Move4Nature

CARPATHIAN MOUNTAINS ESD TRAINING TOOL KIT

ENGLISH VERSION

CARPATHIAN CONVENTION

enSI environment and school initiatives

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Preface

The English version of the Carpathian Mountain ESD Training Tool Kit was developed on the basis of the original Romanian version. The main aim of the English version is to provide the basis for the development of further adapted local versions of the Tool Kit, which can be used in other Carpathian countries and other regions.

The English version is not a word-for-word translation of the Romanian Tool Kit, but has been adjusted and restructured to be more relevant in a regional context. It is recommended that all future local versions, likewise, are not just simple translations of this English version, but are adapted to local conditions and include local examples and data. We included reminders and suggestions for adaptors throughout the text. New national versions of the Tool Kit should reflect the local circumstances of a user country, and the Tool Kit could even be restructured if realities of sustainable development in a particular country render some chapters unnecessary, and require addition of other topics instead.

We would like to bring special emphasis to this message by leaving the English version of the Tool Kit in an "open" form by inviting ongoing improvement: comments, suggestions and input into the current Tool Kit version are foreseen and welcome in order to further contribute to the elaboration of an ever-evolving, more equipped and helpful teaching instrument .

The developers of the Tool Kit are available for related comments, suggestions and inquiries, with every intention for co-operation in developing local versions of the Tool Kit .

Foreword

The Carpathian Mountains - a unique region rich in natural diversity and cultural heritage, is increasingly facing the challenges of development. To address the most urgent needs of the region, the Move4Nature project was initiated, as a cooperative effort by UNEP and a group of Carpathian partners, with the help from OMV - a leading European energy company headquartered in Austria.

The partners agreed that the most effective way to support sustainable development in the region is to focus on schools in the rural Carpathians, in order to teach the younger generation to value, preserve and wisely use the rich resources around them. One of the main ideas from the initial stages of the Move4Nature project was that it should encourage interaction, dialogue, public-private partnership and cooperation between partners engaged in Education for Sustainable Development in the Carpathian Region.

Cooperation on Mountain Sustainable Development is not a new idea in the Carpathians: On 22 May 2003 in Kiyv, Ukraine, the Ministers of the Environment of the Czech Republic, Hungary, Poland, Romania, Serbia and Montenegro, Slovak Republic and Ukraine signed the Framework Convention on the Protection and Sustainable Development of the Carpathians. The Carpathian Convention provides the framework for cooperation and policy coordination in various sectors – including that on Education for Sustainable Development (addressed in Article 13 of the Convention) – and a platform for joint strategies and dialogue between all stakeholders involved.
UNEP Vienna - Interim Secretariat of the Carpathian Convention (UNEP Vienna – ISCC), facilitated the necessary connections between the Ministries and contacts among the ESD partners in Carpathian countries, to support the development of the Move4Nature project. In fact, the first project meeting took place at the margins of the Second Meeting of the Conference of the Parties to the Carpathian Convention (COP II), on June 17-19, 2008, in Bucharest, Romania. The initiation and development of the Move4Nature in Romania also coincided well with the Romanian presidency of the Carpathian Convention: from June 2008 to 2011.

The Carpathian Mountain ESD Tool Kit aims to introduce the Carpathian Convention and its main principles of ecosystem-based thinking, cooperation and sustainable development to the rural mountain communities, as well as to draw attention to and encourage critical thinking about the urgent development-related issues, such as transportation, energy, and Climate Change. We hope that the use of the Tool Kit helps educators in Romania to teach their students to discover and value the natural and cultural heritage in their surroundings. At the same time, we hope it facilitates sharing knowledge, ideas and experience among communities within Romania, throughout the Carpathians, and perhaps even with other mountainous regions, and thus helps to build the necessary connections and networks to aid sustainable development of the mountainous regions.

As valuable as UNEP Vienna - ISCC could be in its guidance, the Tool Kit owes its development to enthusiasm, dedication and hard work of many individuals in Romania and other Carpathian countries, who have provided their time, energy, expertise and creativity to the development of the educational materials and their introduction to and review by the local educators in Romania. Their devotion to the development of ESD in the Carpathians, in order to ensure the sustainable development of the mountain communities, we are sure, will lead to productive results, and has made already a sizeable contribution through the Move4Nature project in Romania.

We hope that introduction of the Carpathian Mountain ESD Tool Kit is only the beginning, which has given rise to a vibrant network of experts and activists devoted to the proliferation of ESD in the mountain areas, and that it will receive resonance and follow-up with further fruitful activities in Romania, throughout the Carpathians, and all around the world.

Harald Egerer
Carpathian Convention Project Manager

Introduction

About the Tool Kit

The Carpathian Mountains ESD Training Tool Kit (hereinafter referred to as the Tool Kit) is one of the main outputs of the Move4Nature Initiative. It was developed by The Carpathian Sustainable Learning Network (CA-SALEN) in partnership with the United Nations Environment Programme – Interim Secretariat of the Carpathian Convention (UNEP-ISCC), the Environment and School Initiatives (ENSI), and contribution from other partners[1], with the support of OMV in the framework of the Move and Help initiative.

In developing this Tool Kit, all the authors and contributors had one common vision, namely to provide helpful ESD resources and information to teachers in order to enable them to incorporate all elements of sustainability into their teaching methods and activities. In addition, the Tool Kit aims to encourage and guide teachers to work with their students and all members of their communities to consider sustainable development in their everyday lives. There is often very little practical material available for teachers to get started with educational activities in the mountain regions. Thus, the main idea was to develop a practical and creative Tool Kit, which would encourage the teacher to think critically and in a systematic way.

A draft version of this Tool Kit was introduced and tested during a series of teacher trainings in Romania in May 2009. Participants were encouraged to provide feedback, links to the curriculum based on their practical experience, as well as local input, such as local examples of natural and cultural diversity and local challenges for sustainable development. Their comments and suggestions were incorporated into this Tool Kit.

The electronic version of the Tool Kit will be available online, in a first stage, in Romanian and English, for comments, further input and dissemination. Thus, the Tool Kit will remain open to further improvement and development through the feedback and suggestions by all Carpathian partners. It can also be adapted to other mountain regions of the world, such as the Caucasus.

Sustainable development and the mountain areas

For the purpose of this Tool Kit, one of the most frequently quoted definitions of sustainable development from the report Our Common Future (also known as the Brundtland Report) can be used:

„Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.“ [2]

This definition clearly points out the three main components of sustainable development: environment, society and economy. However challenging it may be, it is still possible and necessary to find a balance between these components. One of the tools to promote living and working in a sustainable manner both today and in the long term is education.

Education for sustainable development (ESD) is a “dynamic concept that encompasses a new vision of education that seeks to empower people of all ages to assume responsibility for creating and enjoying a sustainable future”.[3] The concept was defined for the first time in Agenda 21, chapter 36 „Promoting Education, Public Awareness, and Training“. The ESD concept integrates three components of sustainable development and identifies four major thrusts of ESD:

1 The list of partners and supporters can be found in the back of the Appendices section

2 World Commission on Environment and Development (WCED). Our common future. Oxford: Oxford University Press, 1987 p. 43

3 UNESCO, Education for Sustainability—from Rio to Johannesburg: Lessons Learnt from a Decade of Commitment, 2002.

- Promotion and Improvement of Basic Education,
- Reorienting Existing Education at all Levels to Address Sustainable Development,
- Developing Public Understanding and Awareness of Sustainability, and
- Training. [4]

Over the past decade many materials, toolkits and guidebooks have been written on the topic of ESD, but not many of them have focused on mountainous regions. Mountainous areas throughout the world, such as the Carpathians or the Caucasus, often face similar problems of underdevelopment, lack of and/or difficult access to information and resources, lack of opportunities and diversity of livelihoods, and migration of the young population to urban centres.

At the same time, mountains are often centres of natural and cultural diversity, and offer important components to the national and global heritage. Many unique natural and cultural features are left undiscovered, however, due to a lack of information exchange and interconnectivity among the rural mountain areas, and their disconnection to urban centres (UNEP, 2007). Sustainable development of mountainous regions in a way that draws attention to the advantages of these areas, particularly nature and wildlife-based tourism, is, therefore, of utmost importance.

The Carpathian Region

As stated in Carpathian Environmental Outlook (2007), "the Carpathian Mountains are the largest, longest and most twisted and fragmented mountain chain in Europe". The Carpathians stretch across seven countries of Central and South Europe: the Czech Republic, Slovakia, Poland, Hungary, Ukraine, Romania and Serbia. They are a unique treasure of natural beauty and ecological value, a source of headwaters of major rivers, and an important reservoir for biodiversity. Many landscapes and habitats, flora and fauna, show characteristic and unique features occurring solely or mainly in the Carpathian region (UNEP, 2007). The great variety of endemic plants and animals characteristic of Carpathian ecosystems is an essential component of biodiversity in Europe. At the same time, the Carpathians form a centre of cultural diversity and living traditions, which are important components of our global cultural heritage.

Carpathian Convention:

To protect the diversity and the rich natural and cultural heritage of the Carpathians, and at the same time promote sustainable development of the region through cooperation and sharing of experiences, the Carpathian countries signed the Carpathian Convention in 2003. The Convention is a legal instrument, which provides ground for cooperation between the countries in various areas, covered by specific Articles of the Convention, such as Conservation and sustainable use of biological and landscape diversity (Article 4), Sustainable and integrated water/river basin management (Article 6), or Sustainable transport and infrastructure (Article 8). The structure and thematic coverage of the Carpathian Convention served as the basis in the development of the Tool Kit. To emphasise this connection, each chapter of the Tool Kit begins with the text of the relevant Convention Article.[5]

The Aim of the Tool Kit: How does the Tool Kit fit into the sustainable development of the Carpathian region?

This mountain-oriented training project was developed in order to acknowledge the importance of education for sustainable development, based on its relevance to the Carpathian Convention (Article 13). The general goal of

4 Education for Sustainable Development: the Education Sector Paper, Report prepared by ESD for an inter-sectoral meeting, March 5, 2003.

5 Find more information about the Carpathian Convention in the Partners and Supporters section of the Tool Kit and at http://www.carpathianconvention.org/

the Tool Kit is to provide approaches to ensure the sustainable management of the mountain areas in the long run and to enable the mountain populations to improve their livelihoods while preserving the unique cultural and natural features by:

- encouraging the populations living in the mountain areas to appreciate their surroundings, and also to become aware of the problems and challenges of sustainable development in their communities;
- showing populations living in those communities how to use the unique local resources in a responsible way;
- popularising the idea of an eco-region by establishing connections between the communities and showing the populations that their communities are not isolated;
- unveiling the interconnectivity, which exists both among the mountain communities and between the mountain/lowland parts of the region, taking into account that these interconnections offer opportunities for an exchange of experiences, and also present the challenges of resource sharing, which need to be taken into consideration;
- facilitating interaction and the exchange of experiences between the mountain communities within each country, as well as on a regional level; and
- collecting local information on existing natural and cultural resources and sustainable development challenges, in order to provide local input into the natural and cultural resource inventories, and to form recommendations for national governments and international developmental efforts.

More specifically, the purpose of the Tool Kit is to introduce sustainable development issues and existing educational tools to teachers of the Carpathian region, and to present a general guideline to developing their own programmes, which are locally relevant and culturally appropriate, and which take into consideration the local environment, economic and societal conditions. The Tool Kit stresses the importance of involving community and schools in working together to achieve sustainable community goals. Thus, the Tool Kit should serve to encourage teachers, students and populations living in mountainous areas to learn how to use unique local resources in a responsible and conscientious way, and to think critically and in creative ways about the environmental problems in their communities, by:

- providing a gate to the existing ESD materials and activities
- encouraging teachers to use the existing resources keeping in mind the sustainable development of the Carpathian mountain regions
- encouraging critical thinking and active participation of the communities

The Structure, Content and Form of the Tool Kit:

The Tool Kit guides teachers to develop an exercise of "Designing a Carpathian nature/cultural trail" and to work with their students to create a "study trail" that is representative of their local area in the Carpathians, taking into consideration resources and information provided in every chapter, such as:

- the natural resources of the Carpathians that the trail presents
- transport to and along the trail,
- cultural components that the trail can offer (local products that are produced there, such as medicinal plants/crafts, traditional means of transportation/mobility, as well as opportunities for rural tourism),
- existing parks and protected areas,
- environmental problems/sustainable development challenges of their local area (decline of plant and/or animal species, changes in the landscape, energy challenges and opportunities, loss of traditional culture, changes in the architectural style of mountain villages, water resources, drinking water problems, etc).

The Tool Kit is structured in the following way:

Introduction is followed by several thematic chapters:

1. **Example of Water: study trail along a local stream Spatial planning**
2. **Public participation**
3. **Biodiversity**
4. **Transportation**
5. **Waste**
6. **Energy**
7. **Cultural heritage**
8. **Sustainable tourism**

The first chapter provides a detailed guideline of how a study trail can be developed with respect to one of the environmental features – water resources. In the ensuing chapters of the Tool Kit other aspects and examples of activities are presented. Teachers are encouraged not to take them as given, but to adapt and improve them to best fit their particular local circumstances.

Each chapter has as the main component some critical questions to reflect upon (about the topic covered in the chapter in connection with the respective local area, leading to the reflection of each aspect on the map) and guides the teachers and students to creatively use facts and references presented in the chapter to design a local study trail. Case studies and examples are presented throughout the chapters.

The appendices include a detailed chapter on ESD Methodology, a guide to the activities listed in the Tool Kit, as well as suggestions for further international ESD resources and useful contacts (including Carpathians and Romanian NGOs and protected areas). In addition, the Tool Kit includes a selection of the thematic maps of the Carpathians. The maps are included to provide illustrations and serve as a visual aid. They also contribute a regional perspective by demonstrating the trends throughout the Carpathian region.

Although not covered in a specific chapter, the issue of global climate change – a very relevant and important theme to understand, especially in the context of developing rural mountainous communities – is present throughout many chapters of the Tool Kit. This is due not only to the growing importance of the problem, but also to its multi-faceted character, which renders it relevant to almost any aspect of rural development, especially through its connection with mobility and transportation.

To make sure that every teacher using the Tool Kit is at least somewhat familiar with the issue of climate change and related information and terminology used throughout the Tool Kit, a basic introduction to climate change is included in the Appendix on Climate Change.

The Tool Kit guides teachers and students on how to create a local trail, but where and how does this fit into the Carpathian map? How can a trail relate to the features and resources in the other parts of the Carpathians? Can the consequences of student actions in his/her locality "spill" across the borders and affect neighbouring mountainous regions and lowlands? Thinking about this and analysing issues on a regional scale by looking at a Carpathian map should facilitate a growing perspective of being an integral part of a Carpathian region.
The teachers are also encouraged to provide and use other relevant maps, such as local maps of the communities.

The chapters also contain questions in connection to the maps provided by the Tool Kit, as well as questions focused on the immediate community surrounding the respective schools. The questions provided are merely examples, meant to encourage the teachers to provoke reflection of the chapter content at the local and regional levels.

Another common component of the Tool Kit is networking and communication. The kit aims to encourage communication between the schools in the Carpathian region, thus enabling the students to share their experiences and understanding of the Carpathians with students from other areas. Such exchange can be facilitated by the network created by the Move4Nature project. The teachers who do not have contacts in schools in other regions or countries of the Carpathians are encouraged to request contacts from the CASALEN network by uploading student letters onto the web site or approaching one of the Carpathian ESD contacts listed on the CASALEN web page. If exchange with other countries is sought, posting of letters in English is most efficient. If interested, contacts with schools in other mountain regions, such as the Alpine and Caucasus regions, can also be facilitated.

The Form of the Tool Kit

The Tool Kit is available in electronic and printed form. The printed versions of the Tool Kit in Romanian, complete with the feedback and inputs of the project partners and the Teacher Training participants, will be distributed to the participating schools in Romania in time for the beginning of the school year 2009.

The electronic version of the Tool Kit will be available online in Romanian and English for comments, further input and dissemination.

- The Romanian version will be available on the web site of the Romanian project coordinator Healthy Environment Regional Organisation (HERO[6]).

- The English version will be available on the CASALEN web site[7] to facilitate feedback, input and adaptation by partners throughout the Carpathians and other mountainous regions.

Translation into other Carpathian languages, comments, input and exchange of ideas about the Tool Kit, its use and its topics, or adaptation of the Tool Kit to other regions, is encouraged in order to support a network of communication and experience exchange on ESD in the mountain areas between experts, teachers, and activists in the field.

How to use and read the Tool Kit

The Tool Kit was originally intended for teachers of higher grades. The final product, however, has been made adaptable to teachers of any grade and various disciplines, as well as any educators responsible for environmental education and other interested users.

The Tool Kit is not a classic rulebook or compulsory teaching material, but rather a set of guidelines from which the teacher will chose methods which fit into his/her practice and the specific circumstances of her/his mountain community. The main advice to users from the editors is

- to be critical,
- to try to develop analytical abilities and the capacity to formulate questions,
- to develop skills to analyse real issues faced by communities,
- to remember that activities presented are suggestions and by no means the only way to think about sustainable development, and above all,
- to "learn by doing".

6 http://herocluj.ro/en

7 http:// www.unesco.pl/edukacja/casalen/move4nature/

Protected Areas and Education for Sustainable Development

Protected areas can play an important role in Education for Sustainable Development, by providing "living classrooms" for various disciplines: sciences, such as biology, geology, ecology; history - as many protected areas contain artefacts of cultural heritage and traditional populations; arts - as inspirational places of natural beauty, and physical education - as they can offer a range of outdoor activities. In addition, they often facilitate research in university studies of natural sciences. As popular tourist destinations, they can also serve as an illustration of sustainable economic development of the rural areas.

Educating local communities about the value of the protected areas is of critical importance, to ensure that the local population (both the younger generation and adults) appreciates the value of the surroundings, and to promote activities which do not harm, but ensure sustainable use of the protected areas' resources, in order to allow economic development and improve local livelihoods.

Many parks in the Carpathians have developed educational programmes and materials, such as manuals and maps, which could be used by the educators, visitors and community members. Besides, knowledgeable park ranges can provide valuable insights about the natural and cultural features of the protected areas. The Carpathian Network of Protected Areas (CNPA) facilitates cooperation between the protected areas and development of outreach activities, such as awareness and educational programmes and information materials (see reference in The Project Partners and Supporters).

Establishing cooperation between the schools and the local protected areas is an important step towards developing an ESD programme. Field trips to the local parks can be organised, with a variation of activities, with the help of park personnel and local NGOs.

Using protected areas located close to the national borders can bring a regional/transboundary dimension to ESD programmes, illustrating the principle of indivisibility of ecosystems by country borders, and importance of cooperation with the neighbours, and at the same time promoting valuable cultural exchange between the students.

Study Trail: Main Methodological Concept of the Tool Kit

The Tool Kit offers material for the elaboration of a thematic trail – a "study trail" – to teach the students to identify and highlight the natural, cultural and economic values of their local area in the Carpathians.

This method has been elaborated by the project partners and tested during the teacher training tour in Romania in May 2009.

The following steps in making a study trail are recommended to teachers:

- A local map may be used or a plain sheet of paper, in which case, a map should be used as a reference during the exercise. Or alternatively, a map of the community can be made for the exercise.

- The map/paper is used to mark the key points that represent local natural and cultural features, such as:
  - examples of unique cultural and natural heritage sites (protected areas, historical buildings, etc.) or of sustainable development (solar panels, ecotourism trails, etc.) proposed by the pupils and teachers
  - environmental problems in the community or unsustainable practices, such as illegal landfills, also proposed by the pupils and teachers

- For each of these key points, with the help of the Tool Kit, teachers can develop a local Tool Kit, containing:
  - work sheets to be used in the classroom,
  - plans of learning activities of convenient duration,
  - proposals of educational projects, using their own educational resources as well as the Tool Kit.

