out information about disaster risk reduction and do not fully grasp the gravity of the problem entirely. However, as a result of proper efforts, even the youngest ones can become important messengers of critical information to their families and others around them.

During the teaching process, students not only perceive the essence of the potential dangers posed to them from disasters, but also realize that DRR is a collective responsibility and most importantly, a way of saving their own lives.

It is also worth noting that at the present, one of the biggest challenges we face today, is providing children with information about the complex cause and effect relationship between mankind and the environment in an easily understandable format. The goal is to help them develop vitally important skills and enable them to make correct decisions in critical situations.

## 5 **METHODICAL INSTRUCTIONS FOR USING THE TEXTBOOK**

This textbook is intended for use by the heads of class of secondary schools in Georgia during the Head of Class Hour – one hour weekly lessons on environmental awareness, disaster risk reduction, good citizenship and a variety of life skills. A head of class is similar to a form tutor or a homeroom teacher who oversees all aspects not directly related to teaching activities, such as managing student`s extracurricular activities. In this context, a head of class has additional teaching responsibilities for DRR topics. This textbook contains practical recommendations for developing sustainable behavioral practices and vitally important skills among students.

The textbook consists of sixteen modules of thematic DRR lessons.

Each module encompasses:

- The topic to be taught and goals;
- Thematic supplementary material for each class, taking into account age-specific features;
- The teaching process (phases);
- Entertaining activities related to the topic;

All lessons are structured around the main disaster risk reduction aspects: disaster preparedness, preventive measures and behavioral practices during and after a disaster. This will help students analyze potential hazards and risks, prevent their negative consequences and develop a culture of resilience.

The textbook also provides an overview of global disaster tendencies and the occurrence of disasters in Georgia, the important role the education system plays in DRR and the necessity to involve parents in the teaching process.

In the last section of the textbook you can find explanatory vocabulary and annexes of the thematic modules. Also included are tests for assessing students` knowledge before and after the course and a list of used and recommended literature.

Before giving a lesson the head of class teacher must:

- study the modules;
- read materials given in the textbook sections and annexes;
- define the goal and content of each lesson;
- prepare the materials and equipment necessary for giving the lesson;
- select a form and method for each lesson
- define the expected results;
- define student activity levels and prepare to analyze the results.

In order to provide a successful lesson, it is useful for the teacher to apply different forms and methods, giving preference to interactive methods.

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## 6 INTERACTIVE TEACHING METHODS

Teachers can use different methods of teaching DRR issues: mini-lectures, debates, brainstorming exercises, presentations, games, the Socratic Method, learning while doing etc.

It is important to deliver information fully and in a qualified manner, taking into account the specificity of each age group. Information must not scare the students. They must learn to evaluate danger before facing it, and stay calm and respond adequately if it actually happens.

Below you can find brief descriptions of each method.

### 1. MINI-LECTURES

A mini-lecture is a brief lecture aimed to provide certain information to the audience.

Lectures of this type provide students certain knowledge but do not develop their skills. It must be taken into account that during mini-lectures, teachers are more active while the students are relatively passive.

Any material about facts, ideas, theories etc. can be selected. The teacher must prepare in advance theoretical and visual material from different sources – diagrams, photos etc., in order to make the lecture interesting for the students. The utilization of visual materials is especially important in cases where a student's visual memory is better developed.

The lecture material must be organized logically (from easy to more difficult) and be easily understandable for students. At the same time, a mini-lecture must not be overloaded with too much information; it is preferable to dedicate one lecture to a single topic.

While giving a lecture, the teacher should arrange the students in a way that will stimulate their active participation. Thus, instead of a traditional frontal arrangement (when the teacher is standing before the class, at the blackboard), it is preferable to place the students in a circular fashion at a round table in order to facilitate increased discussion. Although it is true that a lecture is considered to be a relatively passive form of teaching, the teacher must encourage the students to be active and ask questions. The teacher must constantly have visual contact with the audience; from time to time the teacher must check whether the audience is listening and request corresponding feedback.

At the end of a lecture, the teacher must summarize the main points.

During a mini-lecture, no special technical equipment is needed, although it is preferable to use visual materials such as diagrams, photos, charts and tables. It is also possible to use Power Point presentations; in this case, the teacher will need special equipment – a laptop or a projector.

### 2. DISCUSSION

A discussion is one of the interactive methods used to review different approaches, ideas and problems within a group. During a lecture, the teacher gives students ready information. In the case of a discussion, the process is opposite – students become active while the teacher receives information from them; the more intensive the discussion is, the more effective the discussion becomes.

A discussion is an effective method for developing a number of different skills. These skills include logic, active listening, the formulation of arguments and the ability to listen and respect a differing opinion. A

discussion can serve as good motivation for students. They will try to obtain information on the discussed topic independently, in order to be prepared for the discussion.

Any topic that elicits different opinions can be discussed. This can be a novel, an illustration, a short movie, or even a melody. Questions that should be asked during a discussion are: why/ how/ what/ if. As well as, how is the problem solved?

When a discussion is planned, it must be taken into account that the students should have the necessary knowledge about the topic. This is necessary in order for them to be able to express their opinions, substantiate them and have the ability to constructively criticize the views of other members within the group – otherwise the discussion will lose its meaning and become limited to the arguments of two differing opinions/positions.

In the first place, it is the teacher who is responsible for a successful discussion. He/she must regulate the process and implement the functions of a facilitator; the teacher must clearly define the discussion format: Who will be talking and how long, at what sequence and the teacher must specify how questions must be asked. The teacher must encourage passive students to speak up and ensure that all the students take part in the discussion.

Together with the students, the teacher must define the discussion rules, such as: students must speak one by one; they must not interrupt others; everybody must participate in the discussion; students must discuss views and positions, not personalities; each student must provide arguments to support his/her opinion; students must respect each other's opinion and so on.

The teacher must then take into account that he/she must not be dominant; must not demonstrate agreement or disagreement with any ideas expressed by the participants; and the teacher must be neutral and have the same attitude towards everyone.

To achieve an effective discussion, it is necessary to take into account that the number of participants must not be too large. While working with a large group, a teacher must be able to involve all students in order to ensure that the discussion does not lose its function. It is important to have an equal number of students in disputing groups. It is preferable to place "disputing" parties opposite each other. The teacher, acting as the discussion moderator, must be able to communicate freely with both groups.

After the end of the discussion, it is necessary to summarize its results. At the beginning, this must be done by the teacher, but later on, when the students gain some experience, they will also actively participate in the process. It is necessary to summarize both the contents of the discussion (i.e. what students have learned) and the process (whether the students were comfortable during the discussion and was it easy for them to observe the rules).

In order to organize a discussion, there is no need to have a special environment or to provide special equipment; although, it is preferable to have a blackboard, so that the parties can express their views in writing.

### **Recommendations:**

- Choose a topic that will be interesting for the students and make sure that they have enough knowledge pertaining to the selected subject;
- You can provide students a list of literature in advance, so that they can come prepared for the discussion;
- Explain the discussion format clearly: who and how long will they be talking? At what sequence? What questions should be asked?
- Define the main rules, e.g.:

- 
- students must speak one by one
  - students must discuss positions, not personalities
  - Clearly define your role: during the first discussion the teacher must be both moderator and facilitator; in the following discussions, this role can be implemented by students in turn;
  - Do not dominate!
  - A good method is to give the discussion participants time to prepare answers which then will be stated by the teacher;
  - At the end, summarize the discussion results in order to consolidate the learned material. In the beginning this is done by the teacher. Later on, instruct the students to do it themselves, after they have gained some experience.
  - Ensure the participation of all students, give questions to passive students to stimulate their participation;
  - Organize the discussion without expressing your personal positive or negative attitude towards the views expressed by the arguing parties – your goal is to be neutral and have the same attitude towards everyone;
  - Remember that the first priority is to develop their discussion skills and only after this, to receive correct answers to the questions –the students’ knowledge can be checked by means of traditional methods. Therefore, questions asked during a discussion must start with “Why” and “How”, not “Who”, “What” and “When”.
  - Be patient; give the students enough time to think about the arguments. Remember, that their response time depends on the complexity of the question – the time given for thinking about arguments can be planned before starting the discussion – this must be formulated as one of the rules of the game about which students are informed in advance.

### 3. EXCURSIONS

An excursion is a group visit to an institution or an organization in order to learn about its function. During an excursion /a site visit/ students get an opportunity to observe work processes in its real environment and to receive first-hand information about its characteristic features.

The function of a site visit is illustration. Students will better remember what they saw or heard if they experience themselves first-hand, as opposed to narrated information.

However, teaching in an environment outside school territory may be accompanied by problems. Therefore it is necessary to plan excursions in detail in advance in order to avoid misunderstandings and to achieve the maximum effect. The teacher must take into account and plan for the following issues: the excursion’s purpose and exact time; the appropriate number of students and the excursion’s cost. If the goal of a site visit is to acquaint students with different professions; special attire may sometimes be needed. The visit must also be agreed upon by the host organization in advance.

The teacher must inform the students about the excursion plan beforehand: students must know what they are going to see, what they should pay attention to etc. During an excursion, the teacher must encourage students to ask questions. It might be necessary to take some notes.

After an excursion, the teacher and the students should discuss the results together - what they have seen and heard; whether the information was understandable and interesting; the teacher may plan the subsequent excursion together with students.



## 4. BRAINSTORMING

Brainstorming is a creative group-work method. Its goal is to create and review the maximum number of ideas for solving a concrete problem.

Brainstorming is used when nobody knows the answer to a specific question; we want to formulate as many ideas as possible and then select the desirable number of ideas based on the consensus of the group.

The brainstorming process is rather simple. At the beginning, the teacher identifies the topic and develops a plan. Before brainstorming, it is necessary to agree on the group work rules; for example, all ideas are correct and all of them must be reviewed; during the brainstorming we do not make judgments and assessments; the main goal is the quantity of ideas and not their quality; participants and facilitators are open to all ideas.

Students express as many ideas as possible concerning the specific topic and the teacher writes them down on the blackboard or a flipchart. The time limit is planned in advance – e.g.: 20-25 minutes.

After writing down the ideas, the teacher reads them aloud so that they are clear for all members of the group. After this, the students evaluate the ideas based on a scale of 3-5 and then group together similar ideas. Finally, we select 3-4 ideas that have received the highest rating.

As it has already been mentioned, brainstorming is led by the teacher. He/she must be able to listen attentively, provide feedback and encourage the students to come up with ideas. The teacher must promote the process and receive the maximum possible number of ideas. Remember: the teacher's position is neutral.

After brainstorming, the results must be evaluated.

During a brainstorming session, the group must not be too large. In cases where there is a large group, the teacher must be able to involve everyone in the process. It is preferable for the participants to sit in a circle, maybe around a table, while the teacher stands in front of the group so that everyone can see him/her well. In order to conduct brainstorming, it is necessary to have a blackboard or a flipchart.

## 5. PRESENTATIONS

A presentation is a means to convey theoretical or practical material in front of a group.

A presentation is an effective method for developing skills such as communication, the formulation of statements, the substantiation of personal positions or views and the provision of arguments. Presentations can be made on virtually any topic. It is preferable not to discuss too many topics during a presentation; it is recommended to select a maximum of three topics.

When preparing the material, the teacher must take into account its specificity. If the presentation is made by students, the teacher must give them the typical presentation template in advance.

Presentations consist of three parts:

- 1. Introduction:** An introduction is a necessary part of every presentation. Its goal is to attract the audience's attention and establish initial interest. This part is relatively short and takes up about 20% of the total time planned for the presentation.
- 2. The main part:** The main part of the presentation is the largest and most important one. Here the main thesis and views are discussed using illustrative material. While making a presentation, it is

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necessary to pay attention to the intonation, body language and style because they significantly influence the audience. This part of the presentation takes 70% of the total time the speaker has.

- 3. Conclusion:** In the conclusive part, the presentation must be summarized, i.e. the speaker must stress the purpose, results etc. This part takes about 10% of the total presentation time.

Together with students, the teacher may work out an assessment scale and they can jointly evaluate each presentation, although this is mostly recommended for educational presentations.

Equipment necessary for making presentations includes: a multimedia projector, a laptop, a blackboard or a flipchart. Power Point presentations are preferable.

## 6. CASE STUDY

Case studies are widely used in the education sector. The goal of a case study is to gain additional information and knowledge based on specific examples.

It is not necessary for the case to be about one particular person. It may cover a group of people, different situations, phenomena etc.

During a case study, a specific case must be reviewed and analyzed.

Before a case study, the teacher must prepare the material in advance; such material must be interesting and topical for students; the teacher must take into account age-specific features and the possibility of discussing the topic.

Aside from the material, the teacher must also prepare questions. Such questions may be concerning concrete people, a group of people or the described situation, in order to find out the students' attitude towards the case, whether it is acceptable or not for the students and how the problem can be solved.

During a case study, no special equipment is needed; it is desirable for all students to have access to printed material or the teacher may use a multimedia projector or a laptop.

## 7. ROLE PLAY

Role play is another of the group work formats. It is widely used at all stages of the education system, starting from the primary school education level and finishing with higher levels. During role play, students stage a real situation, act-out certain roles and thus receive theoretical knowledge and practical experience.

Role play is an active form of teaching. During such an exercise, the students can be both mentally and physically active. Aside from reviewing the topic, they also have an opportunity to demonstrate their attitudes and emotions on the topic, which makes the learning process easier and therefore improves the quality of learning. With the help of active teaching methods, students learn the material more easily than by just reading, listening or observing.

Before the start of a game, the head of class teacher must explain the topic and make a brief introduction. E.g.: this game requires cooperation; it will continue for 20 minutes after which we will review and summarize the results.

After this it is necessary to divide the class into groups. For this purpose we can use 4 methods:

1. The group is divided according to the list – in this case the teacher must control the group composition;
2. Students can be grouped according to their wishes;
3. In case of a random division, you can ask the students to count “one-two”. After this, students who count “one” will be in the first group and the students with number “two” - in the second;
4. Students can be grouped by means of colored cards. The teacher must take paper of different colors and prepare colored cards. The number of colors depends on the number of groups the teacher wants to form while the number of cards of each color depends on the number of students in each group. All cards are put into a small basket. Each student has to take one card from the basket. Owners of cards of the same color get into one group. It is also possible to use post cards instead of colored cards. Students can also be grouped according to their birth dates, months or seasons, etc.

After this, the teacher gives the students an instruction. During the group work, the teacher remains neutral and only monitors the process.

The following phase is the play itself. Students perform their roles according to the instruction. The result of the role-playing directly depends on active involvement of the group members and a positive atmosphere. Therefore, passive members of the group must be encouraged to participate in the process as much as possible.

At the end of the role-playing, participants express their views about what they have gained/learned from the exercise. Students express their emotions and feelings; they estimate the results of the group work based on what they have learned and what was positive or negative during the process. The discussion must be positive, covering only the contents and the process - not personalities, participants or their characteristics.

It is also necessary to summarize the results and link the group work with the goals of the role-playing.

## 8. THE SOCRATIC METHOD

With the Socratic Method, the teacher asks only problem questions, not informative ones (e.g.: “What do you think about this issue?” “What explanations do we need for this?”). The teacher does not provide any information to the students. When this method is used, the teacher analyses exceptions and challenges simple ideas. The teacher asks the students to think so that they can find the solution independently.

The Socratic Method can be applied through discussions, debates, problematic questions etc. Sometimes the teacher tells the students about facts that are contrary to views expressed by them, but never reveals his/her own position. The teacher helps the students to challenge the answers given by different reputable persons. The students freely express their views, bold hypotheses and versions; they analyze each other’s arguments.

Below we provide examples of using this method at the lesson:

1. The teacher asks problematic questions in order to stimulate students to think about a certain issue;
2. The teacher provides supporting and contrary examples to illustrate the discussed event;
3. The teacher critically reviews the students’ arguments;
4. The teacher encourages the class to discuss the issue;
5. The teacher promotes development of the students’ ability to provide critical analysis of their own and other peoples’ views;

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6. The teacher asks students to analyze facts and notions and to understand the essence of the material etc.
  7. The teacher asks students to interlink knowledge received from different sources and create a new structure from different elements;
  8. The teacher asks students to draw conclusions (assessments) based on their own arguments.

## 9. LEARNING WHILE DOING

“Learning while doing” is a practical method during which students receive not just information, but the exact instructions necessary for the experiment or simulation. The goal is for the students to carry out actions that will develop their knowledge or skills.

During the practical work, the teacher must intensively use feedback in order to ensure its effectiveness so that the students really understand what they are doing and do not just imitate the actions mechanically. This method is very effective only if proper feedback is received. The teacher must offer the students a scheme or a model of activity with clearly defined targets. The student must be able to understand what is expected from him/her and how success will be evaluated; for example: what is effective “doing” and “goal.”

Thus, the main principles of practice are: the teacher must provide students with practical instructions, incentives and feedback, so that they act consciously. Such instructions may include: the selection of proper tree seedlings to be planted in a specific settlement; the planting of trees; the arrangement of dikes along river banks and checking of water levels in the river; development of the school evacuation plan etc.

The teacher may decide to a) group the main issues under one topic or vice versa, or b) divide one topic according to different issues, depending on the level and abilities of the class.

Younger students can be instructed to draw pictures of natural disasters and then analyze them in class at first with their peers and later on exhibit them at school or in the classroom with the help of the teacher (this method also promotes psycho-correction of children of this age group; they overcome fear and become more mobilized).

In the lower grades, instead of making presentations on natural disasters it is recommended to instruct young students to express their views in the form of a drama. It will be good if the teacher offers a natural disaster scenario and gives the students their own roles.

## GENERAL RECOMMENDATIONS

During a lesson the teacher must take into account the following recommendations:

The teacher must:

- create a positive, frank and creative atmosphere;
- encourage training participants;
- allow students to set the rules of behavior that will be observed by all throughout the process;
- support the positive wishes of students;
- cooperate with each student;
- find out and help to address the students' concerns;
- help each participant to formulate his/her views;
- answer questions critically and openly;
- use the group's proposals to improve the teaching process;

**It is important to stress that the content gives students a good basic knowledge. The process can be considered successful if the students receive some tasks encouraging them to think about the discussed topic and issues. Therefore, it is necessary for the teacher/trainer to:**

- link all topics to real examples and previous topics;
- ask questions that will instigate speculation and creativity among students; avoid giving simple answers like "Yes" or "No".
- give students clear and unambiguous instructions for all actions;
- concentrate on the content of the subject;
- generalize knowledge received by students at the end of each lesson;
- help students to express or group similar proposals and ideas as one statement.

## 7 THEMATIC MODULES

### GOALS AND OBJECTIVES

1. The improvement of the students' awareness of natural disasters and risk reduction;
2. Dissemination of DRR information by means of students among their families and communities;
3. Development of a sustainable behavioral culture and vitally important skills among students.

### TOPIC 1. EARTHQUAKES

#### THE V-VII GRADES

#### ACTIVITIES

##### The 5<sup>th</sup> Grade

##### Goals:

- ❖ To teach students how to identify hazardous and safe places in the classroom;
- ❖ To teach students the main rules for being prepared for an earthquake.

##### Activity 1

The teacher asks students to explain in their own words what an earthquake is, what they have heard about earthquakes, and what causes death and traumas during earthquakes. The teacher helps students to understand that it's not the earthquake itself that kills people but the resulting destruction of buildings and falling of items that are not properly fastened or secured.

##### Activity 2

The teacher asks students if they have ever experienced an earthquake, what were their emotions and what they did during and after the earthquake.

If students have never experienced an earthquake, the teacher asks them to describe what a person might see, feel or hear during an earthquake.

##### Activity 3

The teacher asks students to explain in their own words what a "hazard" is. The teacher writes on the blackboard the following sentence: "*Which are the safest and the most dangerous places in our classroom?*" After this, the teacher uses the brainstorming method and asks students to name such places. The teacher writes the list of these places on the blackboard.

Dangerous Places in the Classroom	Safe Places in the Classroom
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

If needed, the teacher must explain to the students that during an earthquake the most dangerous places are those where things can fall down, get broken and cause traumas, e.g.: heavy book shelves, cabinets etc.

Together with the students, the teacher makes a list of the most dangerous places/items in the classroom. After this, the teacher asks the students to discuss what the room design should be and what changes can be made in the classroom in order to make it safer during an earthquake.

If the teacher finds it necessary, he/she can reallocate items in the classroom so that it becomes safer if an earthquake does occur.

During this exercise the teacher must use *Annex N4* of the textbook – *Classroom Hazard Hunt*.

**Activity 4**

Group work: the teacher divides the class into small groups and gives students 15 minutes to write on cards: *Which are the five most important rules for earthquake preparedness?* When the task is fulfilled, the groups must present the results of their work. The teacher must summarize the results and write on the blackboard:

1. Make sure that all items in the room (such as chandeliers, shelves, mirrors etc.) are reliably fastened;
2. Spot safe places in advance (e.g.: a stable table, door openings, under bearing walls, open spaces well away from buildings and bridges);
3. Prepare in advance a bag with necessary items (potable water and non-perishable food supplies, clothes, a lantern, a first aid kit, documents, a pen and paper). Do not forget to have with you telephone numbers of your relatives and local authorities.
4. Avoid dangerous places (power transmission lines, staircases, balconies, items that can fall down, windows etc.);
5. Know how to protect yourself: “Drop! Cover and Hold!”

Afterwards, the teacher demonstrates the 5<sup>th</sup> rule and asks students to repeat his/her actions after she cries out: “earthquake!” Students have to get under their desks or tables, squat and hold on to something.

**Activity 5**

Work in pairs: the teacher asks students to prepare illustrations and posters on the rule: “Drop, cover and hold!” This is one of the main rules during an earthquake, when students must get under sturdy furniture (desk, table, etc.), cover their heads and strongly hold on to something. Students are given a half an hour to implement this task. After which, their work will be exhibited in the classroom.

**Activity 6**

Work in pairs: the teacher asks students to fill in the table given below. Students are given 15 minutes for this task. After finishing the work, students present the results; the group must review the rules of behavior in the class and at the end, the teacher must make summarizing conclusions.

What should we do during an earthquake?	What we should not do during an earthquake?
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

### Activity 7

Using the brainstorming method, the teacher collects information on what kind of items must be available in the class in the case of an earthquake. Then the teacher divides the students into two groups: one group must work on the design of the kit for the necessary supplies; the other must draw a logo. During the next lesson, the teacher must help the students make the kit and put the logo on it. The school may purchase the necessary supplies. After everything is ready, the teacher and students must agree where to keep all this.

Questions:

1. In case of an earthquake why is it dangerous to be:
  - near windows and mirrors?
  - under a chandelier or a painting?
  - near any items that can fall down?
  - on the balcony? On the stairwell? In the lift/elevator?

### Activity 8

The teacher divides the class into two groups and asks them to draw on a poster a picture of a house destroyed by an earthquake; specifically, a house on a hill that was damaged by a landslide that followed the earthquake. In order to make the picture more realistic, the pupils may glue to the picture some leaves, sand, dry branches, grass etc.

After the task is fulfilled, the teacher will exhibit both pictures in the classroom or the school corridor.

## The 6<sup>th</sup> Grade

Goals:

- ❖ Help students and their families to understand how the placement of items in the wrong location of the house can turn into a serious danger during an earthquake;
- ❖ Teach students what to do in case of an earthquake: simulation training and evacuation;
- ❖ Inform students and their parents about the measures that must be taken before an earthquake happens in order to minimize the possible damages

### Activity 1

The "Family Task": the teacher asks the students to identify, together with their families, the safest and the most dangerous places in their houses, take photos and give reasons why they think that these places are hazardous; discuss whether it is possible to change the location of rooms/items so that they become safer in case of an earthquake.

The exercise can be carried out in several stages:

1. The teacher must give the students a *Family Disaster Plan and Safety Checklist (Annex N1)* and ask them to fill it out together with their parents for the next lesson;



2. Students receive a task to discuss and make together with their families a list of dangers expected during an earthquake (*Earthquake Hazard Hunt – Annex N2*);
3. On the third lesson, the teacher instructs the students to fill in together with their families *Quake-Safe Home Checklist (Annex N3)*.

After the end of the activity, the teacher can award the student who was the best in doing all three tasks and implemented at least two measures reducing the disaster risk in his/her house.

### Activity 2

Practical exercise – “Earthquake Simulation”: this exercise can be done in the classroom, canteen or any other similar environment. This activity can be divided into two lessons. The teacher must warn students in advance about the rules of behavior during earthquakes. The teacher should also inform the students about the school’s emergency action plan by showing the evacuation routes; the teacher explains the purpose of the plan and when evacuation is needed.

The teacher and students leave the building via the evacuation passage and the teacher explains the evacuation rules that must be observed; the teacher instructs the students on how quickly they should pass through the evacuation exit, in an organized manner, without panic and mistakes.

The teacher must once again remind the students that at the moment of an earthquake, the family members or the teacher may not be nearby and they may have to act independently.

After returning to the classroom, the next phase of the exercise starts; the teacher warns the students that as soon as she cries out: “Earthquake!” They must immediately find a safe place and get into a safe position.

The teacher reads aloud to students the *earthquake simulation scenario* (or distributes printed handouts) given in *Annex N5* of the textbook. After this, the teacher says “Earthquake!” and watches the students’ response actions and how quickly and correctly they find safe shelters. The teacher makes notes. After the teacher is satisfied with the students’ actions he/she must also locate a safe position so that students see that the teacher is also safe.