It is recommended that these points and exercises are included in the teaching process in accordance with the curriculum. **Connecting the selected and then elaborated key points will create a great study trail!**

Thus, the school's own Tool Kit would ideally contain the following:

- Up-to-date Tool Kit chapters,
- Examples of proposed local trails with key points, and
- At least 3-4 of the school's own working instruments, with proposed activities.

Teachers are invited to share their study trail proposals in the online version of the Tool Kit at:
www.unesco.pl/edukacja/casalen/move4nature/ .
In this way, the unique local features presented by the schools can also contribute to the national, regional and global database of unique, natural and cultural heritage features.

As you are reading the activities in the Tool Kit, try to relate them to the potential key points of a study trail, which you and your students could design around the school or community. Think of what activities would be most appropriate for each key point

School Portfolio

In the process of developing and elaborating a proposed study trail, a portfolio with the pupils' activities can be put together, containing a selection of the pupils' contributions and accomplishments for each key point and each activity.
As a final result, each school could have a portfolio containing the school's own teaching instruments for education for sustainable development, [8] as well as the resulting students' and teachers' assignments, which each school could show as accomplishments.

The following process of developing and using a local study trail is suggested:

1) Ideally, a team of teachers (at least three teachers, including the school's headmaster), each one specialising in a different subject matter, works cooperatively on the local study trail.

2) The preliminary study trail is prepared by studying the Carpathian Educational Tool Kit, to which teachers add their particular educational craftsmanship and their knowledge of the area/community where their school is located.

3) By means of exercises, the students work toward completing the study trail: Through related activities in schools, they identify at least 5-6 natural, cultural or economic characteristics of their local area, which represent bioregional values or challenges. The pupils are encouraged and given the assignment to consult with their families, neighbours, members of the local community (villagers) and local documents, and are requested to suggest valuable natural and cultural artefacts specific to their neighborhood. These could be areas, which are especially appreciated, certain living beings, natural monuments, local customs, specific crafts and products, problems of water pollution, decrease or disappearance of a certain plant or animal, and others. Basically, their task is to include anything they would like a fellow pupil from another country in the Carpathians, or a guest from a different region, such as the Alpine or the Caucasus regions, to know about their area. Through discussion of these features among the pupils, the most valuable or distinct local features are identified and included in the local trail as key elements.

4) The students are encouraged to place the selected key points on to their area maps/paper.

5) The teachers then choose 5-6 (or more) key points from all of the selected features. The best example can be used to make a large map for the school. Canvas, paper, or the wall can be used, as long as a photo of the map can be taken and thus the end result preserved for at least one year.

6) By connecting the key points, a trail is outlined. The school should also be marked on the trail. The resulting map will contain the names of the locality and school, the position of the school, the county, and the country.

7) The local map will comprise the school and 5-6 elements denoted as key points, which are considered important information for visitors coming from far away or for fellow pupils living in a similar area in the Carpathians.

The first chapter of the Tool Kit, based on the subject of water resources, gives a detailed guideline of how a study trail can be developed with respect to one specific environmental feature. In the further chapters of the Tool Kit other possible activities are presented. Although all the chapters are structured in a similar way, they are not uniform. In addition, none of the activities is definite. Teachers are encouraged to adapt them to their local circumstances and to improve them. Developing activities and materials in addition to carrying out daily teaching duties is, however, extremely hard work. We hope that this Carpathian Mountains ESD Tool Kit will lighten teachers' work load and make their teaching more efficient and effective.

8 Ideally, targeting grades 5 and higher

Make the Tool Kit alive:

Ask your students to write a letter to counterparts from another part of the Carpathians. This could be to students from another school in your country or another Carpathian country. Encourage the students to ask questions about tourism/ecotourism in the other Carpathian areas and to describe the situation in their own community. The students could address the letter to a school in another region, such as the Alps or the Caucasus. If you are not sure where to send the letter to, you can upload it to the CASALEN Tool Kit web site at: www.unesco.pl/edukacja/casalen/move4nature/ and request that one of the ESD focal points facilitate communication to and provide you with the contact information of another school.

Note to the teachers:

Before you start using the Tool Kit, keep in mind that there are many different ways to teach, think and practice sustainable development. No book or Tool Kit can cover all aspects and all possible exercises. This kit is just a starting point and invitation to all of you, together with your students, to seek out activities and solutions in your communities. Herbert Spencer[9] wrote: "The great aim of education is not knowledge but action". We therefore encourage all of you to join us in the effort to continue our work with the help of this Tool Kit: Choose activities and teaching methods that best fit into your curricula and your local communities, develop some new ones, especially ones applicable to your local circumstances. Think critically, and develop creative actions. Try a few activities, and then try a few more. We all know that if we want education to serve the whole community, region or country, sustainability has to be included in the majority of curricula, at all levels and all stages.

It is now your turn to take next steps. Good luck!

9 A renowned British philosopher and thinker of the 19th century, credited with the development of the original idea of evolution, and whose theories on education are, to this day, still well received. For more information, see: PROSPECTS: the quarterly review of comparative education (Paris UNESCO: International Bureau of Education): vol.24, no.3/4, 1994, p. 533–54., UNESCO: International Bureau of Education, 2002, also found on http://www.ibe.unesco.org/publications/ThinkersPdf/spencere.pdf

1. Example of Water: study trail along a local stream

Carpathian Convention Article 6: Sustainable and integrated water and river basin management

Taking into account the hydrological, biological, ecological, and other specificities of mountain river basins, the Parties shall:

(a) take appropriate measures to promote policies integrating sustainable use of water resources with land-use planning, and aim at pursuing policies and plans based on an integrated river basin management approach, recognising the importance of pollution and flood management, prevention and control, and reducing water habitats fragmentation;
(b) pursue policies aimed at sustainable management of surface and groundwater resources, ensuring adequate supply of good quality surface and groundwater as needed for sustainable, balanced and equitable water use, and adequate sanitation and treatment of waste water;
(c) pursue policies aimed at conserving natural water courses, springs, lakes and groundwater resources, as well as preserving and protecting wetlands and wetland ecosystems, and protecting against natural and anthropogenic detrimental effects, such as flooding and accidental water pollution; and
(d) further develop a coordinated or joint system of measures, activities and early warning for transboundary impacts on the water regime of flooding and accidental water pollution, as well as co-operate in preventing and reducing damage and providing assistance in restoration projects.

CONTEXT AND GENERAL INFORMATION

As an organic part of the Carpathian area, schools in rural mountain areas may offer an important contribution in regard to the identification of local values, creating specific educational means to enhance the possibilities offered by the curricula for education for sustainable development in the mountainous areas of the country and in other Carpathian areas outside of Hungary.
In everyday reality water management is integrated in the management of the environment as a whole, and so many of the activities proposed in this chapter can also be used for other environmental areas and issues. This chapter comprises examples of elements we suggest to be included in one key area: the local stream.

The aims of the interactive strategies are the following:
- to develop the ability to work well in groups, to collaborate in the identification and articulation of values and perspectives in the Carpathians, to encourage the sustainable use of the water resources;
- to develop the ability to perceive the interrelationship between subject matters, which corresponds to the interrelationship of phenomena in real-life processes, especially in view of conserving local natural, cultural and economic values; and
- to develop the ability to foresee likely future consequences of today's actions.

Six themes are presented schematically, with the aim of adapting these to local situations. Possible ways of implementing these six subjects in the classroom/school are proposed, some of them for during a class, others as a chain of activities in the field with a previously established aim – as projects. Class activities are proposed, which are to be continued individually by the pupils as smaller projects and may later form parts of some larger school projects. The duration of the activities is generally 1-2 hours, according to the tasks and local possibilities.

Possible Structure of the Proposed Activities:

Organisational details: objective, materials, and proposal for duration and place of the activity. Each subject will be arranged according to the following stages:

1. Awakening of interest – stimulation of the group's interest in the study of the subject, creating motivation.
2. Capturing attention by concentrating on certain perceptible aspects previously unknown to the participants.
3. Direct experience through activities.
4. Discussion between participants and in groups to share impressions and new knowledge during the activities.

Proposed Themes:
1. Emotional map of an area
2. Biological methods for the evaluation of water quality
3. Adopting a stream in an area; observation by scientific means
4. Practices of good management; how clean are the water- and riverbanks?
5. Drinking water; the tale of the water in the well.
6. Conservation and the use of drinking water
7. Some of the proposed themes are described.

ACTIVITIES

A local stream – one of the key points of the lokal carpathian thematic study trail

1. Emotional Map of the Area

Objectives: *to draw attention to local values and problems existing along the banks of the river or stream;*

- *to identify problem;*
- *to improve the ability to communicate with others;*
- *to develop social competence; and to draw attention to the condition of the water resources, sensitisation;*
- *capturing attention by concentrating on certain unknown details; direct experience through activities;*
- *and discussions among the participants.*

Number of participants: *20-30*

Materials: *sheets of paper, coloured pencils, and cardboard support for field activity.*

Duration: *60 minutes*

Place: *Possible example: Fifty minutes at the riverbank, with a possible continuation of the activity for making a poster or an album that includes the emotional experience of the area in another 50-minute activity in the classroom. At the end the group presents at school what they discovered at the riverside, and present an album or a poster to the community*

Competencies, skills: *carrying out experiments*

Connection with other subject matters: *biology (botany), economic geography, and chemistry*

Further possible homework: *pupils conduct interviews with elderly people in the village about ancient tales connected to the stream; they write compositions, poems, and make collages of photos taken along the stream.*

Forget about textbooks! Captivate the pupils' interest and organise a walk along the stream. The participants are given tasks about things they see, hear, and feel. They draw pictures, take photos and little video-clips, and then create a presentation of their impressions and of the things they have made to show others at school, at home or in their community.

Sensitisation and capturing attention: the camera and the photographer

Twenty minutes: After a short walk with the pupils along the riverbank, the group is divided into pairs of "photographer" and "camera". The group walks through the area once again. Their task this time is to take two pictures. The photographer directs the "camera" who has his/her eyes closed. The photographer looks for a subject that is interesting and captivating, and orients the "camera" in the right direction. When the subject is found, the photographer lightly tweaks the "camera's" ear; opens his/her eyes and thus takes the picture. Then they exchange roles and do it again. At the end the pupils share their reasons for the choice of their subject in pairs and write these down. Groups taking real photos can make the activity more complex. Also, photos made beforehand can be used, and the pupils can choose from these if the activity takes place in the classroom.

Activities through direct experience and tasks: making an emotional map of the area

a) Individual (15 minutes): each pupil chooses one of the photos taken, which s/he could use to present the area to visitors. Each participant gives a number to the photo or drawing s/he has chosen and makes up five sentences explaining his/her choice, writing them down on a sheet of paper.
b) The participants find a picture with something disturbing. They name these elements and formulate three sentences describing what is wrong.
c) Work in pairs (15 minutes): after the group members communicate with one another, they make a drawing on the sheet of paper on which the five sentences were written, as well on the paper on which the three sentences describing what is wrong are written. Thus, there will be a sheet for what was found that was perceived as beautiful, and another for what was perceived as disturbing.

Each participant will present one idea and the page s/he completed to the other participants (duration depends on the number of group). On a larger board with a sketch of the area on it, the pairs who present their two sheets of paper to their classmates identify the places. There may also be things, which cannot be localised or drawn, but they too are discussed with the class.

Homework: the pupils develop their own page. They may add drawings, photos, and short compositions.

Further ideas: Plan and create an album by the class or a poster with the best pages to show others. The emotional map may be completed and perfected by adding photos.

2. Adopting a Stream in an Area: Observation by Scientific Means

Adopting means taking care. How can we adopt a stream in our community? In order to do this, the area first has to be inspected. Details are found which might normally not be considered to be of any importance. Deeper knowledge means greater care, which may have implications for the present or future. Based on this subject, partnerships between communities can be created with pupils from schools from different areas and different internal and international educational systems.
The water from rivers and lakes is not just a solution of various substances; it is also a medium for life. In order to fulfil this function, the substances in the water must vary between certain optimum limits corresponding to the requirements of the living organisms, which make up the aquatic ecosystem. As a consequence of human activity, pollution modifies the physical, chemical and biological characteristics of water and changes the balance of this ecosystem. Water is considered to be polluted when the modification of its content affects its use: when it cannot be used as drinking water, in industry, agriculture, pisciculture or for pleasure any more without being harmful to human health, as well when animal and plant life are disturbed. Impurity of water means temporary or lasting modification of its properties.

Physical properties: temperature, transparency, colour, smell, conductivity

Chemical properties: its pH (concentration of hydrogen ions), concentration of dissolved O_2, Cl_2, H_2S, of NO_3-, NO_2-, NH_4+, CN-, heavy metals, toxic organic substances (phenol and detergents).

Biological properties: condition of the aquatic fauna and flora.

Objectives: *sensitisation;*
developing responsibility in regard to local decisions;
developing the ability to observe and measure;
making sketches of an area, and being able to orient on a map.
Number of participants: *15-25.*
Materials: *appropriate shoes for the area to be explored, rubber gloves, tape measure, 0.5 mm strainer, wire net with handle of about 20 cm circular diameter, thermometers, chronometers, 5 x 25 x 5 cm trays, about 20 pieces of 5 x 5 x 3 smaller trays, magnifying glasses, and a notebook.*
Duration: *4-5 hours*
Place: *on the riverbank*
Competencies, skills: *to get better acquainted with an area, to discover undesirable changes which are the result of human activities, and to collect evidence for proposals meant to stop certain undesirable human influence.*

Activity:

During a walk along the stream various tasks are given to the pupils, beginning with taking photos. Then the breadth, depth, temperature and speed of water are measured, and the riverbed is described. A sketch of a map is made, by establishing points of reference. The area is identified on the map. Traces of human activities are described. Erosion, plants on the bank, and life in the water and near the stream are observed.

a) Choosing an area of the stream to be explored. We choose one of the following areas: source, middle area (to be found between the source and the river mouth), or the river mouth. This information is important, as the animal and plant species living at the water mouth area are not the same as those living in the source area.

A few points to observe:

- Safety first! Choose places for water sampling where the probability of any kind of accident is minimal.
- After heavy rains, water is muddy, so don't take samples then, as the results will not be accurate.
- Samples should not be taken in places where another water source flows into the stream.
- Samples should be taken in a variety of places – where the speed of the water is higher and lower.
- Living beings that are sensitive to pollution are more easily found in areas where the oxygen content of the water is higher.
- Macro-invertebrates may be captured more easily after sunset.

b) Surroundings of a stream. By exploring the surroundings of a stream we may find explanations for changes in the biotype we are observing and analysing.

1. **Plants on the riverbank.** These plants may influence the life of the river by offering shade, by protecting the bank against erosion and by filtering the river water with their roots.
2. **The presence of waste.** It is worth noting the presence of waste in the area, as well as the kind of waste that is found (plastic, paper, rubber, tins, bottles, organic waste, etc.).
3. **The presence of foam.** Foam on the surface of water does not necessarily point to pollution; it may also have natural causes. It is difficult the make a difference between the two cases. There are, however, several differentiating indicators: for instance, the presence of small waterfalls. Sometimes the formation of this foam is due to organic substances of vegetal origin, especially following heavy autumn rains (the same phenomenon as whipping egg-white). Another sign may be the colour of the foam: glaring, unnatural colours usually point to industrial pollution of the water.
4. **The riverbed.** The type of riverbed may be important to note, especially for a biological analysis. Different types of materials (large stones, gravel, sand, and silt) give shelter to different groups of animals.
5. **Vegetal residue covering the riverbed.** A high percentage of vegetal residue in the water leads to an increase in populations of degrading organisms, an excessive consumption of dissolved oxygen, and hence to degradation and poorer biodiversity due to the elimination of "clean water" species.
6. **Algae covering stones**. Algae occur mostly in those parts of a river with transparent, clear water, rich in nutritive substances. An abundant presence of algae usually influences aquatic ecosystems unfavourably.
7. **Presence of leaves eaten in a lace-like form.** The presence of such leaves clearly indicates the presence of Gammarus-es (latarus), a species living in waters rich in dissolved oxygen (over 7-8 mg/l).
8. **Breadth of the riverbed.** This is usually estimated visually; it is recommended to establish some points of reference.
9. **Depth of the water at the site of sample collecting.** This can be measured very easily with a stick. It can also be useful to draw a rough sketch of the cross section of the stream. With the aid of this sketch and a measure of the speed of the water, the output of water can be determined at that particular section.
10. **Speed of flow.** To determine the speed of water flow, you have to choose a portion of the stream, measure the length of that portion, and then put on the surface of the water an object that floats (for example, a piece of wood, a leaf, or an apple). The progress of the chosen object must not be influenced by the wind; also, it should not be too large, otherwise its inertia could skew the measurement. Time the interval in which the object covers the established distance. Repeat the procedure several times (3-4 times) and put the average time on the card.
11. **Colour of the water.** Clean water is transparent, without colour, but it may be of various shades of colour (brownish, greenish) due to natural causes. Water colour is assessed by filling a white vessel with water from a particular spot. Notice if there is any flow of used water through various smaller or larger lateral canals, as if they are there you could assume that the colour is not natural.
12. **Formulate an opinion about general impressions of the place.** These may be important in case we decide to change or improve something. The pupils may, for homework, make up a composition, or collect a local story about the stream. Local customs in connection with the water can also be used.

WORKSHEET:

Field study of the course of water of a stream or river:

1. Name of the stream: _____
2. Point of observation: _____
3. Name of the observer: _____
4. Date and hour of the observations: _____
5. Weather conditions on the day of the observation: sunshine____rain ____ other conditions ____ (underline or encircle according to the condition encountered) air temperature ____ ____degrees in centigrade
6. Description of the observed area _____
   What section: at the source ____ in the middle section .____at the river mouth .....
   Description of the environment around the location: forest ____pasture ____farmland ____gardens ____ other ____
7. Plants growing in the area
   _____ trees_____bushes_____other_____
8. Aesthetic aspect _____
9. Can you see foam on the surface of the water? YES NO
10. What color is the foam? White ____ Coloured ____ Other____
11. Describe the waterbed ____ rocks, ____stones,____ pebbles, ____sand, ____organic waste,____concrete, ____other
12. Leaves in the water? _____
13. Holed leaves? _____
14. Algae on the stones? _____
15. Average breadth ____ 1 m ____ 1-5 m ____ 5-25 m ____ 25-100 m
16. Smell of the water? _____
17. Colour of the water: transparent _____ brownish _____ greenish _____ other _____
18. Approximate and then measure the average breadth of the riverbed: _____ m
19. Depth of the water at the observation site: _____ cm
20. Speed of flow _____ m/s

How much do you like the place?

0 1 2 3 4 5 6 7 8 9 10

not at all indifferent very much

The results can be summarised in the table below:

Properties	**Measured values**	**Modality of determination**
Aspect: a) colourless b) opaque c) turbid d) coloured		This is performed at the place where the sample is collected. The water is introduced into a graded 100ml cylinder for a) and b). In the case of c) 1 dm3 water is filtered through a piece of previously weighed filtering paper, then it is dried at 1050C and weighed again. The difference between the two values gives the amount of alluvia in g/dm3. If the water is coloured, case d), yellow indicates – Fe3+, blue – Cu2+, brownish yellow – colloidal clay, and reddish yellow indicate waters coming from peat bogs.
Transparency	_____ cm	Tie a small metal plate to a piece of rope and lower it vertically into the water. When the plate cannot be seen anymore, the length of immersion is measured by establishing the length of the rope. This length is directly proportional to the transparency of the water.
Speed of water flow	_____ m/s	Mark a 10m section along the river. Throw an apple tied to a piece of rope into the water a few metres before point 0. Measure the time needed to cover the distance of ten metres. Calculate the speed of the apple, which will also give you the speed of the water flow.
Water temperature and air temperature	_____ degrees in Celsius	Wait until the thermal balance is established between the thermometer and the water (or air), the thermometer being in the water (or air).
Smell of the water at 600C	_____ Without odour smell _____ of swamp _____ of wood _____ wet _____ mouldy _____ earthy _____ fishy _____ grassy _____ carbohydrates _____ medicine _____ hydrogen _____ sulphur _____ of faeces _____ indefinite	The water sample is introduced into a 150-200cm3 balloon with a large neck and covered with a glass plate. After bringing it to the temperature needed for the measurements, the lid is raised, and air inhaled from the balloon in order to discern the smell. The intensity of the smell is evaluated subjectively according to the following scale: 0 - without odour 1 - perceptible only by an experienced person, very weak 2 - perceptible, weak; 3 - clearly perceptible 4 - strong enough to be unpleasant; 5 - very strong, unbearable. Only 0 and 1 are drinkable.