In about 20-30 minutes the teacher gives an evacuation order and watches how quickly and correctly the students take the necessary items (e.g.: coats and hats in winter, maybe student’s ID etc.) and how they leave the building through the evacuation passage.

If there is no opportunity to stay in the yard and discuss the situation, the students return to the classroom. The teacher must then explain what mistakes have been made and what has been done correctly. The teacher must also tell the students how long it has taken to leave the building etc.

If needed, the teacher must give the students instructions and repeat the exercise again at the same lesson or at the next one. After participating in the exercise, the students must discuss the experience(s) they have gained. In order to assess the students’ performance during the exercise, the teacher must use *Annex N6 – Drill and Evacuation Checklist*.

### Activity 3

The teacher divides the class into groups of four people and asks them to prepare brochures and posters with illustrations that will help in the dissemination of information about potential earthquake hazards and the safety rules among the local population.

After implementation of the task, the groups must demonstrate their work in the classroom and then in the school building, Afterwards, the material can be disseminated into the community /posted in the settlement.

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## The 7<sup>th</sup> Grade

### Goals:

- ❖ Help students to identify the potential hazards surrounding them and help them make correct decisions for reducing disaster risks;
- ❖ Teach students what to do in different situations during an earthquake;
- ❖ Inform students about the measures that need to be taken after an earthquake.

### Activity 1

“Risk identification”: the teacher offers the students a chance to work in pairs and spot dangerous places:

1. in the classroom and corridors;
2. in the school building;
3. in the territory surrounding the school;
4. in the settlement (village, city, district).

The students voluntarily choose one of the above topics and work on the list for 15 minutes. After they finish the task, the teacher must summarize the results and ask one of the “volunteer” students to write the list on the blackboard.

Clue: the final product must look approximately like the table given below:

### Potential hazards identified by us (the students)

<b>IN THE CLASSROOM AND CORRIDORS:</b> <ul style="list-style-type: none"><li>- book shelves and furniture that can fall down during an earthquake;</li><li>- things that can fall from shelves and walls;</li><li>- broken glass /windows;</li><li>- parts of the ceiling that may fall down and broken lamps;</li><li>- destruction of walls.</li></ul>	<b>IN THE TERRITORY SURROUNDING THE SCHOOL</b> <ul style="list-style-type: none"><li>- tiles falling from the roof;</li><li>- broken glass /windows;</li><li>- bricks falling from walls and the chimney.</li></ul>
<b>IN THE SCHOOL BUILDING</b> <ul style="list-style-type: none"><li>- fire caused by the damaged electrical and gas network;</li><li>- flooding of the territory as a result of damaged water pipes.</li></ul>	<b>IN THE SETTLEMENT</b> <ul style="list-style-type: none"><li>- damage of communications;</li><li>- fire caused by the damaged electrical and gas network;</li><li>- flood caused by damage of the dam;</li><li>- damage of bridges, railways and main roads (highways)</li></ul>

### Activity 2

The teacher divides students into groups and tells them to answer the following questions:

#### Group I

1. What should we do if we are in a building (e.g.: at home or school) when an earthquake happens?
2. Which places are the most dangerous?
3. Whose instructions should we follow? What should you do if you are alone?
4. It might happen that your family members are not nearby. Who should you call to receive help after an earthquake? Do you know the telephone numbers?

#### Group II

1. What should we do if we are in an open area when an earthquake happens?
2. Which places are the most dangerous?
3. Whose instructions should we follow? What should you do if you are alone?
4. What should we do in case of evacuation and what items should we take with us?
5. It might happen that your family members are not nearby. Who should you call to receive help after an earthquake? Do you know the telephone numbers?

Students should work in groups writing their ideas on a flip chart. When they finish, the teacher asks them to present the results. Each group must appoint a leader who will make the presentation. The teacher makes comments and refines the rules together with the students.

The students return to their places. The teacher asks a “volunteer” student to demonstrate how they should act during an earthquake if they are in the classroom.

The teacher names an activity and the student demonstrates it; e.g.: moves away from the window, hides under a table, stands near the weight-bearing wall etc. Other students watch the demonstration and repeat the actions.

If something is not clear the students should ask questions. The teacher must watch their actions and make notes to see if everything is done correctly.

If there are students with limited abilities in the class, the teacher must make sure that he/she understands the instructions so that the student can find a shelter as quickly and safely as he/she can.

“Science Corner” – questions:

1. What is an epicenter of an earthquake?
2. How do we measure an earthquake?
3. What is a seismograph?

## SUPPORTING MATERIAL: EARTHQUAKE



### Terminology and Notions

An **earthquake** is unexpected violent shaking of the earth’s surface due to a sudden release of underground energy.

Earthquake is one of the most violent natural phenomena. According to the number of victims and destructive force, it exceeds all other natural disasters. Even today people are helpless in the face of this natural phenomenon that causes a lot of death and destruction.

The earthquake epicenter is a projection of the earthquake hypocenter on the earth’s surface. A hypocenter is the immediate center where the earthquake is formed.

In general, earthquakes may be caused by a number of reasons: volcanic activity, karst cavities, explosions etc. but such earthquakes are usually rather weak (unless caused by a nuclear explosion). Therefore, when people talk about earthquakes they usually mean vertical and/

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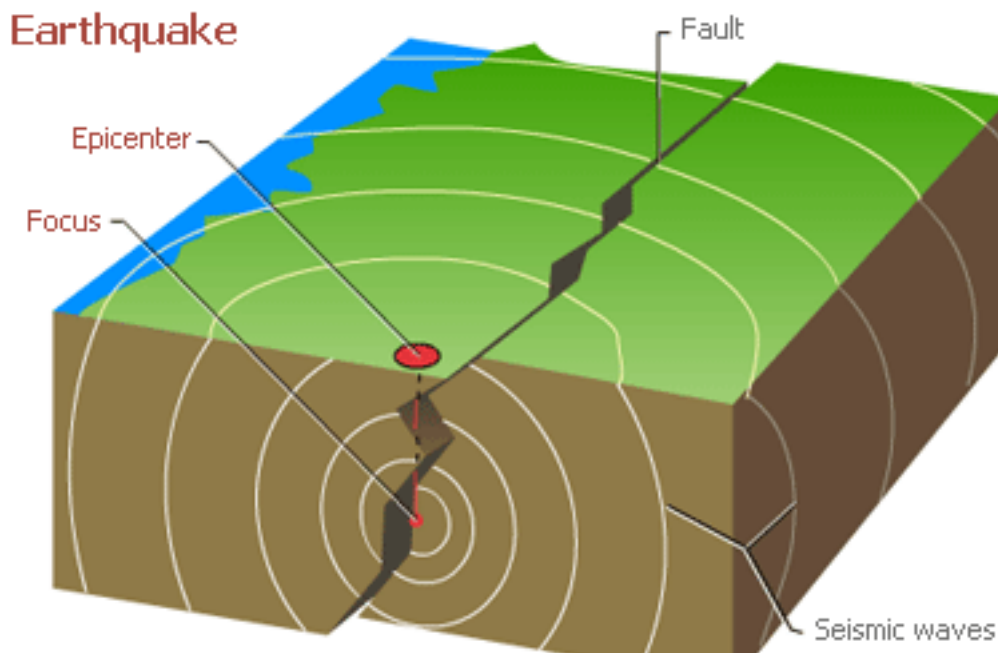
or horizontal movement of tectonic plates towards each other as a result of processes going on in the lithosphere and the upper mantle of the earth. These processes cause sudden ripping of the integrity of the earth's crust, spreading resilient waves.

The Theory of Plates (*the theory of global tectonics*) fully explains the causes of earthquakes. According to the Theory of Plates, the lithosphere consists of several big plates that move with regards to each other. Usually 6 big continent size plates are singled out. These are: the African, American, Antarctic, Australian, Indian, Eurasian and Pacific. In addition, there are 14 relatively small sub-continental plates: the Philippines, Caribbean, Arabian etc.

Earthquakes also happen under the ocean and can cause tsunamis. There are also some weak earthquakes that do not cause serious danger and their radius usually does not exceed several kilometers.

During an earthquake, window glass can be broken, dishware can fall from shelves, plaster can fall from the ceiling; book shelves, cupboards and chandeliers are shaking, cracks may appear in the walls and ceilings; fire may start or a door may be blocked up. All this is accompanied by a deafening noise. An average earthquake continues for 5-20 seconds. The longer the earthquake lasts, the bigger the damage is. Earthquakes are accompanied by destruction and often the loss of human lives. Unfortunately, mankind has not created any tools or measures any that absolutely ensure our safety, except that buildings and structures must be built to code in compliance with the seismic norms.

**Figure 2: Graphic Imitation of an Earthquake**



Source: <http://edelweistretno.files.wordpress.com/2010/04/earthquake.gif>

Earthquake measurement - earthquakes are measured with a device called a seismograph. The Richter scale measures the magnitude (size) of an earthquake on a scale of 1 to 10 using a seismograph. Each step in the scale indicates a tenfold increase in the energy of the earthquake.

The Richter scale was devised in the 1930s by an American geophysicist called Charles Richter. The most powerful earthquake ever recorded was in Chile in 1960, which registered 9.5 on Richter scale.

The Modified Mercalli scale assesses an earthquake’s severity according to its effects on a scale of 1 to 12 in Roman numerals (I - XII). A Mercalli scale I earthquake is one that is only detectable with special instruments. A Mercalli scale XII earthquake causes almost total destruction of cities and reshapes the landscape.

## TSUNAMI

Tsunamis - are gigantic waves or series of waves that are a dangerous natural phenomenon. They are caused by earthquakes, volcanic eruptions or landslides under the sea and near the sea shore. “Tsunamis” in the Pacific Ocean may spread at a very high velocity (up to 100km/h) for thousands of kilometers. The waves range from 1 to 5 meters high. In places where the water’s depth is shallow (near the shore) the height of waves increases significantly and may reach anywhere from 10 to 50 meters.



This huge volume of water hits the shore causing floods, the destruction of buildings, damage to power transmission and communication lines, roads, bridges, piers, as well as the death of people and animals. Tsunamis are preceded by a shock wave of air, similar to an explosion, which destroys buildings and structures. A Tsunami consists of several waves. Very often this is a series of waves that hit the shore at one hour intervals.

The warning signal of a sea quake or Tsunami is an earthquake. Usually, before the Tsunami starts, the water moves significantly away from the shore, revealing the sea bottom for hundreds of meters of several kilometers. Such a retreat may continue for several minutes or half an hour.

The waves may be accompanied by a very loud noise that can be heard before the waves become visible. In some cases a tsunami may be preceded by mild flooding of the shore. Strange behavior of animals may also serve as a signal for the forthcoming disaster.

### Earthquake Occurrence

It must be noted that at the end of the 20<sup>th</sup> century, in Georgia, like in throughout the world, the number of strong earthquakes significantly increased, causing more and more destruction.

Georgia is located in a seismic region, where 7 magnitude earthquakes may occur and the macro seismic effect of these earthquakes is 9.

The seismic hazard is especially high in urban areas, where the high density of the population and the existence of urban infrastructure significantly increase the risk of death and damages.

It is worth mentioning that Georgia, as well as the whole Caucasus region, belong to the so called *average seismic zone*. Regions included into this category are those where the average interval between strong earthquakes is more than 1000 years.

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Historical documents provide us with a lot of information about destructive earthquakes that took place in the Caucasus (and Georgia). Many of them give rather exaggerated descriptions of earthquakes, although it is still possible to define parameters (intensity and location) of those earthquakes that happened in the past. According to this data, there is a description of a strong earthquake that took place on the territory of Georgia before Christ. There is more information about earthquakes that happened in the Middle Ages. Descriptions of some of the earthquakes are so detailed that seismologists can estimate their macro-seismic effect and magnitude.

In the 20<sup>th</sup> century, several strong earthquakes occurred in Georgia. In 1920 the epicenter of a strong earthquake was near Gori. The magnitude  $M=6.2$ , while the intensity was 8-9 digits. The earthquake caused a lot of death and destruction. In 1963, an earthquake of  $M=6.2$  magnitude and 9 digit intensity took place near the village of Chkhara, causing destruction.

The strongest earthquake happened on the territory of Georgia in 1991, known as the Racha earthquake. The magnitude was  $M=6.2$ , while the intensity was 9 digits. The epicenter was located in the high mountainous villages of Racha and Imereti. Up to 200 people died. The earthquake caused a lot of destruction in Racha, Imereti and Shida Kartli. It damaged and destroyed about 46,000 residential homes, 1,000 factories and other facilities. Up to 100,000 people became homeless. The earthquake was followed by many aftershocks. Some of them were rather strong, causing additional damage and death.

The magnitude of the Racha earthquake equaled that of the Spitak earthquake, although the surface effect of the last one was still stronger. While comparing the consequences of these two earthquakes, it is worth to mention that fortunately the territory of Racha was scarcely populated at the time. Even today, very little restoration has been done there – less than half of the houses have been restored. This is one more example of how long- lasting the consequences can be.

A year and a half after the Racha earthquake, in October 1992, another strong earthquake struck with a 6.5 magnitude. The epicenter was near Barisakho and its intensity in the epicenter was 8 digits.

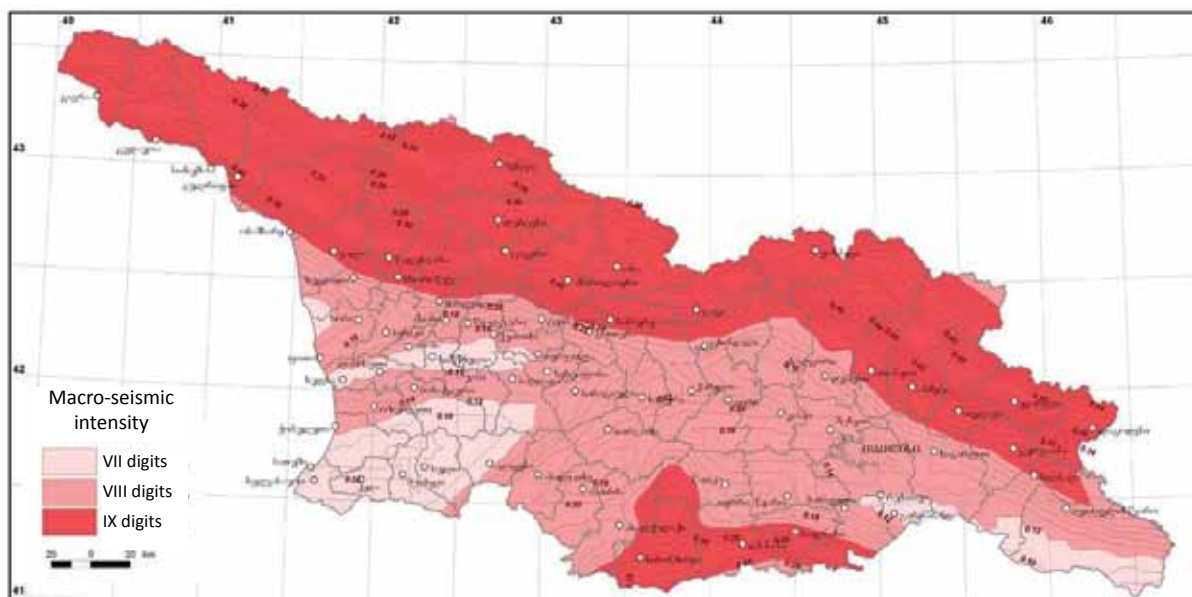
It must be noted that scientists have developed geographic maps that indicate seismic hazards. These maps show all earthquake hazard zones, taking into account macro-seismic intensity and magnitude. These maps can help us to recognize the risk and take preventive measures. In Georgia the zones of seismic activity are: Racha-Imereti, Kartli and South Georgia.

Similar to this, we can also draw maps (although not on a scientific level) that would help us to understand the risk in advance and take preventive measures. It is important to remember that the existence of risk maps is an important factor during an emergency. They provide us information regarding our living environment – the location of buildings, structures, rivers and lakes. They also provide us with the expected risks associated with these things.

**Figure 3: Seismic Risk Assessment Map for Georgia**

**THE SEISMIC RISK MAP**

Maximum Horizontal Acceleration



Source: Seismic Monitoring Center, Ilia State University

**Rules of action before, during and after a disaster**

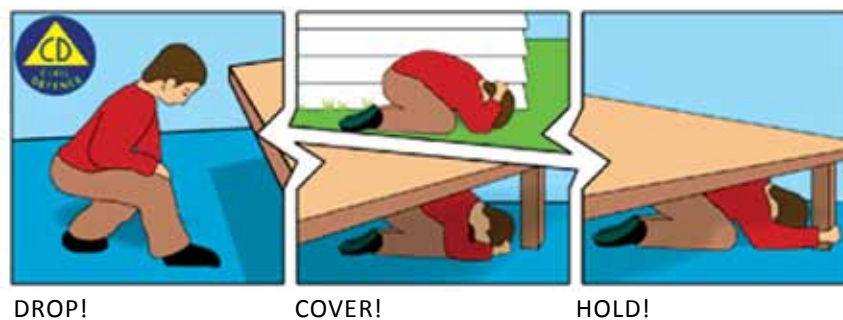
**Before a disaster:**

1. Remember the rules that must be observed during an earthquake at home, at school, in a place of public gathering, on transport systems or in the street;
2. Investigate and spot in advance dangerous places at school and at home;
3. With the help of adults, spot safe places in all rooms of your house and the classroom;
4. Learn the Emergency Action Plan of your school;
5. Together with your family members design a Preparedness and Response Plan for your family;
6. Spot the gathering place within the school territory;
7. Remember the telephone number(s) of the municipal emergency authorities;
8. Remember that during an earthquake, internal/external glass windows, doors, partitions and elevators are dangerous;
9. Do not hang shelves over your bed;
10. Do not place mirrors and big pictures near the bed;
11. Reliably fasten shelves to walls; make sure that the wardrobes and cupboards are stable; remove heavy items from upper shelves; do not put glass items on shelves;
12. Do not put beds near big windows, external walls or glass patricians;
13. Do not block the apartment entrance, corridors or stairwells;
14. Do not put flammable things near the gas stove;
15. Water heaters must be firmly fixed to the walls. Taking into account that in case of an earthquake water heaters become the best water reservoirs, try not to damage them;
16. Prepare special supplies (water, non-perishable food, a lantern, first aid kit etc.).

### During a disaster:

1. Stay calm, do not panic;
2. If you are in a building, lie down on the floor under a table or any other furniture and firmly hold on to something until the earthquake has stopped;
3. If there is no table or desk nearby, cover your face and head with your hands and lie on the floor in an internal corner;
4. Keep away from windows, entrance doors and everything that can fall down;
5. Do not try to leave the building quickly; during earthquakes people mostly die because they try to run out of the building and become trapped under ruins if the building is destroyed;
6. Do not go to the stairwell, a balcony or an elevator;
7. Stand under a door opening only if this is the nearest shelter, the building is not very old and you are sure that you will be safe there;
8. If you are in the street, keep away from buildings; try to get into an open space and avoid power transmission lines;
9. If you are at home, turn off electrical equipment and gas quickly;
10. If you see that the door is blocked, do not be afraid, this is caused by the deformation; also, do not be afraid of noise coming from braking tableware, glass and other breakable items; this usually accompanies earthquakes;
11. If you are in bed, do not move; cover your head with a pillow in order to avoid traumas;
12. If you feel an earthquake while you are in a car or any other transport, stay inside, avoid stopping under buildings, bridges and trees; do not get out of the car; this is safer because the car can protect you;
13. If you are in chemistry class or a laboratory where chemicals are stored, try to leave the room because chemicals may cause injuries;
14. If you are in a mountain area, avoid rockslides and landslides that may follow an earthquake.

**Figure 4: Actions to be taken during a disaster**



*Source: The Ministry of Defense and Emergency Situation Management of New Zealand*

### After a disaster:

1. Stay calm, do not panic;
2. Act according to the prepared plan or wait for instructions given by adults;
3. First of all check if you have any injuries; then check the condition of the surrounding people. If you cannot do this, wait for the rescue team;
4. After the earthquake is over and you leave the shelter, do not return for 2-3 hours unless it is absolutely necessary because the quakes may repeat (an aftershock);
5. Be careful when you get into the building, collapse may happen again;
6. Check if there is fire; in case of a mild one try to extinguish it;



7. There is a possibility of gas leakage and damage caused to electrical wiring;
8. Be careful while opening wardrobe doors to take necessary items;
9. Use only lanterns; do not use an oil lamp or a candle!
10. Avoid using a toilet if the sewage system has been damaged;
11. Use only solid and canned food;
12. If there is lack of water, use water from the water heater tank;
13. Inform relevant authorities about your neighbors (people with special needs, elderly people living alone etc.);
14. Listen to the radio to receive information about the earthquake.

## TOPIC 2. FLOODS, FLASH FLOODS

### THE V-VII GRADES

#### ACTIVITIES

##### The 5<sup>th</sup> Grade

##### Goals:

- ❖ Help students in understanding risks associated with floods and to teach them the main rules for being ready for a possible flood
- ❖ Teach students the rules of safe behavior during a flood.

##### Activity 1

A situational exercise: the teacher tells the students a story about one settlement located on a river bank. The water level in the river frequently increased and flooded the territory; the population was not protected and the number of victims was high.

The teacher asks the students to develop mandatory rules for the population of that settlement that would help them to reduce the number of victims and damages. The students must write official rules on cards prepared in advance and put the cards into an *Idea Box*, also prepared in advance. Students are given 10 minutes to think about the rules. When they finish, the *Idea Box* is opened and the students' ideas are written of the blackboard.

Here are some rules that students may come up with:

- ✓ Houses must be built on special pillars;
- ✓ There must be a rescue team in the country;
- ✓ The river banks must have embankments.

The teacher must post the rules on the wall and return to them after explaining the topic.

##### Activity 2

“Spotting safe places”: The teacher asks the students to work in pairs and mark on the map of their city/village these items:

- lowland areas;

- 
- elevated areas which are safe during floods.

After this, the students are given a home task and are asked to justify their choices by taking photos of safe/elevated areas.

### Activity 3

The teacher asks the students to prepare posters for the population, showing actions to be taken during a flood. The teacher must review the results of their work, hang the posters and arrange an exhibition.

Questions:

1. What is flood?
2. During which seasons are floods most frequent? Why?
3. Which of the Georgian rivers are most prone to floods?
4. Which river passes through your city/village?
5. Is flooding characteristic of your region/city/village?
6. Where do you think floods can be expected in your region/city/village? Why?
7. Who/Where are you going to call in case of a flood? Do you have the necessary telephone numbers?

## The 6<sup>th</sup> Grade

**Goals:**

- ❖ Help students and their families to prepare for floods;
- ❖ Assist students in identifying potential flood risks.

### Activity 1

“A Group Project”: the teacher asks the students to collect information about the last year’s floods in Georgia. What was the temperature in spring? What was the average snow level in the winter? What is the situation this year as compared to the last one? Are floods/flash floods expected?

### Activity 2

“Brainstorming”: What items should not be located on the first floor? Give a list of easily perishable goods.

### Activity 3

The teacher asks the students to sketch a design of a house located in an area subject to flooding. What must be taken into account? While the students are working, the teacher asks them to remember typical houses in west Georgia, link their features to the climate conditions (floods) and make conclusions on whether traditions must be remembered and taken into account.

### Activity 4

The teacher tells students about the actions to be taken during floods. Students must explain why these rules must be observed.

Questions:

1. What climate conditions cause floods?
2. How can people protect themselves? (inclusion into a social project)
3. A flood is expected: What documents should you collect first of all? Work in groups of four people. Justify your choice.

4. What products do we need to have with us? What are the selection criteria?
5. Why should we inform our family about the selected shelter?

### The 7<sup>th</sup> Grade

#### Goals:

- ❖ Enhance the students' knowledge of the rules of behavior during and after floods

#### Activity 1

The teacher divides the class into four groups. He/she asks the students to remember the rules of behavior during and after a flood and asks them to prepare illustrated posters or brochures for younger children, their families, school teachers and school administration.

#### Activity 2

The teacher divides the class into four groups. He/she asks the students to draw a flood scenario showing damages in a case where the population was not prepared (e.g.: houses built on the river bank, no embankments, etc.). It is preferable if the flood causes are also shown on the picture (e.g.: strong rains, the river flow blocked as a result of human actions, etc.)

#### Questions:

1. What should the state do in order to reduce damages caused by floods?
2. What can we do?

### SUPPORTING MATERIAL: FLOODS



#### Terminology and Notions

**Flood** is the building up of large quantities of water, generally caused by heavy rains which the soil is unable to absorb.

**Flash flood** is a rapid flooding of geomorphic low-lying areas – washes, rivers, dry lakes and basins. It may be caused by heavy rain associated with a storm, hurricane, or tropical storm or meltwater from ice or snow flowing over ice sheets or snow-fields. Flash floods may occur after the collapse of a natural ice or debris dam, or a human structure such as a man-made dam.

Floods are seasonal phenomena that occur during periods of rain and the melting of snow. On most of the Georgian rivers, floods take place in spring and last more than one month. A flood may also occur if the river flow is blocked by a landslide. It must be noted that when the snow cover is thick and the weather is very frosty winter, or while in spring the temperature increases abruptly and there is a lot of rain, the probability of flood is very high.