The conclusions and results of the measurements could be presented at school, either in the school magazine or as papers/articles presented at various scientific sessions, etc. They will be useful when we wish to make changes in the community in regard to the attitude and care towards the stream.

3. Biological Methods for the Evaluation of Water Quality.

As mentioned above, natural water is not only a simple solution of different substances, but it is also an environment for life. In order to fulfil this function its characteristics and the substances it contains must vary between optimum values in accordance with the requirements of the living organisms, which make up the aquatic ecosystem.

Objectives: *Evaluation of water quality through the identification of the macro- invertebrates is a method of evaluation based on biological observation. Starting from the presence of macro-invertebrates, the quality of water can be evaluated by a simple visual examination*
Materials: *Rubber boots, rubber gloves, 0.5 mm sieve (net), a broad tray, 15-20 small boxes, magnifying glasses, small white spoons, and a notebook*
Duration: *about two hours*
Place: *walk along the river bank*
Competencies, skills: *visual observation, technical skills*

Activity:

1. Have you seen any life in this stream? At the beginning of the activity the pupils, in pairs, tell each other a recently experienced event about anglers or fish for about five minutes each, trying not to interrupt each other's story.
2. What else lives in the water besides fish? How can we examine life in the water? Are we going to find anything else under the stones? Images with macro-invertebrates are shown.
3. Water samples are collected:
   a) In a stream with stones the thin net is placed vertically against the current, so that it reaches the water-bed, and the stones are gently moved by hand or foot for 2-5 minutes. Any small animals on the stones and under the stones will enter the net. Some species are very tightly attached to the stones, and these animals are placed by hand into the net. The sample is then transferred into a somewhat larger tray with less water, from where the small living organisms will be carefully chosen, observed and identified as in figure 2.
   b) A firmly tied net for vegetables, filled with some stones and leaves, is placed into the water a week before the activity, and removed at the time of the activity. These traps will be populated by invertebrates in a short while. In this way, all we have to do is take the bags out of the water. It is recommended to camouflage the bags, but be sure that you are be able to find them!

There are several ways to the information about the types and number of collected macro-invertebrates. The essence of any technique is that the larger the diversity of the species found, the healthier the water is. Very sensitive species will not be found in large numbers in low-quality water, while the presence of sensitive species indicates very good quality water.
Observation is generally done at several points in time.

4. Discussions about the way in which the presence of the village influences the abundance (or lack) of species. What can be done? Who is responsible? If we do not find any species with low tolerance against pollution, we will ask for help from specialists in the field.

While on the riverbank, we lean over and watch the water attentively. If we see Grammarus, characteristic for oxygenated waters, we may also look for larvae of Tricoptera and Plecoptera. If we do not find any of these, but there are snails present, the water is in a state of medium pollution. If there are no snails either, but worm-like living things are visible, this indicates that the water has a low oxygen content, that the water quality is low, and the river is polluted. A red colour indicates a very high level of water pollution.

3. Good Management Practices:

The starting point for good management is to examine the current situation. Answering the following question can be a basis: How clean are the water and the riverbanks? Why are they not clean? What are the sources of fixed and undetermined points of water pollution? What extraneous elements can you find on the riverbanks?

Objectives:
a) to differentiate between fixed points of pollution and other points which cannot be localised
b) to understand and admit that any person may contribute to pollution and is responsible for the quality of surface waters
c) to develop plans in order to reduce pollution
Number of participants: *20-30*
M***aterials:*** *pencils, coloured pencils, erasers, fountain pens, books, or any other small object belonging to the groups you are working with.*
Duration: *about 50 minutes*
Place: *in the classroom,.*
Competencies, skills: *critical observation, foresight, self-knowledge*

A large band of paper is obtained by sticking at least two large sheets of packing paper together to make a total length of at least 2m. Draw a river on the paper with a blue marker and colour it in. Divide the river with a longitudinal line through the middle of the river. Divide the picture of the river into vertical strips and number the areas according to the number of groups, which have been formed. In the case of eight groups with three members each, for example, you will have eight columns. Each area is divided into two by the line going along the middle of the river.
A discussion can be facilitated in the classroom so that the pupils can contribute thoughts and insights they may have on human impacts – both negative and positive – that change the quality of waters. They will be helped in understanding the importance they play in preserving the quality of waters.

Ask the pupils how water circulates, and what large rivers flow though their country. Pictures of rivers and lakes in their country may be shown. Ask the pupils where the springs of these rivers are, and what they flow into. Ask them across how many areas of the country these rivers flow. Analyse the ways in which the rivers are used, according to the area they flow through. Ask the pupils to think about how this use may affect the waters. Ask the pupils how the people who live at the lower section of a river may feel about the way in which the water is used by people living in the upper section.

Activity:

1. Tell the pupils that they have inherited a part of the land near the river and one million Euro. Ask them to write, in groups, about how they will use the land and the money.
2. Cut out and give the each group of pupils one strip from a sheet of packing paper and coloured pencils. Explain that blue represents water and white represents their piece of land. They have one million Euro to develop their land as they wish. They can build a farm, a motel, a factory, a house, a park; they can exploit the natural resources of the ground, plant trees or do anything else (30 minutes). When the pupils have finished their drawings ask them to look at the number of their strips of papers. Explain them that each strip is part of a whole, and when put together, all the strips make up the original drawing of the river. Ask the pupils to assemble the strips on the river. The strips have to be put together according to their numbers 1 being the uppermost section of the river and 8 the section furthest down.
3. Ask the pupils to describe how each group developed its land use, and how they used the water. They will have to identify whether their actions polluted the water and if they discarded any materials into the river. Ask them to represent every piece of their contribution to water pollution by one of the items found in their schoolbags (books, pens, pencils, etc.)
4. Next, ask the pupils to give away objects representing pollution to their classmates down the river. Ask the pupils to say what kind of polluting element they are holding before giving it away. Each pupil will give his/her object(s) to the next one, until the last pupil will receive all the handed-down objects.

Conclusion: Talk about how those pupils living in the middle section and those living at the last portion of the river are feeling. Can they develop their lands in the way they would like to? Are the pupils who live in the lower sections of the river affected by those who live in the upper area of the river? Might the activities of the latter affect the quality of water for the former?

The pupils then get their objects back. Explain that those objects, which were easy to identify, are the fixed, known sources of pollution (pipes, canals), while the other objects, which were more difficult to identify or could not be identified, represent sources of pollution that are difficult to localise. Give the pupils the table below with the main sources of pollution. Ask them to write a composition at home about the way in which they can diminish their contribution to pollution.

Discussion. Evaluation, Follow up: Ask the pupils to share their opinion about individual contributions to the quality of water, to write a composition about what they can do to protect the quality of water, and to make differentiate between fixed (known) points of pollution and those difficult to localise. Table 2 can help to initiate the discussion.

Table 2. Sources of pollution and practical Means of Good Management

Nr.	Sources of pollution	Practical means of good management
1.	Roads and highways	• To keep paints, solvents and oil products in specially equipped places, covered, in dry places or where there is water drainage • To repair fuel leaks on any motorcars • To forbid the spilling of fuel on village roads (on the earth) • To use natural fertilisers • To build special basins for rain water that washes off of roads and afferent areas • To decrease the number of new roads being built together with other afferent units (petrol stations, shops, car repair shops, etc.) • To cover the margins of roads by growing plants or forest vegetation
2.	Agriculture	• To read and respect the user's instructions for chemicals, fertilisers and pesticides • To observe the conservation techniques of farmlands • To respect agricultural land designation • Rotation of plant cultures • To cover exposed soil surfaces with forest vegetation (to support and protect the soil) • To plant belts of forest for protection against winds • Sustainable use of pastures • To build dykes in sloped areas to protect against erosion • To use water plants along rivers and canals
3.	Forestry	• To monitor waters entering and leaving an area • To prevent the increase of turbidity in lakes and rivers by building decantation basins for the waters coming from the exploitation areas • To plant a protecting forest curtain around an exploitation area • To implement plans for diminishing erosion on logging roads

Nr.	Sources of pollution	Practical means of good management
	Mining	• To monitor the waters which enter and leave the area • To deviate and transport contaminated waters far away from clean waters (keeping the clean water clean) • To build basins and canals for collecting water; to plant forest vegetation to prevent erosion • To clean contaminated water • To drain torrents • To take special security measures for the prevention of accidental contamination of torrents with materials resulting from mining • To build protection dykes along the canals used for the transportation of used water
5.	Construction	• To implement plans to control and reduce the amount of materials resulting from any building activity • To plant forest vegetation to prevent erosion • To deposit solvents, paints and other building materials with a high risk of contamination only in specially equipped places • To build temporary canals and basins to collect rain water which washes from the working area • To monitor the waters which enter and leave the respective area.
6.	Residential	• To use natural fertilisers in parks, green areas and gardens • To build septic fosses for household water • To observe the instruction for the use of chemicals, fertilisers and pesticides

4. Drinking water. The Tale of the Water in the Wells

Objectives: *The pupils will recognise the necessity of cooperation among all members of a community in finding a solution to an environmental problem. Pupils will work together to find the solution to the given problem.*

Number of participants: *20-30*

Materials: *Four packs of 52 cards (of the same kind)*

Duration: *50 minutes.*

Place: *The classroom*

Competencies, skills: *co-operation, task-division, empathy, common problem solving*

Activity:

1. **"The Tale of the Water in the Wells"** is read to the pupils to introduce the idea that cooperation ensures success.

"The Tale of the Water in the Wells"
In the village Satul Mic a problem occurred: the waters of the wells had become toxic as the underground waters of the area were infiltrated with dangerous chemical substances. The problem had to be solved as soon as possible, since it affected the quality of life of the whole village community. Everybody was sure that Somebody would do something to solve the problem. Anybody could have done it, but Nobody did. Now Somebody is angry because Everybody was responsible. Everybody thought that Anybody could do it, but Nobody did not realize that Everybody should have done it. In the end Everybody accused Somebody when Nobody did not do what Anybody could have done.

2. Before the lesson begins, make sure that the four packs of cards are complete. Shuffle all four packs of cards together, and then divide the cards into four groups of 52 cards each.
3. Divide the pupils into four groups. Each group represents one of the following members of the community: Group A – businessmen; Group B – politicians; Group C- general population; Group D – pupils.
4. Tell the pupils that the four groups form a community together, the community in which they live. At present they have an environmental problem affecting all of them. Each group is responsible to ensure that the community will find a solution to the problem. The solution is represented by a complete pack of cards. The solution may be that the whole class works together to make one pack of cards complete, or each group may work individually. The pupils will figure the solution out by themselves, without the help of the teacher.
5. Next, give each group one pack of mixed-up cards. After two minutes, or when a pack of cards is complete, discuss what happened. See the questions below. If no group succeeds in having a complete pack of cards in two minutes, but instead, are quarrelling about the cards they need, underline that they need to try again. Let them try two or three times. They will begin to understand that they need to organise and communicate as groups.

6. **Questions for discussion:**
   - *What did you do at the beginning?*
   - *Was your group competing with others to find the solution?*
   - *Did you try to exchange cards?*
   - *Are there several solutions (more than one complete pack of cards)?*
   - *What do you think: how many ways of cooperation exist to make one pack of cards complete?*

During the discussion it will be emphasised that:
- *We are the members of the same community.*
- *Although we have different interests as separate groups, we have to cooperate and work together for a common goal.*
- *Isolation of any of the groups will not help anyone, but may cause friction and resentment.*
- *Pointing a finger at one of the groups as being responsible for failure will not contribute to a favourable climate and will not help solve the problem.*
- *Cooperation between the groups is better than competition. Right from the start, each group is responsible for making sure that the community will find a solution to the problem.*

7. Divide the pupils into four groups and give each group a name: *Everybody, Somebody, Anybody, and Nobody.* While reading, the teacher points at the group, which will then call out its name: Everybody, Somebody, Anybody or Nobody. Each group stands up when its turn comes to say its name, after which everyone in the group sits down again.

8. Discuss with the class how the groups felt when they wanted to solve the problem together and found it hard to find a common solution.

6. Conservation and Use of Drinking Water

*O**bjective:** The pupils will determine how various methods of water conservation help conserve water; they identify the usual ways of water conservation, which they may change or adopt. They realise how important water conservation is.*
*N**umber of participants: 2**0-30*
***Materials:** pencils, papers*
***Duration:** two 50-minute lessons*
***Place** the classroom*
***Competencies, skills:** reflection, self-awareness, environmental-awareness*

Introduction for the teachers:
The earth has a finite quantity of fresh water suitable to be used. Fortunately water is recycled naturally (through collection, cleaning and distribution) within a hydrological cycle. Humans have developed technologies which increase the speed of cleaning water. Because of multiple factors (draughts, floods, increase of population, contamination, etc.) the water reserves do not always meet the needs of the community. Water conservation can ensure availability of necessary fresh water reserves for everyone now and in the future. Thus, it is important to use only the strictly needed amount of water. Basically, water conservation means a change of habits.

One simple habit is to turn off the water tap whenever you stop using it. Another example is that you can use the water in which laundry was rinsed, to soak the laundry to be washed. For cleaning the sidewalk, some use a water jet when a broom could do the job just as well. People are also encouraged to reduce the amount of water they use by taking a short shower instead of pouring a bath.

For certain water conservation practices greater effort and more money may be needed, but in the long term this will save resources. For instance, water hoses or showers may have ends with smaller holes added to them, which will reduce water consumption and increase water pressure. Replacing the water basins of toilets with smaller ones will also reduce water consumption. The volume of water use can also be decreased if watering of gardens is done in the morning or in the evening, when evaporation is less. More complex methods of water conservation may involve building watering systems, which spread water by pulverisation.
Water conservation will ensure more fresh water and reduce the amount of polluted domestic water. From an economical point of view, saving clean water or producing less polluted water means that less water has to be treated. A realistic programme of water conservation may help a community avoid building new water cleaning stations, and eventually this means saving money.

Activity:

Ask the pupils to describe ways in which they use water. They will describe or draw situations in which they think that water has been wasted. The pupils show their drawings and discuss methods by which water may be conserved.

1. Ask the pupils to keep track of the water they use for an entire week. They can find help in doing this in the table below (Evaluating the Amount of the Water Used). During the lesson develop a plan together to measure the amount of water used and ask them to write down the number of litres of water used for every activity.
2. The following week, ask the pupils if they used water more efficiently. Did they waste any water?
3. Discuss the reasons why water should not be wasted. The pupils will take into consideration that in the future water resources will be limited, people's needs for water worldwide will increase partly due to population growth partly due to development of developing nations, and at the same time the cost for using water should be kept as low as possible.

4. Ask the pupils to think about a water conservation plan comprising a set of activities by which they may conserve water at school and at home. Their plan may be supplemented with "Primary Measures for Water Conservation".

Ask the pupils to identify 3-5 methods with which they can conserve water. The list of Primary Measures for Water Conservation" below may be of help. Ask them to put these down on paper, and, until the following week, to try and apply them and note the results in a diary. Remind the pupils that time and effort are necessary for these methods to be successful.

Conclusion: At the end of the week, ask the pupils if their methods of water conservation changed the amount of water they used. Invite them to compare results. Which method is easier to use? And which is more difficult? Ask the pupils to create posters showing the benefits of water conservation. The posters may comprise many things that people can do to save water.

Discussion: The evaluation of the activity is done by asking the pupils to present methods of water conservation and compare the quantity of water used before and after the implementation of their conservation plan. Ask the pupils to write an article to show why, in their opinion, water conservation is so important.

Table for Evaluating the Amount of the Water Used
There are various estimates about the average quantity of water a person uses per day. You can use either your own estimate or the following one:

Drinking water and nourishment:	about 15 litres
Water in the toilet tank:	10 litres
Brushing teeth (water flowing from the tap while brushing and rinsing)	5 litres
Washing dishes (the water left to flow):	113 litres/number of persons
Washing dishes (the water kept in the sink):	87 litres/number of persons
Dishwasher :	15 litres per cycle
Water for a shower:	10 litres/minute, about 80 litres for a shower
Taking a bath in the tub:	about 250 litres/one bath
Water for washing laundry:	100 litres/number of persons at one washing
Washing machine:	about 50 litres/cycle/number of persons

Other evaluations can also be calculated and used. The important thing is that all should use the same average values. This could be another separate theme.

List of Primary Measures for Water Conservation
- Turn the tap off when you don't use the water; don't let it flow while you brush your teeth, and turn the water off while you soap yourself
- Use the washing machine only when you can use it at full capacity

- Keep water in the refrigerator instead of letting the water flow until it becomes cold
- Limit the time for taking a shower to 10 minutes
- Take a shower instead of a bath
- Wash your hands with water in the wash basin, instead of letting the water flow
- Try to use rain water for watering flowers
- Use cold water to wash vegetables, fruit and your hands
- Repair the taps from any water leaks

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Further References:

Please, see the reference to the Danube Box and the World of Carpathians in Appendix 3. Annotated further references.
See the Chapter 7. Energy on water – energy connections.

QUESTIONS:

- What is the connection between the rivers and the mountains?

Water in your community

Do you leave close to a stream or a river? Where is the source of this stream/river? Where is the mouth?
Are there lakes in your area? Where do they receive the water from?

Water in the Carpathians using a Map:

Please look at the Map 4. Richness of fish species in the Carpathian River Basins. Can you find your community at the map?
What can you say about the richness of fish species in the rivers in your country? In neighbouring countries? Close to your community?
What could this indicate about the water quality in the rivers?

Many rivers cross country boundaries. If one part of the river is polluted: how many countries does this affect? Can you find parts of the river basins where people from two or more countries could cooperate to take care of the rivers? Are they already cooperating?

2. Spatial planning

Carpathian Convention Article 3 – Integrated approach to land resource management

The parties shall apply the approach of integrated land resource management as defined in Chapter 10 of Agenda 21, by developing and implementing appropriate tools, such as integrated management plans in regards to the areas addressed in this Convention article.

Carpathian Convention Article 5 Spatial planning

1. The Parties shall pursue policies of spatial planning aimed at the protection and sustainable development of the Carpathians, which shall take into account the specific ecological and socio-economic conditions in the Carpathians and its mountain ecosystems, and provide benefits to the local people.
2. The Parties shall aim at coordinating spatial planning in bordering areas through developing transboundary and/or regional spatial planning policies and programmes, and enhancing and supporting co-operation between relevant regional and local institutions.
3. In developing spatial planning policies and programmes, particular attention should, inter alia, be paid to:
   (a) transboundary transport, energy and telecommunications infrastructure and services,
   (b) conservation and sustainable use of natural resources,
   (c) coherent town and country planning in border areas,
   (d) preventing the cross-border impact of pollution, and
   (e) integrated land use planning, and environmental impact assessments.

CONTEXT AND GENERAL INFORMATION

What Does Spatial Planning Mean?

Spatial planning refers to the way in which we human beings use the surface of the Earth: whether to build urban or rural localities, to produce food or various crops, to conserve nature or grow forests, etc. If we focus on a certain area, the way space is used becomes more specific: residential buildings, factories, shopping areas, parks, pastures, etc. Different cultures have developed different approaches to land use, and these are often defined by traditional practices and customs. This is why German towns, for instance, are characterized by rectangular house lots with houses that have courtyards which are not visible from the street, or why stone-paved public squares are characteristic for most West European towns.