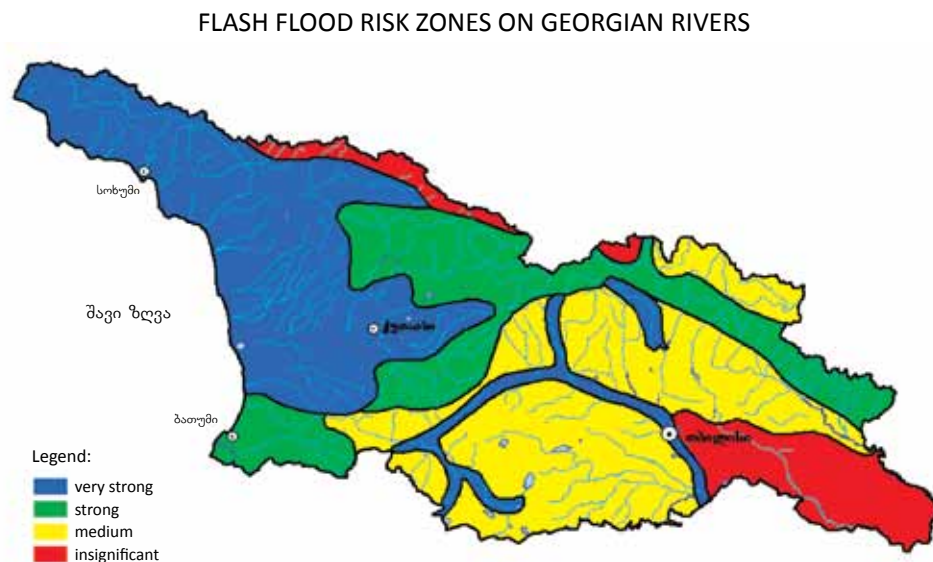
Hydraulic shock, which is caused by a large quantity of water, can cause a lot of damage; for example: the destruction of buildings /structures and bridges, economic sectors (mostly agriculture) and it can cause the deaths of people and animals.

## Flood Occurrence

It is necessary to note that floods mostly occur on fertile lands along coastlines that are densely populated; therefore damages are significant. Of all the sectors of the economy, losses are especially high in the agriculture sector, where floods cause the erosion of soil, damage to crops and the death of poultry and domestic animals. This may aggravate starvation problems in developing countries where the share of agriculture in the country's economy is very significant.

During the last decade, the frequency and destructive nature of floods has increased, making society more sensible towards this hazard. In addition to global climate change (that intensifies extreme weather), the frequency and destructive nature of floods can also be attributed to population growth. The places chosen by people to live and to develop the economy (mainly agriculture) are within the risk zone. These zones are sea coasts and river banks. According to the conclusions made by the International Panel of Climate Change (IPCC), if in the 21<sup>st</sup> century, the temperature increases by 1.4-5.80°C, the sea level will rise from 9 to 88sm and the flood risk will increase even more. This will have a direct impact on the increase of economic losses and the number of victims. It is interesting to note that floods of a disastrous nature are characteristic of rivers with mixed water sources (glaciers, precipitation).

**Figure 5: The Map of Flash Floods in Georgia**



Source: National Environmental Agency

The sediment level in Georgia increases in parallel to the elevation from the sea level (2000 m.) and decreases from the west to the east. If a river passes through an area characterized by high precipitation and the river sources are mixed, its water flow is high. Many Georgian rivers start in the *Big Caucasus*- among glaciers and a lot of snow. Flood periods on such rivers may continue for 6 months in spring and summer. This is the time when the intensive melting of snow starts while spring is a rainy season. Therefore, the water level in such rivers increases significantly. The biggest floods are characteristic of the following rivers: the river Tergi (although not on the territory of Georgia because only the upper part of the river passes through Georgia), the Mtkvari, Rioni, Tskhenistkali, Aragvi and Alazani.

In the past years, floods and flash floods have taken place about once every 8 to 10 years. Recently, that number has increased; such events have been happening once every 5 or 6 years. The table shows the economic damages and deaths that took place in Georgia during the recent years as a result of this natural phenomenon.

**Table 5: Economic Losses and Loss of Human Lives as a Result of Floods in Georgia**

Flood	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number	4	16	6	10	20	8	7	16	20
Loss(million GEL)	4.1	78.7	4.2	20.5	80.0	15.0	40.3	38.0	30.0
Deaths	-	-	2	1	4	1	1	1	5

### Rules of action before, during and after a disaster

#### Before a disaster:

1. If in your residential area, floods are frequent, do not keep easily perishable items on the first floor of your house; it is better to paint the walls instead of putting up wallpaper;
2. In order to be prepared for possible natural hazards, plan in advance the necessary items you should have: copies of documents, clothes, shoes, non-perishable food and water, a radio, a lantern, a medical kit;
3. In big cities, one of the most dangerous places to be is the metro system because it is located underground and can be easily flooded;
4. If a settled area is within the flood and flash flood risk zone, the area must be studied in advance in order to identify an elevated place that can serve as a temporary shelter if the main territory is flooded. Such elevated places must be found near your school and house after which you must define the shortest route to the place;
5. If there is not enough time for evacuation, you need to get on the roof of a stable building or in a tall tree and wait for help. In this case it is important to tie a colored cloth on a stick so that you can be easily noticed. After dark, if visibility is limited (there is fog), it is necessary to signal periodically with a lantern;
6. Give information beforehand about your evacuation place to family members, friends and relatives. Knowledge of correct information may have a vital importance; after a disaster it will be easier to find each other because you will agree in advance;
7. In order to avoid additional losses, turn off the gas, water and electricity supply;
8. Damage will be less if you clean flood water trenches and if there is some vegetation (e.g.) grove along the banks. Actually, preliminary environmental measures reduce the flood and flash flood risk!
9. Remember the telephone number(s) of the municipal emergency authorities (police, ambulance, fire department and the local administration) in case you need them in an emergency;
10. The main thing is to remember that you must take care of the environment! Do not pollute it, because if the river flow is blocked the territory may be flooded!

#### During a disaster:

1. All doors and windows of the building must be closed;
2. It is necessary to turn off the gas, water and electricity supply;
3. You must not get near the river or any other water reservoir;
4. It is necessary to get to an elevated place selected in advance or the roof of a stable building;
5. It is necessary to signal with a colored cloth fastened to a stick during the day and give periodic light signals after dark;
6. If you are in a car, the driver must avoid the source of flood;
7. If a car becomes stuck in the mud you must not stay inside; water can easily wash away the car. It is necessary to leave it and get to an elevated place (tree, hill or roof).

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**After a disaster:**

1. It is necessary to wait until the danger is completely over;
2. After returning home, check the building for cracks and other damages in order to find out whether it is safe. Make sure that there is no danger of the building falling down;
3. Do not turn on electricity; do not use electrical equipment until you are sure that it is completely dry;
4. Be very careful about animals, especially venomous snakes that may find a shelter in your building during a flood;
5. You must also be careful with hanging furniture, pictures and lamps, because they may fall down;
6. All products that got wet must be thrown away;
7. The risk of epidemic is high; there is a danger of water contamination;
8. Due to the sewage and water supply system damages you must drink only bottled water until the disaster consequences are fully eliminated.

## TOPIC 3. LANDSLIDES

### THE VI-VII GRADES

#### ACTIVITIES

##### The 6<sup>th</sup> Grade

**Goals:**

- ❖ Give students information about landslides, their causes and results;
- ❖ Teach students about the measures that need to be taken in order to avoid landslides;
- ❖ Inform parents and communities at large with the help of children.

**Activity 1**

With the use of the brainstorming method the teacher collects information about the following issues:

- What is a landslide? What have the students heard about landslides?
- What causes landslides?
- How do human activities stimulate landslides? What do we do wrong?
- What can be the consequences of landslides?

The teacher writes information on a flipchart and, if necessary, adds his/her own views.

**Activity 2**

The teacher divides the class into groups of 4 people and asks the students to draw on the flipchart a plan on the topic: "What can we do to prevent landslides?" After the students fulfill the task, they present the results of their work.

**Activity 3**

The teacher instructs the class to work in small groups and to develop plans of action during a landslide. The plan must reflect the following information:

1. How to get necessary information?

2. Whose instructions must we wait for/follow?
3. When is it necessary to evacuate from the area of a landslide hazard?
4. A list of necessary items must be developed.

The teacher asks the students to substantiate their answers; after this, the students make presentations and discuss the issue.

#### **Activity 4**

The teacher instructs the class to prepare small informative booklets and design them as they wish. At the next lesson, the students must make presentations on their booklets.

### **The 7<sup>th</sup> Grade**

#### **Goals:**

- ❖ Help students to become aware of landslide hazards;
- ❖ Teach students how to identify potential landslide hazards in their settlement;
- ❖ Teach students ways to mitigate landslide hazards.

#### **Activity 1**

Group work: the teacher divides the students into small groups and asks them to develop landslide hazard mitigation projects for their region/village/city.

For this purpose, students must gather information about landslides that took place in their region/city/village over the last two years.

The plan must reflect the following information:

- Where have landslides happened?
- During which season have landslides happened?
- What has stimulated a landslide?
- What were the population's damages resulting from landslides? Is there any information about the damages caused by landslides in the region/village/city?
- What measures have been taken after a landslide?
- Was it possible to avoid the disaster?

The teacher asks the students to develop recommendations about the preventive measures that can be implemented at the individual, as well as regional/village/city levels. Students can prepare recommendations in the form of a poster.

#### **Activity 2**

Together with students, the teacher plans to plant trees on the territory of their region/village/city; the planting area must be agreed upon ahead of time by the municipality.

#### **Activity 3**

The teacher asks the students to prepare a poster about actions to be taken during a landslide and after leaving the landslide risk zone. The teacher will place the posters in the classroom.

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#### Activity 4

The teacher gives the students the home task of finding information about landslide risk zones on the territory of Georgia.

The teacher reviews the work in class and helps the students to come up with a complete list; the teacher asks the students to mark all landslide zones on the map of Georgia using colored markers.

The teacher provides the students the following topics for discussion:

- Why are these areas especially dangerous as landslide zones?
- What are the risks of living in such a zone?
- How high is the landslide risk in your region/village/city?
- What measures are taken in the region to avoid landslides?
- What can be done to mitigate the landslide risks of the population living in the landslide zone?

#### Activity 5

The teacher shows the students an example of a map that illustrates landslide risk zones and explains its purpose; the teacher explains the key symbols (legend). Using this example, the class prepares a schematic landslide map for the municipality.

The teacher reviews the results and the class discusses the following issues:

1. How important are such maps for the municipality?
2. How can we use these maps?
3. Who may find this information useful?
4. How can we make such plans available for the population living in the specified region/village/city?

### SUPPORTING MATERIAL: LANDSLIDES



#### Terminology and Notions

**Landslide** is soil, rocks and vegetal debris that are transported suddenly or slowly down a slope because the soil is not sufficiently stable. Landslides may happen when there is a lot of rain, or during earthquakes or volcanic eruptions. The risk is greater when people build their homes in the wrong place, or cut down trees so that there is nothing left to bind the soil when it rains heavily.

Landslides are accompanied by a loud noise. The amount of soil sliding down during a landslide may reach tens and thousands of cubic meters and in some cases even more than that.

Landslides may damage and destroy residential houses, industrial buildings, roads, main pipelines, power transmission lines and cause the injury and death of people.

Landslide Prevention Measures are divided into preventive and engineering/protective activities:

1. Prohibition of felling within the landslide risk zones, also prohibition of construction, underground explosion and unmethodical melioration on slopes in the vicinity of water reservoirs;
2. Afforestation of slopes where there is a landslide risk;
3. Construction of anti-landslide structures such as embankments, bearing structures and walls.

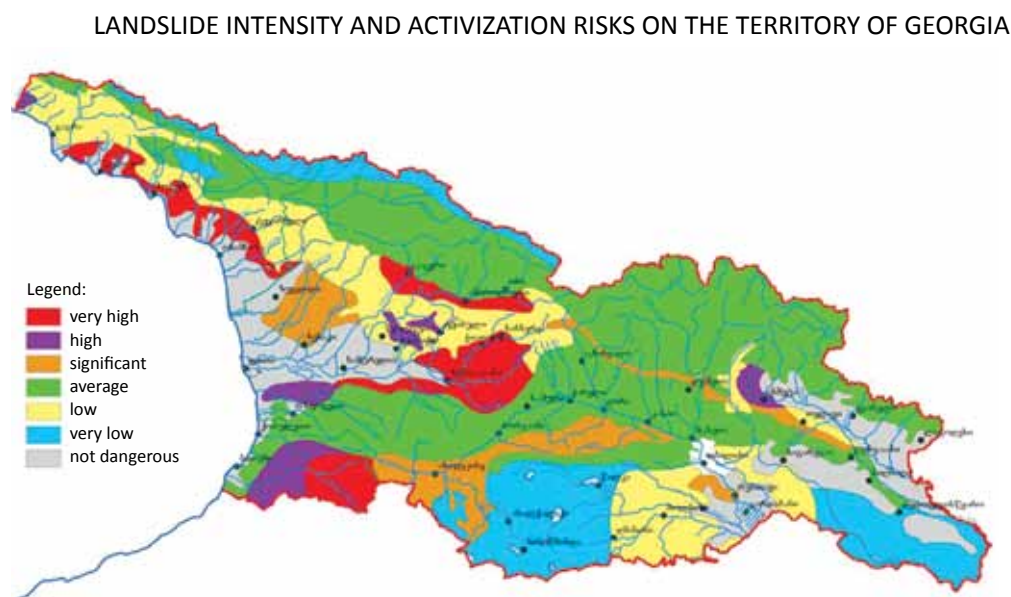


It is also necessary to prohibit the pasturing of cattle within the landslide area and to plant crops that need hoeing.

### Landslide Occurrence

In Georgia, the risk of landslides and rockslides is very serious. As of today, up to 50,000 landslide sites have been identified, threatening about 2,000 settlements with more than 200,000 residents. The total area of landslide sites exceeds 1.5 million hectares. In the agriculture sector, harm caused by landslides reaches millions of US dollars.

**Figure 6: The Map of the Georgian Territory and Regions Damaged by Landslides and Subject to Landslide Risks**



Source: National Environmental Agency

It is well known that that if the amount of precipitation falling on a certain territory does not exceed the average multi-year parameter (i.e. is within the norm) the landslide frequency does not increase.

### Rules of action before, during and after a disaster

#### Before a disaster:

1. Gather information about possible landslide sites and the area of their spreading;
2. Take care of the environment! It is convenient to plant trees in the landslide risk sites (the type of species that can stop a landslide and at the same time have useful plants);
3. Remember warning signs of an approaching landslide: stuck windows/doors; cracks on the roads; leakage of water on slopes where there is a landslide risk.
4. Inform the authorities about landslide signs you have noticed; wait for further information and act according to the situation, taking into account these rules.

---

**During a disaster:**

1. As soon as you receive information about a landslide danger, turn off gas, electrical equipment and the water supply network. Get ready for evacuation in compliance with a plan developed in advance;
2. Act in accordance with the information provided by the emergency authorities (depending on the landslide speed);
3. If the landslide speeds are low (several meters in one month) act according to your circumstances: transfer structures to a safe place spotted in advance; move furniture and luggage to a safe place.
4. If the landslide speed is high (0.5-1 meter in 24 hours) you must be evacuated immediately, in accordance with a predefined plan;
5. When you are evacuated, take with you documents and valuable items, also warm clothes and food – depending on the circumstances and instructions. You have to move to a safe place immediately.

**After a disaster:**

1. Check the roof and walls of buildings that survived the disaster; check damages of electrical gas and the water supply network;
2. After a landslide it is necessary to organize cleaning and rehabilitation work.

## TOPIC 4. MUDFLOWS

### THE VI-VII GRADES

#### ACTIVITIES

##### The 6<sup>th</sup> Grade

**Goals:**

- ❖ Give students information about mudflows, their causes and results;
- ❖ Help students in the analysis of potential mudflow hazards and the identification of safe places in their settlement;
- ❖ Teach students about the measures that must be taken during and after a mudflow.

**Activity 1**

The teacher makes a presentation about mudflows and discusses the following issues (it is recommended to use visual material):

1. What causes mudflows? During which seasons are mudflows most anticipated and why?
2. In which places are mudflows most expected and why?
3. What are the warning signs that tell us about an approaching mudflow?
4. What should we do if a mudflow occurs?
5. What things must be prepared before a mudflow happens in order to have them readily available during a disaster?

Together with the teacher, students must spot safe places where it is possible to find a shelter during a mudflow; such places must be identified on the school territory, as well as in the whole town/village.

After this, students discuss the following issues:

- Are their family members informed about safe places?
- Which is the shortest way that the teacher and students can use to get to a safe place?

- What items must be prepared by the families in advance? How can the students help their families?
- The students come up with a list of necessary items that they should carry with them in case of evacuation.

The teacher stresses a case when evacuation is impossible and explains the rules of safe behavior; he/she also informs the students which authorities must be contacted (e.g.: a fire department, an emergency rescue team, the police, the emergency ambulance etc.); the teacher must find out whether the students have those phone numbers; if no, the teacher must give them the numbers.

### Activity 2

The teacher distributes pre-prepared forms to the students that must be filled in individually by each student or by the whole group. The teacher may add or change the list of statements given in the form.

Example:

		Yes	No
1	Before going to the mountains it is necessary to study the mudflow risk in advance		
2	It is almost impossible to save a person hit by a mudflow		
3	Before leaving your house for evacuation it is necessary to turn off electricity, gas, and water systems		
4	Before leaving your house it is necessary to close windows, doors and ventilation pipes tightly		
5	Mudflows can be avoided		
6	Mudflows can be forecasted		

After doing the exercise, the teacher must review the answers with the students and discuss which of them are correct and which of them are incorrect.

### Activity 3

The teacher asks students to prepare an illustrative, informative brochure on what people should know in case of a mudflow. The teacher must review the brochures in class after which they can be disseminated in the school and the settlement.

## The 7<sup>th</sup> Grade

### Goals:

- ❖ Give students information about the measures necessary to prevent mudflows;
- ❖ Teach students how to identify potential mudflow hazards in their region/city/village;
- ❖ Teach students the rules of safe behavior at home, in school and in an open area;
- ❖ Teach students how important it is to be prepared for a disaster and to be familiar with the evacuation routes in advance.

### Activity 1

The teacher asks the students to prepare a poster showing mudflow prevention/risk mitigation measures that can be taken by:

1. Individuals
2. The region/city/village

The teacher displays the posters in the classroom or the school corridor.

---

## Activity 2

The teacher divides the class into 3 groups; each group has to come up with a schematic evacuation plan for one of the following situations:

1. You are at home when a mudflow happens
2. You are at school when a mudflow happens
3. You are in an open area when a mudflow happens.

The scheme must show the main sites/places (in the village/city) that must be passed during an evacuation; the scheme must contain information about the main rules of behavior during evacuation and the final destination point. Each group must make a presentation to inform the other groups about the work results.

The teacher gives students the following topics for discussion:

- Why is the mudflow hazard so high in these places?
- What are the general risks related to life in a mudflow zone?
- How high is the mudflow risk in the region/city/village?
- What rivers pass through (near) the city/village that may create risks for the population?

The teacher instructs the students to prepare a poster on the topic: "What can be done to mitigate the mudflow risk of the population?"

## SUPPORTING MATERIAL: MUDFLOWS



### Terminology and Notions

**Mudflow** is a sudden flow of fine-grained mountain sediment, big stones and rock mixed with a large volume of water down a steep slope, river canyon or plane as a result of intensive rains or sometimes a brief heavy rain. It is important to note that mudflows can also be caused by damaged dams, embankments and other hydro-technical structures. These damages may be caused by problems related to the engineering design, as well as seismic quakes. Mudflows often form waves moving at a high rate of speed (10m/sec. or more). Its duration may vary from dozens of minutes to several hours. The height

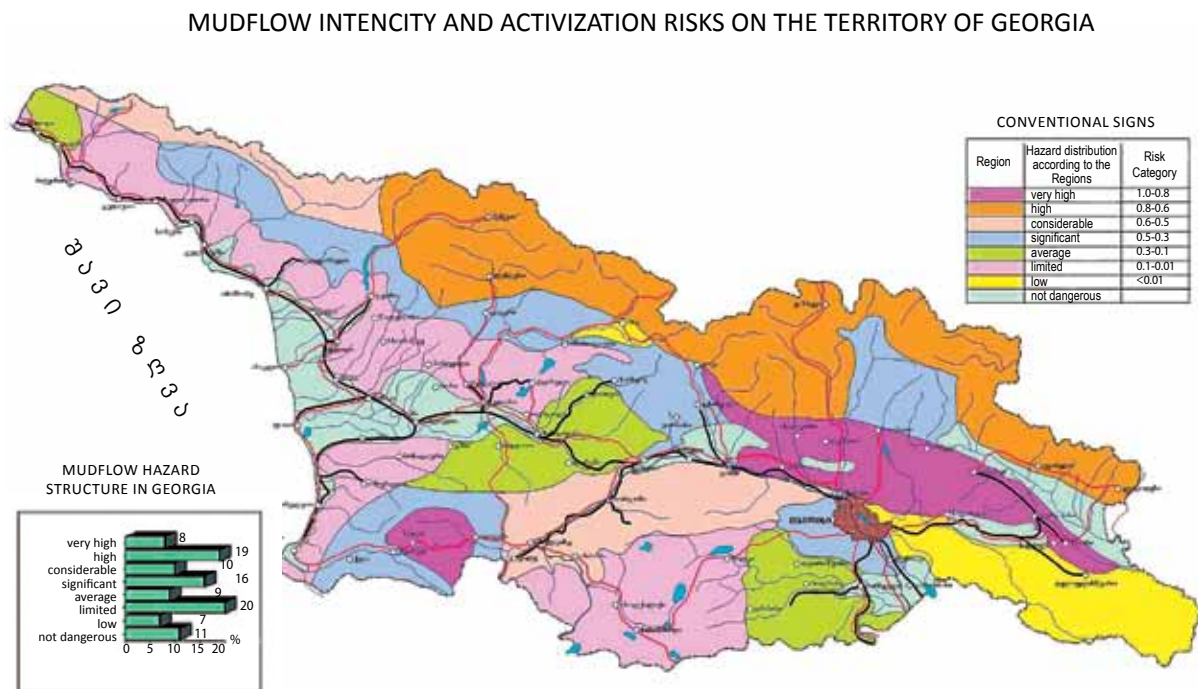
of a mudflow wave may reach 15 meters. The noise can be heard at a great distance. Mudflows kill many people and destroy buildings and structures.

Mudflow prevention measures include: construction of anti-mudflow structures such as embankments/dams, bypass trenches; the regulation of water levels in mountain lakes; planting of trees on mountain slopes to increase the binding force of soil; monitoring; early warning system and evacuation plans.

### Mudflow Occurrence

As of today, mudflow hazards have been identified in more than 2,500 river basins in Georgia. This natural phenomenon threatens hundreds of settlements including the cities of Tbilisi, Telavi, Kvareli, Oni and Mestia. Annual economic losses incurred by the country as a result of mudflows reaches in average 10-20 million US dollars per year.

Figure 7: The Map of Mudflow Hazards on Georgian Territory



Source: National Environmental Agency

## Rules of action before, during and after a disaster

### Before a disaster:

1. Usually the places where mudflows may occur are well known. Before going to the mountains study the route and identify dangerous places. If there are any such places along your route avoid them, especially if it has been raining a lot;
2. Always remember that it is almost impossible to save a person hit by a mudflow. You can save your life only by avoiding it;
3. In case of a preliminary evacuation, turn off electricity, gas and water before leaving the house; close windows, doors and ventilation pipes tightly;
4. People who live within the mudflow risk area must find out whether their houses are located in the high-risk zone. Ordinarily, people must be denied permission to build a house in a mudflow risk zone. If the house has already been built within such a zone it is necessary to take measures to strengthen its foundation and walls, make embankments and bypass trenches, plant trees or build walls to strengthen the slopes and take additional protective measures to strengthen communication systems.

### During a disaster:

1. If you receive a warning signal (by radio, telephone or any other means of communication agreed in advance) or hear the characteristic noise similar to that of a very fast train, it is necessary to leave lowland immediately and move to an elevated area 50-100 meters up;
2. It is important to remember that the flow may carry very large stones that may be a real threat to personal safety;
3. Try to move to a safe place immediately in accordance with a predefined scheme.

### After a disaster:

Assist injured people and help the emergency team to clean debris and roads blocked by the mudflow.

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## TOPIC 5. ROCKFALL, ROCKSLIDE

### THE 7<sup>TH</sup> GRADE

#### ACTIVITIES

##### Goals:

- ❖ Give students information about rock-fall and rockslide;
- ❖ Help students identify the potential hazards in their settlements;
- ❖ Teach students safe behavior rules that must be followed while passing rock-fall risk zones.

##### Activity 1

Using visual material, the teacher reads a mini-lecture about rockfall, touching on the following topics:

- What is a rock fall / rockslide?
- What are the most dangerous seasons for rockfall? Which regions are the most risky?
- What climate conditions stimulate rockfalls?
- What damages can be caused by a rockfall?