More specifically, spatial planning is the decision-making process on how a certain piece of land should and will be used. In the past this decision-making process was solely the responsibility of public administrations. During the past decades, however, consultation between decision makers and those who use and/or live in an area has become more frequent and even compulsory in most European countries [10]. Thus, the way in which a city or a village and all its functions are conceived is a matter of public interest, and the citizens are welcome to participate in the decision-making process (as is shown in chapter 1 regarding public participation).

Sustainable Spatial Planning

Developing a system and an approach that ensures the sustainable, long-term use of an area, and making sure that such a system will serve all its users well, is a challenging undertaking. Practices in this domain in the past century have shown both errors, which may occur in the process, as well as solutions that could be adopted in accordance with the specific character of an area in question.

An important aspect of spatial planning is to make a territory habitable. This objective is the basis for all planning, for land distribution and the systematisation of services, which serve human life. Construction of durable buildings should take into account their impact on the environment, and also make the most effective use of available resources, as is explained in the section below that refers to energy efficiency.

An increasingly widely used principle in spatial planning is the concentration of human settlements, so that its inhabitants have access to local resources and services without having to travel far. This includes, for instance, ensuring easy access to recreation facilities and health services within a relatively short distance. In this way settlements would make use of a relatively concentrated infrastructure (streets, public utilities, water, sewage, communication, etc.), which is cheaper to build and maintain. On the other hand, even though they should be concentrated, settlements should also offer their inhabitants the necessary spatial comfort, ensuring people's need for private space, recreational space etc. One solution to this problem is the adoption of certain rules in town planning that would, for instance, define the maximum height of the buildings or the longest distance from a housing unit to the nearest park.

Settlements are also analysed nowadays from the perspective of the resources they use. As we analyse the functioning of a town, for example, we discover that most of its resources come from outside the town, and sometimes even from very distant places: food is transported by planes, energy is sometimes produced far from a settlement, and most goods are made in factories in other countries. Moreover, many people live tens of kilometres away from their places of work. In recent years, the prevention of such dependence on external resources and the increasing use of local resources have become frequent topics of discussion. Paying attention to these issues could also help control the size of urban settlements: towns should grow in size only if they can ensure their capacity of supplying sufficient local resources. Thus, the impact of a settlement on its environment could be more precisely estimated and even reduced.

10 Of the Carpathian Countries, the Czech Republic, Hungary, Poland, Romania, and the Slovak Republic have adopted legislation on this issue.

Another principle of sustainable land use refers to location and the use/function of a particular piece of land. A negative example in this respect would be the placement of a factory that produces a high level of noise in the middle of a residential district, or the placement of a warehouse for waste materials in a protected natural area. The principle of location is directly linked to equity and the respect shown to the rights and obligations of all inhabitants or users of one piece of land. In addition to the basic human rights (access to education, to a clean environment, to health services etc.), the public administrative body can also define more specific rights and obligations for land users. It is also responsible to ensure that there is no discrimination between land users in applying the rights and obligations (according to criteria related to wealth, education, religion, ethnicity etc.). This principle of equity is sometimes breached when discriminatory practices lead to decisions that affect the rights of land users (for example, by positioning a polluting factory or having very little green area in a poor neighbourhood district).

Last, but not least, the following are some elements of sustainable land use from an ecological point of view:
- conservation of rare landscapes, habitats and species
- avoiding the unsustainable use of natural resources
- avoiding or compensating the effects of development upon an environment
- implementing methods of land use that are compatible with the natural potential of a respective area

From a cultural point of view, spatial planning should promote existing values, guaranteeing citizens the conservation of and access to important elements of their "collective memory". An example is the conservation of buildings in historical areas, and the promotion and protection of natural areas that represent landmarks of the local culture (such as natural monuments, special natural features, natural and cultural heritage elements, etc.) and are characteristic of a certain area.

Spatial Planning in the Mountain Areas

Traditionally, rural mountain areas are characterized by decentralization, mainly for two reasons:
- low degree of access (only along valleys with rivers)
- the space surrounding the households is used to meet the current needs of the inhabitants (pastures, forests, rivers, etc.)

This poses a series of problems, especially if we consider the arrangement of a territory from the perspective of centralization: it is much more difficult to build up infrastructure (electricity, water supply, sewage, etc.) for a small community that is spread out over a large territory.
From the perspective of sustainable development, however, the situation is rather positive when solutions are sought that make use of local resources and contemporary technology. For example, it is much more efficient in a mountain community to produce energy from renewable sources (wind, water, solar, biomass, geothermal), and these sources of energy are easier to implement in communities that are located close to nature. The use of local resources is a sustainable alternative when building houses from traditional materials or producing food, as it has a much smaller impact on the environment.
In this context, the concept of "appropriate technologies" (AT) was developed, in order to take into account the environmental, ethical, cultural, social and economical aspects of communities where technologies are used. The concept of AT incorporates the use of fewer resources, ease of maintenance, lower cost, and a much smaller environmental impact than conventional industrial production. An example of AT are the very simple systems for collecting rainwater, to be used in agriculture or for human consumption. These technologies can help inhabitants of rural areas improve their life quality without producing serious damage to the environment, from the extraction of raw materials to the reintegration of waste into the environment.
An essential aspect of land use in the mountain areas is the conservation and protection of natural resources. Because these resources are more difficult to access, the natural integrity of the environment in these areas has been mostly preserved. At the same time, it is now possible to improve the quality of life in these areas while avoiding uncontrolled development. This offers rural communities the chance of improved their livelihood, an area that has not been fully explored to date.

Waste management in mountain areas puts pressure on the environment, if only because of centralized waste collection systems requiring transportation of waste over long distances, in order to reach the processing and storage facilities. The negative impact of new food packaging is now obvious in the mountain areas. Although for some time, inhabitants of mountain areas managed to stay away from such globalization "benefits", both because of difficult access to such goods, and because of the conservative attitude characteristic of highlanders, paradoxically, the new packaging now seems to be highly appreciated by the population. If a psycho-sociological analysis of this phenomenon were done, the results would probably reveal the negative and powerful involvement of the media in this process, as it promotes consumption practices that are extremely harmful to the very existence of mountain populations, not to mention the negative impact on the environment and the huge amount of waste that comes from plastic packaging.

Woodcutting in the mountain forests in Romania is not restricted whatsoever in the inhabited areas. In some rural localities more than 25% of the households use mechanized tools for wood processing. This is because in these regions almost all residents gain their livelihood almost exclusively from wood processing. The authorities lack vision and take no action to diversify the occupational structure of these sensitive areas. In addition to the discomfort created by the noise from wood processing equipment that are used mainly in the courtyards of houses, and disturbances created in the electrical supply meant to serve domestic use, large amounts of waste (mostly sawdust) are discarded, almost without exception, at the riverbanks. Then, when the water levels rise, the sawdust is away by the rivers. Sawdust is an extremely polluting element when it gets into the water, because it obstructs oxygen absorption. When it is incorrectly deposited on the ground, the process of decay contaminates the surface and underground waters and leads to the emission of methane, which is a greenhouse gas twenty-four times stronger than carbon dioxide.

QUESTION:
- What does spatial planning mean?

Spatial Planning in your Community:
- What is the structure of the locality you live in?
- What kinds of activities are carried out in your locality? Where are they carried out? How does their location affect the way of life of the locals, or the environment?
- How efficient is the access to public services (education, culture, healthcare)?
- Where do the every-day resources used by the locals come from (water, food, electricity, heat, other goods)? Could they be produced locally?
- What kinds of infrastructure (transportation, water supply, sewage, waste) are available in the area? Is it enough? What should be improved? What possible improvements could be made?

Spatial Planning in the Carpathians using a Map:
Look at the following maps in order to facilitate discussion with the class [11]:
- Diversity of land cover and land use in the Carpathians (Map 5)
- Vision for large scale protected areas of the Carpathians (Map 6)
- Road and rail network density in the Carpathians (Map 8 and 9)
  - *Is the land in the Carpathians distributed properly, in your view?*
  - *Which county has more agricultural/urban area?*
  - *Do you agree with the vision of the protected areas shown on the map? Could you suggest any other area to be protected?*

Note for those implementing the above locally:
Add references to local spatial planning regulations, and some local cases, which could be used as a basis for discussion.

11 Other relevant maps can be found in the Carpathian Environmental Outlook (KEO), Ch3, available at http://www.carpathianconvention.org/NR/rdonlyres/573C03A6-18C4-4001-A845-0AF5E12CC516/0/CH_3a.pdf

ACTIVITIES

Planning and Land Use Debates: A good way of discussing values of the Study Trail key points

Objectives: *stimulation of a decision- making process concerning spatial planning at a local level.*
Materials: *sheets of writing paper*
cards with the description of various roles, images from the area or any materials which may support the points of view being presented.
*N**umber of participants:** 15-20*
Duration: *2 hours*
Place: *classroom, outdoors*
Competencies, skills: *analysis, comparison, synthesis, negotiation, argumentation*
Connection with other school subjects: *physical and human geography, civic education*

Our Pasture – A Joint Decision

The pupils are presented with the case of a pasture in their neighbourhood, together with the description of the various roles they will play during the following hour at a simulated public debate (see the descriptions below). In this public debate the teacher will be the moderator. The decision, resulting from the conclusion of the debate, will be made by those pupils representing the Mayor's Office.

Some rules for the organisation of the debate:

Each part is played by only one pupil, with the exception of the group representing the Mayor's Office;
The contents of each part should be known only by the pupil(s) playing the respective part;
The moderator ensures that each participant has a similar amount of time (e.g. 5 minutes) to present his/her point of view;
Each participant may take to the debate materials or documents in support of his/her point of view;
The order of participant presentations is decided by the representatives of the Mayor's Office;
The debate cannot last longer that one hour;
The audience present at the debate must not intervene with arguments or varying points of view, but they will be allowed to share their opinions about the decision taken by the representatives of the Mayor's Office.

Description of the Case

The village situated in the Carpathians where you live has picturesque surroundings: forests, a small mountain river, and a meadow. The main occupation of the inhabitants is agriculture.

Due to the tourism potential of the village, the Carpatus Ltd. firm is very interested in building a tourist complex on the outskirts of the village, which will comprise six holiday cottages with six rooms each and a luxury restaurant, sports grounds, and a swimming pool. The firm declares that if it is granted approval for building the complex, it will improve the main road in the village to attract as many tourists as possible.

The site on which the firm wishes to build the complex is a meadow has been the property of the village for the past 100 years. It is a place were the villagers organise reunions on a regular basis. It is a place for events that display and sell the goods/produce of the local craftsmen and farmers, a place for public debates or for celebrating holidays, and where the young people meet to dance. Recently it was discovered that several protected plants, specific to the Carpathians grow in the meadow, and the area will be declared a protected natural area in the near future.

The local Mayor's Office organises a public debate and invites several people interested in this upcoming decision, people representing different groups in the village. At the end of the debate the representatives of the Mayor's Office will decide whether to grant approval for the Carpatus Ltd. Firm or not.

Roles to Play:

The mayor and two councillors

You represent the local Mayor's Office, which is delighted that a firm is interested in investing at your local level. You don't yet know all the details of the project, but what you know for certain is that the investment will bring money to the village and the firm will have to pay local taxes for its activities, thus the public income of the village will increase. You know that most of the villagers are poor and you would be glad if this enterprise would generate local employment (although the investors have not guaranteed this). The village also needs a new road, as the old one is full of holes and people cannot easily come to the village. There are other sites available for construction in the village, and you don't know why the firm wants this site in particular. You don't know what the firm will do about the garbage and wastewater produced by the complex. If, on the other hand, the meadow is declared a protected area, you can think of several opportunities to develop the village through this, and a tourist complex right in that very location would be of no use in this regard. You want to make a decision that takes the opinions of village residents into account and you will have to represent your decision before the public.

Manager of the Carpatus Ltd firm

You came to this village for the first time four years ago and you liked it very much. You think you could make a lot of money by building this tourist complex. Later you could buy more and more land in the area and start a lumber business. This site is very important to you because it is just near the forest and you would like to build an entire holiday resort, even with a hunting ground for rich customers. You think that the nature around the village should be used as much as possible, because it can make you as rich as your customers. You might employ some local people too, but mostly you need well-trained staff, which you cannot find here. The food will be brought from the city, as you expect clients who will be hard to please. The local people will, however, also have something to gain, as they will have a new road and will have the possibility to open up shops for the tourists.
Assert this point of view at the public debate organised by the Mayor's Office. Bring drawings, photographs or objects to illustrate your point of view and to convince the audience.

School headmaster

You have been the headmaster of the local primary school for 20 years. Everyone knows and trusts you. You are sad because the young people are leaving the village to find work, even though you know that there are possibilities of work here too in agriculture or in tourism. More and more people from the nearby town appreciate the natural environment and the traditional products made by the villagers and wish to come to the village, so a resort seems like a good idea. You are disappointed, however, because five years ago you proposed to the mayor to build a library on the meadow of the village. This would have been appropriate in your view as it located near to the school, but the proposal was not approved in spite of the fact that the children and the teachers supported it. The mayor told you that it will be discussed more at a later date, but he never mentioned it again.
Tell your opinion at the public debate. You have to decide together with everyone else present what the village will look like in the following years.

Representative of the farmers' association

You come from a family that has been dealing with farming and sheep breeding for several generations. You love the village where you live, the surrounding nature, the traditional customs. You wish to make a living by selling the traditional products of the area, but at present this is rather difficult. You think that the complex will bring visitors and create a market for the traditional products. You would like your two sons to remain in the village to help you with the work, but they want to go to the city to earn a better living. The complex may provide some well-paid jobs for them or, by attracting visitors, present an opportunity to start a business in connection to local tourist opportunities. You have discussed the matter with other farmers, and you have come to the conclusion that if the firm does not guarantee to use and promote the food produced in the village, the investment will not help you. It will only destroy a necessary part of the village, the place where you can sell your products at the fair organised by the village, and where many people come.

Assert this point of view at the public debate. Bring drawings, photos, products or objects to illustrate your point of view and to convince your audience. You have to decide together with everyone how the village will look in the following years.

Representative of the villagers who live near the meadow

You are young and have not left the village yet because you don't want to be separated from your family or give up your way of life in the village. You enjoy silence, you like to fish at the bank of the nearby river, you like woodcarving. This is how you earn money for your living. All your neighbours think that the new complex will attract many people, but they do not agree with it since their street will become crowded with cars, people, and street vendors. This will mean exhaust gases, noise from morning to night, not to mention the agitation while the construction of the facilities will be going on. You think that there will be much garbage and a lot of dirty water, and you don't know where they will put this as there is no sewage yet in the village, and the garbage pit is very small. Also, the river near your house would be much closer to the proposed complex than the garbage pit. You have seen in the village where your brother lives that the river near the village has become the garbage pit of a private hotel. The meadow is the playground for your children, and you often see deer and foxes there. You wish that the tourists who come to the village could stay at your neighbours' houses, eat natural traditional food prepared by the locals, sleep in beds made by the local craftsmen, and go for walks on the paths nearby. You think that this complex will only create problems for you and your neighbours.

Comment: The above description seems to be primarily against the company because all of the wishes are for an alternative tourism rather than the proposed complex. Perhaps you could add a sentence on why this character could also be interested in the complex.

Assert this point of view at the public debate. Bring drawings, photos, products or objects to illustrate your point of view and to convince the audience. You have to decide together with everyone how the village will look in the following years.

3. Public Participation

How to Influence and Participate in Environmental Decision Making

CONTEXT AND GENERAL INFORMATION

The Aarhus Convention

The rights of people to participate in decision-making processes in environmental matters, to access environmental information, and to have access to justice were laid down by an international treaty, called the Aarhus Convention. All of the Carpathian Convention countries are part of the Aarhus Convention and have introduced laws in their respective countries to implement these at the national level. The Convention considers the above rights as essential elements of the right to live in a healthy environment, as well as the obligation to protect the environment for the benefit of future generations. The Aarhus Convention has three main pillars:

I. First pillar: THE RIGHT TO KNOW
II. Second pillar: THE RIGHT TO PARTICIPATE IN PUBLIC DECISIONS
III. Third pillar: THE RIGHT OF ACCESS TO JUSTICE

I. First pillar: THE RIGHT TO KNOW.

FACT SHEET I

Elements of the right to know
Environmental Information is information on any element of the environment, such as air, water, soil or biological diversity (including genetically modified organisms); information on activities and programmes affecting these elements; and effects that the state of the environment may have on human health and safety. Environmental information can be conveyed in any form e.g. written, visual, electronic, etc.

1. Anyone can ask

2. for any environmental information

3. from any public authority, for example, national ministries and agencies, and their respective regional and local offices; state, regional or provincial ministries and agencies, and their respective regional and local offices; as well as local or municipal government offices, such as those found in cities, towns or villages.

4. WITHOUT having to provide ANY REASON: Authorities are not allowed to ask why anyone may need the information before they provide it. They have to give access without knowing the intended use of the information.

5. The authority has 30 days to respond.

6. Exemptions: national defense, public security, privacy, commercial confidentiality and information, the release whereof could harm the environment (e.g. the breeding sites of rare species).

7. In addition to the authorities' obligation to provide information when requested, they must also actively engage in collecting and producing environmental information (e.g. they are required to produce state of the environment reports).

8. Emergency situations: authorities must immediately distribute all information in their possession that could help the public take preventive measures or reduce harm.

II. Second pillar: THE RIGHT TO PARTICIPATE IN PUBLIC DECISIONS.

FACT SHEET II

Concept of public participation in decision-making processes:
a. The reason behind this right:
Authorities can make more environmentally-friendly decisions and laws if they also ask for and consider the public's opinion. Very often the public has the most accurate and up-to-date information on the environment. Also, public participation ensures transparency and accountability, and therefore, improves the quality of decision-making processes.

b. Types of procedures the public has the right to participate in:
The public has the right to participate in three types of decision-making procedures:
- Decisions on specific activities significantly affecting the environment (granting or denying permissions), such as road construction, nuclear power plants, etc;
- Adoption of plans, programmes and policies relating to the environment;
- Law making.

c. The obligations of authorities are:
- to inform the public of the proposed activity, planning process or law-making program early on in the process, while the options are still open;
- to provide access to relevant information free of charge;
- to provide information about the authority responsible for decision-making processes, the method for submitting comments, as well as dates and times of opportunities for public participation.

Authorities must consider the public's opinion in their decisions. Each decision must be publicly accessible and provide valid reasoning. Although public consultations and public hearings are not legally binding, meaning authorities may end up making decisions that differ from the public's opinion, these forms of public participation are very useful to complement and improve any decisions made.
Referendums, however, do have a binding effect, which means that authorities are obliged to base their decisions on the result of a successful referendum and the public opinion it reflects.

II. Third pillar: THE RIGHT OF ACCESS TO JUSTICE.

FACT SHEET III.

Elements of the right of access to justice:
Anyone can appeal to a court of law or another independent and impartial body, such as an ombudsman (See Appendix I):

i. When the request for information has been ignored, wrongfully refused, or inadequately answered;
ii. When the right to participate in a decision-making process has been breached.

Note for those implementing the above locally:
Change the Romanian legal texts, links and examples to the local ones. Modify the structure of the chapter in order to reflect your local legal situation. Emphasize the most relevant local possibilities in public participation.

QUESTION:
The chapter questions are closely connected to the suggested activities and distributed throughout the ACTIVITIES section.

ACTIVITIES

Could you organise a public debate about one of the Key Points of the Study Trail? What would be the main issues discussed?

I. Activities for the first pillar:

1. Open discussion of a specific case

Objectives: *to understand why it is important to get information,*
who needs to be informed, and
when the information has to be provided
Number of participants: *20-30*
Materials: *case study*
Duration: *30-40 minutes*
Place: *classroom*
Competencies, skill: *information gathering and critical analysis of information*

In advance

1. Ask the students to collect information and evidence on the Internet or in their local library on how the public was informed about a specific environmental case and what kind of information it had received. Conduct some preliminary research yourself or study the case in Box 1. Distribute the results among the students.

In the classroom:

2. Share the information that the students or/and you have found.

Box 1. The Case of Chernobyl

The Case: Chernobyl nuclear disaster with a special emphasis on the lack of information.
The Chernobyl disaster was a nuclear reactor accident in the Chernobyl Nuclear Power Plant in the former Soviet Union. It was and remains the worst nuclear power plant disaster in history. Radioactivity was released into the environment that negatively impacted the health of millions of people. It is difficult to directly link the deaths to radiation, but it has been proven that hundreds of thousands of people died prematurely because of exposure to high levels of radiation.
At first the government tried to withhold information about the accident. The first explosion took place at 1:23 am on April 26, 1986. Evacuation of the 50,000 residents of Pripjaty started at 2 pm on April 27. The first news about the accident was released to the public at 9 am on April 28.

3. Inform students that the „right to know" did not exist in the Soviet Union when Chernobyl happened. Now, however, public authorities are obliged to make environmental information available in a timely manner, and so they must now inform residents without any delay in the case of an accident.

4. Raise the following questions:
   - *What difference do you think an immediate release of the information about the accident could have made?*
   - *Do you think that people living close to the site of the accident should have been fully informed? Why?*
   - *Who else do you think should have been informed about the catastrophe?*

2. Information selection

Objectives: *to get a sense of what we consider as environmental information.*
Number of participants: *20-30*
Materials: *list of information*
Duration: *20-30 minutes*
Place: *the classroom*
Competencies, skills: *information gathering and critical analysis of information*

In advance:

1. Write several examples of environmental information and non-environmental information on cards (one example of information per card). You can use the example list of information provided in Box 2, but also provide additional information relevant to your community.

In the classroom:

2. Break the class into groups of 5-6 students. Each group should receive the same amount of mixed cards. Hand out a pile of cards to each group and ask them to select environmental information.

3. Raise the following questions:
   - What did you select and why?
   - Can you mention any other examples of environmental information you have heard of or think is important?

Box 2. An Example List

Environmental information:

- SO_2 level in the air of the nearest city
- Heavy metal concentration in a creek running through a village
- Heavy metal concentration of the drinking water in a city
- Chances of getting cancer within 5 years as a result of an explosion in the chemical factory just outside a village
- Information on the effects of an explosion in a paper factory on the water quality of a nearby river
- Pollution released by a chemical factory in a town

Non-environmental information:

- Names of two people who got paralyzed in an accident in a nuclear power plant in town
- Annual salary of the environmental engineers employed by a chemical factory in town
- Information about the sponsoring activity of the firm operating a nuclear power plant
- Information about the profit of a local farmer
- Information on the nationality of employees of a factory

4. Ask the students the following question:
   - An official at the mayor's office refuses to provide the information you requested unless you write down the reason why you need that information. Is he/she in the right? Do you think you should explain why you need the information you asked for?

In case the discussion does not come to the same conclusion, explain to the students that authorities are not allowed to ask why we need the information before they provide it. They have to give access without knowing the intended use of the information.

3. Application of the acquired information on the right to know in a specific case

Objectives: *To develop the following competencies:*
- *Critical thinking, systemic thinking*
- *Making joint decisions*
- *Acquiring a joint and general understanding about the environmental aspects of investments.*

Number of participants: *20-30*
Materials: *pencils, papers, case description*
Duration: *40-50*
Place: *the classroom*

Note: S*tudents are expected to mention environmental information that includes the following: estimated effects of construction and the future road on protected species and habitat, the noise level in the nearby village (from the traffic on the new road), air pollution, etc.*

Students should at the least come up with the authority issuing the construction permit and the environmental authority as a possible source of environmental information.

1. Break the students into groups of four and ask them to sit in circles.

2. Present the case in Box 3 to the class:

Box 3.The Retezat National Park
Let us assume that you live in a village in the area of the Retezat National Park, which is the second biggest protected area after the Danube Delta in Romania. National authorities have been planning to build a road through the Retezat National Park, in order to connect two national roads across the mountains.

3. Ask the students to discuss the following questions in their groups:
   - What information do you feel is necessary to know before permitting the road?
   - What are your options to receive that information? Are they available?
   - How can you get the necessary information?
   - Is there a similar issue close to your area?

4. Ask the groups to share their answers with the class and to make a chart or write on the board.

II. Activities for the Second Pillar:

1. Open discussion

Discuss the following questions in a whole-class setting:

- *Should people have a say in whether or not power plants, roads, and waste treatment plants get built?*
- *What might be the advantages and disadvantages? Who should be able to express his or her opinion or concerns in official procedures on whether to permit certain projects effecting the environment?*

2. Semi-role play

Objectives:

- *To get a sense about the role of different actors in the society*
- *To develop critical thinking, systemic thinking competency*
- *To understand and learn how to represent the interests of a specific groups*

Number of participants: *20-30*
Materials: *case descriptions, Brief instructions of roles for the students:*
Duration: *50-90 minutes*
Place: *the classroom*

Prepare two cases. You can use the case provided below in Box 4 or find/prepare cases more relevant to your community (you can ask a local NGO to help you). The case can be made up with the students and related to the local government of the town or village where the school is located. It could, for example, focus on the authorisation of a landfill, tourist infrastructure, or road construction.

BOX 4. An example of a case: Rosia Montana
The Rosia Montana gold mining project has been under the public eye since 2001. Rosia Montana Gold Corporation, a Romanian-Canadian company, proposed an investment project to exploit gold and silver from the 2000-year old mines in Rosia Montana. The project involves: relocating a 2000-person community (including churches, four graveyards, cultural heritage houses etc.), destroying three mountains through on- ground exploitation, creating a huge highly toxic cyanide lake (containing the substances resulting from the extraction of gold), and removing 2000-year old archeological relics from the old mines, which are one of the two oldest archeological gold mining sites in Europe.

In advance:
1. Make three copies of the case description you are going to use,
2. Write the three different roles on three separate sheets of paper (See Box 5)

In the classroom:
2. Ask the students to organize into three groups. Provide them with the case, their role descriptions and relevant information from fact sheet II. Give them minimum 1/2 hour to prepare their opinion.
3. Ask the groups to present their tasks and findings to the class.
4. Discuss with the entire class and ask other groups if they have something to add, and to share their feedback on and impression of the presentations.

Brief instructions of roles for the students:

Group 1. You are members of an NGO, which was given the task of convincing the residents of the community to participate in the public hearing. What would you say?

Group 2. You are residents in the local community. Discuss and present to the class your fears of and reasons for participating in the public hearing, and the information you would ask for at the hearing.

Group 3. You are the authority. What obligations do you have in this case?

(For answers consult fact sheet II.2.a., I.2.2., II.2.c.)

III. Activities for the third pillar:

1. Discuss the following questions with the class:

- Do you think that authorities always provide access to environmental information?
- What should people be able to do in case authorities deny access or participation in decision-making processes?

Appendix I: Fundamental rights, Freedoms – Extract from the Romanian Constitution[12]

All citizens enjoy the rights and freedoms granted to them by the Romanian Constitution. Those human rights and freedoms significantly relating to the main aim of the project are the following:

• Right to information (Article 31)

(1) A person's right of access to any information of public interest shall not be restricted.
(2) The public authorities, according to their competence, shall be bound to provide correct information to the citizens in public affairs and matters of personal interest.
(3) The right to information shall not be prejudicial to the measures of protection of young people or national security.
(4) Public and private media shall be bound to provide correct information to the public opinion.
(5) Public radio and television services shall be autonomous. They must guarantee any important social and political group the exercise of the right to broadcasting time. The organisation of these services and the parliamentary control over their activity shall be regulated by an organic law.

• Access to culture (Article 33)

(1) The access to culture is guaranteed under the law.
(2) A person's freedom to develop his/her spirituality and to get access to the values of national and universal culture shall not be limited.
(3) The State must make sure that spiritual identity is preserved, national culture is supported, arts are stimulated, cultural legacy is protected and preserved, contemporary creativity is developed, and Romania's cultural and artistic values are promoted throughout the world.

• Right to protection of health (Article 34)

(1) The right to the protection of health is guaranteed.
(2) The State shall be bound to take measures to ensure public hygiene and health.
(3) The organisation of the medical care and social security system in case of sickness, accidents, maternity and recovery, the control over the exercise of medical professions and paramedical activities, as well as other measures to protect physical and mental health of a person shall be established according to the law.

• Freedom of assembly (Article 39)

Public meetings, processions, demonstrations or any other assembly shall be free and may be organised and held only peacefully, without arms of any kind whatsoever.

• Right of association (Article 40)

(1) Citizens may freely associate with political parties, trade unions, employers' associations, and other forms of association.
(2) The political parties or organisations which, by their aims or activity, militate against political pluralism, the principles of a State governed by the rule of law, or against the sovereignty, integrity or independence of Romania shall be unconstitutional.

12 The text was downloaded from the Romanian Parliament's website: http://www.cdep.ro/pls/dic/site.page?id=371

(3) Judges of the Constitutional Court, the advocates of the people, magistrates, active members of the Armed Forces, policemen and other categories of civil servants, established by an organic law, shall not join political parties.
(4) Secret associations are prohibited.

• Protection of children and young people (Article 49)
(1) Children and young people shall enjoy special protection and assistance in the pursuit of their rights.
(2) The State shall grant allowances for children and benefits for the care of ill or disabled children. Other forms of social protection for children and young people shall be established by law.
(3) The exploitation of minors, their employment in activities that might be harmful to their health, or morals, or might endanger their life and normal development are prohibited.
(4) Minors under the age of fifteen may not be employed for any paid labour.
(5) The public authorities are bound to contribute to secure the conditions for the free participation of young people in the political, social, economic, cultural and sporting life of the country.

2. The People's Advocate (Ombudsman), Ioan Muraru (in 2009)
The Institution of the Advocate of the People is an autonomous public authority, independent of any public authority. The Advocate of the People shall be appointed in order to defend the persons' natural rights and freedoms.

The acts, which are the subject of petitioning:
- The public authorities' administrative acts and facts, which violate the constitutional rights and freedoms of people, shall be the subject of petitioning.
- The law includes in the category of administrative acts, which are the subject of the People's Advocate activity, also acts of public corporations (autonomous stage management).
- Refusal of administrative bodies by the public and belated issuances

Who may petition the People's Advocate?
Any individual regardless of his/her citizenship, age, race, gender, political affiliation or religious belief may petition the People's Advocate.

Actions by the People's Advocate to defend citizens' rights and freedoms may be performed either by request or ex officio. The Advocate of the People may decide whether his activity be confidential or not, depending on the motivation and reasons behind a request, and also if a person whose rights and freedoms have been infringed upon specifically asks for confidentiality.

The necessary conditions for the petitions to be received and examined:
- The petitions must be submitted in written form and may be sent by mail, email, fax or can be submitted personally or by a mandatory (who must indicate his/her full name and domicile) to the Institution's headquarters or territorial offices, with the occasion of the audiences, or directly to the registration office;
- In case of well-grounded reasons, the petitioner may introduce his petition orally or through the dispatch service, which will record the petition and fill in the standard forms;
- The petition must be signed by the petitioner;
- The petition must contain the following: full information related to the aggrieved person's identity (full name, domicile); information about the injustice suffered (rights and freedoms violated, facts invoked and their description); the name of the administrative authority or the public servant involved; proof of the public administration's delay or refusal to deal with the petition, under the law, within the established term; an obligatory specification whether as to the petition is related to a case wherein a decision is pending or whether it is the subject of judgement; and the names of the public authorities to which the case has been referred to up until now.
- All the relevant documents shall be attached.

The Advocate of the People has the following duties:

a) To co-ordinate the activity of the Institution of the Advocate of the People;
b) To receive and distribute complaints lodged by persons aggrieved by the public administration authorities through violations of their civic rights and freedoms, and to decide on these complaints;
c) To follow up on the legal solution in regards to the complaints received and to request the public administration authorities or civil servants concerned to put an end to the respective violation of civic rights and freedoms, to reinstate the complainant in his/her rights and to redress for the damages thus caused;
d) To formulate points of view, at the request of the Constitutional Court;
e) To notify the Constitutional Court on the unconstitutionality of laws, before their promulgation;
f) To bring directly before the Constitutional Court the exception of unconstitutionality of laws and ordinances;
g) To represent the Institution of the Advocate of the People in front of the Chamber of Deputies, the Senate, and the other public authorities, as well as in its relationships with any natural or legal persons;
h) To employ the staff of the Institution of the Advocate of the People and exercise disciplinary powers over this staff;
i) To act as the principal authoriser for payment and receipt of public money;
j) To perform any other duties as established by the law or by the Regulation on the Organisation and Functioning of the Institution of the Advocate of the People.

The Deputies of the Advocate of the People

The People's Advocate deputies shall carry out their activities – in regard to the Carpathian sustainable mountain development – in the following areas of specialization: human rights, equality of opportunities between men and women, religious cults and national minorities (Erzsébet Rücz in 2009), children, families, young people, pensioners, and persons with disabilities. (Mihail Profir Stelian Gondo in 2009)

The Deputies exercise the following powers:

a) to guide and co-ordinate activities within their area of specialization;
b) to co-ordinate activities regarding personal data protection;
c) to inform the Advocate of the People on the various activities of the departments;
d) to distribute the petitions to the departments;
e) to endorse the reports, points of view on unconstitutional exceptions, recommendations, as well as any other acts presented for approval to the Advocate of the People;
f) to exercise, in the order that the Advocate of the People has established, his powers, in case of temporary inability of the Advocate of the People to perform his duties;
g) to carry out any other commission which the Advocate of the People may legally establish.

The address of the People's Advocate institution

3 Eugeniu Carada St., sector 3, Bucharest
Telephone: +40 21 312.94.76; +40 21 312.94.62Fax: +40 21 312.49.21
Internet: http://www.avp.ro
E-mail: avp@avp.ro

Appendix II: List of sources of information on public participation (organisations, links to Romanian law)

1. European Youth Portal, Active citizenship section

Participation in European matters:
http://europa.eu/youth/active_citizenship/where_to_have_your_say/index_eu_en.html

Participation within Romania:
http://europa.eu/youth/active_citizenship/where_to_have_your_say/index_ro_en.html?CFID=4717180&CFTOKEN=d9a389e56bc58995-F04AD68E-D2E2-6194-C85EB51D3AA30AF0&jsessionid=420750e693a162775f31TR

1.1 Active citizenship: Where to have your say in regard to Romania

15-25.ro:
Portal for young people built upon the concepts of knowledge, the virtual journey and interaction. It is a place where young people can express themselves about anything, and requires registration.
http://www.15-25.ro [RO]

ANSIT: National Agency for Supporting Youth Initiatives
Forum for young people on topics such as youth involvement, non-formal education, etc. Registration is required to participate.
http://www.ansitromania.ro/forum/index.php [RO]

APC: Romanian Association for Consumer Protection
This is the place to file an online complaint if you have a problem with the expiration date of food you have purchased. You can also download the monthly magazine "The Consumer's Voice" for free.
http://www.apc-romania.ro [RO]

Anyhow forum
Participate in the debate forums available on this website on various themes. There is also an entertainment section. You must be logged in to post comments.
http://oricum.lgcb.ro/forum.php [RO]

Citizens' debate
This site hosts discussions among citizens about Romanian society in order to promote local democracy. Statistics on categories. Check out the topic or subject list. Search by keywords.

APDR: Association Partners in Development Romania
The goal of this association is to promote and facilitate social dialogue while simultaneously improving the level of citizen participation in community life. Read more about its activities and projects.
http://www.apdr.ro [EN][RO]

CeRe: The Resource Centre for Public Participation
This Centre helps non-governmental organisations and public institutions find the most efficient way to involve the citizens in decision-making processes. The website provides information and useful materials related to different tools on participation and public consultation.
http://www.ce-re.ro/ [EN][RO]

Civitas Foundation
The site presents this Foundation, which was created to enhance the capacity of local government and to stimulate citizens' involvement in decision-making processes and local governance. You can make use of the

counselling and training services provided. Don't miss the publications section.
http://www.civitas.ro [EN][FR][DE][HU][RO]

DEEP: Foundation for Development through Economic Education and Partnership
DEEP is a non-profit Romanian non-governmental organisation created to empower individuals to work together to transform their communities and to achieve sustainable socio-economic development. Find out more about its activities and projects.
http://www.deep.ro [EN][RO]

1.2. Active citizenship: Your rights in regard to Romania

Constitution
The Constitution of the Republic of Romania online, with a description of human and fundamental rights.
http://www.constitutia.ro/ [RO]

Constitutional Court
If you feel that some law in Romania is discriminating against you, than you can turn to the Constitutional Court with your claim. Find contact details and a partial description of the procedure. You can also find publications, events, press releases and useful links. The main presentations are also available in English and French.
http://www.ccr.ro [RO]
http://www.legi-internet.ro [EN][RO]

Juridica Online
Direct online consultation from a team of specialists in Romanian law and administration (courts of law, public notary offices, police, investments and management of real estate, mayoralty). Discussion forum.
http://www.juridicaonline.ro [RO]

Legal information
Legal information, official texts and publications, including the constitution, codes, laws, etc. Selection of Internet sites dealing with legal questions. Some of the material is available in English and French.
http://legal.dntis.ro [RO]

Ministry of Justice
Presentation of how the department functions and the history of the Romanian justice system. Legal texts, services, and practical tips on different juridical matters and a selection of links.
http://www.just.ro [RO]

Romanian Ombudsman
Mediation organisation that deals with conflicts between taxpayers and the government. Presentation of the organisation and its activities. Statistics and reports. Useful Internet links. Some sections are available in English and French.
http://www.avp.ro [RO]

Romanian legislation
Find a variety of online legal resources, including dictionaries (legal, Latin, etc.), advice on legal procedures, online order forms and a section where you can give your views on different legal subjects.
http://www.indaco.ro/info_legislativ.html?lang=ro [RO]

4. Biodiversity

Carpathian Convention Article 4: Conservation and sustainable use of biological and landscape diversity

1. The Parties shall pursue policies aiming at conservation, sustainable use and restoration of biological and landscape diversity throughout the Carpathians. The Parties shall take appropriate measures to ensure a high level of protection and sustainable use of natural and semi-natural habitats, their continuity and connectivity, and species of flora and fauna characteristic to the Carpathians, in particular the protection of endangered species, endemic species and large carnivores.

2. The Parties shall promote adequate maintenance of semi-natural habitats, the restoration of degraded habitats, and support the development and implementation of relevant management plans.

3. The Parties shall pursue policies aimed at the prevention of introducing alien invasive species and releasing genetically modified organisms that could threaten ecosystems, habitat or species, and control or eradicate these.

4. The Parties shall develop and/or promote compatible monitoring systems, coordinated regional inventories of species and habitats, coordinated scientific research, and their networking.

5. The Parties shall cooperate in developing an ecological network in the Carpathians, as a constituent part of the Pan-European Ecological Network, in establishing and supporting a Carpathian Network of Protected Areas, as well as enhance conservation and sustainable management in the areas outside of protected areas.

6. The Parties shall take appropriate measures to integrate the objective of conservation and sustainable use of biological and landscape diversity into policies in a number of areas, such as mountain agriculture, mountain forestry, river basin management, tourism, transport and energy, industry and mining activities.

CONTEXT AND GENERAL INFORMATION

Biodiversity In The Carpathians

The diversity of ecosystems is affected by multiple influences, such as the climate or human activities. The diversity of animals is usually higher where the climate is mild, where food and shelter are abundant, or where ecosystems are overlapping, for example, near seashores where terrestrial and marine ecosystems meet. More recently, human-created ecosystems or ecosystems in more intense climates tend to comprise certain species, in the first case, because the changes are occurring too quickly, in the second because not many species are adapted to extreme conditions.

The main factors necessary for the survival of species are sufficient food, water, shelter and habitat. In most cases animals will adapt their food, shelter and space requirements to the ecosystem they live in. Thus, different animal species respond to the variable components of the different types of ecosystems. Some animals are adapted to just a single ecosystem, while others, such as migratory birds, migrate from one season to another to different altitudes or latitudes.