##### Activity 2

The teacher divides the class into small groups and instructs them to draw a map of rock fall hazards in the municipality; when students finish the task, they must make presentations and answer the following questions:

1. How high is the rock fall risk in their region/city/village?
2. How is it possible to mitigate the risk?
3. What are the risk mitigation measures that can be carried out by individuals and at the municipality level?

If there is a rock fall risk in the area, the teacher helps the students to evaluate the preventive measures taken in their village/city and identify measures that must be planned and implemented.

##### Activity 3

If the region/city/village is located in the rock-fall risk zone, the teacher must invite a rescuer or an alpinist to talk to the students; special focus must be placed on preventive/protective measures; students must be given an opportunity to ask questions.

##### Activity 4

The teacher divides the class into three groups and asks them to draw posters of safety rules that must be observed while passing through a rock fall zone. When the students finish working on the task, the groups display the posters in the classroom and should make presentations on the materials they have designed.

## SUPPORTING MATERIAL: ROCKFALL, ROCKSLIDE



### Terminology and Notions

**Rock-fall** refers to quantities of rock falling freely from a cliff face. **Rockslide** is a type of landslide caused by rock failure in which part of the plane of failure passes through intact rock and where material collapses en masse and not in individual blocks. The mode of failure is different from that of a rock-fall.

Rock-falls and rockslides are processes formed under the influence of gravity. Their formation is promoted by relief, tectonic/geological, climatic and technological (human activity) factors. Rock-falls and

rockslides may form in hard rocks as well as in relatively weak ones. These processes are characteristic of slopes built from clay rocks.

Rockslides are especially dangerous for those using public roads and railroads. Residential houses often also suffer from this disaster as well. This natural phenomenon is especially dangerous for tourist groups and alpinists passing through rockslide risk zones. The main preventive measures include the identification of rockslide areas and their isolation by means of metal nets, the arrangement of terraces on mountain slopes, and the construction of protective structures.

### Occurrence

Rockslides mostly occur on slopes with inclinations greater than 20°C. Considerable fluctuation between the day and night temperatures creates discontinuities of the rock surface. Water that gets into such cracks freezes and widens them. This process is repeated many times and finally destroys the rock. In winter, frozen water binds rock mass. Therefore, on frosty winter days the rockslide probability is lower. The risk increases in spring, in the first half of the day, when the sun's thermal activity reaches its maximum. Rockslides are also characteristic of the summer season, especially if there is a lot of rain.

Rockslides are characteristic of mountain regions of Georgia. Recently this phenomenon has created serious problems for Chiatura and nearby villages. Rockslides are more characteristic in the south and south-east slopes. High rockslide risk zones include: canyons, river beds, and all kinds of depressions that provoke the movement of rock mass in a certain direction. A rockslide can also be caused by improper actions of an alpinist climbing a cliff.

### Safety rules for moving through rockslide risk zones:

1. Gather information about possible rockslide areas along your route;
2. Choose a safe season and time (period) of the day/night;
3. While passing through possible rockslide areas choose hilly sections;
4. Pass through the possible rockslide areas one by one, taking maximum security measures;
5. The distance between tourists moving along, up or down rock fall piles must be as small as possible;
6. Mountain climbers must not move along two routes with different elevations, one above the other; this is especially important when two groups are passing the area at the same time;
7. While passing through possible rockslide areas, check the reliability of supporting points so that they do not break down and fall from the slope You must catch all unstable stones that start rolling down and warn others about them;

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8. It is unacceptable to pass rockslide areas during rain, snow, thunderstorms and periods of strong wind;
  9. When a group passes through a rockslide risk zone, one of its members must watch if there is a danger and give a signal to others; similarly, the mountain climber who steps on unstable rock and sends it down must give a warning signal to others.
  10. In case of a rockslide, stand with your back pressed to the rock or find a shelter under a jut. If there is no such opportunity, stay where you are and watch for falling rocks in order to be able to jump aside at the last moment to avoid it.

## TOPIC 6. STRONG WINDS

### THE 7<sup>TH</sup> GRADE

#### ACTIVITIES

##### Goals:

- ❖ Provide students information about strong winds and their destructive force;
- ❖ Help students identify the warning signs of possible strong winds;
- ❖ Teach students the rules of safe behavior before, during and after a strong wind.

##### Activity 1

The teacher divides the class into groups and asks them to prepare an informative brochure on safe behavior rules during a strong wind. The first group makes a presentation about what must be done at home during a strong wind, the second – in the street, the third – in a car, the fourth – in wildlife area.

##### Activity 2

The teacher divides the class into groups of four people and requests that they prepare a poster about the damages caused by strong winds (damage of buildings and plants, damage of electrical wiring etc.). After the students finish working on the task, they should make presentations and the posters are exhibited in the classroom.

##### Questions:

1. What causes wind?
2. How should we prepare for a strong wind? Why is it important to prepare in advance?
3. How can a strong wind damage the population?
4. Which rooms are the safest ones during a strong wind? Substantiate your answer.
5. What is a tropical cyclone?
6. What can be the benefits of a strong wind?
7. What should be done after a strong wind? Justify your answers.



**SUPPORTING MATERIAL: STRONG WINDS**



**Terminology and Notions**

**Wind** is caused by differential heating of the Earth’s surface (differences in pressure); the greater the difference of temperature and pressure between two points, the stronger the wind. Wind speed and turbulence can be affected by geography: mountains, vegetation, buildings and structures for example.

A strong wind can break or uproot trees, shatter windows. Strong winds can also lift objects into the air potentially causing damages and death. Dust flying in the air reduces visibility and therefore increases the number of car accidents. In the sea, a

strong wind may create high waves and increase the sea level. Erosion caused by wind can be very damaging for agriculture.

Tropical cyclone/whirlwind/tornado as a disastrous phenomenon formed in the tropical zone. Due to its disastrous nature, this natural phenomenon requires a lot of attention. Tornadoes or cyclones are formed by a circular bulk movement of air- this air rotates counterclockwise in the northern hemisphere and clockwise in the southern hemisphere. The lower part of the funnel-shaped wind touching the Earth’s surface can cause damage on several different scales. The world’s meteorological stations monitor its formation and movement in order to provide notice to at risk populations by means of the early warning system. Preparedness means the minimization of damages. There are five different categories of tornadoes of varying destructive force.

**Table 6: Wind Categories and Damages**

Category	Wind Speed (miles/hour)	Damages
-	Below 73	No damages
1	74-95	Minimal: damage of non-capital type buildings, vegetation and traffic signs
2	96-110	Average: damage to all buildings that are outdated or not built according to the standards
3	111-130	Extensive: damage of small up to standard buildings, blocked up roads
4	131-155	Extreme: roofs are uncovered; trees uprooted/broken, roads blocked up, buildings destroyed, houses flooded in the coastal area
5	Above 156	Catastrophic: most of the buildings and vegetation are destroyed, roads blocked and buildings flooded

**Strong Winds Occurrence**

Winds occur everywhere on the earth’s surface. They can bring benefits (the main component being water circulation, electricity generation, and plant pollination) as well as harm. Sudden strong winds are characteristic of all latitudes and can occur at any time of the year.

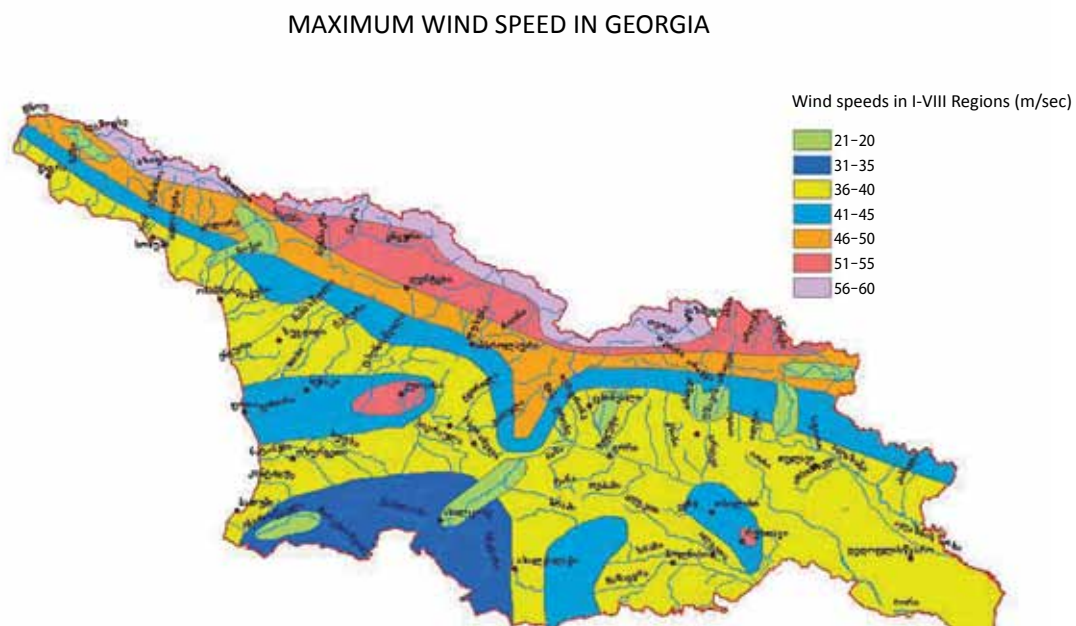
Preparedness for strong winds is necessary. Otherwise damages may be serious.

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The global climate change and temperature increase can make winds even more severe. The active exchange of heat energy between the atmosphere and the ocean can increase the number of storms on the ocean surface. Frequent storms in combination with melting glaciers will flood coastal zones causing huge losses. Rising temperatures intensify evaporation, increasing the amount of precipitation. Changes resulting from these factors may be positive for certain areas, but mostly they will increase the frequency of floods / flashfloods and the consequent losses.

In Georgia, the occurrence of strong winds is high in the Caucasus range, Kolkheti plain, Zemo Imereti, Shida Kartli, Tbilisi, Gare Kakheti and Samtskhe Javakheti regions.

**Figure 8: Map of Maximum Wind Speeds in Georgia**



*Source: National Environmental Agency*

## Rules of action before, during and after a disaster

### Before a disaster:

1. It is important to know that if we see quickly approaching storm clouds it is possible to predict strong winds several minutes in advance;
2. In this case, the items placed on the balcony and in the yard must be firmly fastened or taken into the room; it is necessary to close and fasten windows, doors and blinds.

### During a disaster:

1. If during a strong gust you are in a building, it is necessary to close and fasten windows and doors; it is preferable to stay away from windows in order to avoid being injured by flying glass that can be broken by different items flying in the air due to the high winds. It is better to stay in internal rooms that do not have windows – in a corridor or a bathroom;
2. Turn off all electrical devices;

3. Stay in the building until the wind is over. Remember that after a storm is over it may be repeated;
4. If the building was damaged e.g.: the roof was torn off while you are inside, it is better to move to the less damaged part of the building or get under some massive furniture until the storm is over;
5. If during a strong gust you are in the street, avoid the various items that may fall from balconies. Quickly find a shelter inside a stable building. Protect yourself from things flying in the air. You can protect yourself with your hands or a scarf. It is necessary to protect the eyes, nose and mouth from dust;
6. Remember that the wind speed is higher in narrow spaces between buildings;
7. If you are in a wildlife area, try to find a place protected from the wind. If there is no such place nearby, lie down on the ground;
8. If you are in a car it is better to stay there and close the windows. Do not park the car under unstable objects that can break down and fall on the car.

**After a disaster:**

1. If the wind has felled any power transmission lines, it is dangerous to approach them because of the electrocution risk. It is better to inform the local authorities so that the problem can be addressed in the shortest possible time. In case of fire it is better to avoid it and call a fire department;
2. Do not get near the objects that are suspiciously bent (pillars, transmission poles, trees) that might have survived the storm but can still fall down later;
3. Be careful while using gas and electrical equipment because they might be damaged and gas might be leaking. If a high voltage line has fallen on your electric equipment it might be under high voltage;
4. If you are in a damaged building, move to the less damaged part of the building or get under some massive furniture until the storm is over; after the storm is over take your documents and leave the building.

## TOPIC 7. HAIL

### THE 5<sup>TH</sup> GRADE

#### ACTIVITIES

**Goals:**

- ❖ Provide students information on the hazards of hail;
- ❖ Teach students the rules of safe behavior in different environments during hail.

**Activity 1**

A situational exercise: David and Giorgi have decided to go for a walk. At this moment, clouds have appeared on the sky. The air temperature is 14°C. Giorgi is scared to go out but David convinces him that there is no probability of hail in such weather.

**Activity 2**

The teacher gives the students cards prepared in advance and asks them to write down a list of damages that may be caused by hail, after which the students must put their lists into an *Idea Box* prepared in advance. The students are given 15 minutes for thinking. After this, the *Idea Box* is opened and the students' ideas are written on the blackboard.

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### Activity 3

The teacher asks the students to work in groups in order to come up with the rules of safe behavior at home, in wildlife areas and in a car during a hail storm.

### Activity 4

The teacher asks the students to work in groups in order to come up with the rules of safe behavior at home, in wildlife areas and in a car after a hail storm.

Questions:

1. Was the boys' behavior correct?
2. During which seasons are hails expected?
3. What are the signs warning us about hail?
4. Where in Georgia is hail most frequent / rare?
5. Where is hail most damaging?

## SUPPORTING MATERIAL: HAIL



### Terminology and Notions

**Hail** is a form of solid precipitation which consists of balls or irregular lumps of ice that are individually called hail stones. Hail stones on Earth consist mostly of water ice and measure between 5 millimeters (0.20 in) and 200 millimeters (7.9 in) in diameter, with the larger stones coming from severe thunderstorms. Hail mostly comes during warm seasons of the year when the temperature on the earth's surface is above 20°C. Hail may continue for 6-15 minutes.

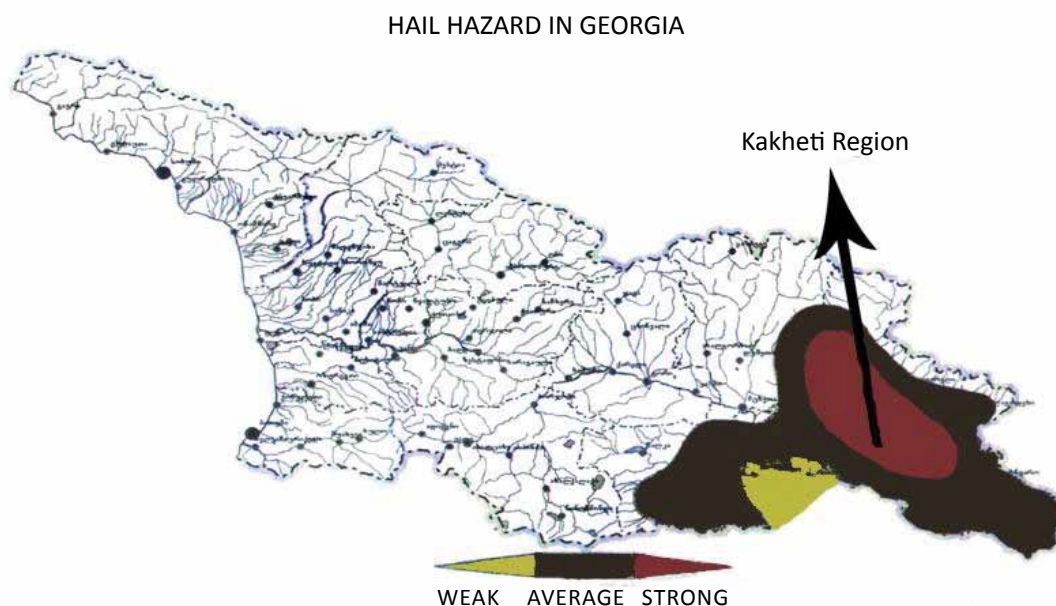
Hail is one of the undesirable natural phenomena that can harm agriculture. It can damage crops considerably and also domestic animals. Annual

losses caused by hail are significant. It is necessary to remember that storm clouds must be avoided during warm seasons.

### Hail Occurrence

It is known that in Georgia hails are especially frequent on hills and plateaus. It rarely occurs on the plain and wide river canyons.

**Figure 9: The Map of Hail Risk Distribution in Georgia**



*Source: National Environmental Agency*

Hails are especially frequent in the Javakheti Mountains, the southern slopes of Achara-Inereti, the Trialety ranges and the north part of the Kakhети range. Damages are most significant in those Kakhети districts where viticulture takes up a significant share in the local economy. The table given below shows the damages suffered by the country during last ten years.

**Table 7: Losses Caused by Hail in Georgia (2001-2009)**

Hail	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number	8	8	7	11	19	11	7	5	15
Losses (mIn. GEL)	10,4	6,8	6,0	12,5	6,9	6,2	5,0	2,9	9,5

### Rules of action before, during and after a disaster

**Before a disaster:**

Remember that storm clouds must be avoided during warm seasons.

**During a disaster:**

1. If you are in a building, stay away from windows in order to avoid injuries from broken glass;
2. Stay at home until the hail is over;
3. Hails are often accompanied by lightning and thunderstorms, therefore avoid using electrical equipment;
4. If you are in the street, find a shelter immediately. If there is no shelter, cover your head with your hands, a bag or some clothing. Avoid low places because they may be filled with water and hail stones;

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5. If you are in the country, try to find a shelter. If you are in the open area lie down on the ground and don't forget to cover your head and face with your hands;
  6. If you are in a car, stop it and stay where you are. It is preferable to find a covered place; for example a bridge, garage or a shed. Avoid places covered with hail stones because you may lose control of the car; close windows and sit with your back to the windows in order to avoid injuries if the glass is broken.

**After a disaster:**

1. If there is an injured person next to you call an ambulance; tell the doctor the size of the hail stones;
2. If power transmission lines are broken it is dangerous to approach them because there is a risk of electrocution; in the case of fire it is better to avoid it and call a fire department.

## TOPIC 8. LIGHTNING

### THE 6<sup>TH</sup> GRADE

#### ACTIVITIES

**Goals:**

- ❖ Help students to analyze lightning hazards;
- ❖ Help students to spot places that will be safe during lightning;
- ❖ Teach students the rules of safe behavior at home and in open space during lightning.

**Activity 1**

The teacher divides the class into groups of three-four students and gives them the task of preparing posters listing what must be done at home during lightning.

**Activity 2**

The teacher divides the class into groups of three-four students and gives them the task of preparing posters listing what must be done if they happen to be in an open area during lightning.

**Activity 3**

A situational exercise: One day, in May, Lizi and Tamuna decided to go for a walk and gather flowers in a forest. They wanted to give the flowers to their mother and make her happy. The girls were just going to leave the house when they noticed dark clouds in the sky. The weather forecast had predicted a heavy rain. Lizi was scared and asked Tamuna to think about a different present for their mother. Tamuna was surprised and told Lizi that she was a coward: "Put on your rubber boots and let's go!"

**Questions:**

1. Can we expect lightning/thunder in such weather?
2. Is Tamuna's proposal correct? Why?
3. What should the girls do if they are near the forest when the rain starts?

**Activity 4**

The teacher gives a home task to the students, asking them to check the weather forecast for the weekend and to analyze whether lightning can be expected. The students must substantiate their opinions.

Questions:

1. Why lightning is not characteristic of the cold winter season?
2. What is usually damaged by lightning?
3. What number should you call if lightning causes fire?

## SUPPORTING MATERIAL: LIGHTNING



### Terminology and Notions

**Lightning** is an atmospheric electrostatic discharge (spark) accompanied by thunder, which typically occurs during thunderstorms, and sometimes during volcanic eruptions or dust storms. Lightning generates 10-20 ampere current and is therefore fatal. It is especially dangerous for people in an open area.

Lightning strikes often have fatal consequences. On average, 300 people die from lightning in the world every year. Lightning mostly strikes tall things, such as trees that break down and catch fire or it may strike power transmission lines and antennas fastened on roofs and buildings- again causing fire.

### Occurrence

Lightning occurs during thunderstorms, within rain clouds gathered in the sky. Lightning may also occur during volcanic eruptions, tornadoes and sand storms. Lightning is a seasonal phenomenon, less characteristic of cold winter periods.

## Rules of action before, during and after a disaster

### Before a disaster:

1. If you are planning to go to the countryside, check the weather forecast;
2. If a thunderstorm is expected it is better to postpone the trip;
3. It is good if you can estimate the distance to the front line of a thunderstorm. In order to do this you must check the time interval from the moment you see the lightning until you hear thunder. Lightning always precedes thunder. We know that the sound speed travels on average about 1km every 3 seconds. Reduction of the time interval between the sight of lightning and the resulting thunder means that the danger is approaching and protective measures must be taken. If there is no interval between lightning and thunder means, it means that the cloud is already over your head.

### During a disaster:

1. If you are in a building it is necessary to close windows, doors, ventilation pipes and chimneys;
2. It is necessary to turn off the telephone, TV set, and other electrical equipment because lightning may strike electrical cables and pass through wiring;
3. Do not take a shower because water and metal both conduct electricity;
4. Do not light the fireplace because the heat coming from the chimney may attract lightning;
5. It is better to stay away from electric wires, lightning rods, water pipes, antennas and windows;
6. Do not go out without an urgent necessity;
7. If during a thunderstorm you are in an open area, do not stand under a tall tree. Lightning is most damaging for oaks, fir trees and poplar. It is better to stay 30-40 meters away from them, and under

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short trees. Avoid trees that are standing separately. Remember that lightning does not strike bushes!

8. If the area is open, it is better to find a lower place or a cavity and squat there. It is dangerous to stand or lie down on the ground, because this increases the exposure area;
9. It is necessary to get rid of metal items such as a bicycle, coins etc.;
10. Do not stand under an umbrella;
11. If you are near a water reservoir it is better to stay away from it and find a low place;
12. Do not run during the occurrence of lightning; move slowly towards a shelter because the air flow may attract lightning;
13. If you are in a car, do not get out. It is better to close the windows and turn of the antenna. Do not park your car under tall trees or any structures that may fall down and hit you;
14. If there is an injured person next to you, remember that the victim may lose consciousness; it is necessary to provide first aid.

**During a disaster:**

1. If there is an injured person next to you, call an ambulance;
2. In case of fire, it is better to stay away from it; move opposite the wind direction and call the fire department. Act as described in Topic 9: Fire.
3. Stay near a road because smoke may reduce visibility;
4. Cover your mouth with a wet cloth in order to protect your lungs; Remember that near the ground there is less smoke in the air, therefore it is better to breathe such air.

## **TOPIC 9. FIRE**

### **THE V-VII GRADES**

#### **ACTIVITIES**

##### **The 5<sup>th</sup> grade**

**Goals:**

- ❖ Help students understand fire hazards and rules for preventing them;
- ❖ Teach students the main rules of safe behavior during a fire.

##### **Activity 1**

The teacher divides the class into three groups and asks one group to paint pictures of trees, a campfire, a river, animals etc. The other two groups must write on colored stickers a list of measures that must be taken in order to protect forests and what actions are prohibited in a forest. After the students finish working on the task, they hang the poster on the blackboard and put the colored stickers in the appropriate places.

##### **Activity 2**

The teacher divides the class into groups of three or four students and gives them the task of preparing an illustrated poster or a brochure:



1. What would you do if your clothes caught fire?
2. What would you do if your friend's clothes caught fire?

Afterwards, the students will make presentations of their work in the class, with the help of the teacher.

### Activity 3

The teacher asks the students to think about and write on cards (prepared in advance) on how to avoid fire. The students put cards into a box, also prepared in advance. The teacher opens the box and reviews the answers one by one. A "volunteer" student draws the sun on the blackboard and writes the correct answers on each beam.

### The 6<sup>th</sup> grade

#### Goals:

- ❖ To help the students and their parents to develop a fire security plan and to organize an evacuation training.

### Activity 1

The teacher divides the class into three groups and gives them the following topics for discussion:

Group 1: What should you do if you see that the fat on the frying pan has caught fire?

Group 2: What should you do if you see that smoke and fire does not allow you to leave the room?

Group 3: What should you do if you cannot leave the apartment because of fire?

Group 4: What should you do if there is a fire in the classroom?

The teacher asks the students to be creative (prepare an illustrative poster or a brochure etc.). After they finish, two students from each group must make presentations and the teacher summarizes the topic.

### Activity 2

The teacher divides the class into groups of five and asks them to prepare for the next lesson; a scenario (a brief play) about how we should prepare for a fire. The teacher asks the students to discuss this issue with their parents and ask them for advice. At the next lesson, the students must perform the play after which the teacher will make a summary and fully inform the students about the rules of behavior during a fire.

### Activity 3

The teacher divides the class into groups and asks them to prepare a poster "Fire Extinguishing Rules." The groups prepare the posters and exchange them; they analyze the differences and present new (summarized) rules; the class discusses the necessity to know/follow the rules.

### Activity 4

An individual task: the teacher explains to the students the importance of having an evacuation plan and gives them the task of drafting such a plan at home, together with their parents. The plan must show exit paths from each room and an additional emergency exit from the building. It is preferable to use red arrows to show the exit routes. The plans must be drawn on graph paper used for math. It is desirable to show the apartment plan (windows, corridors etc.).

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## The 7<sup>th</sup> grade

### Goals:

- ❖ To teach students how to act during and after a fire in a forest or in the countryside.

### Activity 1

The teacher instructs the students to gather information on how deforestation can impact the climate, reduce resources of potable water and cause landslides. Afterwards, the students must make presentations.

### Activity 2

The teacher divides the class into groups and offers them the following scheme:

How to extinguish a small fire?	What must be taken into account while leaving a dangerous zone?
1.	1.
2.	2.

### Activity 3

A Social Project: cleaning of a forest.

## SUPPORTING MATERIAL: FIRE



### Terminology and Notions

**Fire** is a chemical reaction which requires the participation of three elements: oxygen, heat and flammable substances.

Massive forest and peat land fires may start in hot and droughty weather as a result of lightning, human carelessness or from other causal factors. Fires can lead to the destruction of buildings, wooden bridges and poles, power, transmission and telecommunication lines, warehouses of containing oil products and other fuel, as well as cause injury to people and animals.

During droughts or windy weather, fire may destroy not only low vegetation but also trees. Under these circumstances, fire may spread to tree crowns, especially fir trees. The spreading speed of low fires is 1-3 m/sec., while in the case of high fires it may reach up to 100m/sec.

Burning peat and plant roots may cause underground fires to spread in different directions. Peat can ignite by itself even under water and burn without air. A smoldering column of hot ashes and blazing peat dust can form above burning peat land and travel considerable distances in situations where there is wind, creating new fire points.

### Fire Occurrence

According to statistics, more than 500 forest fires were recorded in Georgia in 2010.

Shares of forest fire causes in percentages:

- Irresponsible actions and carelessness of people in forests – 93%;
- Lightning/thunderstorm – 2%;
- Other causes – 5%.

## Rules of action before, during and after a disaster

### Before a disaster:

1. Make bonfires far from bushes and trees and always have with you some means necessary for extinguishing the fire;
2. Create a safe zone between the house and flammable plants;
3. Below a 3 meter height cut off all branches of trees standing near your house;
4. Remove moss and dry branches from plants standing near the house;
5. Clean ditches and pits from dry branches, leaves and cones;
6. Keep flammable materials in checked safe containers;
7. Work out an evacuation plan for leaving the house and its vicinity. Have an alternative option just in case;
8. Work out an emergency communication plan (in case if you are isolated by fire);
9. Ask your relative or friend living in a different location to be your contact person;
10. Have special equipment and supplies (a lantern and a radio with spare batteries, food and water supply and first aid kit);
11. It is preferable to have smoke detectors at home;
12. Have a fire extinguisher and know how to use it. Remember that a fire extinguisher can be used during the first minutes when the fire starts, until it turns into a serious fire;
13. Stay away from burning and flammable lighting equipment, especially in summer;
14. Remember that it is important to use fireproof materials during construction (e.g.: use thick furnaced glass for big windows and doors).

### During a disaster:

1. If fire has just started, wrap the unplugged iron (TV set) in a thick woolen blanket of cloth and try to ensure that air cannot penetrate it. If burning has not started it is necessary to leave the place urgently. Remember that smoke is toxic;
2. A weak fire that has caught a TV set on fire can be put out with water, but do not stand next or behind the TV set because the kinescope may explode and injure you;
3. When water cannot be used (because the equipment is plugged-in) or there is no water and the fire is not strong, you can use cooking soda or calcite soda, washing powder, sand, soil (e.g. from a flower pot), although you must quickly leave the area if these measures do not help;
4. If you are in the kitchen and see a flame of burning fat on the frying pan close the cover quickly and turn off the gas. You must absolutely not pour water on the burning frying pan because the water will boil and you run the risk of being splashed by boiling water and fat. If the fire started in your absence and the window of opportunity the enables you to put it out quickly has passed (1-2 minutes), leave the house immediately;
5. When you leave the house close the door tightly in order to limit the spreading of the fire (doors can hinder fire for more than 10-15 minutes), call adults and the fire department;
6. If the fire and smoke allow you to leave the house, turn off electricity before leaving;
7. Harmful combustion products may fill the room at your height or higher. Therefore leave the room on your knees or crawl out; near the floor the temperature is lower and there is more oxygen;

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keep your head no higher than 30 cm above the floor; above this height accumulation of heavy poisonous gases (including carbon dioxide) is possible;

8. While leaving a burning building, make sure that all your friends (relatives, classmates) are next to you; if not, immediately inform adults / teachers;
9. If there is no opportunity to leave the room, move towards a window, stand there and try to attract attention of people standing outside. Give signals from the window – wave a big bright cloth in the daytime and light a lantern at night;
10. If you are in a burning room, try not to open the doors and windows without an urgent necessity (if you are suffocating or losing consciousness) because in this case, the room will no longer be airtight; smoke will quickly fill it and breathing will become impossible even at an open window;
11. If your clothing has caught fire do not run because this will intensify burning. Take the clothes off, throw them in a safe place and put out the fire. If it is impossible to take off clothes wrap yourself into a blanket (or any other cloth) or lie down on the floor or on the ground and try to put out the fire by rolling. Use these methods to assist other people;
12. If you are near a fire in a forest or peat land and cannot extinguish the fire by yourself, immediately inform people who nearby about the necessity to leave the hazard zone;
13. A small fire can be put out if you place branches with leaves on it, pour water on it, cover it up with dirt or stamp it with you feet;
14. If you are in an open area or in a field, breathe near the ground, because there is less smoke there; cover your nose and mouth with any cloth you can find.

**Things that must never be done during a fire:**

- ✘ never endanger your life to save property;
- ✘ never pour water on burning electrical equipment if it is switched on! if a TV set, a refrigerator or an iron is burning turn off the electricity from the main disconnect switch or unplug them without endangering your life;
- ✘ do not hide in a wardrobe, a storeroom, a corner etc.;
- ✘ do not use an elevator;
- ✘ do not open windows and doors (this increases pressure and intensifies combustion);
- ✘ do not jump from windows of upper floors;
- ✘ do not panic;
- ✘ do not try to extinguish the fire by yourself;
- ✘ do not try to leave by means of a staircase full of smoke.

**After a disaster:**

1. After leaving the fire zone, inform the administrative body of the settlement, forestry, fire department and local population about the place, area and characteristics of the fire.
2. Be careful after returning to the area damaged by the fire because hot spots may suddenly develop a flame;
3. Immediately check the roof and put out fires at all possible fire sites;
4. Cover your mouth with wet cloths in order to protect your lungs from injury.

## TOPIC 10: DROUGHT

### THE 7<sup>TH</sup> GRADE

#### ACTIVITIES

##### Goals:

- ❖ Provide students with information related to drought and its causes;
- ❖ Help students to understand that if the right decisions are made, it is possible to ease/reduce the drought effects;
- ❖ Teach children the rules of actions that need to be taken during a severe drought.

##### Activity 1

The teacher divides the class into groups and asks them to prepare posters that focus on actions taken before, during and after a drought. Following the completion of the exercise, the posters are placed on walls and the groups make presentations.

##### Activity 2

The tutor divides the class and provides the following topic for discussion:

**Group 1:** Can we avoid the drought?

**Group 2:** Can we reduce the accompanying results of a drought?

After 15 minutes, two students from each group make presentations and a discussion is held.

Key points/suggestions for discussion:

- Rational use of water
- Construction of dams
- Planting methods
- Rain/storm water collection etc.

Questions:

1. What is drought?
2. What danger does a human being face during severe heat?
3. List symptoms of overheating (hyperthermia).

#### SUPPORTING MATERIAL: DROUGHT



##### Terminology and Notions

**Drought** is a period of time (months or years) during which a part of the land suffers from lack of rain, causing severe damage to the soil, crops, animals, and even people, sometimes causing death. Drought may also be caused by soil transformations occurring as a result of the actions and/or activities of humans, as well as from the degradation of the environment.

Strong heat is characterized by a 10°C or more increase of average outside temperature for several days. In this case, there is a danger that it can cause an increase of body temperature in humans beyond

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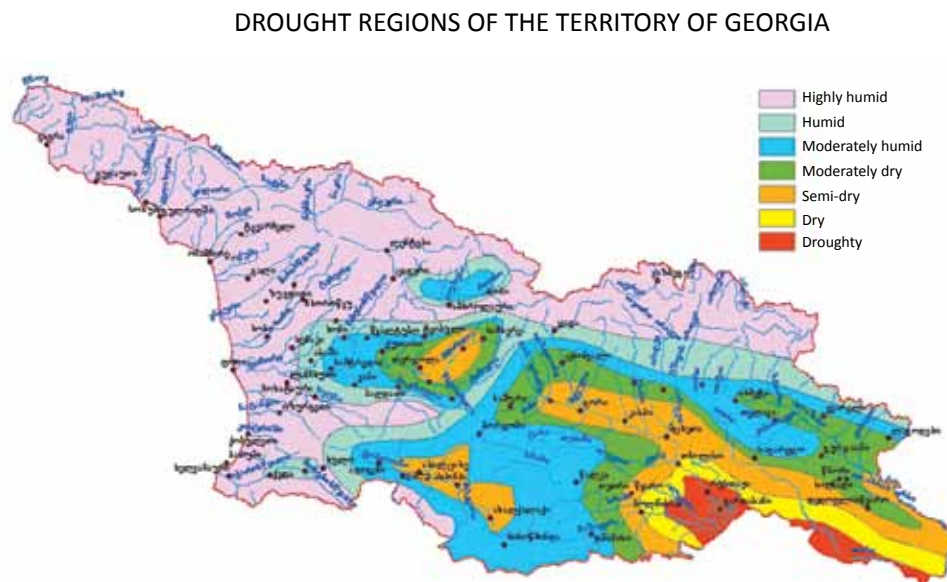
37.1°C, as well as affect changes in thermoregulation, when the body temperature reaches 38°C. Such critical conditions are caused as a result of long-term and overheating, which can cause sunstroke or cardiac abnormalities. Symptoms of overheating (hyperthermia) are: the reddening of the skin, the desiccation of mucous membranes, strong thirst, possibly faintness, cardiac abnormalities and decreased respirations (breathing).

Plants and crops are damaged as a result of drought and the agricultural sector incurs great losses. The price of food also increases. In worst case scenarios, droughts can cause massive hunger, illness and the migration of large swaths of the population.

### Drought Occurrence

Droughts can be observed in practically all parts of Georgian territory. This phenomenon is particularly acute in the regions of Shida and Kvemo Kartli, in Kakheti, as well as the Zemo Imereti regions.

**Figure 10: Drought Regions on the Territory of Georgia**



*Source: National Environmental Agency*

### Rules of action before, during and after a disaster

#### Before a disaster:

1. Store the vessels and in case of need, fill with water;
2. Prepare the clothes appropriate for heat conditions, also household appliances (ventilators/fans, air-conditioners);
3. If you are in the countryside, arrange stalls, pavilions, wells, also window shutters. If possible, purchase an autonomic source of electricity in order to provide energy for household electric appliances;
4. Utilize water economically;
5. Your family members should know and you should teach them how to respond to overheating or cases of hyperthermia.

**During a disaster:**

1. Avoid the effects of high temperatures;
2. Wear light-colored air-penetrable clothing (preferably cotton) and a hat. Remember, that sunburned skin does not secrete sweat and does not cool;
3. Walk unhurriedly; try to spend as much time as possible in the shade;
4. In case of overheating (hyperthermia), immediately move to a shady, cool, breezy area or take a shower;
5. Consume adequate amounts of water (stay hydrated); Try to cool your body to avoid sunstroke;
6. Remember that during drought, the probability of fires also increases.

**After a disaster:**

1. If anyone faints after sunstroke, emergency medical measures should be taken: Begin basic cardio-pulmonary resuscitation (CPR) immediately and call for Emergency Medical Services/Assistance (EMS) if possible;
2. Contact local government agencies to receive information about disaster and assistance for the population.

## TOPIC 11: AVALANCHE

### VI-VII GRADES

#### ACTIVITIES

##### The 6<sup>th</sup> Grade

**Goals:**

- ❖ Provide students with information regarding avalanche and its related hazards;
- ❖ Help the children to identify territories under the hazard of avalanche;
- ❖ Teach students safe norms of behavior in case of an avalanche.

##### Activity 1

The teacher shows the students a short film (or Power Point presentation) about avalanche; after the film presentation, the students should discuss the following issues:

1. What is an avalanche?
2. What causes an avalanche?
3. Which season of the year is the avalanche most likely to occur?
4. Which part of the day is the avalanche most likely to occur?
5. What climatic conditions facilitate the occurrence of an avalanche?
6. What are the warning signs of an avalanche?
7. What damage/losses can the avalanche bring?

##### Activity 2

The teacher asks the children whether they have information regarding the parts of Georgia that avalanches are most likely to occur and how often avalanches occur in their region/village/town.

The teacher makes a short presentation as to how to act in case of an avalanche and what is recommended

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to be done when this happens. Then the teacher asks students to volunteer to demonstrate the safest pose that has to be taken during avalanche.

The students observe the demonstration and note the teacher's instructions. If there is the will, other students should repeat the recommended pose.

**Activity 3**

The teacher invites a mountain climber or rescuer who has experience with avalanches to talk with the students.

The alpinist tells the students about his experience, what he saw, heard and felt during the avalanche. During the talk, a special emphasis is placed on preventive measures and actions to be taken in potential avalanche areas.

The alpinist/rescuer discusses with the children the list of those necessary items one should have when being in mountains.

The students ask questions and note the recommendations.

**The 7th Grade**

**Goals:**

- ❖ Teach the students how to behave if they have to travel to mountainous regions in winter;
- ❖ Provide the students with information about protection from avalanche and the norms of behavior during an avalanche.

**Activity 1**

The teacher gives a task to the students that entail developing a plan or *matrix* that indicates how to behave when they have to travel through mountainous regions in the winter. This task should be done in groups.

1. What information should they obtain in advance regarding the weather, location/place?  
-----
2. What information should they hold regarding potential risks?  
-----
3. What should they supply themselves with for travel?  
-----
4. Put together a list of necessary items for housing, transportation, as well as the things they need to carry with them during travel.  
-----

The groups present their plans. The teacher, together with the students, summarizes the presentations and makes a unified list.

**Activity 2**

The teacher breaks the students into groups and tasks them to prepare posters on the following topics:



**Group 1:** What could be done to avoid an avalanche? To reduce the chance of an avalanche occurring?

**Group 2:** How to behave during an avalanche if we are alone? Or with somebody?

**Group 3:** How to behave after an avalanche? Who to ask for help? How to help ourselves?

The teacher provides the necessary resources to the students and if required – instructions. Following the completion of assignment, the groups make presentations and display the works in the classroom.

Questions:

1. What is envisaged under avalanche protective measures?
2. What works are done during the avalanche danger?

### SUPPORTING MATERIAL: AVALANCHE



#### Terminology and Notions

An **avalanche** is a sudden rapid flow of snow down a slope, occurring when either natural triggers or human activity causes a critical escalating transition from the slow equilibrium evolution of the snow pack. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Powerful avalanches have the capability to entrain ice, rocks, trees, and other material on the slope.

An avalanche is preceded by a specific whistle sound, which is often a sign of its approach.

For avalanche formation, the surface incline in the range of 20-45° is optimal. On relatively steep slopes, snow packs and avalanches are less likely to occur. During spring periods, mainly wet snow masses create avalanches. Dry snow masses are no less dangerous and actually move faster; this occurs mainly in winter.

The avalanche might cause the destruction of buildings, engineering structures and the blocking/covering of roads and mountain paths with dense snow. During avalanches, inhabitants of mountainous districts, tourists, alpinists, geologists, border guards and populations within proximity of the avalanche are at risk of trauma and can be covered under a thick layer of snow.

Avalanche preventive measures consist of the observation of avalanches, organizing operative forecasting services and the artificial triggering of the avalanche. Protective engineering measures envisage plant seeding, construction of special dams, avalanche cutters and the building of exits/corridors and tunnels in potential avalanche areas.

During an avalanche hazard, the following preventive works are carried out: in potential avalanche areas, snow pack/accumulation is controlled, the avalanche is artificially caused, protective structures are constructed, and rescue facilities are prepared.

#### Avalanche Occurrence

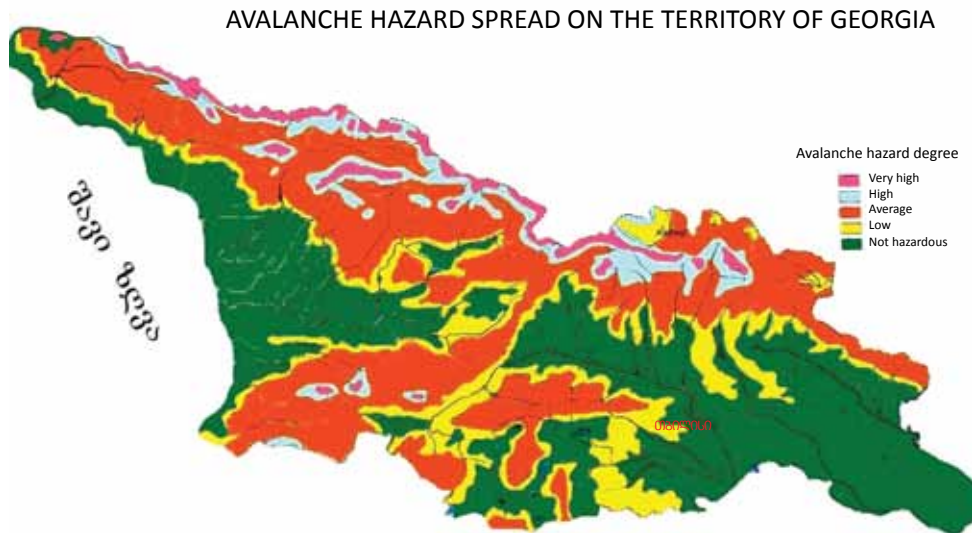
Avalanche disasters are characteristic to Georgia. Avalanches that have occurred during over recent years covered 36% of the territory of Georgia. There were also cases of deaths as a result; thousands of dwellings and other structures damaged, roads and electro-transmission lines were destroyed. Monetary losses incurred by avalanches have exceeded tens of millions in USD.

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More than 50% of Georgia’s territory is located within avalanche hazard zones. This occurrence is particularly true in the medium and high mountainous zones. The most dangerous areas in this regard are the west and central sections of the Caucasus Mountains and the mountainous regions of Guria and Ajara.

Approximately 220 settlements and households and 10,000 structures comprised of 40,000 people lie within the hazard zones of the country.

**Figure 11: Avalanche Hazard Spread on the Territory of Georgia**



*Source: National Environmental Agency*

## Rules of action before, during and after a disaster

### Before a disaster:

1. Don't travel to the mountains in bad weather. If you must – inform the person who will contact the rescue/emergency service in case of need.
2. When in the mountains, pay attention to weather changes.
3. When going to the mountains, you should be aware of potential avalanche areas.
4. Avoid the avalanche hazard. Avalanches are more frequent in places where the inclination of the mountain slope is over 300, and over 200 on slopes without forests and bushes. Avalanches are observed during snows on slopes whose inclination exceeds 450.
5. During an avalanche hazardous period, avoid the slopes and foots of mountains whose incline exceeds 300, and after snow – on slopes and mountain foot areas where the incline is within 200.
6. The most hazardous period for avalanches is spring when the snow layer is already high and starts melting from dawn till dusk. Avalanche danger is still a concern in mountainous areas during the summer period.

### During a disaster:

1. Immediately leave the hazardous area – run or walk quickly, and move to a safe area, or seek shelter under the mountain jut, don't stand behind young trees.
2. If you are unable to escape from an avalanche, get rid of all baggage, get into a position with your head facing in the direction of the avalanche's movement.

3. Try to hold your knees tight to your chest.
4. In order to protect your mouth and nose, cover them with a pair of gloves, scarf, or a collar. Try to remain on top of the avalanche and make a hand movement similar to swimming in order to get to the edge of the avalanche (its speed is less on the edge).
5. When the avalanche stops, try to create a free space around the face and breast for ease of breathing (an air pocket).
6. If you can, move to the surface (you will find its location by fall direction of any/item or saliva).
7. Don't cry/shout when you fall in avalanche; snow completely suppresses the sound of your voice, watch your strength, oxygen and warmth.
8. Try not to fall asleep.
9. Remember that you are being looked for and will be certainly saved. There are cases when people fallen in avalanches were saved after several days, and in some cases even after two weeks.

**After a disaster:**

1. If you fell beyond the avalanche zone, by any means inform the administration of the nearest settlement about the occurrence and start looking for victims.
2. Having come out of the snow, carefully investigate your body independently or with the help of rescuers, and if needed, assist yourself.
3. Inform your relatives and close people about your condition and of your location.
4. When reaching the nearest settlement, inform the local administration about the avalanche.
5. Address the local medical point or doctor even in the case that you were not injured by the snow, then act according to the instructions of either a doctor or a rescue/emergency team.

## TOPIC 12: SNOW-DRIFT, SNOW-STORM

### THE 7<sup>th</sup> GRADE

#### ACTIVITIES

**Goals:**

- ❖ Provide students with information related to snow-drift and the respective hazards;
- ❖ Teach children to exercise safe behavior during a snow-drift.

**Activity 1**

The teacher makes a short presentation about the snow drift:

- What is a snow drift?
- What causes a snow drift and what conditions are suitable for it?
- What damage can a snow drift bring?

Investigate together with the children the degree of risk for their area is for snow drift; explain the rules of behavior during a snow drift and what measures they can take to help adults.

**Activity 2**

The teacher breaks the children into two groups and gives them a task to develop a plan as to how they should act during a snow drift when they are at home and when they are in an open area.

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The following information should be reflected in the plan:

1. How should they obtain the necessary information?
2. How can they identify a disaster?
3. How should they act to reduce damage?
4. What kind of things/items will help them to reduce damage during a disaster?
5. Who can they contact when this happens? Do they have the phone numbers of the respective services?

The teacher asks the students to justify their answers. The students transfer their plans and ideas onto a poster and make a presentation and discuss each issue.

### Activity 3

Group project: the teacher gives a task to the students to develop a project pertaining to snow drifts that have occurred in Georgia in recent times. The students ask the following questions in the project:

- Where did the disaster happen?
- What were the preconditions of disaster?
- What were the losses incurred by the population due to the disaster?
- Was it possible to reduce the damage or avoid the disaster by carrying out the respective preventive measures?

The students should prepare a small-scale action plan of what could be done in an individual city/town/village/region to reduce the damages and losses caused by the disaster.

The students present their work.

## SUPPORTING MATERIAL: SNOW-DRIFT, SNOW-STORM



### Terminology and Notions

A **snowdrift** is a deposit of snow sculpted by wind into a mound during a snowstorm. Snowdrifts resemble sand dunes and are formed in a similar manner, namely, by wind moving light snow and depositing it when the wind is slowed, usually against a stationary object. **Snowstorms** are storms where large amounts of snow fall.

A snowdrift and snowstorm are hazardous to the population. Roads, settlements and buildings are covered with snow. The height of the snowdrift might reach 1 meter, and in the mountainous districts – 5-6 meters. During a snowdrift or a snowstorm, visibility on the roads might be reduced to within 20-50 meters. These phenomena can also cause damage to or destroy buildings and roofs, as well as fell electric power lines.

## Rules of action before, during and after a disaster

### Before a disaster:

1. If you receive warning regarding a heavy snow-storm, tightly close the windows, doors, garret and ventilation pipes;
2. Stick paper tape onto the window glasses, close the shutters;

3. Store two-day supply of water and food, medicines, autonomous lighting devices (lanterns, kerosene lamps, and candles), travel cooker, radio receiver on batteries;
4. Remove all items from balconies and window sills that could be blown away by heavy winds;
5. Switch on the radio receiver and TV set to get important information;
6. Be ready for electricity cut-off;
7. Move to a strong building if possible;
8. Prepare snow removal tools.

**During a disaster:**

1. One can leave the building only in an emergency, leaving alone is absolutely not recommended;
2. Travel by car only on larger roads and highways;
3. When getting out of the car, don't go beyond the visibility area of the car;
4. If the car stalls on the road, switch on an alarm signal with interrupted horn, hang a bright colored piece of material on the antenna, wait for assistance inside the car. In addition, leave the engine turned on and the glass slightly down for ventilation purposes to avoid carbon monoxide poisoning;
5. If you lose your direction from a settlement when walking, enter the nearest house and wait until the snow-storm is over;
6. Be careful when making contact with strangers, as during disasters, cases of car theft, the robbing of apartments and office spaces drastically increases.

**After a disaster:**

1. If you happen to be in a blocked building during a heavy snow-drift, carefully and without panic find out whether there is a possibility of leaving the building independently;
2. Inform the police or local administration about the snow-drift characteristics;
3. If it is impossible to clear the snowdrift independently, try to contact the emergency service;
4. Switch on the radio-receiver or TV set and follow the instructions provided by the local government;
5. Take measures to preserve warmth and economically consume the food supply;
6. If you suffer the freezing of various parts of the body, warm the frozen part and rub with dry soft material/fabric, then put into the warm water with a gradual increase of temperature of up to 40-45 degrees. If the pain has gone and sensitivity has returned, dry yourself, put on warm clothes and see the doctor.

## TOPIC 13: GLAZE-ICE

### VI-VII GRADES

#### ACTIVITIES

##### The 6th Grade

**Goals:**

- ❖ Provide the students with information about glaze-ice and its related hazards;
- ❖ Help the children to identify potential hazardous areas during the occurrence of glaze-ice;
- ❖ Teach the students what to do during the glaze-ice in order to reduce traumas.

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### Activity 1

The teacher asks questions:

- What is a glaze-ice?
- When does it occur?
- What damage can it bring to humans?
- Are there are places in our school which might become dangerous during the glaze-ice.