Although extinction is a natural process, intensive and excessive human activity has led to a dramatic increase in its rate. The loss of habitat due to human impact is considered to be the main cause of the disappearance of many species. Other major causes are: modification of habitat, inadequate or illegal personal or commercial use of animal species, perturbation of migration routes and of mating behaviour, pollution, disturbing human presence, control of prey animals that are sometimes considered parasitic by man, global warming, as well as natural causes.

It is very difficult to identify the exact number of species that disappear each year. Many plant and animal species are still not named or known. Estimation of how often animal and plant species become extinct is still a controversial subject. Some scientists consider that human beings are responsible for the disappearance of close to a hundred species daily. Other scientists give lower figures, but few contradict that human actions accelerate the rate of extinction of species.

Bio-Indication Of The Environment In Local Conditions

Living organisms could be defined by their ecological valence, which expresses how suitable the environmental conditions are for them. Also, it defines the limits within which the given organism is able to live. Organisms with a narrow ecological amplitude can be used to monitor these conditions. Such organisms are called bio-indicators, and the method used to determine them is called bio-indication. Bio-indication is used at various levels – cells, organs, organisms, populations, communities, and biocenoses. In the exercises below, bio-indication is used at the level of organisms and communities. Easier tasks in this area neither require deeper knowledge of biology and ecology, nor laboratory equipment. More challenging tasks require a higher skill level from the teacher. For some of the tasks, consultations with an expert are needed, and a microscope is necessary. Consultations and equipment can be used when working with talented youth and during competitions. This approach (i) promotes gradual and adequate learning at various levels of education, and (ii) is in compliance with the principles of education for sustainable development. The goal is not to acquire pre-determined results, but merely to point to the handling of particular issues. The problems should be logically understood by the students in order to promote individual solutions by them. In doing so, we are trying to fullfil the message conveyed by J. A. Comenius[13] : "The pupil is not a vessel to be filled; it is a torch to be lit."
We will focus on the task of bio-indication of air and water quality and use the organisms that are considered the most sensitive to changes – the lichens and water organisms.

13 A 16th century protestant bishop, widely accepted as having laid the foundations of a science of education.

The generally accepted definitions of the terms used in this activity:

Extinct species – entirely disappeared species
Endangered species – species in imminent danger of extinction
Critically endangered species – species that will disappear if humans do not intervene directly and soon
Threatened species – species present in an area, but threatened due to their diminishing number
Rare species – species, which are not in danger at present but should be kept an eye on and especially cared for due to their small number (some species have always been rare due to their position in the food chain or to certain preferences of habitat)
Peripheral species – rare species in a certain area because they lives in the marginal area of a particular habitat

Local environmental authorities or non-governmental, environmental organisations may supply a list of local animals according to the above categories. The list may vary from location to location because each area comprises varied habitat conditions within its borders. Thus, a vegetal or animal species may be absent or may have disappeared in one area, but may be abundant in another one, and, therefore, will not be considered threatened.

QUESTIONS:

- What kinds of local habitats do you know?
- Is there any diminishing habitat in your area?
- How many local plants and animals can you name?

Biodiversity in Your Community

- Do you know of any local endangered or threatened species?
- What factors are threatening biodiversity in your area?
- Do you know of any bio-indicator species in your area?
- What do bio-indicators tell you about your area?

Biodiversity in the Carpathians using a Map

Refer to the Map 7. Concentration Regions of Endemic Vascular Plant Species in the Carpathians

- Identify the regions where most endemic plants are located in your country. What endemic plants are located there? Do any of the plants have special value (such as medicinal plants?)
- What endemic plants are located in other countries? Are they different or same plant species?
- Are the regions of concentration of endemic plant species designated as protected areas or parks? Should they be?
- With which Carpathian neighbours should you cooperate to protect the endemic plant species? Why?

Further Reference:

See the reference to the World of Carpathians in Appendix 3.

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Note for those implementing the above locally:
It is recommended to enlarge the list of references on lichens, with the resources written in a layman way (in the Carpathian region several of them are available, such as the World of Carpathians, referenced in Appendix 3). Lots of pictures are available on the internet. A starting point for funding: http://www.bgbm.fu-berlin.de/sipman/keys/default.htm

ACTIVITIES

1. How to Identify the Biodiversity of a Landscape

Objectives: *To enable pupils to estimate the biodiversity of a landscape*
Age: *6-18*
Number of participants:2*0-30*
Materials: *a magnifying glass container for insects*
Duration: *minimum 1 hour*
Place: *outdoor, natural and cultural landscapes*
Competencies, skills: *observation, concluding, identifying habitats, plants, animals*

1. Observe together with the pupils the different parts of a landscape and try to identify the habitats that it is made up of. Depending on the age of the students, they should not even be given the scientific names, but should be given an explanation in simple terms: deciduous/coniferous forest, river/lake, meadow (hay field or pasture land), area with bushes or shrubbery, roadsides, etc. according to the specific character of the area.
2. Try to explain to the pupils signs of biodiversity: the number of species of trees, flowers, insects flying around them, birds which they see or hear, lizards or little frogs, if you see any.
3. Divide the children into groups and observe in more detail the various aspects of biodiversity: plants, insects, birds, reptiles, and mammals.
4. Make detailed investigations about how many different species you observe. Then choose a piece of land 5/5 m for plants and insects, or a larger spot for birds or mammals, and count the number of different species you can find in this area. You don't have to be a scientist for this activity – you just have to see how many different types of flowers exist. Look at the colors of the flowers, their height or the shape of their leaves. Count the different insects you see. Try to catch some of them in a magnifying glass container for insects. Study them carefully, and then don't forget to let them loose in the same spot where you originally caught them. If you wish to identify them, use a plant classifier.
5. Plants: mark a 5/5m area in the landscape and try to identify the number of different plant species. You don't have to name them, just look at the shape of their leaves, at their flowers. If you wish to identify them, however, use your plant classifier.
6. Birds: birds can be identified either by watching them, by listening to them, or by studying their flight. Try to count the number of different species of birds you see, and how many different bird sounds you hear. Some birds give out several types of sounds for various situations. You may, therefore, end up counting more different sounds than the number of birds you have seen.
7. Insects: You can very easily catch insects in two ways: Take a piece of white cloth and lay it under a tree or a shrub. The insects will fall on it. Then you can collect them in the magnifying glass container for insects and study them. Don't forget to let them loose in the end. Or you take a net and try to catch them in the air or on the grass. Try not to damage them when you put them into the container.
8. Mammals are the most difficult to observe, and can be counted only after long periods of watching. Mammals are especially tricky to observe in the daytime because most of the time they are shy and hide. However, in the evening in rural areas many bats can be observed quite frequently. In the winter, if you take short walks around the school, many footprints of bigger and smaller mammals (hares, squirrels, foxes, etc.) can be seen.
9. Aquatic animals: if you take them out of the water, be careful to keep them wet while being studied and then place them back where they had been.

After you have identified the habitats and species in your school neighbourhood, try to estimate a value for biodiversity on a scale of 1 to 5: 1 for very low biodiversity, 2 for low biodiversity, 3 for medium biodiversity, 4 for high biodiversity, and 5 for very high biodiversity. Give these values to the habitats you identified and discuss with the pupils which of these have the highest biodiversity and, possibly, why.

2. Fragmentation of Habitats

Objectives: *To understand the how are the different species interconnected in habitat, and how can humans influence of habitats*
Age of pupils: *10-14 years old*
Number of participants: *20-30*
Materials: *cardboard, ball of string, pencils*
Duration: *minimum 1 hour*
Place: *Classroom or outdoor activity*
Competencies, skills: *co-operation, system thinking*

The participants form a circle; everyone has a small piece of cardboard on which various elements of a landscape are written (e.g. river, grass, forest, cave, etc.). The facilitator holds a ball of string in his/her hand.

The first part of the activity symbolises the movement of big carnivores, bears, for example. The string follows the route of the bear. The bear leaves the cave and walks in the forest (the facilitator throws the ball of string first to the cave, then from the cave to the forest, etc.), then the bear takes a bath in the river, etc. In the end, all the elements of the landscape written on the cardboards will be connected by the string, thus forming a network of routes, which the bear follows to find food and water, shelter or its mate.

After this part of the activity the facilitator describes to the participants a short scenario, namely, that a large building company is going to build a motorway across the middle of the county. The motorway is symbolised by scissors, which cut the string. The route of the bear is thus disturbed and destroyed.
This activity may be good to start with, demonstrating that animal life is often endangered by human activity. In addition, it can also serve to explain conflicts of interest: What is more important: to save the habitats or to build new roads for transport and travel?

3. Barriers for Animals and Finding Solutions

Objectives: *To presents the challenges and opportunities of habitat protection*
Number of participants: *20-30*
Materials*: map, ball of string*
Age of pupils: *10-18 years old*
Duration: *minimum 1 hour*
Place: *Classroom activity*
Competencies, skills: *analysis, creativity, using of maps.*

Note: *Students are expected to mention environmental information that includes the following: estimated effects of construction and the future road on protected species and habitat, the noise level in the nearby village (from the traffic on the new road), air pollution, etc.*
Students should at the least come up with the authority issuing the construction permit and the environmental authority as a possible source of environmental information.

Take a map of the area in which you wish to carry out the activity and imagine a route from one end of the map to the other. Whenever you come across an obstacle, which is impossible to cross (busy highways, railways, localities, factories, shopping centres, etc.), mark the respective obstacle with a red spot and try to find an alternative route. If you also find obstacles, which can be crossed only with difficulty and unsafely (river, not very busy highways, etc.), mark them with a green spot.

Try to find a migration route from one side of the map to the other for a big animal, such as a bear, avoiding the red and green spots. In case you cannot find any route, try to find solutions, for instance, establish a green corridor, re-naturalise rivers, modify fences, etc.

4. Move to the Ecosystem That is Suitable for You

Objectives: *To present pupils the relationship between animals and the environment*
Age of pupils: *10-16 years old*
Materials: *Cards with animals, material for making six posters with various ecosystems*
Duration: *minimum 1 hour*
Place: *Classroom activity*
Competencies, skills: *system thinking, environmental awareness*

Note: *The pupils play a game with the objective of identifying the characteristics of an animal, which can be found in several ecosystems, and the way in which its environment is suited to it.*

1. Cut out the cards with animals

2. Divide the class into six groups and give each team the task of finding the **biotic** (plants, animals) and a**biotic** factors (temperature, rainfall, vegetation) of one of the following ecosystems: forest, hillside meadow, mountain pastureland, rocky land, river/lake, and inhabited areas.

3. After the posters are finished, ask each team to describe the ecosystem represented on their poster.

4. Divide the playing area into six equal parts and place a poster in each section.

5. Divide the pupils into six different groups.

6. Explain to the groups that they are going to play a game. The aim is to match the animals with the ecosystems in which they live. The pupils will have to decide whether the animal already lives or could survive in the respective ecosystem or if it has to change ecosystem.

7. Give out the cards with animals to the pupils.

8. One after the other the pupils are asked to read the cards and guess what the described animal is. If they think that the animal is in the wrong ecosystem, they should move it to the correct ecosystem. If the rest of the group thinks a wrong choice was made, they should say, "Change the ecosystem" and then explain why and into which ecosystem the animal should be moved.

9. After all the animals had been distributed among the ecosystems, discuss the following:

- Has each animal been placed into the correct ecosystem?
- Is there any animal that could be placed in more than one ecosystem?
- Why can some of the animals live in several ecosystems and others not?
- Which are the similarities and differences between the animals living in the same ecosystem?
- Which ecosystem provides the highest diversity of animals? What characteristic of this ecosystem makes it possible to have such high biodiversity?
- Which are the factors influencing the distribution of animals in an ecosystem?

Ask the pupils to get back into their initial groups again and find other animals, which live in the ecosystems they represent. How are these ones adapted to the climate?

Evaluation:
Choose three animal cards and ask the pupils to describe the ecosystem in which each animal lives. Give positive feedback, encourage co-operation!

5. Observation of Lichens (Box 1)

Objectives: *To present student the possibility to use lichens as biondicators*
Number of participants: *20- 30*
Age of pupils: *10-18 years old*
Duration: *minimum 1 hour*
Place: *Outdoor location: natural and cultural landscapes*
Competencies, skills: *observation, system thinking*

1. Motivate and inform students (what are lichens, why they are able to adapt to challenging habitat conditions, educate them on their biology and physiology, discuss the diversity of species in relation to habitat diversity).

2. Choose a different location for study according to the degree of landscape synanthropisation (changes of landscape caused by human activities and influence).

3. Explain principles and scope of bio-indication.

4. Manage the process of fieldwork, group division, samples collection and determination/motivation.

5. Take into consideration nature protection principles.

6. Manage discussion and facilitate group work (let groups working independently present their own results).

7. Help groups to create and use tables:
   a. A table to identify the type of location they are working in
   b. A table to describe the lichen population in a location

8. Revise and generalise the results produced by the groups, help them formulate and present their results, incorporating principles related to the environment and environmental health.

Most often, we can find lichens on tree barks, branches, rocks, walls, concrete surfaces, but also on ground, at the base of trees, houses and on flower-pots. If easier tasks are the aim, lichens should be observed in their natural environment. If further investigation is needed, which could not be realised on the spot, bigger free-growing foliose and fruticose lichens can easily be picked by hand (or a knife can be used to detach them from the surface). Crustose lichens can be cut off with a piece of bark (it is important that their fibrous/wooden parts do not get damaged). Lichens from the ground are easily pooled out and cleared. From rocks or concrete, the lichens are collected along with a small piece of substratum by using a chisel. Dry the lichens so that they do not get moldy. Spread them on a piece of wrapping paper, clean them and put them in an envelope. Make your own envelopes and choose their size according to the type of collected lichen. Make notes of your observations! Mark the envelopes, arrange them in a box and put them in a dry place. Guided by the teacher, use the collected material to make a small exhibition that can be used later when working on more complex tasks.

Box 1 Bio-indicators – Lichens
Lichens, unlike other plants, are not unified organisms. Their body is formed by the filaments of the fungus and clusters of algae. The mutual relation of both these parts is so close that they form one organism, which differs from the original ones by appearance and ecological demands. A particular kind of fungus usually connects only with a certain kind of algae. This mutual relation is of such a symbiosis that is beneficial for both partners. There are three common forms of lichens' vegetative tissues: 1) thallus crustose (paint-like, flat), 2) foliose (leafy), and 3) fruticose (branched). The crustose thallus is firmly attached to the substratum with its bottom part, and cannot be detached without being damaged. The foliose thallus is not attached to the substratum along its entire bottom part; it is attached only with a part of its thallus or in one place (in

the centre). It can, therefore, be detached quite easily from the substratum, to which it connects with fungus root-like filaments, fragile rhizines or other similar structures. The thallus is divided into lobes. The fruticose thallus is also connected to the substratum in only one place, but it is branched with a crusty layer along its entire body.
Due to symbiosis, lichens are able to live a long life (crustose for a hundred years, fruticose for about ten years, and foliose generally less long as they grow faster). Since the lichens do not control water flow and dry out quickly, the plant can lose most of its moisture in a relatively short time. The lichen can remain in this state for quite a long time. Although most lichens are adjusted to extreme life conditions (soil, climate), they cannot withstand polluted air.
Why are lichens so sensitive to air pollution?

- They do not have an impermeable protective skin as do other plant groups
- They intake unfiltered moisture and gases from the air through their entire body
- They accumulate a great amount of pollutants in their thalli, without an ability to get rid of them
- They grow very slowly, thus having a very low regeneration ability
- Most importantly, the balance (exchange between the fungus and algae) is destroyed in the thallus due to the presence of polluting compounds, which means that the algae dies first, and then the entire lichen.

The most sensitive are those lichens that grow on trees. They have disappeared from cities and other places with increased nitrogen pollution or concentration of SO_2 sulphur-dioxide. Toxic compounds, such as heavy metals, fluorine, bromine and radioactive compounds, can also harm lichens. These compounds can concentrate in lichens, thus indicating an increased presence of toxins in the air. Lichen species that live on rocks and on the ground are more tolerant to pollution than lichens growing on trees. This is due to the fact that the substratum (limestone, dolomite, alkaline rocks) appeases the impact of the acid pollutants. In addition, in the winter months the snow cover protects them. The lichens growing on trees are much more affected by pollutants than those growing on different substrata, as much more pollutants get caught in the tree crowns than on un-wooded surfaces, and thalli are supplied by moisture from the entire tree. Those lichen species that can be used to monitor air quality are called indicators. They are divided according to their sensitivity to selected compounds. The tree lichen species are most often used as indicators of increased air pollution.

Considering their tolerance/ecological amplitude, a number of scales have been created to evaluate the degree of air pollution. These scales are, however, used only for general orientation. Nitrogen-demanding species can, for example, live in cities. Lichens, like other bio-indicators, can be used as indicators of air quality or pollution. The presence or absence of lichens is, however, not proof of air pollution or quality. In addition to air quality there are several factors (such as local climate, competition with other plants), which may influence the presence or absence of lichens in a certain locality. If you observe changes in the presence of lichens, one of the explanations could be a change in the degree of air pollution, but before coming to a definite conclusion on this, take some direct measurements of the air pollution too. Lichens can indicate where it is worthwhile to measure air pollution, but they are not to be used as "lab equipment" in determining the accurate level of air pollution in any specific location [14].

14 More information and activities using lichens can be found in the World of Carpathians (refer to Appendix 3. "Annotated Further References" for more information).

5. Transportation

Carpathian Convention Article 8: Sustainable transport and infrastructure

1. The Parties shall pursue policies of sustainable transport and infrastructure planning and development, which take into account the specificities of the mountain environment, by taking into consideration the protection of sensitive areas, in particular biodiversity-rich areas, migration routes or areas of international importance, the protection of biodiversity and landscapes, and of areas of particular importance for tourism.
2. The Parties shall cooperate towards developing sustainable transport policies, which provide the benefits of mobility and access in the Carpathians, while minimising harmful effects on human health, landscapes, plants, animals and their habitats, and incorporating sustainable transport demand management on all stages of transport planning in the Carpathians.
3. In environmentally sensitive areas, the Parties shall co-operate towards developing models of environmentally-friendly transportation.

CONTEXT AND GENERAL INFORMATION

Transportation is a vital means of communication and an important aspect of development in our contemporary society. It can, however, also come with a price, including an environmental one.

Contemporary transportation is often harmful to the environment, both locally as well as globally: problems such as air pollution, noise, and vibrations affect human health and the well being of communities. Among other impacts, it contributes largely to the current global climate change. The main relationship between transportation and the climate is relatively simple: the transportation system today is almost entirely dependent on fossil fuels. Burning oil, as well as coal and natural gas, is the main anthropogenic source of carbon dioxide – one of the gases responsible for the greenhouse effect that contributes to changes in the climate system.

> *Within the European Union about 28% of the greenhouse gas emissions come from transportation, of which 84% from long-distance road traffic and 10% from urban traffic.*

Another harmful transportation-related pollutant is lead. Lead emissions have a detrimental effect on the quality of plants growing near road infrastructures, air quality and human health. Fuels used in vehicles have been significantly improved by reducing their lead content. Since 2000 the use of petrol containing lead has been forbidden in European Union countries, which has resulted in a considerable decrease in lead emissions.

The emission of polluting substances, such as nitrogen oxides, carbohydrates, carbon monoxide, powders, etc. also causes a series of health problems. The most common diseases caused by pollution due to transportation are: cancer, cardio-vascular and respiratory diseases. Improvement of technologies has resulted in a reduction of emissions, but this was compensated for by an increase in traffic, and so the level of pollution caused by transportation has unfortunately remained approximately the same. Children, youth, the elderly, and persons with respiratory disorders are the most vulnerable groups in this regard.

Transportation of goods has greatly increased in the past decades – more than any other area of transportation, leading to several problems:

- increase in the emissions of polluting substances and greenhouse gases;
- noise pollution;
- increased number of accidents and victims;
- increased costs of road maintenance and repair, caused by increased traffic by lorries, whose owners compensate only in part for the damage they cause.