Then the teacher explains the rules as to how they should behave during the expected glaze-ice; presents measures to be taken to reduce injuries: metal soles on the heels of shoes/boots, adhesive plaster or insulation tape on dry shoe soles, treatment of shoe soles with flint cloth etc.

### Activity 2

The teacher asks the students to prepare a poster on the following topic: “How to behave and reduce injury during glaze-ice.” After the exercise is completed, the groups place the posters in the classroom and make presentations.

## The 7<sup>th</sup> Grade

### Goals:

- ❖ Teach the children to forecast the glaze-ice;
- ❖ Familiarize the children with actions to be taken in case of falling on glaze-ice.

### Activity 1

This exercise can be done only in the winter period.

The teacher asks the students to regularly check the weather forecast for one week and enter the data in a preliminarily prepared table.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Temperature during the day							
Temperature during the night							
Precipitation							

Based on the data, they will discuss whether the glaze-ice is expected in their town/village within the next week. The teacher asks the students to justify their thoughts.

### Activity 2

The teacher breaks the class into four-person groups and asks them to prepare illustrative posters on the following topic: “Action rules during a fall due to glaze-ice”. Following the completion of the assignment, the students make presentations and the works are discussed.

## SUPPORTING MATERIAL: GLAZE-ICE



### Terminology and Notions

**Glaze-ice** is a smooth, transparent and homogenous ice coating occurring when freezing rain or drizzle hits a surface. It is similar in appearance to clear ice, which forms from supercooled water droplets. It is a relatively common occurrence in temperate climates in the winter when precipitation forms in warm air aloft and falls into below freezing temperature at the surface.

Glaze-ice mainly occurs during relatively moderate frosts (0°C), sometimes during even lower temperature (-16°C). The thickness of the ice crust/outer layer often reaches several

centimeters and can break or damage trees due to the significant weight it adds. Glaze-ice can also block roads, stop traffic and damage electrical utility lines on poles.

### Glaze-ice Occurrence

Glaze-ice occurs during the intrusion of cold air-masses to Georgia from the west and from the east; relief shape plays a big role in its occurrence-particularly the directions of mountain ranges.

Glaze-ice is more frequent on the slopes in the wind direction. Glaze-ice occurs on the Javakheti mountain range, the western part of the Likhi range, the Gagra range and the Mamisoni pass for 3-6 days during the year. It rarely occurs in between the mountain plains.

## Rules of action before, during and after a disaster

### Before a disaster:

1. If, according to the weather forecast glaze-ice is expected, measures should be taken to reduce the probability of trauma and injury.
2. Prepare to wear less slippery shoes, apply metal soles on the heels, adhesive plaster or insulation tape on dry shoe soles, also treat shoe soles with flint cloth etc.

### During a disaster:

1. Walk on the sidewalk carefully and without running, making full steps using the whole sole of the shoe. In addition, slightly weaken legs; remove hands from your pockets to preserve balance.
2. Try to move in groups to soften the stroke when falling on the ground.
3. For the elderly, it is recommended to use a stick with rubber bottom or a special pointed stick while walking.
4. If you slip, get down to your knees, to reduce the falling height.
5. Glaze-ice is often followed by a freeze. In this case, special attention should be paid to electric utility lines and electro-transport contact network wires, as there is a threat of their breakage. If you notice the broken wires, notify settlement administration.
6. In case of a fall, apply ice to affected area wrapped in a polyethylene bag and rag/cloth for 20 minutes maximum with 5 minute intervals. This will stop the hemorrhage process and hinder the development of swelling. After the first 48 hours, you may switch from cold compresses to warm compresses to further mitigate the effects of swelling and bruising.

### After a disaster:

If after falling you feel strong joint pain or pain in the affected part of the body, dizziness or headache, visit the doctor immediately!

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## TOPIC 14: VOLCANIC ERUPTION

### THE 9<sup>TH</sup> GRADE

#### ACTIVITIES

##### Goals:

- ❖ Provide the students with information about volcanoes and risks related with the volcanic eruption;
- ❖ Teach children to identify potentially hazardous areas and safe territories;
- ❖ Familiarize the students with rules of getting ready for volcano eruptions when they are in the disaster area.

##### Activity 1

The teacher breaks the students into groups and asks them what items they should have when they are out of the disaster territory. The groups make presentations and discuss the similarities and differences between those presentations, summarize and develop a unified list.

##### Activity 2

The teacher breaks the class into two groups. The first group works on the action rules during a disaster, the second group works on the necessary behavior after a disaster. The rules will be posted in school.

##### Activity 3

The teacher explains to the students a risk scale.

For example: 1 is lower risk, 5 – is the highest. The teacher should suggest situations to which the students should apply points respective to the risk scale. Have the students justify their choice:

	Situation	1	2	3	4	5
1	Being at the ocean shore with the expectation of a volcano eruption					
2	Being on a bridge with the expectation of a volcano eruption					
3	Finding a shelter underneath the house located on a high solid place					

## SUPPORTING MATERIAL: VOLCANIC ERUPTION



### Terminology and Notions

**Volcanic eruption** is explosions or emissions of lava, ashes and toxic gases from deep inside the earth, through volcanoes. The volcanic eruptions may also trigger earthquakes, tsunamis, floods or landslides.

### Volcano Occurrence

Volcanoes are generally found where tectonic plates are diverging or converging. A mid-oceanic ridge, for example the Mid-Atlantic Ridge, has examples of volcanoes caused



by divergent tectonic plates pulling apart; the Pacific Ring of Fire has examples of volcanoes caused by convergent tectonic plates coming together. By contrast, volcanoes are usually not created where two tectonic plates slide past one another. Volcanoes can also form where there is stretching and thinning of the Earth's crust in the interiors of plates, e.g., in the East African Rift, the Wells Gray-Clearwater volcanic field and the Rio Grande Rift in North America.

Despite the fact that active geological processes are characteristic of the Caucasus mountain system and it represents young mountains, only extinct volcanoes are found here.

### **Rules of action before, during and after a disaster**

#### **Before a disaster:**

1. We should be aware that the territory located within the radius of 65 km from the volcano part of the high-risk zone. The territories that are far from the volcano are less dangerous and more time is available to vacate the territory if the volcano should become active;
2. The dangers presented might be of the following character: lava that burns and destroys everything on the surrounding territory, stones that might be thrown from the crater long distances (as far as 30 km), and ash, which is spread on a wider scale. This causes flight delays, the reduction of visibility, plant/seed damage, etc.
3. In economically developed countries there is a practice of prior notification regarding potential volcano eruptions, which reduces damage caused by the volcano;
4. In the hazardous zone, it is necessary to have extra filters both for cars and home ventilation/heating systems;
5. It is necessary to have wrapping plastic/polyethylene in order to wrap and protect the computer and other electric equipment in case of necessity;
6. It is necessary to have an ample food and water supply;
7. It is necessary that all family members have masks to protect their lungs when breathing;
8. Find out whether there is an alarm or warning system in place where you are located, and how it operates;
9. It is recommended to select a higher, steady location prior to evacuation since there is a high probability of flood when this happens;
10. It is necessary to agree to a location and time of meeting with family prior to the event of a disaster.

#### **During a disaster:**

1. During a volcano eruption, it is necessary to leave low-lying areas, as it is considered to be a high-risk area;
2. If there is a general evacuation regime, it is necessary that you follow the official instructions;
3. Take with you the necessary items (first aid kit, lantern/lamp, radio, and mask) and food and drink;
4. Wear clothes with long sleeves and long trousers, put on a hat and a mask;
5. When evacuating, observe maximum caution in gorges and bridges, as there is a danger of landslide and flood. Quickly leave such areas;
6. If evacuation is impossible, find a safe shelter in a building or room. Lock all the doors and windows. Try not to let the ash in. Take the higher floor, as it is possible that poisoning gas accumulates on lower floors of the building.

#### **After a disaster:**

1. After the volcano eruption, there is still a danger of it further erupting. The location might become unpopulated and inappropriate for living due to the volcano;
2. Wait for the information regarding the situation from TV and radio broadcasts;
3. Leave the doors and windows locked;

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4. If you have to leave the building, it is necessary that you wear clothes with long sleeves and long trousers, put on a mask and protective glasses;
  5. Frequently water the yard to avoid the possibility of ash flying into the air;
  6. Check whether the neighbors need any assistance;
  7. Frequently clean rooms with vacuum cleaner or wet duster.

## TOPIC 15: CLIMATE CHANGE

### VIII-IX GRADES

#### ACTIVITIES

##### The 8<sup>th</sup> Grade

###### Goals:

- ❖ Provide the students with information about climate change and related hazards;
- ❖ Discuss the causes and effects of climate change;
- ❖ Help the students to analyze how we contribute to global climate change.

###### Activity 1

Brainstorming: before the start of the lesson, the teacher asks the students to express their opinions about climate change; *eg*: What have they heard about it? What are the effects of climate change? A “volunteer” should write down opinions of the students on the board. After the exercise is completed, the teacher talks to the students about climate change; its causes and effects.

###### Activity 2

The teacher breaks the class into small groups and suggests preparing illustrated posters about the negative effects of climate change. The students are given 30 minutes for the exercise. After the completion of the exercise, the posters are posted and the leader of each group makes a presentation.

###### Activity 3

The teacher breaks the class into groups of four and asks them to think of what effects can climate change bring to different regions of the world. When doing the exercise, the students should consider various aspects related to climate change (temperature increase, sea level rise, increase of desert processes etc.) and indicate on the world map possible effects caused by these aspects.

During the exercise, the students can use the world map, which is provided in *Annex N9*.

##### The 9<sup>th</sup> Grade

###### Goals:

- ❖ Provide the students with information about climate change and its negative effects on Georgia;
- ❖ Help the teachers and their parents to analyze what effects climate change can have on routine life (family, farming, business, humans and society), as well as the effects on cities and countries;
- ❖ Familiarize the students with climate change mitigation measures;
- ❖ Help the children and their parents to analyze what could be done to stop global warming.

**Activity 1**

The teacher asks the students to search for information about climate change mitigation measures and prepare for the following questions:

1. What do you know about climate change mitigation measures?
2. What is the Kyoto protocol and what are its objectives?
3. How many countries ratified the Kyoto protocol?
4. When did Georgia sign up for the Kyoto protocol?

**Activity 2**

Brainstorming: what effect does climate change have on Georgia? The teacher writes a list of ideas on the board and then discusses them with the group.

**Activity 3**

Work in groups of four: the teacher asks the students to think of what effects climate change could bring: increased temperature, lack of water resources, droughts, frequent rains and floods, reduced bio-diversity, effects on family farming, businesses, humans and society and cities and countries.

The students are given the following table to discuss and are asked to fill in the table together with their parents. Then the issues are discussed in class at the next lesson.

	Increased temperature	Lack of water resources and droughts	Frequent rains and floods	Reduced bio-diversity
Family farming				
Business				
Humans and society				
Cities				
Countries				

**Activity 4**

The teacher explains to the students that we, as individuals and as a society can do much at home and at school by adopting climate change mitigation measures. The most important is that people understood what climate change is, what simple steps should be taken to mitigate climate change and its effects and thus, achieving significant results.

Then the teacher breaks the class into small groups and asks them to prepare an informational brochure which will provide advice to people as to what measures should be taken with regards to climate change. The students are given the instruction that during the exercise, attention is to be paid only in one direction (eg: energy conservation). The teacher may specify any other climate change mitigation measure for this exercise.

After the completion of the assignment, the teacher asks the students to take the brochures home, discuss them with the family and at the advice of parents, expand the information provided in the brochures.

At the next lesson, the brochures are discussed and presented in the class.

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### Activity 5

Individual exercise: the teacher asks students to write a letter (about one page) to a social or other influential leader in the community and explain to them their suggestions regarding climate change and its negative effects. The students should describe what is happening around them and provide recommendations with regards to that particular (adaptive or mitigation) measure, which will facilitate the reduction of such occurrences or their prevention in future.

### SUPPORTING MATERIAL: CLIMATE CHANGE



**Climate change** is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions or the distribution of events around that average (e.g., more or fewer extreme weather events). Climate change may be limited to a specific region or may occur across the whole Earth.

Scientists consider that as opposed to all other periods of noted climate change, current global change is mainly caused by human's industrial activity and intensive use of natural resources, which causes an increase in the so-called "greenhouse gas" (carbonic acid, nitric protoxide, methane, water steam etc.) concentration in the atmosphere.

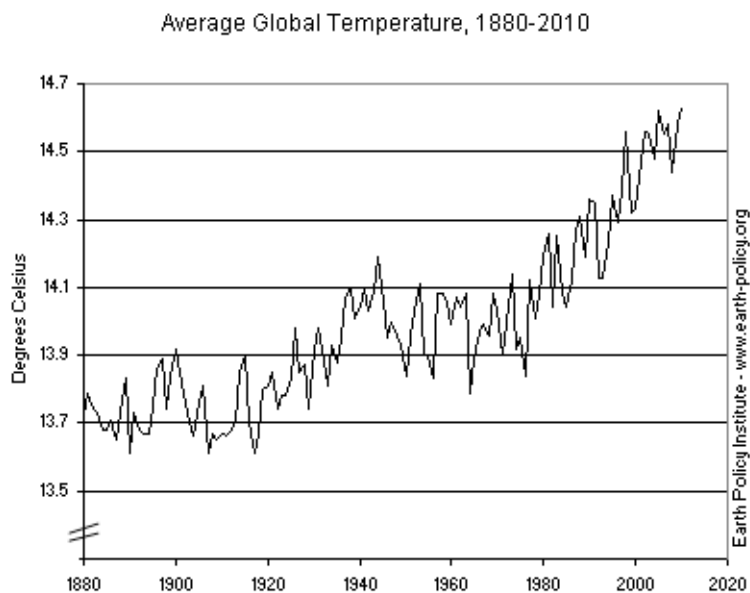


Some scientists still consider that warming is caused by natural reasons, for instance volcano eruptions or solar activity. However, by comparing the increase of gas concentration and temperature, close relationship between them becomes obvious.

**Global warming** is the continuing rise in the average temperature of Earth's atmosphere and oceans. Global warming is caused by increased concentrations of greenhouse gases in the atmosphere, resulting from human activities such as deforestation and burning of fossil fuels.

During the last century, the process of earth warming has significantly increased.

If such a tendency of global temperature increase continues, the world of future generations will be different from the contemporary one in many aspects.

**Table 8: Average Global Temperature Change**

Source: NASA GISS, Earth Policy Institute, <http://www.earth-policy.org/indicators/C51>

**Human's influences on climate change:** increased consumption of fossil fuel (coal, oil, and natural gas in particular) contributes to the increase in concentration of greenhouse gases. Alongside industrialization and the quick development of transport systems at the end of the 20<sup>th</sup> century, air pollution with greenhouse gases has increased. It should be noted that industrialization has caused the increased of number of cars, planes, electro-stations, factories and processing plants. More and more resources are needed for their operation. This fact further increases the concentration of greenhouses gases.

In addition, when compressing/compacting the waste on dump sites, air escapes, which creates an oxygen-free environment. As a result of the decomposition methane gasses are dispersed. Added to this are livestock residues and rice plantations, which are also the source of methane. In today's atmosphere, the concentration of methane is higher than in any other time of human existence.

Also, an important factor is increased population (the world's population has exceeded 7 billion), which increases the consumption rate of resources. Increases not only fuel consumption, but also forest cutting, which in the end will negatively affect the ecological equilibrium of the earth.

To summarize, the following main factors facilitate the increase in amount of greenhouse gases:

1. Increased population;
2. Industrialization;
3. Forest cutting;
4. Dump sites and livestock residues.

**Climate change effects:** climate change may be followed by a number of negative effects: glacier melting, a change in the ecosystem, the disappearance of many species, an increase in the arid earth area, the rise of ocean levels, the flooding of coastal lines or smaller islands, an increase in the spread of disease, also frequent natural disasters and extreme temperature, which, of course, will cause a reduction in agricultural yield.

When we talk about the increase of extreme temperatures, it should be noted what effect might follow. Countries with suitable natural resources produce the largest part of food consumed in the world. The

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majority of the population lives in these countries. In conditions of increased temperature and reduced sediments, soil erosive processes will activate. The soil will dry out and will be easily transferrable by wind or water. And this causes a reduction of productivity.

An increase of temperature will activate even stronger winds. The wind is produced by the uneven heating of the earth's surface; the greater the temperature difference between the places, the stronger the winds will be (snow-storm, hurricane, and tornado). Intensive exchange of thermal energy on the ocean's surface will increase the number of storms. The frequent storms, together with glacier melting, will cause the flooding of coastal lines, which will bring enormous damage.

The reduction of sediments in desert areas and generally, in arid areas, is followed by the overall increase in desert lands. The plant life will be reduced. As a result of this desertification process, the landscape will become degraded, productivity will decrease and unbearable conditions are created for livestock breeding. As a result, this will cause hunger in population.

A break of ecological equilibrium may cause the mass emigration of populations, which are a great cost for any state.

To summarize, effects of the climate change are:

1. A hotter and drier climate in throughout the whole world (glacier melting, sea level rise, change of ecosystems etc.);
2. Extreme temperatures, frequent natural disasters (storms, floods, flooding of coastal lines, etc.) and eco-migration related to natural disasters;
3. Intensification of the desertification process;
4. Negative effect on bio-diversity (reduction of plant-life and the disappearance of many species);
5. Increase in the spread of disease area;
6. Changes in agriculture (reduction of yield/productivity);
7. Effects on poor countries.

**Climate change mitigation and adaptation measures:** the world's countries are trying to find the solution and are trying to mitigate the effects of climate change. For this very reason, in 1997 the ways for fighting climate change were identified in Kyoto (Japan) and the agreement about the reduction in greenhouse gases was signed. Special responsibility was applied to developed countries since they are the largest consumers of resources. Nowadays, the Kyoto protocol is ratified by 187 countries. The goal of this document is to fight against climate change with emission reduction, and the stabilization of greenhouse gas concentration in the atmosphere, which would not be hazardous for the earth climate. Georgia signed the Kyoto protocol in 1999.

Today scientists and engineers work on the development of alternative sources of energy. These are: wind energy, solar energy and safe nuclear energies. An increase in energy efficiency will reduce the emission of carbonic acid – the most significant greenhouse gas. Adaptation with climate change covers different types of measures, which are directed towards the reduction of the undesirable effects caused by global climate change. For the period of its existence, human beings have revealed a strong capability in adapting to changes of environment and climate. Examples of these are: improvement of irrigation methods of agriculturally arable areas, the selection of more climate change resistant crops etc.

In order to stop global warming, we can:

1. reduce the consumption of resources (e.g. paper, plastic etc.) and where possible, recycle and reuse;
2. Explain to friends and parents to change their driving habits (e.g. use the car less, change the cars that are consuming much fuel);
3. Provide thermo insulation/heating in houses since it reduces heating and air-conditioning costs by almost 40%
4. Save electricity (switch off electric appliances when you don't need them, use energy-efficient lamps).

**Climate change and Georgia:** Due to geographic location and difficult relief conditions, Georgia is significantly vulnerable to climate changes. Despite the fact that Georgia's contributions to the world's emissions are small and only make up 0.01%, climate change effects are still strongly presented. One of the significant reasons for this was the energy crises (in the 90's) due to which forests were cut.

Because of climate change, natural disasters have become more frequent; lengthy rains a regular occurrence, landslides, floods, avalanches have also become frequent. In some places there are noticeable desertification processes.

With frequent disasters, the most affected places in Georgia are agricultural producers like Dedoplistskaro, Signagi and the Sagarejo municipalities. In these municipalities, the number of sediments has been reduced and the frequency of droughts has increased. The desertification process strongly changes these territories (Udabno, Taribana, Natbeuri, Didi Shiraki, Patara Shiraki) and renders them useless.

Migration processes are more and more frequent in the mountainous region of Ajara where landslide processes have become active. From these territories, 10,000 eco-migrants have moved to other parts of the country during the last 15 years.

Climate change and the increase in heat and precipitation have caused an increase in the cases of disease (leishmaniasis and malaria). Due to the increase in the average of annual temperature, the increase of infectious diseases is also expected to increase in the future. Children and the elderly represent a special risk group in this respect.

If climate change continues at the same speed as it has, by 2100, average temperature in west Georgia will increase by 3.5°C, and precipitation will be decreased by 6%; temperatures in east Georgia will increase by 4.1°C, and precipitation will increase by 14%, which will be particularly acute in the summer period.

Such change of temperature in the plains of east Georgia, particularly in Marneuli, Gardabani, Sagarejo, Signani and Dedoplistskaro will cause soil exhaustion, the reduction of agricultural productivity and will facilitate the activation of the desertification process. Temperature change will also cause reduction of water resources.

## TOPIC 16: NATURAL DISASTERS

### VIII-IX GRADES

#### ACTIVITIES

##### The 8<sup>th</sup> Grade

##### Goals:

- ❖ Familiarize children with the main concepts of disaster risk reduction: “hazard”, “disaster”, “disaster risk”, “vulnerability”, “capacity”, “prevention”, “family emergency plan”, etc.;
- ❖ Help the students realize that incorrect actions might increase our vulnerability towards the disaster.

##### Activity 1

The teacher breaks the class into small groups and asks them to draw a picture describing the disaster. Then they discuss – how did the disaster happen? What actions did the community take? What would you do? Then the pictures are posted in the class and discussed.

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## Activity 2

The teacher breaks the class into three groups and asks them to draw a large poster showing how the students can reduce the vulnerability of their community towards disasters. The groups should agree ahead of time what will be depicted on the poster. The pictures should then be presented in the demonstration area.

## Activity 3

The individual project – “Development of family disaster preparedness plan”. The teacher gives the students one week to develop the plan together with their parents. The plan should include the identification of potential hazards in the house, as well as secure locations, preparedness measures for different types of disasters, evacuation plan, etc. Following completion of the exercise, the students make presentations of their family disaster plans in the classroom, a competition is held and three best projects are revealed.

For the exercise, the students are given a *Family Disaster Plan and Safety Checklist (Annex N1)*, a *list of potential hazards during an earthquake (Annex N2)*, and the *Quake-Safe Home Checklist (Annex N3)*, as auxiliary material.

## Activity 4

Social project: “Let’s convince people to protect the environment”.

The teacher reminds the students that as a result of intensive tree felling, the vulnerability of the population towards landslides increases. On the territory of the school or on the settlement territory, the teacher plants trees and other plants together with the students. If the group decides to plant the trees, it is important to select such species, which are suitable in terms of the prevention of landslides and soil erosion.

## Activity 5

Group project: “The development of a risk map for the settlement”.

The teacher breaks the class into groups of four and gives a task. The task is carried out on the basis of the following instructions:

“Search from information sources or ask adults as to what kind of significant dangers your settlement has faced in the past. Determine which locations are most dangerous during flood, earthquake, landslide and storm.

- What disasters have taken place in this area? What happened? When?
- What did people do?
- What should be done to prevent a disaster happening in the future? Who are the people and organizations in your community who are able to help on this issue?

Draw the most important buildings: school, town hall, hospital, fire station, police station and houses. Also draw buildings that could be dangerous, such as factories, dams, or electricity generating plants as well as buildings that are in a weak state of repair. Draw a different symbol for each kind of building. Identify all the roads, rivers, electricity lines, water supply and sewage systems and waste dumps. Use a different color to show each of these areas.

Show how badly the buildings could be affected (a little, quite a lot, totally wiped out) and use a different symbol or color depending on the level of risk and the type of risk, for instance flood areas or landslide areas. Identify where the people who will need the most help in the event of a disaster live: schools, homes for the elderly, hospitals and nursery schools.

Discuss different possible solutions for reducing the risks and preventing disasters in your community. Share with your classmates and teacher what the people in the neighborhoods you have visited have told you.



What measures could your community take to make people safer? Which people in your community could help you?

The students are given two weeks to complete this task.  
After the completion of the assignment the groups make presentations.

For the development of a community hazard map, the students can use conditional symbols/markings provided in *Annex N7* and use the situational picture provided in the *Annex N8*.

Questions:

1. What is a hazard?
2. What is a disaster?
3. What is vulnerability? What actions increase our vulnerability?
4. What is disaster risk?
5. Can we prevent disasters?
6. What is a community risk map?
7. What is the family disaster plan and why is it necessary?

**The 9<sup>th</sup> Grade**

**Goals:**

- ❖ Provide the students with information about natural and anthropogenic hazards and help them analyze in what conditions these hazards can become disasters;
- ❖ Discuss with students natural disasters trends in Georgia.

**Activity 1**

Social project: the teacher, together with the class, organizes a cleaning campaign of nearby rivers. It is also possible to include local agencies in the activity.

**Activity 2**

The teacher breaks the class into small groups and mentions that there are different types of hazards. Some of them are natural, some – caused by humans (anthropogenic). Then, s/he gives them 15 minutes to think and write on the flipchart what conditions are necessary for these hazards to become disasters.

**Activity 3**

Debates: the teacher breaks the class in two groups and gives 15 minutes to think on the following topic: “Why do disasters happen? Are there natural reasons or are they caused by a human”? The first group is tasked to provide arguments about disasters caused by natural reasons, the other group – those with human causal factors. The debates are held, following completion of which, the teacher provides a summarizing conclusion by use of auxiliary material.