The increase in the transportation of goods by road is due to the fact that it appears to be the most cost-effective, because not all costs are paid by the polluters themselves. Non-direct external costs, such as health and environmental damages, are not taken into account.

Taxation of transportation could be an effective way of internalising these non-direct costs by making the polluters pay a higher, more realistic price. Proper taxes on polluting, noisy forms of transportation and tax relief for cleaner transportation could be used to reveal that sustainable transportation is also more economical and gradually encourage a shift to cleaner transportation options, which in turn would lead to reduced greenhouse gas emissions, air pollution, and noise.

Transportation by railway has a smaller impact on the environment and generates a much smaller amount of greenhouse gases. This means of transport is also more energy-efficient due to the low friction of the rails, and because much larger quantities can be transported by one engine than by the many road vehicles.

The direct environmental impact of river transportation by water (navigation and rafting) is relatively low due to similar reasons as with railway transportation, but the recent floods in Europe have raised a series of questions about the impact of large establishments along rivers banks (such as dams, dikes etc.) and also about the hydrographic basins. The construction of canals has considerably reduced the water absorption capacity of the

watersheds, and thus droughts [15] and floods have become more frequent in human settlements and agricultural areas that were established after regulating the rivers. Such regulation also impacts the biodiversity of an area, particularly those species living close to rivers.

Of all types of transportation, air transportation produces the largest amounts of carbon dioxide emissions when considering fuel consumption per passenger or per kilometer covered. In Romania, for example, air transportation produces over 12% of the overall carbon dioxide emissions in transportation. Moreover, the emissions from burning kerosene at high altitudes (9-13 km) remain in the atmosphere for a very long time.

In spite of all these concerning facts, it is estimated that the steps taken to reduce emissions in transportation will have very little effect. Why is this so? Common judgement is still based on the belief that the development of the transportation system (which in Europe means mainly developing the road networks and airports) is essential for a continued rise in prosperity and competitiveness. Thus, an extension of the European road network, which allows for greater traffic and consequently an increase in carbon dioxide emissions, is a policy promoted both by representatives of the industry and governments. These projects are supported by European structural funds aimed at developing a trans-European road network, and are expected to increase competitiveness and commerce in the EU. The inevitable result, however, is increasing carbon dioxide emissions from road transportation. The long-held and continued assumption that prosperity is closely connected to an expanded road network and increased traffic has long been questioned by ecologists, and recently, as a result of efforts by environmental organisations, some governments are starting to reconsider it as well.

Reducing emissions from transportation can be accomplished in several ways:

1. Intermodal transportation, i.e. the efficient use of available transportation ways, in consideration of their costs and environmental impact: railway and water transportation should be used as much as possible; road and air transportation should be used less;
2. Increasing energy efficiency: fuel consumption per 100 km has diminished relatively little in present-day cars as compared to those of 50 years ago. Many reports have been produced, which mention the correlation between the shape of a car and its tire quality to the energy performance of the car[16];
3. Changing the citizens' behaviour – promoting greater use of trains, public transportation (especially electrical trams or trolleybuses), bicycles or walking, when possible;
4. Technical innovations (e.g. in the field of electrical cars);
5. Replacing fossil fuels with other types of fuel, such as bio-ethanol and bio-diesel. Careful use of bio-fuels can reduce transportation emissions, but, on the other hand, the tendency to replace oil products with bio-fuels over the past ten years has led to an increasing cultivation of plants used for bio-fuel production and thus resulted in a decrease of agricultural land available for the production of food crops, leading to increased food prices.

Transportation in the Mountain Areas

Although mountain areas often suffer because of a lack of proper infrastructure and the small number of transportation options, the pressure of economical development is very strong. Thus, common sense and economical calculations are needed to decide upon the best solutions for development in the area of transportation. At first glance it may seem essential to build as many roads and motorways as possible and even provide infrastructure for air transportation into areas difficult to access. On the other hand, careful attention should be paid to how these would affect the quality of life in those areas, both positively and negatively.

15 Building canals alters the natural course of rivers and limits the amount of water flowing into the floodplains. Since the water flow is thus limited, it fails to supply the underground and surface reservoirs (lakes, etc.) in the floodplains. This also reduces evaporation, rendering the local climate dryer. Thus, unless an area is prone to high precipitation (rain), the soil becomes dryer and the underground water levels lower.

16 For further information please consult publications on the European Federation for Transport and Environment website: www.transportenvironment.org

The natural value of the mountain areas may well be higher than their currently perceived economic value. If we take into account the potential of developing rural, cultural and ecological tourism, based on the natural resources as well as the role of nature in these areas in providing natural resources for the lowland areas (such as the role of forests in maintaining air and water quality, used both in towns and in agriculture), the necessity to conserve and protect the environment in the mountains is very obvious. To support decisions on conservation, a series of toolkits that help evaluate the economic value of nature was developed. As an example, the International Union for the Conservation of Nature (IUCN), one of the leading global organisations in the field, developed a guide that shows how healthy ecosystem benefits can be accounted to evaluate their financial value. This is done by examining an ecosystem's direct and indirect benefits in the present and for the future [17].

Consequently, when we speak about sustainable transportation and the creation of infrastructure in mountainous areas, it is necessary to keep the following in mind:

- protection of natural resources and biodiversity is of great importance; as a matter of fact, development of infrastructure within and near officially protected areas is at present prohibited by law within the European Union;
- introduction/use of environmentally friendly means of transportation (animal-driven, train, bicycle, etc.); and
- matching the dimensions of the infrastructure with the needs of the area, and the requirements of preserving the natural landscape (upon which tourism is highly dependent).

Last, but not least: a common misconception is that building transportation infrastructure will ensure investments and help promote the economic development of an area. On the contrary, economic development is not necessarily connected to the existence of an extensive infrastructure; the quality of the environment and the quality of life in a certain area could also provide a very good basis for economic development. At least from the point of view of sustainable tourism, development is largely dependent on the conservation of authentic natural areas, to offer guests what cannot be found in developed countries, i.e. a closer connection with a rural lifestyle, in harmony with the natural surroundings. Thus, animal-driven transportation, especially in the protected areas, but also in those areas where rural tourism is practiced, does not signify underdeveloped status, but should be viewed as an environmentally aware means of transportation and delightful for those who love nature. Simultaneously, when accessing remote areas for tourism purposes, it is important to limit the large-scale use of motor vehicles promoted by tour operators, since these vehicles (in addition to emitting greenhouse gases) have a negative impact [18] upon the flora and fauna, which were inaccessible before and are not accustomed to human impact.

QUESTIONS:

- What is sustainable transportation?
- Name some advantages and disadvantages of transportation by car.

Transportation in your community

- What types of transportation are used in your area? What is their impact on the environment?
- How can you characterise the transportation infrastructure in your area? Should it be modified or not? If yes, how? How well is your area connected with transportation networks: is there a functioning railroad? Which form of transportation do you generally use?
- Which places of interest in your country/neighbouring countries can you visit by train? Where would you need to drive? Which places are inaccessible to both trains and cars?
- What could you do to reduce your impact on the environment when you travel?
- Is there a natural park close to your village/town? How can you/a visitor get there?

17 Pagiola, Stefano; von Ritter, Konrad; and Bishop, Joshua, Assessing the Economic Value of Ecosystem Conservation, The World Bank Environment Department in collaboration with IUCN, October 2004

18 Such as producing noise and compressing the soil by their wheels (treading).

Transportation in the Carpathians with the help of a Map
Refer to the maps [19]:
- Rail Network in the Carpathians (Map 9)
- Road Network in the Carpathians (Map 8)

- In which countries/regions are the road and rail networks most developed?
- According to the maps: is the rail or the road network better developed throughout the Carpathians? And what about in your country?
- Which transportation options to your area are available to visitors from other parts of your country? What about visitors from neighbouring countries?
- The general tendency is to close down old/inefficient railroad systems in the Carpathians and replace them with motor roads[20]. Is this a good solution with respect to the environmental impact of transportation? Do you have any ideas/suggestions in regard to the best way to connect your area to urban centres and other rural areas in the Carpathians?

Trail Exercise Questions:
- If you wanted to take a visitor to show them natural and cultural heritage in your neighbourhood (such as a park, lake/river, caves, churches/castles, traditional market, etc) how would you get there? What would you consider when choosing a way of getting there? Could you walk/bike? Would you use motorised transportation?
- Can you develop a "walking tour" of the interesting sites in your community?

Further References:

- For a detailed description of the transport infrastructure in the Carpathians:
  - The Carpathian Environmental Outlook (KEO), chapter two
- Co2nnect Project: CO_2 on the way to school: http://www.co2nnect.org/
- Transportation: The „Environmentally Sustainable Transport Goes East" project http://esteast.unep.ch/

ACTIVITIES
Which means of transportation will you use to take a visitor on your Study Trail?

1. Who is more convincing?

Objectives: *stimulation of the ability to support ideas by using various sources of information*
Age of pupils: *10-18 years*
Materials: *photos, drawings, diagrams, Power Point presentation, projector, etc.*
Number of participants: *at least 5-6 pupils (divided into two groups) + another 5 pupils (the jury)*
Duration: *60 minutes*
Place: *the classroom*
Competencies, skills: *data generalisation, analysis, comparison, synthesis, negotiation*
Connection with other subject matters: *Physical Sciences and Humanities, Geography, Chemistry*

Activity:
Three groups of students are formed – two debate groups and one "jury". The debaters will present the advantages and disadvantages of public transportation and personal cars (supported by relevant material) to the jury. The presentations have to include general and specific information as well as realistic data. Theoretical information

19 Another useful map may be Map 2.8 Stock of passenger cars in the Carpathians, 2003, p. 71, available at http://www.carpathianconvention.org/NR/rdonlyres/2B0F3DF0-FD36-42AF-8AA8-D6B460DC5B8A/0/02CH_2.pdf

20 Can you find up-to date Carpathian and local maps to trace the differences?

should be supported by images. One group will present only the advantages of the type of transportation presented, while the other group will try to identify their disadvantages.

At the end of each presentation both members of the competing groups and the jury may ask each other questions. The winning group will be decided, both according to the presentation and the answers provided.

Discussion: Both public and individual transportation represent sources of pollution and are large energy consumers, but not all vehicles produce the same amount of pollution. Programmes encouraging public transportation, especially electricity-driven forms (trams and trolleybuses), are needed, and should be included in the development plans to make them more attractive and accessible than personal vehicles.
In most of the Carpathian countries prices continue to favour the use of personal vehicles instead of public transportation. The total cost of transportation by car, including the costs of purchase, maintenance, insurance and operation of a car has remained stable, while the costs of other means of transportation have increased.

The increasing use of personal cars has had a damaging effect on public transport. Between l990 and 2001 the number of vehicles transporting goods has increased by 76%, while that of motorcars has increased by 149%. The increased intensity of travelling has been directly influenced by the expansion of industrial development, by the rehabilitation and improvement of county and village roads, and also through growth in the degree of urbanisation.

2. How many kilometres do you eat up a day?

Objectives:: *to highlight the environmental consequences of everyday actions*
Age of pupils:*8-18*
Materials: *photos, drawings, diagrams, Power Point presentation, projector, etc.*
Number of participants: *20-30*
Place: *the classroom*
Competencies, skills: *data collection, analysis, comparison, synthesis, negotiation*
Connection with other subject matters: *Geography, Social Studies,*

This activity consists of collecting information about the places where various kinds of food come from and calculating the quantities of carbon dioxide produced during their transportation. The pupils have to find an alternative menu made up of locally produced food.

Activity:

Write a menu for one day and try to establish where the various kinds of food come from (example: cheese from Holland, grapes from Italy, olives from Greece, etc.). Take into consideration the fact that different components of product may come from different countries (example: canned tuna fish with mayonnaise: the fish comes from Thailand, the mayonnaise from Holland, and the can is produced in yet another country).

Calculate how far the various kinds of food travelled until they got to your table. What is the polluting effect of this transportation? How does the quantity of greenhouse gases emitted during the transportation contribute to climate change? The average car emission per kilometre is around 200 mg of CO_2.

Discuss what you could do to diminish the emission of greenhouse gases by changing your nutritional habits. Make up a “short distance” menu in which the food comes from the area you live in.

BOX 2. Distance covered by some foods:

Product	Place of origin	Distance covered (in km)
Peaches	Spain	2,800
Apples, grapes	Italy	1,800
Melons	Greece	1,100
Potatoes	Holland	1,960
Raisins	Iran	3,000
Black tea	China	7,300
Canned fish	Thailand	8,200
Rice	Indonesia	0,300

6. Waste

Carpathian Convention Article 10: Industry and Energy

The Parties shall promote cleaner production technologies in order to adequately prevent, respond to and remediate industrial accidents and their consequences, as well as to preserve human health and mountain ecosystems.

CONTEXT AND GENERAL INFORMATION

Pollution is generated in the production of unnatural materials, which cannot be adsorbed by or reintegrated into the environment after their use. The real problem is not only the wide variety of these materials, but also how they are handled. In addition to the fact that they are produced from non-renewable resources, they are also thrown away randomly, without clear knowledge of the impact this may have on the environment.

As the amount of resources across the world is finite, it has become obvious at a global level that the use of material resources must be restricted in order to ensure that they are not exhausted and enough is left for future generations. Recycling these materials is an objective necessity. Even though absolute exhaustion of mineral and energy resources is unlikely, the accelerated decrease in the level of useful contents of the reserves [21] is leading to increased financial, energetic and technological efforts to extract them and introduce them into the economical circuit.

Recovering and re-introducing material resources into the production cycle are a strategy that is being used to balance economic development, resource consumption and the protection of the natural environment.

The use of garbage pits is the most commonly encountered method of solving the problem of waste. It is also the oldest method. In antiquity the Greeks began to use garbage pits when the inhabitants were asked to transport waste outside of the city, depositing it all in one place. It was then that very deep pits were built for the first time; today they are called landfills. Unlike those made by the ancient Greeks, the landfills today are much more hygienic. At the bottom of the pit, a layer of clay or a special kind of plastic is placed, or a combination of the two, which does not allow infiltration of the polluting liquid substances, which are produced from waste, to the soil.

"Integrated waste management" refers especially to the identification of the best solution for collecting, transporting and treating waste taken from different sources.

There are multiple options for waste treatment, according to the nature of waste. Generally speaking, the preferred hierarchy of the options is as follows:
- reducing the quantity of waste;
- economically efficient recycling of waste;
- composting of organic waste;
- incinerating waste in conditions with minimum impact on the environment; and
- depositing waste under supervision.

Communities all over the world are making an effort to recycle as much waste as possible. Newspapers, glass, metal and plastics are most frequently recycled. Unfortunately, not every community has the necessary facilities to recycle these materials.

Composting consists of depositing organic materials separately from the rest of the waste to let them decompose. After having decomposed, they are used as fertilizers. Since organic waste makes up about 18-20% of the total waste of a community, composting is a very effective solution to reducing waste quantity.

Diminishing the quantity of waste may also be accomplished by reusing certain products. For example, consumers may buy goods with less packaging or packaging that can be reused, thus reducing the quantity of materials that are eventually discarded. By diminishing the quantity of waste, the landfills can be used for a much longer time.

The conversion of waste into energy (a method known as "recovery of resources") takes place by combustion of waste and transforming the heat thus produced into steam (thermal energy) or into electrical energy. Such

21 The useful content of the reserves refers to the quantity that is economically profitable to extract. Some of the reserves are located in locations that are difficult to access, and therefore cannot be extracted by means of modern technology, or their extraction is too expensive and thus not economically profitable.

conversion reduces the volume of waste by 70%, which means that a much smaller quantity of waste gets deposited into the landfills (thus prolonging their lives). However, this process produces ashes that have to be deposited in the landfills, as well as greenhouse gas emissions. The newest conversion stations have devices to control the levels of pollution. Still, ecologists are worried that this practice may lead to generating more waste in order to ensure sufficient "fuel" to produce energy, and that this is not a sustainable use of resources, as materials that can be recycled or reused are instead destroyed, along with the resources needed to produce them in the first place.

Management of Waste in Romania

In Romania the National Strategy for the Administration of Waste was elaborated by the Ministry of Environment and Water Administration in accordance with the responsibility of adjusting the national strategy to follow the European legislation in the field of waste administration and in accordance with the Government's Emergency Ordinance 78/2000 concerning waste, as modified and approved in Law 426/2001. It was elaborated for the period of 2003-2013, and it will be revised periodically in accordance with the technical progress and environmental protection requirements.

In 2006 the quantity of waste coming from the mining industry, industrial activities and the city waste reached over 320 million tons. The latter represented 6,808,837 tons, of which about one per cent was recycled (almost half of it was paper).

Urban waste generated in Romania in the year 2006 was made up of the following:
- paper and cardboard: 12%
- glass: 11%
- metals: 5%
- plastics: 3%
- textiles: 5%
- biodegradable organic waste: 46%
- inert waste (constructions): 7%
- other kinds of waste:11%

Urban waste is not collected selectively (only a few pilot waste separation projects exist today), and it is eliminated by storing it

The objectives of waste administration are as follows, in decreasing order of priority:
- Preventing the production of waste by applying "clean technologies" in activities that generate waste;
- Reducing the quantity of waste by applying the best practices in every activity that generates waste;
- Capitalization by reusing, recycling, and energy recovery;
- Removal through incineration or depositing.

When Romania joined the European Union, it had to take greater responsibility in regard to waste management.

Packaging materials and waste resulting from the use of packaging:
- Up until December 31, 2011: to fulfil the objective of capitalizing 50% of the total waste, and recycling 15% of wood and plastic waste.
- Up until December 31, 2013: to fulfil the objective of capitalizing 60% and recycling 55% of the total waste, and to reach the objective of recycling 60% of glass and 22.5% of plastic waste.
  Equipment for the recycling of electrical and electronic waste:
  Up until December 31, 2008: WHAT??

Recycling, collecting and capitalization of waste:
- Up until July 16, 2017: closing in several stages the 101 waste storing locations in urban areas.
- Up until December 31, 2009: temporary stocking of dangerous industrial waste.

- Up until December 31, 2013: reaching compliance with the EU legislation for the 23 storage areas for waste produced by the chemical, metallurgical and energy industries.

Seventy per cent of the waste resulting from the use of packaging materials comes from the population and thirty per cent from the industry. The efficiency of selective waste collection depends mainly on making people aware of its necessity.

The selective waste collection shall be implemented in three periods:
- 2004-2006: experimenting (pilot projects), awareness-raising;
- 2007-2017: spreading selective waste collection nationwide;
- 2017-2022: implementation of selective waste collection in more challenging areas (collective housing, scattered rural settlements, mountainous areas).

Waste and the Environment
The largest amount of emissions coming from landfills is due to methane. A plan to recover methane was prepared in accordance with the directive resulting from biodegradable waste in waste storage areas (Directive nb.99/31 CE concerning waste depositing).

Other types of impact on the environment through waste are the following:
- pollution of surface water, groundwater, and soil;
- contribution to the greenhouse effect (through methane emissions due to the decay of organic matter); and
- possible risks to human health through water pollution as a result of depositing waste into landfills.

Reducing the Impact of Waste on the Environment
In order to protect the environment, we need to be aware of why efficient waste management is so important. In addition, the waste we produce must be carefully controlled to make sure that it does not harm the environment and our health.

Most of our daily waste can be recovered, and if this is done, the quantity of deposited waste will be greatly diminished, leading to a decreased impact upon the environment.

Choosing to recycle materials will also lead to multiple benefits:
- reducing the risk of over-exploitation of natural resources by diminishing demand for new raw materials;
- reducing energy consumption: although the process of recycling is also a consumer of energy, it is more economical than the processing of new materials;
- reducing the pollution of air and water: since the materials have already been processed, recycling them is less polluting than producing new materials from scratch;
- reducing the need for waste storage by decreasing the quantity of waste going to landfills; and
- creating new jobs and profits: recycling is a new branch in the economy, which requires manpower and brings in profit.