**Activity 4**

The teacher asks the students to present a natural disaster scenario at their selection, where they will show: the hazards existing in the settlement, disasters triggered as a result of human actions, the destructive effects of the disaster on the vulnerable community, etc.

The teacher asks the students to be creative when doing the exercise (using artistic tools, markers, pens, etc.)

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Then students make presentation of their work in the class.

Questions:

1. What are disaster prevention and mitigation measures?
2. What is the Hyogo Framework for Action?

## SUPPORTING MATERIAL: NATURAL DISASTERS



Earthquake, flood, mudflow, hurricane, volcano eruptions are natural disasters and have been happening throughout the whole history of human existence. However, drastic increases in population, the degradation of the environment and the increase of poverty levels have transformed these natural phenomena into real disasters, which bring large numbers of deaths, destruction and material loss.

A **hazard** is a phenomenon caused by natural or human forces which endangers a group of people, their belongings and their environment, when they have not taken precautions. For instance, if you live near a volcano, the eruptions are a hazard even

though they may not occur for many years. There are different types of hazards. Some are natural while others are caused by human beings, such as so-called industrial or technological hazards (explosions, fires, toxic chemical spillages).

A **disaster** is the result of a hazard that has struck the community. The effects of a disaster depend on how vulnerable the community is to a particular hazard, or its inability to withstand it or respond to it.

A disaster takes place when the following three conditions occur at the same time:

- When people live in hazardous places like, for example, close to an active volcano, on unstable slopes where landslides are likely to happen, or close to rivers which could flood.
- When a hazardous phenomenon occurs, be it natural or human-made.
- When the phenomenon also causes a lot of damage, especially where no preventive measures have been taken.

### Are disasters caused by people or by nature?

Natural phenomena can sometimes strike very hard and cause disasters if preventive measures have not been taken or if some human activities have harmed the natural environment or upset the balance of the ecosystem.

For instance, too much water that the soil is unable to absorb can cause floods, while too little water in some regions can lead to drought. But people can make the situation worse, for example when trees are chopped down and no new ones are planted. This makes the soil very dry and dusty, which can lead to erosion. When the rains come, there are not enough roots and vegetation to bind the soil together, and a landslide can occur.

Most wildfires are caused directly or indirectly by people. Farmers, for example, sometimes burn their fields to get rid of weeds before planting, and the fire can get out of control. Sometimes people are careless with

cigarettes or forget to put out bonfires when they go camping. A little spark is sometimes all it takes to start a fire.

If we destroy parts of nature such as coral reefs, forests, or fragile mountain plants, we are destroying the natural barriers that protect us from tsunamis, drought, landslides, floods and other hazards.

**Vulnerability** is the inability to resist a hazard or to respond when a disaster has occurred. For instance, people who live on plains are more vulnerable to floods than people who live higher up.

In actual fact, vulnerability depends on several factors, such as people's age and state of health, local environmental and sanitary conditions, as well as on the quality and state of local buildings and their location with respect to any hazards.

There are several situations that can increase our vulnerability to disasters.

One example is when people cut down too many trees at a faster pace than nature can replace them. This is what we call deforestation. It increases the vulnerability of many communities to rain which, when they fall on unprotected soil, cause mudslides, landslides, floods and avalanches.

Building homes in high-risk places makes us more vulnerable. For instance, if you live too close to a river and people have been throwing garbage into it so that the water cannot flow on through, you will be more vulnerable to floods.

A well-informed and well-organized community, that meets to talk about what they are going to do about the natural hazards, is less vulnerable than a community that is unaware of them.

**Risk** is the probability that a hazard will turn into a disaster and is depicted in the following formula:

$$\text{Disaster Risk} = \frac{\text{Hazard} \times \text{Vulnerability}}{\text{Capacity}}$$

Vulnerability and hazards are not dangerous, taken separately. But if they come together, they become a risk or, in other words, the probability that a disaster will happen.

Nevertheless, risks can be reduced or managed. If we are careful about how we treat the environment, and if we are aware of our weaknesses and vulnerabilities to existing hazards, then we can take measures to make sure that hazards do not turn into disasters.

Risk management doesn't just help us prevent disasters. It also helps us to put into practice what is known as sustainable development. Development is sustainable when people can make a good living and be healthy and happy without damaging the environment or other people in the long term. For instance, you can make a living for a while by chopping down trees and selling the wood, but if you don't plant more trees than you cut down, soon there will be no trees and will no longer have the means to make a living. So, it isn't sustainable.

**Disaster prevention** and **mitigation** are all those actions we can take to make sure that a disaster doesn't happen or, if it does happen, that it doesn't cause as much harm as it could. We can't stop most natural phenomena happening but we can reduce the damage caused by an earthquake if we build stronger houses and on solid ground.

What is prevention? Taking measures in order to avoid an event turning into a disaster. Planting trees, for example, prevents erosion and landslides. It can also prevent drought.

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What is mitigation? Taking measures that reduce vulnerability to certain hazards. For instance, there are building techniques that ensure that our houses, schools or hospitals will not be knocked down by an earthquake or a hurricane.

Prevention and mitigation begin with:

- Knowing which hazards and risks we are exposed to in our community.
- Getting together with our family and our neighbors and making plans to reduce those hazards and risks and to avoid them harming us.
- Actually doing what we planned to do in order to reduce our vulnerability.

We can't stop natural phenomena from happening. But we can make them less damaging if we understand better why they happen, and what we can do to prevent or mitigate them.

Since people are partly responsible for disasters happening, we have to change what we are doing wrong, in order to avoid or reduce the impact of natural phenomena.

Every community must get to know its own features and surroundings: the natural environment as well as environment built by human beings. This is the only way for a community to manage the hazards that surround it and to reduce its own vulnerability to these hazards.

**Community Risk Map** is a big drawing or model of the community showing all the important buildings such as schools and hospitals, farm land, roads, and any other things that could be affected in the event of a disaster. It also shows potentially hazardous elements or places such as areas that might get flooded or very dry grasslands that can catch fire. It also shows all the resources, such as people and things that can help the community to get ready and protect itself, like the fire station, or a healthcare center.

Risk maps help us to understand the hazards and risks in our community and encourage everyone in the community to take action to prevent a possible disaster or reduce its effects if it happens. For example, they show schools or other important buildings that are in high-risk area for landslides. It also helps us be better prepared for a potential emergency. For example, they show where the safest buildings are, or which are the best routes to follow if we are ordered to evacuate the area.

## **8 INVOLVING PARENTS IN DISASTER RISK REDUCTION EDUCATION**

The family represents a natural environment for the development of a child and provides the basis for which the child's future personality is formed. In the family, a child gets involved in all types of activities – intellectual-learning, working, social, value-orientation, arts-creative, playing or free relations.

The feeling of love accompanies a child in the family throughout his/her life – starting before birth and reaching adulthood. This feeling positively affects the child's development and growth: it provides a constant feeling of happiness; it acts as a reliable anchor for the child's existence and provides protection from outside hazards. The parents meanwhile, fulfill the role of respected advisers, supporters and older friends.

In order for children to behave safely, only having information is not sufficient. We would like to teach a child to use this information in order to develop vital skills. Parents should help them in this. For the development of appropriate reactions and skills, practical education occupies a leading place.

Thus, it is important to involve parents in preventive works to be carried out with respect to natural disaster risk reduction.

Involving parents in the mentioned issues can be achieved by parent meetings and individual or group consultations facilitated by the head of class, with the assistance of the activities provided in the manual, etc.

It is also desirable that the head of class asks the students together with the family to analyse and fill in the annexes provided in the manual, placing special emphasis on developing the family disaster plan with the help of the manual.

It is important that the parents' interest and participation is achieved, as active cooperation in this process facilitates the establishment of closer cooperation between the school and family on issues that focus on ensuring children's safety.

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## 9 GLOSSARY

**Aftershock:** earth tremors that occur after a notable earthquake, sharing the same cause.

**Avalanche:** is a sudden rapid flow of snow down a slope, occurring when either natural triggers or human activity causes a critical escalating transition from the slow equilibrium evolution of the snow pack. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Powerful avalanches have the capability to entrain ice, rocks, trees, and other material on the slope.

**Capacity:** an ability to cope with a difficult situation. It means having skills and knowledge to respond and prepare for a risk.

**Climate Change:** is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions or the distribution of events around that average (e.g., more or fewer extreme weather events). Climate change may be limited to a specific region or may occur across the whole Earth.

**Community Risk Map:** is a sketch of an area or a place, made by people in the community. It shows the risks, the vulnerability and the capacity of the community and its members in relation to potential hazards.

**Disaster:** a disaster is the result of a hazard that has struck the community. The effects of a disaster depend on how vulnerable the community is to a particular hazard, or its inability to withstand it or respond to it.

**Disaster Prevention:** measures taken to prevent a hazard turning into a disaster.

**Disaster Risk:** the probability of a hazard (earthquake, hurricane, etc.) turning into a disaster, with serious economic, social and environmental consequences.

**Disaster Risk Management:** ability developed by a community to handle hazards properly so that they do not necessarily become disasters.

**Disaster Risk Reduction:** a systematic approach to identifying, assessing and reducing the risks of disaster. It aims to reduce socio-economic vulnerabilities to disaster as well as dealing with the environmental and other hazards that trigger them.

**Drought:** period of time (months or years) during which a part of the land suffers from lack of rain, causing severe damage to the soil, crops, animals, and even people, sometimes causing death.

**Early Warning System:** is any system of biological or technical nature deployed by an individual or group to inform of a future danger. Its purpose is to enable the deployer of the warning system to prepare for the danger and act accordingly to mitigate or avoid it.

**Earthquake:** violent shaking or jolt of the earth's surface due to movements originating from deep underground.

**Emergency:** is a situation that poses an immediate risk to health, life, property or environment. Most emergencies require urgent intervention to prevent a worsening of the situation, although in some situations, mitigation may not be possible and agencies may only be able to offer palliative care for the aftermath. While some emergencies are self-evident (such as a natural disaster that threatens many lives), many smaller incidents require the subjective opinion of an observer (or affected party) in order to decide whether it qualifies as an emergency. The precise definition of an emergency, the agencies involved and the procedures used, vary by jurisdiction, and this is usually set by the government, whose agencies (emergency services) are responsible for emergency planning and management.

**Emergency Kit:** is a bag or a box that every family should have ready prepared to take with them in case of an emergency. It should contain non-perishable food, drinking water, clothes, flashlight and batteries, a portable radio, and a first-aid kit.

**Erosion:** the continual wearing away of the soil by heavy rain, wind and poor land use.

**Fire:** a chemical reaction which combines three elements: oxygen, heat, and a flammable substance.

**Flash flood:** is a rapid flooding of geomorphic low-lying areas – washes, rivers, dry lakes and basins. It may be caused by heavy rain associated with a storm, hurricane, or tropical storm or meltwater from ice or snow flowing over ice sheets or snowfields. Flash floods may occur after the collapse of a natural ice or debris dam, or a human structure such as a man-made dam.

**Flood:** the building up of large quantities of water, generally caused by heavy rains which the soil is unable to absorb.

**Glaze-ice:** is a smooth, transparent and homogenous ice coating occurring when freezing rain or drizzle hits a surface. It is similar in appearance to clear ice, which forms from supercooled water droplets. It is a relatively common occurrence in temperate climates in the winter when precipitation form in warm air aloft and fall into below freezing temperature at the surface.

**Global Warming:** the process of quick growth of the ground layer of the earth's atmosphere and the drastic increase in average annual temperature of the world's oceans.

**Greenhouse Effect:** is a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases, and is re-radiated in all directions. Since part of this re-radiation is back towards the surface, energy is transferred to the surface and the lower atmosphere. As a result, the temperature there is higher than it would be if direct heating by solar radiation were the only warming mechanism.

**Greenhouse Gas:** is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect.

**Hail:** is a form of solid precipitation which consists of balls or irregular lumps of ice that are individually called hail stones. Hail stones on Earth consist mostly of water ice and measure between 5 millimeters (0.20 in) and 200 millimeters (7.9 in) in diameter, with the larger stones coming from severe thunderstorms.

**Hazard:** a phenomenon caused by natural or human forces which endangers a group of people, their belongings and their environment, when they have not taken precautions. For instance, if you live near a volcano, the eruptions are a hazard even though they may not occur for many years.

**Hurricane:** strong winds that start over the sea, rotating in big whirling circles, bringing rain with them. They are also known as tropical cyclones and typhoons.

**Landslide:** soil, rocks and vegetal debris that are transported suddenly or slowly down a slope because the soil is not sufficiently stable. Landslides may happen when there is a lot of rain, or during earthquakes or volcanic eruptions. The risk is greater when people build their homes in the wrong place, or cut down trees so that there is nothing left to bind the soil when it rains heavily.

**Lightning:** is an atmospheric electrostatic discharge (spark) accompanied by thunder, which typically occurs during thunderstorms, and sometimes during volcanic eruptions or dust storms.

**Mitigation:** measures to reduce vulnerability to hazards.

**Mudflow:** a sudden flow of mud consisting of fine-grained mountain sediment, big stones and rock mixed with a large volume of water down a steep slope to a river canyon or plane as a result of intensive rains or sometimes a brief heavy rain.

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**Preparedness:** measures taken preliminarily for the implementation of effective responses, which also implies timely and efficient warnings, the temporary relocation of humans and property from the hazardous zone.

**Rock-fall:** refers to quantities of rock falling freely from a cliff face.

**Rockslide:** is a type of landslide caused by rock failure in which part of the plane of failure passes through intact rock and where material collapses en masse and not in individual blocks. The mode of failure is different from that of a rock-fall.

**Seismic activity:** vibrations in the earth's crust, which may sometimes result in phenomena such as earth tremors, earthquakes or tsunamis.

**Snowdrift:** is a deposit of snow sculpted by wind into a mound during a snowstorm. Snowdrifts resemble sand dunes and are formed in a similar manner, namely, by wind moving light snow and depositing it when the wind is slowed, usually against a stationary object.

**Sustainable Development:** a form of development that allows current needs to be met without endangering future generations. In other words, that does not turn nature into a hazard for human beings, nor human beings into a threat to nature.

**The Hyogo Framework for Action (2005-2015):** a framework for action with five priority areas for promoting a strategic and systematic approach to reducing vulnerabilities and risks to hazards, hereby building the resilience of nations to disasters.

**The Kyoto Protocol:** a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), aimed at fighting global warming.

**Thunder:** is the sound made by lightning. Depending on the nature of the lightning and distance of the listener, thunder can range from a sharp, loud crack to a long, low rumble. The sudden increase in pressure and temperature from lightning produces rapid expansion of the air surrounding and within a bolt of lightning. In turn, this expansion of air creates a sonic shock wave which produces the sound of thunder. The distance of the lightning can be calculated by the listener based on the time interval from when the lightning is seen to when the sound is heard.

**Tornado:** very violent gusts of whirling, funnel-shaped winds which spin along over the ground.

**Tsunami:** gigantic wave, or series of waves, caused by an earthquake, volcanic eruptions or landslides under the sea.

**Turf fire:** is underground fire that covers a large territory and occurs in the lower layer of the forest surface (20 cm and more) or turf soils.

**Volcanic eruptions:** explosions or emissions of lava, ashes and toxic gases from deep inside the earth, through volcanoes.

**Vulnerability:** the inability of people and communities to withstand a hazardous phenomenon or the inability to respond after a disaster has occurred.

**Wildfire:** uncontrolled fire which destroys forest, jungle and vegetation as well as animal species. Such fires can get out of control and spread very easily over vast areas. Depending on the type of vegetation or material that is being burnt, they are called forest fires, bush fires, grass fires or peat fires.



# 10 ANNEXES

## Annex 1: Family Disaster Plan and Safety Checklist



Name, last name: \_\_\_\_\_

Date of completion: \_\_\_\_\_

### Family Disaster Plan

- As a family we decided upon the safest places in each of the rooms of our house. For example, under heavy furniture such as a solid kitchen table or desk, as well as the corners of inside walls.
- We identified the most dangerous places in each of the rooms. These can be places that are close to windows, bookcases, large mirrors, cupboards, hanging items, ovens or fireplaces.
- We identified evacuation plans for each of the rooms in our house.
- We know which emergency exits we will use in case of having to leave the house and the building during emergencies.
- We all know that if we're in a one-storied building during the earthquake and we can leave it, we should act fast, but with care. If we cannot leave the building, we know we have to act as follows: "lie down, cover up, stay strong":
  - Kneel in a safe place
  - Hang on to a dining table or a desk so that the table is above you
  - Put your head down and close your eyes
  - Stay like this until the shaking stops.
- We know the addresses and phone numbers of people that we can call during emergency situations. Specifically:
- We have all agreed on a safe meeting place where each of us would meet after the earthquake.
 

At home: \_\_\_\_\_

On the street: \_\_\_\_\_

Out of our district (town): \_\_\_\_\_
- We have made copies of important documents and we keep them with a pre-prepared emergency kit (e.g., our backpacks).
- We have fixed tall and heavy furniture, equipment, electric and air equipment, lighters and other items that can harm us and our children to the floors, walls and ceilings.
- We have a fire extinguisher that is filled each year.
- We know how to use the fire extinguisher.
- We have isolated flammable substances and have ensured their safety.
- We keep shoes and small battery-operated flashlights by our beds.
- We know that if the earthquake happens while we're cooking, before finding a safe place we need to turn off the oven.
- As a family, we have discussed what should be done after the earthquake.

#### Reminders:

- Stay calm
- Be ready for aftershocks (repeated earthquakes). They could be strong. In case of aftershocks, find a safe place to hide.

**For parents only:**

- Make sure nobody's hurt. As needed, use first aid.
  - Look for fire sources.
  - If you think there could be damage, turn off the main electricity source. Do not start turning switches on or off.
  - Close gas valves if there is a possibility of gas leakage. Find gas leakage by smell and never by matches or candles.
  - In case of damaged pipes, turn off the water both inside as well as outside.
- We know that after the earthquake we should not light a match or candle until we are completely sure there is no gas leakage.
- We have created a store of items needed for evacuation (including 4 liters of water per person per day, food for 3 days, flashlights with spare batteries, first aid kit, cash, underwear, hygienic items).
- We review our plan every six months.
- We introduce our plan to our friends and advise them to do the same.

**Annex 2: Earthquake Hazard Hunt**



Name, last name: \_\_\_\_\_

Date of completion: \_\_\_\_\_

**Earthquake Hazard Hunt**

The Earthquake Hazard Hunt should begin at home, with all family members participating. Imagination, and common sense are all that are needed as you go from room to room and think about what will happen when the earth starts shaking. Check for objects that may slide, fall, and fly where people spend the most time - where they sleep, eat, work and play. Do some detective work! Make a list of what needs to be done and tackle it one by one until it's finished!



As you tackle what needs to be done, prioritize the items as follows:

1. **Secure life threatening items first (eg. wardrobes in bedroom or things blocking exit)**
2. **Secure those things that would entail significant economic loss (eg. computer, a/v equipment)**
3. **Secure those items that will let you live more comfortably (eg. family heirlooms, breakables)**



- Move heavy items below the head level of the shortest family member.
- Tightly secure furniture to walls (including kitchen cabinets).
- Make sure white appliances and hot water heaters are secure.

- Fasten LPG tanks and other gas cylinders to the wall.
- Make glass that may break into large shards less dangerous (hang long curtains, rearrange furniture, install strengthened glass.)
- Secure heavy and important electronic items.
- Secure lighting fixtures to ceiling.
- Fasten pictures on closed hooks.
- Check for any hazardous materials (poisons, flammable materials); make sure they are secure
- Consider replacing kitchen cabinets latches with ones that will hold shut during a quake.

Hazards We Found:

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Dates Corrected:

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### Annex 3: Quake-Safe Home Checklist

Name, last name: \_\_\_\_\_

Date of completion: \_\_\_\_\_

1. Place beds so that they are not next to large windows .
2. Place beds so that they are not right below hanging lights.
3. Place beds so that they are not right below heavy mirrors.
4. Place beds so that they are not right below framed pictures.
5. Place beds so that they are not right below shelves with lots of things that can fall.
6. Replace heavy lamps on bed tables with light, nonbreakable lamps.
7. Change hanging plants from heavy pots into lighter pots.
8. Use closed hoods on hanging plants, lamps, etc.
9. Make sure hooks (hanging plants, lamps, etc.) are attached to studs.
10. Remove all heavy objects from high shelves.
11. Remove all breakable things from high shelves.
12. Replace latches such as magnetic touch latches on cabinets with latches that will hold during an earthquake.
13. Take glass bottles out of medicine cabinets and put on lower shelves. (PARENTS NOTE: If there are small children around, make sure you use childproof latches when you move things to lower shelves.)
14. Remove glass containers that are around the bathtub.
15. Move materials that can easily catch fire so they are not close to heat sources.
16. Attach water heater to the studs of the nearest wall.
17. Move heavy objects away from exit routes in your house.

18. Block wheeled objects so they can not roll.
19. Attach tall heavy furniture such as bookshelves to studs in walls.
20. Use flexible connectors where gas lines meet appliances such as stoves, water heaters, and dryers.
21. Attach heavy appliances such as refrigerators to studs in walls.
22. Nail plywood to ceiling joists to protect people from chimney bricks that could fall through the ceiling.
23. Make sure heavy mirrors are well fastened to walls.
24. Make sure heavy pictures are well fastened to walls.
25. Make sure air conditioners are well braced.
26. Make sure all roof tiles are secure.
27. Brace outside chimney.
28. Bolt house to the foundation.
29. Remove dead or diseased tree limbs that could fall on the house.



1. china cabinet



2. tall knickknack shelves



3. bookshelves



4. tall, heavy table lamp



5. hanging plant



6. mirror on wall



7. heavy objects on wall shelves



8. window air conditioner



9. hanging lamp or chandelier



10. unsecured TV on cart with wheels



11. bed by big window



12. heavy objects on shelves above bed



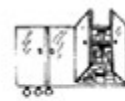
13. heavy picture above bed



14. hanging light above bed



15. cabinet doors not fastened



16. medicine cabinet doors not fastened



17. fireplace bricks



18. unattached water heater



19. chimney



20. gas stove with rigid feed line



21. heavy wall clock



22. house not bolted to foundation

## Annex 4: Classroom Hazard Hunt

- Are free-standing cabinets, bookcases, and wall shelves secured to a structural support?
- Are heavy objects removed from shelves above the heads of seated students?
- Are aquariums and other potentially hazardous displays located away from seating areas?
- Is the TV monitor securely fastened to a stable platform or securely attached to a rolling cart with lockable wheels?
- Is the classroom piano secured against rolling during an earthquake?
- Are wall mountings secured to prevent them from swinging free or breaking windows during an earthquake?
- Are hanging plants all in lightweight, unbreakable pots and fastened to closed hooks?

## Annex 5: Earthquake Simulation Scenario

Imagine that you hear a low, rumbling, roaring sound. The noise builds, getting louder and louder, for a few seconds. Then, Wham! There's a terrific jolt. You feel like someone suddenly slammed on the brakes in the car, or like a truck just rammed into the side of the building.

The floor seems to be moving beneath you. It's hard to stand up, or even stay in your seat. If you do stand up, you might feel like you're riding a raft down a fast river. When you walk, it's like trying to walk on a trampoline or a waterbed. You hear someone say, "Earthquake! Drop, Cover, and Hold!"

I want all of you at your desks to take cover as quickly and quietly as you can, right now. Please listen very carefully.

The shaking and commotion may last about 60 seconds or a little longer. We'll have our timer count off the seconds for as long as this earthquake lasts. [The timer may begin counting softly now.]

The building is creaking and rattling. Books are falling from the bookcase. Hanging lamps and plants are swaying. Suddenly a pot falls to the floor and smashes, and the plant spills. A window pane just shattered, and glass is falling to the floor. The table is sliding, too.

Be sure to stay in the drop, cover, and hold position under your desk. If your desk is moving, grab the legs and move with it.

You hear noises outside. Dogs are barking. Cats are meowing. A baby is crying. People are shouting and screaming. The shaking is making church bells ring. You hear crashing sounds, from brick chimneys and other loose parts of the building falling to the ground. Trees outside are swaying and scraping against the walls.

Inside the room, pictures are moving on their nails. Oh! That one just fell off the wall and crashed to the floor. The desk drawers are sliding open. The lights begin to flicker on and off... they just went out! Now the door swings back and forth on its hinges. Bang! It slams shut. There's silence now. Just as suddenly as the noise and shaking began, the room grows quiet. [The timer can stop counting now.]

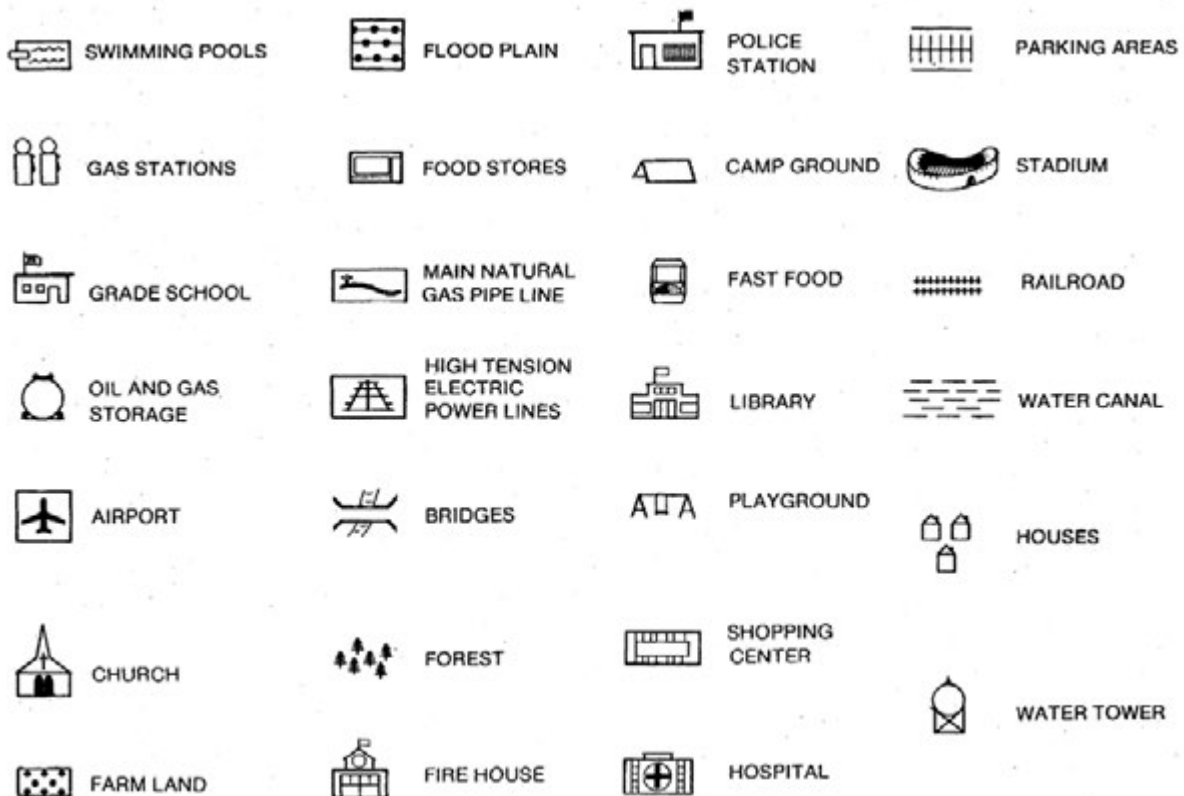
Please, everyone, get back in your seats. It is important to remain very quiet and wait for instructions. When it is safe to leave the building, I am going to lead you outside to an open space. Stay together, and be ready to take cover again at any moment, because the shaking may start again. Sometimes other quakes, called aftershocks, occur after the damaging earthquake has stopped.

## Annex 6: Drill and Evacuation Checklist

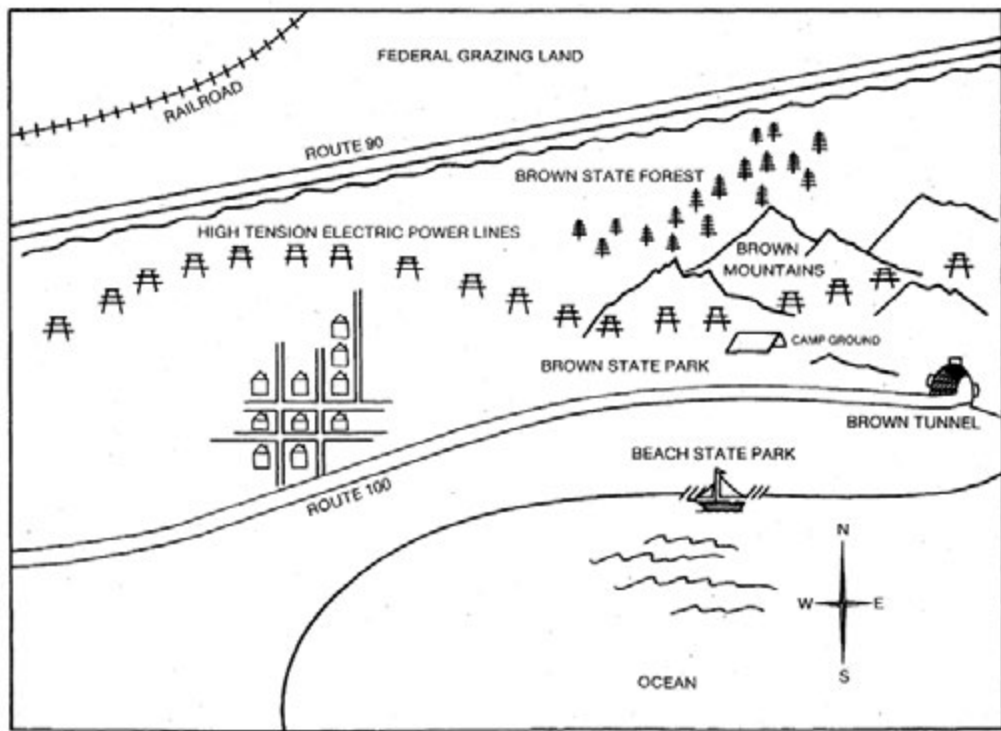
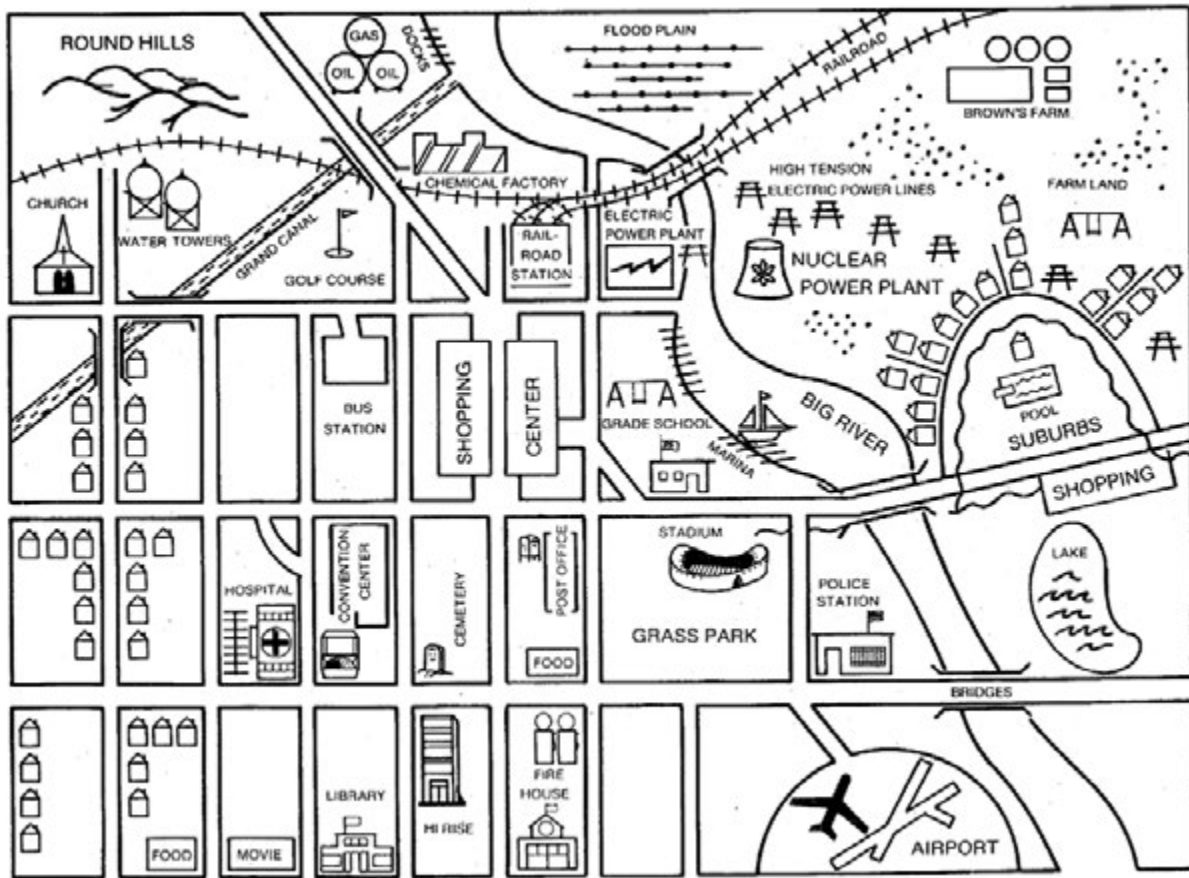
1. Did everyone know what to do when told to Drop, Cover, and Hold.
2. Did everyone follow the procedure correctly?
3. In the classroom, the library, or the cafeteria, was there enough space for all the students under desks, tables, or counters?
4. In the gym or in the hallways, were students able to take shelter away from windows, light fixtures, trophy cases, and other hazards?
5. Do students know how to protect themselves if they are on the playground during an earthquake? If they are in a school bus or a car?
6. Did everyone remain quietly in their safe positions for at least 60 seconds
7. Did students with special needs participate in the drill and evacuation?
8. Did we remember to take our emergency kit and class roster when we evacuated the classroom?
9. Did everyone go to the safe outdoor area in an orderly way?
10. If we had to change our evacuation route to get to the safe area, did we make wise decisions?

**What should we do to improve our results?**

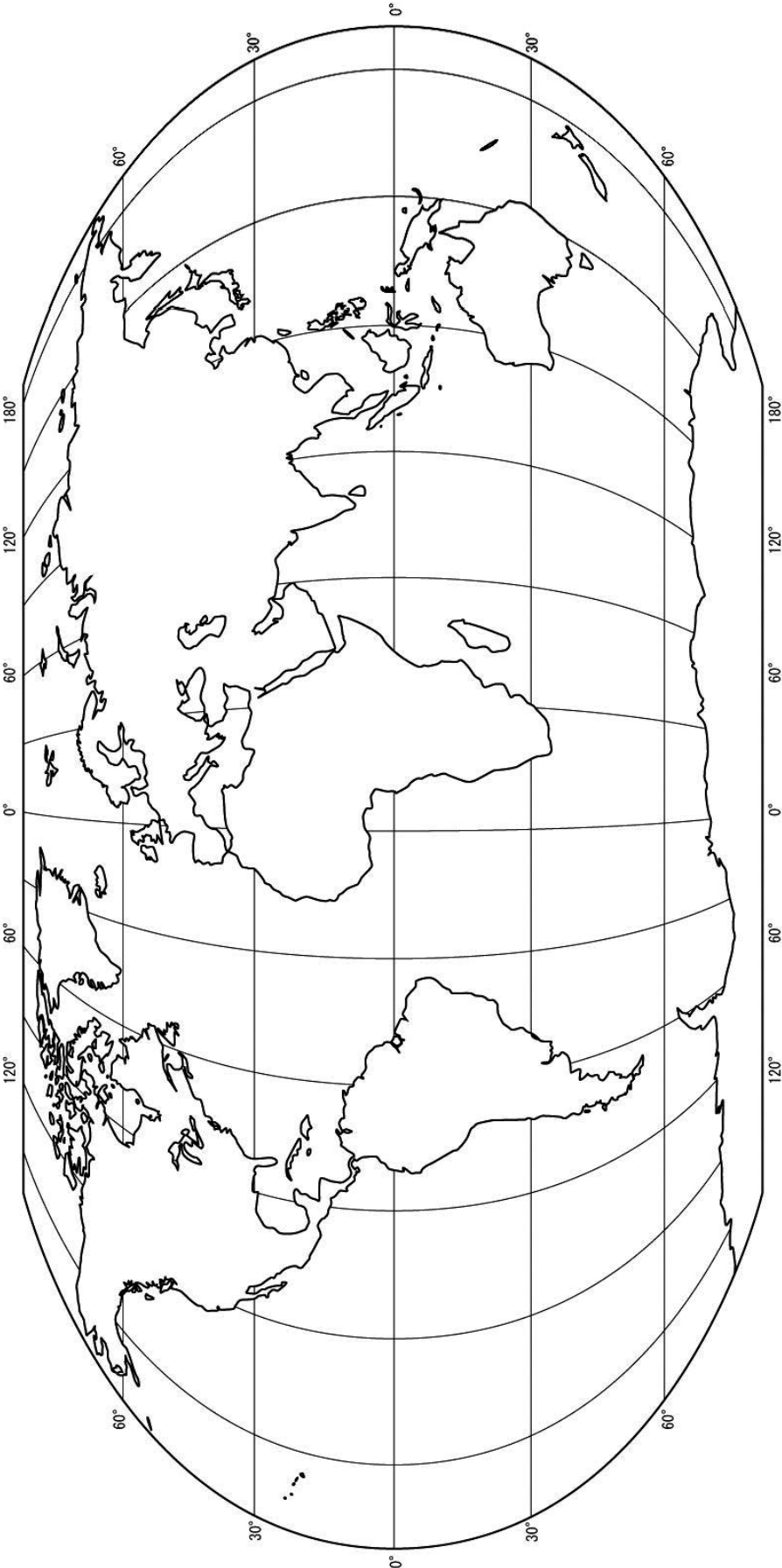
## Annex 7: Auxiliary Material – Examples of the Legend for Community Hazard Mapping



Annex 8: Auxiliary Material – Community Hazard Mapping



**Annex 9: Auxiliary Material for the Topic – Climate Change (#3 activity for the 7th grade)**





## Annex 10: Tests

### Tests for Students of the 5th Grade

#### Topic: Earthquake

1. What do you do in your classroom during the earthquake?
  - a. Lie down, hide my head and stay firm
  - b. Lie down, hide my head and start shouting
  - c. Sit by the desk and wait for until the earthquake is over.
2. Which of the following items has to be fixed before the earthquake?
  - a. Bookcase
  - b. Chair
  - c. Table

#### Topic: Flood

1. Reasons for the flood are as follows:
  - a. Melting snow
  - b. Heavy rains
  - c. Playing with the fire
  - d. Hail
2. What should we do during the flood?
  - a. Climb up to a higher spot
  - b. Kneel down and hold on to a solid item
  - c. Run outside

#### Topic: Hail

1. List signs of approaching hail:
  - a. Nearing of storm-like clouds during a warm period of the year
  - b. Nearing of storm-like clouds during a cold period of the year
2. What do we do in case of being at home during hail?
  - a. Stand close to windows
  - b. Avoid using electronic appliances
  - c. Leave the building immediately
3. What do we do if we're outside in the nature during hail?
  - a. Hide in lower spot
  - b. Hide under high trees
  - c. Hide in a covered place.

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**Topic: Fire**

1. Which rules should we follow while lighting a fire in the forest?
  - a. Light a fire far from bushes and trees
  - b. Never leave a fire unattended.
  - c. Always carry a fire extinguisher
  - d. Only light a fire close to the watercourse
  - e. All of the above

**Tests for Students of the 6<sup>th</sup> Grade**

**Topic: Earthquake**

1. When you leave a building during the earthquake, you should not do the following:
  - a. Use elevators
  - b. Go to the balcony
  - c. All of the above
2. What should you do if you are inside a building during the earthquake?
  - a. Stand by the window
  - b. Hide under solid furniture
  - c. Stand by firm inside walls
  - d. Stand under the door frame
  - e. Lie down on the floor
  - f. Not use matches.
3. List places that can be dangerous in the classroom:

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**Topic: Flood**

1. What should we do to avoid floods?
  - a. Not to pollute rivers
  - b. Constantly observe not only the dikes on the river of our village, but its beaches as well
  - c. All of the above
  - d. None of the above
2. What would you do if you are on a roof or higher ground during the flood?
  - a. Will go downstairs
  - b. Will try to swim towards the drift
  - c. Will continuously give disaster signals

**Topic: Landslide**

1. What should we do to avoid landslide?
  - a. Plant trees
  - b. Build bridges
  - c. Climb up the hill
2. What should you do if you're not at home during the landslide?
  - a. Climb on the roof of a safe house
  - b. Leave the place
  - c. Kneel and hold on to a solid item.

**Topic: Mudflow**

1. Reasons for mudflows are:
  - a. Heavy winds
  - b. Fires
  - c. Earthquakes
  - d. Long-term rains
  - e. Heavy snow melt
2. How do we act during a mudflow? Circle one or several answers:
  - a. If we're at home, we should hide in the bathroom
  - b. If we're at home, we should hide under a heavy piece of furniture
  - c. If we're not at home, we should run to the nearest high ground towards the direction of the mudflow
  - d. If we're not at home, we should run to the nearest high ground against the direction of the mudflow.

**Topic: Lightning**

1. What should you do during a thunderstorm? Circle one or several correct answers.
  - a. Do not hide under tall trees
  - b. Avoid being close to electric transmission poles, water pipes and antenna
  - c. Try to remain in the building
  - d. Lock doors and windows
  - e. Do not get close to metal items
  - f. All of the above
2. What would you do if a thunderstorm occurs while you're on an open space out of doors?
  - a. I will hide under the tall tree
  - b. Lie down on the ground
  - c. Will immediately find lower ground and sit there

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**Topic: Fire**

1. What should you do if your clothes are on fire?
  - a. Run until the fire disappears
  - b. Lie down on the ground and start rolling until the fire has been extinguished.
  - c. All of the above
2. What should you not do in the building during a fire?
  - a. Try to extinguish a large fire yourself
  - b. Open the balcony door or window
  - c. All of the above
3. How do we leave a building in smoke?
  - a. Walk bent over or crawl and cover up with a heavy and, if possible, wet cloth
  - b. Run out to the balcony
  - c. Use the staircase in the smoke

**Topic: Avalanche**

1. What would you do when an avalanche occurs?
  - a. I will run or walk fast from the danger area
  - b. Will move to a safer place
  - c. Hide behind the cliff
  - d. Will not stand behind young trees
  - e. All of the above
  - f. "b" and "d" are correct
2. What do we do if we're in the avalanche? Circle one or several correct answers.
  - a. We should shout, as loud as possible
  - b. We should go to sleep
  - c. We should remain calm
  - d. We should not shout

**Topic: Glaze-snow**

1. How would you prepare if freezing rain or sleet is expected? Circle one or several correct answers.
  - a. Will wear less slippery shoes
  - b. Will wear shoes with metal heel protection
  - c. Will post plaster or isolation plaster to the bottoms of the shoes.

### Tests for Students of the 7<sup>th</sup> Grade

#### Topic: Earthquake

1. Identify the safest place on the street during the earthquake
  - a. Near the shop
  - b. Near the electric poles
  - c. Open space
2. Identify the safest place in the building during the earthquake
  - a. Under the solid table
  - b. Near the TV set
  - c. By the window
3. List places that can be dangerous in your home:

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#### Topic: Flood

1. How can we prepare for the flood? Circle one or several answers.
  - a. Study higher ground that is seldom flooded
  - b. Have sufficient dishes
  - c. Fix all items at home that fall
2. During the flood and afterwards we cannot:
  - a. Use water from flooded wells
  - b. Use electricity
  - c. All of the above

#### Topic: Landslide

1. What are the characteristics of a landslide? Circle one or several answers.
  - a. Stuck doors and windows
  - b. New cracks on the floor, ceiling and walls
  - c. Land sliding down, toward one direction
  - d. Warping or misshaping of roads and buildings
  - e. Polluted air

#### Topic: Mudflow

1. What measures should be taken to avoid mudflow?
  - a. Fortifying ground by planting trees
  - b. Constructing electric stations
  - c. Constructing new buildings

- 
2. After the landslide it is expected to have:
    - a. Erosion
    - b. Damaged piping
    - c. Damaged buildings
    - d. All of the above
    - e. "b" and "d" are correct

**Topic: Rockslide**

1. When is a rockslide expected?
  - a. In winter
  - b. During frosty days
  - c. In summer during intensive rains
  - d. In spring, during the first part of the day when the warmth of the sun reaches its maximum.
2. What should we do while moving on the rockslide areas?
  - a. We should carefully examine holding points
  - b. We should stop each of the moving stones and warn others about it
  - c. All of the above

**Topic: Strong Winds**

1. How would you act if you're in a building during a strong wind?
  - a. Close doors and windows
  - b. Turn off all electric devices
  - c. Avoid going into inside rooms that have no windows
  - d. "a" and "c"
  - e. "a" and "b"
  - f. All of the above
2. How would you act if you're outside during a strong wind?
  - a. Will hide under the balcony
  - b. Find shelter in a firm building
  - c. Will kneel and wait for the wind to stop

**Topic: Fire**

1. How would you put out a small fire?
  - a. With twigs and leaves
  - b. Water
  - c. Cover it with moist dirt

- d. Feet
  - e. All of the above
  - f. Only “a” and “b” are correct
2. Main reasons for forest fires are:
- a. Irresponsible actions of people towards fire when in the forest
  - b. Thunder
  - c. Hail

**Topic: drought**

1. How would you prepare for a drought?
- a. Will make a storage of dishes and, if needed, will fill with water
  - b. Use water carefully
  - c. Will have clothing and electronic appliances (ventilators, AC) appropriate for heat
2. What would you do during a drought? Circle one or several answers.
- a. Will avoid impact of high temperatures
  - b. Will wear light color air-transmitting clothes, shoes and hats
  - c. Will try to remain inside and out of the sun as much as possible
  - d. Drink as much water as possible
  - e. Will wear dark-color air-resistant clothes, shoes and hat so that I’m not hot
  - f. Will only drink water in case of absolute necessity.

**Topic: Avalanche**

1. Before the avalanche:
- a. Should not go to the mountains while snowing or in bad weather
  - b. Should not pay attention to the temperature change while in the mountains
  - c. While going to the mountains we should know of possible avalanche areas
  - d. “c”
  - e. “a” and “c”
  - f. All of the above
2. Avalanche-prone areas are:
- a. Mountain slopes with less than 45° degrees
  - b. Mountain slopes with more than 45° degrees
  - c. Mountain slopes with less than 30° degrees.

**Topic: Snow Drift**

1. During drifting snow :
- a. We should leave the building immediately

- 
- b. We should only leave the building if accompanied by adults
  - c. We should only leave the building when absolutely necessary.

**Topic: Glaze-Snow**

- 1. How would you act in case of glaze-snow?
  - a. Will walk carefully and slowly, putting the whole foot down, with both hands in my pockets to avoid the cold
  - b. Will walk carefully and slowly, putting the whole foot down. My legs would be relaxed my hands would be free.
- 2. What would you do in case of falling down?
  - a. Will immediately call the doctor
  - b. Will put ice on the injured part of the body for 30 minutes
  - c. Will put a plastic bag of ice wrapped in cloth on the injured part of the body
  - d. Will put a vinegar soaked cloth on the injured section of the body
  - e. Will put a plastic bag of ice wrapped in cloth on the damaged or injured section of the body for 5-minute intervals and for no more than 20 minutes.

**Tests for the Students of the 8<sup>th</sup> Grade**

**Topic: Climate Change**

- 1. What negative effects does the climate change bring? List at least three:

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**Topic: Natural Disasters**

- 1. List natural disasters:

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- 2. What is the name of a natural or man-made condition that severely affects people due to their vulnerability?
  - a. Danger
  - b. Risk
  - c. Disaster

**Tests for Students of the 9<sup>th</sup> Grade**

**Topic: Volcano**

- 1. What distance from a volcanic eruption is considered to be at high risk ?



- a. Distance located within a 65 kilometer radius from the volcano
  - b. Distance located within a 195 kilometer radius from the volcano
2. Volcanic eruptions may result in an earthquake, tsunami, flood or landslide
  - a. False
  - b. True
3. What would you do if you're in a high risk zone during a volcanic eruption? Circle one or several answers.
  - a. Will wear long-sleeve clothes, a hat and a mask
  - b. Will move away from high ground, since it is dangerous
  - c. If there's a general evacuation, will follow official instructions
  - d. If there is no evacuation possible, I will move to the highest floor of the house since there could be hazardous gases accumulating in the lower parts of the building during the eruption
  - e. Will open all doors and windows
  - f. Will try not to let the ash into the building.

**Topic: Climate Change**

1. Which of the listed below is one of the most important methods to combat climate change?
  - a. Reduction of resource use
  - b. Irrational expenditure of resources
  - c. Planting trees
2. Which of the climate change events are visible in Georgia? Circle one or several answers.
  - a. Increased incidence of non-transmitted diseases
  - b. Increased cases of drought throughout Georgia
  - c. Frequent natural disasters

**Topic: Natural Disasters**

1. What is disaster prevention?

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2. What are mitigation measures?

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<http://www.earth-policy.org/indicators/C51>

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## 12 RECOMMENDED EDUCATIONAL MATERIALS

Before the disaster, during a disaster, after a disaster, Caucasus Environmental NGO Network (CENN)

Civil Protection and Safety – Supporting Material for Teachers, National Centre for Teacher Professional Development, 2011

FEMA for Kids – <http://www.fema.gov/kids/>

FEMA U.S. Fire Administration for Kids – <http://www.usfa.fema.gov/kids/flash.shtm>

USGS Earthquake Hazards Program for Kids – <http://earthquake.usgs.gov/4kids/>

<http://www.coderedrover.org/>

<http://www.edu4drr.org/>

<http://www.police.ge/index.php?m=301>

<http://www.edu4hazards.org/teachers.html>

<http://www.fema.gov/areyouready/index.shtm>

<http://www.preventionweb.net/english/professional/trainings-events/edu-materials/?tid=36>

<http://www.proventionconsortium.org/?pageid=37>

<http://www.stopdisastersgame.org/en/home.html>

<http://video.nationalgeographic.com/video/player/environment/environment-natural-disasters/>



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