Reducing, Reusing, Recycling

Reducing refers to decreasing the quantity of waste by reducing our consumption, buying only those products we strictly need, as well as buying products with as little packaging as possible. Conservation and the moderate use of natural resources plays a key role in reducing waste.
We can reduce the amount of waste we produce by selecting goods, which don't have to end up in a landfill.

Box 3. Tips on reducing waste

First of all, buy and use as little as possible! If we all bought more than we needed, our planet would need to be four times as large as it is to have enough room for waste storage. So buy only what you need, and use all you have bought well! In case you don't use something any more, give it to someone who needs it. This is important, especially in the case of dangerous products, such as various types of chemical compounds (e.g. paints), etc.

- Select the things you buy according to their packaging. You can reduce the volume of waste by choosing goods that are not excessively packaged. Packaging is meant to protect the content, to keep it hygienic, and present information about it. However, many producers make very elaborate (and expensive!) packaging, hoping to attract more customers or trying to create the impression that their product is better than their competitors' products. Consequently, when you buy a product, have the following in mind:
- Buy only those goods whose packaging can be recycled or reused. Colourful packaging, which does not add to the quality of the product, is often impossible to recycle. You can buy juices or water in large containers and then divide them into smaller bottles;
- Buy more concentrated rather than diluted goods so that less containers will have to be discarded after they have been used;
- When you know that you will need a large quantity of a certain product (e.g. detergent or toothpaste) buy it in the largest amount possible, instead of in several smaller portions. This will also help save money, because, as already mentioned, packaging is expensive. Many stores now have bulk section where you can buy things in large quantities and package exactly the quantity you need;
- Refuse to take plastic bags at shops! Take your own bags from home instead;
- Buy durable, high-quality, goods. Furniture, for example, is meant to last for many years. You can save a lot by repairing things instead of buying new items.

Reusing: Many goods can be used again and again in their original form instead of being thrown away, or they can be given to someone who has greater need for them. Don't forget: something you don't need any more could be useful to someone else!

Box 4. Examples of things you can reuse:

- When you use plastic cups, plates or cutlery, do not throw them away! They can be washed and used again at least five more times.
- When you want to replace something in your house, donate the things you don't want anymore. Someone else will certainly be glad to have them.
- Use giftbags made of textile material rather than paper, so that they can be reused.
- Instead of buying disposable products, choose those that can be used several times, without putting your health at risk.

Recycling means transforming the materials either into the same type of product or into new ones, instead of throwing them away. Processing objects from recycled materials requires less energy than using raw material.

Almost any object in the house, school or workplace, which cannot be used any more can be recycled and transformed into something else. You would be surprised to know how many things can be obtained from a recycled object. A juice bottle may, for example, become a T-shirt, a comb, a box, or a hundred other objects, which can then be used for several years.

Box 5. Recycling

Recycling Paper saves huge amounts of wood, and thus, decreases the need to clear forests. One cubic metre of wood takes 70 years to be produced naturally. One ton of waste paper can replace one ton of cellulose that is otherwise obtained from 3-4 cubic meters of wood, thereby saving 4,000 KW/h energy, or 250 kg of conventional fuel, or 26,000 litters of water.

Recycling Plastics
Although quite a recent invention of modern times (A. Parkers 1860), plastic is used very frequently all across the globe. There are several reasons why it is liked so much: it is light, waterproof, and does not break. Plastic, however, is produced from oil compounds and takes hundreds, even thousands of years to decompose naturally. By recycling one plastic bottle, the amount of energy saved is enough for a 60W electric bulb to run for 6 hours, or a television set for 20 minutes.

Recycling Glass
Reusing of glass is more efficient than recycling it. The best method, therefore, is to return bottles so that they can be reused. In this way most of the glass packaging can be refilled, and the cost of raw material decreases. Recycling glass reduces air pollution by 20% and water pollution by 50%. By recycling one glass bottle the amount of energy saved is enough for a 100 W electric bulb to run for 4 hours.

Recycling Aluminium
Of all the materials that can be recycled, recycling aluminium cans is the most efficient. When an aluminium can is recycled, another identical can is obtained, i.e. an identical amount of raw material is saved. When recycling other materials, there is always some loss of material for the production of an identical finished product.

Waste Management in Mountainous Areas
Waste management in mountainous areas requires special attention for the following reasons:
- Most mountain inhabitants depend directly, including economically, on the quality of the natural resources available around their households (pastures, water, forests, etc.).
- Mountainous areas are to a large extent depended upon by lowland regions to supply them with the necessary resources, such as water, the quality of which deteriorates if waste is improperly deposited further upstream.
- A great potential exists in reducing, recycling and reusing waste in the mountainous regions.
- Finding adequate and appropriate space to deposit waste (the most frequently used method at present) is challenging due to the important requirements of nature protection and biodiversity conservation, as landfills cannot be built near or within protected areas.
- Depositing waste in remote places requires higher transportation costs.

Uncontrolled waste disposal along rivers and small valleys is frequently encountered in the mountain areas. This has a great negative impact on the environment, since it affects both the water resources of the local communities, as well as of the communities in the lower regions. In addition, the uncontrolled deposit of waste endangers the health of the population and the natural biodiversity.
There is a great, as of yet still untapped potential in composting. Biodegradable household waste, as well as waste resulting from agriculture and forest exploitation (manure, sawdust) should be reused in agriculture. In several localities, places for selective waste collection have already been created, including sections for compost production. The compost obtained from waste can be sold or given to the local farmers for the fertilization of their farmlands.

QUESTIONS:
- What is waste?
- What is the best way of dealing with waste?
- How could you reduce the production of waste?
- What kind of waste do you know of?
- What is a waste reserve?
- How could a waste reserve be used?
- Why waste reserves are dangerous for the environment?
- What is composting? Do you compost at home?
- What is reusing?
- What does recycling mean? What could be recycled?

Waste in your community:

- If you take a visitor to the places of interest in your area, would they appear clean and well cared for?
- Is there garbage/waste in your community: on the streets, close to the rivers, in the nearby parks, close to cultural heritage sites (churches, castles, etc)? What is the waste predominantly: plastic bottles? paper? glass?
- Who do you think is depositing it there and why? Where should it go instead?
- What do you suggest as the best way to keep your area clear from such waste?
- Are there landfills near your village or town? What do you think about them?

Sources and References

National Agency for Environment Protection, Generation and Administration of Waste in 2006, Bucharest, 2008, p.3-6.

Note for those implementing the above locally:
Change the Romanian examples and links to the local ones. Modify the structure of the chapter in order to reflect your local energy situation. Emphasize the most relevant local possibilities and problems concerning sustainable energy supply.

ACTIVITIES

Are there recycling possibilities along your Study Trail? What should you do to avoid seeing waste at the key points?

1. Let's make our own paper

Objectives: *to support better understanding of paper recycling*
Age of pupils: *6-18 years*
Materials needed: *waste paper, water, glue, starch, pots, mixer, colours, thread and coloured paper*
*N**umber of participants:*** *20-30*
Duration: *60 minutes*
Place: *the classroom*
Competencies, skills: *making experiments, testing of a working hypothesis, checking of solutions.*
Connection with other subject matters: *Biology (Botany), Economical Geography, Chemistry.*

Activity:

There are several methods of making paper from waste paper or from plants (superior class plants or even algae). The method of processing waste paper is most accessible. The pupils are asked to bring newspapers or other waste paper to class. The paper is cut into one cm squared-size fragments and left to soak in a pot filled with water for 24 hours. There should be no metallic fragments (staples, clips) in the pot. After the soaking, glue is added to the mixture. If possible, the contents of the pot may be mixed in a mixer; if not, they can be mixed/kneaded by hand. Coloured pieces of thread or coloured paper may be added to the mixture. The paste obtained is then spread over a 20-30 cm squared flexible wire net and left to dry. After it has dried, it is gently removed from the net and smoothed (e.g. by ironing). The paper thus obtained may be decorated with drawings or collages. If the paste is dense enough, it can be modelled into various shapes.

Discussion: Human activities result in an enormous amount of waste, 40% of which is waste paper. Waste means any object, product or material, which is not used any more and is discarded. All this waste paper can be reused/recycled for the production of other paper goods.

Cellulose is the natural substance at the basis of paper production. Cellulose is the basic element of the cell wall of all plants. Thus, every plant contains tissue, which will produce cellulose, if correctly processed. Cotton, in its raw state, contains about 91% natural pure cellulose. Other sources of paper are hemp (77% cellulose), soft or hard wood (57 up to 65% cellulose). For the production of one ton of common paper, about 2 to 3.5 tons of wood are used, i.e. around 20 trees are cut down. Paper is obtained from the cellulose fibres of wood through a process of chemical boiling. By recycling one ton of waste paper, 17 trees are saved.

In Romania
In 2003, 260,000 tons of cellulose and 457,000 tons of paper were produced in Romania, meaning that about 9,000,000 trees were cut down, which could have been saved by recycling 450,000 tons of waste paper. From the point of view of environmental pollution and energy consumption, recycled paper is more economical than common paper. By recycling one ton of waste paper 30,000 litres of water are saved, 28% to 80% less electrical energy is needed, and air pollution is reduced by 95%.

2. Your Contribution Counts!

Objectives: *initiating the concept of public campaign by selecting themes relevant for the target group*
Materials: *A4 sheets of paper, flip chart*
Number of participants: *20-30*
Duration: *50 minutes*
Place: *the classroom*
Competencies, skills: *applied research, learning through discovering, communication, and creativity*
Connection with other subject matters: *Language and Communication*

Our goal is to create a model of a public campaign that is designed to draw attention to an environmental problem (e.g. reducing the amount of and/or recycling solid waste). The pupils are asked to cover the following stages working in groups of four to six members:

1) Evaluation of the amount of waste produced over the length of a week by each pupil's family: paper (packaging, newspapers), plastic (containers, bottles for drinks), textiles, glass, organic substances (food that was not eaten);
2) Evaluation of the problem at a local level (the amount of waste produced by the community, what kind of waste, which ways of waste management are applied, etc.);
o Elaboration of a plan for a public campaign, which should contain the following elements: what is the target group; how to promote the issue; how to formulate message in order to reach the target group and be received efficiently (the content and delivery of the campaign should draw attention through their creativity and originality); how long will the campaign be presented for and through what channels; and finally, criteria for measuring the efficiency of the campaign.

The materials the pupils make should be presented in front of the whole class. They should be analyzed, and classified according to efficiency and originality at the end.

Discussion: One family sorts out the domestic waste to be recycled, and another simply discards them without selecting. Why? Do those who do not sort their waste need more information? Do they need to be financially stimulated? Are those who recycle motivated by education and care within the family or by the "pressure" of recent information?
The first step in designing a communication programme is to evaluate and gauge the motivation of the people whose behaviour we wish to change. Only a low percentage of the population actually shows the kind of behaviour we wish to see expand to a much larger number of the population. If we know why people behave in a certain way, we can estimate the degree in which a message can influence them and can attempt to make others follow their example with more precision.

The second step consists of elaborating a model message designed to start or to stop a certain kind of behaviour. The pre-testing stage is very important, as it allows for the identification of potential errors or inconsistencies between the proposed objectives, the target group and the method chosen. It is also important to find out what type of media is preferred by the target group. The feedback facilitates subsequent adaptation of the implementation process, and at the same time ensures successful monitoring and evaluation of the programme.

3. Waste Is ... Just Waste?

Objectives: *to promote creativity using fundamental knowledge connected to the problem of waste*
Age of pupils:*10-18 years*
Materials: *paper, pencils, different kinds of waste*
Number of participants: *20-30*
Duration: *40 minutes.*
Place: *the classroom.*
Competencies, skills: *team-work, creativity, communication*
Connection with other subject matters: *Art Education, Teaching, Counselling and Orientation.*

Activity:

four categories of cards are made, according to the number of participants, with the name of one category written on each card:

- paper
- plastic
- glass
- organic waste

Each participant is given a card (stuck to their backs with adhesive tape), without them knowing what word is written on their backs. They have to find out what their "card" is by asking their classmates only "yes" or "no" questions – e.g., "Is it used for making containers for drinks?" The participants with the same cards on their backs will form a group. Each group will receive several kinds of waste belonging to the category they represent (e.g. waste paper, PET containers, glass bottles, apple skins, etc.). The four groups are given the following tasks:

- paper – to create a fashion presentation.
- plastic – to make up a juggling act.
- glass – to create a musical score.
- organic waste – to make a sculpture.

4. Less Waste!

Objectives: *to recognise ways of solving the problem of waste*
Materials: *a set of notes for each group*
Number of participants: *20*
Duration: *60 minutes*
Place: *the classroom*
Competencies, skills: *group work, development of the ability to collaborate and take joint decisions, establishing connections and information exchange*
Connection with other subject matters: *Technological Education, Civic Education, Geography*

Note: *This is a team activity in which the pupils receive a set of notes, which they have to analyse and arrange in a certain order, according to their importance in solving the given problem of waste. The pupils have to decide which are the best solutions for solving the problem of waste.*

Activity:

Divide the students into several groups. Write statements on pieces of paper and distribute them to the student groups. Discuss each of them in groups, then arrange the notes in order of their importance, with 1 standing for "not important to reduce waste" and 5 standing for "very important to reduce waste".

Each group should explain the order it has chosen, connected with the respective action items / lifestyle choices. After having finished the presentation, try to find a common order so that everyone agrees.

Examples of statements:

Those who take care of a place and keep it clean will take more care of cleanliness and environmental health in the future.

If we paid more attention to our shopping habits we would produce less waste

In order to achieve less waste, more cleaning activities should be organised.

Recycling is the best solution for solving the problem of waste.

The problem of waste would be solved if more garbage depositing sites would be set up.

There would be less waste if the people who dispose of it improperly were fined.

To reduce the amount of waste we should avoid buying single-use goods.

There would be less waste if there were more garbage containers along the streets.

We would produce less waste if we would use objects to the maximum of their serviceable life.

7. Energy

Carpathian Convention Article 10: Industry and Energy

1. The Parties shall promote cleaner production technologies in order to adequately prevent, respond to and remediate industrial accidents and their consequences, as well as to preserve human health and mountain ecosystems.
2. The Parties shall pursue policies aimed at introducing environmentally sound methods for the production, distribution and use of energy, which minimize adverse effects on biodiversity and landscapes, including wider use of renewable energy sources and energy-saving measures, as appropriate.
3. Parties shall aim at reducing adverse impacts of mineral exploitation on the environment and ensuring adequate environmental surveillance on mining technologies and practices.

CONTEXT AND GENERAL INFORMATION

To observe and implement the principles of sustainable development, it is necessary to understand what impact our actions have on the environment and what solutions are available to reduce this impact as much as possible. With this in mind, we can organise our lives and use of resources according to some basic rules:

- using the natural resources available in the vicinity of where we live as much as possible;
- understanding and using resources as they have been used traditionally in the area where we live;
- evaluating the impact of our lives upon the environment and adapting our behaviour and the use of the resources we need in such a way that the environment is least affected.

These principles are even more important in rural mountainous areas, where natural resources are rich and varied, but where there is an increased tendency to over-exploit them. To ensure sustainable development of these mountain areas, it is necessary to use the available resources rationally, so that our descendants will also be able to enjoy them.

Almost every aspect of our daily life is dependent on energy. Energy can be defined as the ability to perform mechanical work. For the last 5000 years human beings have developed machines to perform mechanical work and discovered various ways of transforming different sources of energy into useful energy in order to fuel these machines. Energy is also used for cooking and heating.

Energy consumption has significantly increased since the beginning of the industrial era, when the first modern machines were invented and manufactured. Such machines were able to do the hardest work, which in the past had required a great concentration of manpower. Productivity, therefore, increased dramatically, and, at the same time, the cost of production diminished significantly. The discovery of the internal combustion engine led to the extended use of motorised transportation – motorcars, trains and airplanes.

Constantly increasing energy consumption, as a consequence of the continous growth of the global population, also results in an increasing pressure upon the Earth's resources, especially fossil fuels, and upon ecosystems and the climate. Fossil fuel resources are limited and cannot be regenerated in the same time frame as that in which they are used, because they are being used up so much quicker than it tool from them to be formed. These are the so-called non-renewable energy sources.

One of the problems which has been taken into consideration relatively recently is the decrease in discoveries of new oil deposits and other non-renewable energy sources, in spite of the ascendant trend in the demand for energy resources. Specialists estimate that a peak in the exploitation of oil resources will be reached in 2030, after which this resource will become less available, leading to a rapid increase in energy prices, and an immediate need to turn to other energy sources. Ideally, and necessarily, this shift in turning to other energy sources, would be happening now with great urgency and intelligence.

Given the ever-increasing global population and the growing energy consumption, the present use of energy is not sustainable, even for the next generation. A more efficient use of energy, including an increased use of renewable energy resources instead of fossil fuels, should be adopted as soon as possible.

Energy and the Environment

All sectors of the economy (industry, transportation and agriculture), as well as households, are energy consumers. The main sources of energy remain fossil fuels, which generate various kinds of pollution as a consequence of the burning process. This pollution comprises emissions of various gases, such as carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxides and particulate matter, such as carbohydrates and ashes.[22]
The types and quantities of pollution depend on the origin of the fossil fuel and on the burning process. For

22 For more details on climate change see the Appendix 2 Climate Change.

instance, burning petrol in the engines of motorcars produces a different proportion of polluting agents than diesel oil. Some of these polluting agents, especially the particles of carbohydrates and carbon monoxide, are very dangerous to human health and other living organisms. Human exposure to small quantities of carbon monoxide can generate fatigue, dizziness, headaches and, if the exposure is severe, it can produce failure of lungs and heart and even lead to death. Sulfur and nitrogen oxides combine with rain water to form acid rains. The term „acid rain" was used as long ago as 1858 to refer to rain made more acidic by acid gas pollution. It has harmful effects on water (it destroys biodiversity and has already eliminated a series of fish species), soil and plants (particularly wild mountainous areas where plants are directly in contact with clouds and where human actions cannot minimize high acidity effects), and human health (illness and premature deaths, such as cancer and other diseases). [23]

Some of these gaseous polluting agents, among which carbon dioxide is prevalent, contribute to the intensification of the greenhouse effect. They are called greenhouse gases. Observations concerning global temperature over the past 100 (or even more) years show that an increase of temperature by 10C (which has already been reached in present days) may be associated with the increasing proportion of carbon dioxide in the atmosphere. This increase differs from the fluctuations in carbon dioxide along the history of the earth, because they are induced by humankind much more rapidly than in previous periods.

Since the main cause of global warming is the emission of greenhouse gases resulting from burning fossil fuels to produce electrical energy in thermo-electric power stations, the main strategy to reduce the greenhouse effect and thus the global climate change is to use less energy provided by fossil fuels. As domestic consumers use 40% of the total energy, the change in the energy use at homes would be a significant contribution to, and a good starting point, for the efficient use of energy.

One of the the main solutions we have to reduce the use of and the dependence on fossil fuels is to use them more effectively:

- Use co-generation (the combined production of electrical and thermal energy, since in a classical electrical power station most of the heat is lost, being either emitted into the atmosphere or transferred into cooling water);
- improvement of energy efficiency in the domestic, industrial and transportation sectors. In the case of buildings, for example, thermal insulation, the use of proper building materials, and the installation of efficient heating systems can be used and would make a huge difference;
- reducing the irrational / unnecessary use of electrical energy in households: using ecological illuminating systems, turning off electronic equipment/household appliances instead of leaving them on stand-by etc; and
- production and use of renewable energy (wind, solar, geothermal, biomass and small hydro-energy).

Nuclear energy has been promoted as a clean source of energy for the last 50 years and as a viable sollution to climate change. The topic is very controversial nowadays since a large number of environmental organisations and research institutes have shown that nuclear energy is neither clean, nor carbon neutral. No reactor in the world is inherently safe. Moreover, there is no secure, risk-free way to store nuclear waste and no country in the world has a solution for high-level waste that stays radioactive for hundreds of thousands of years[24]. Even if it were climate-friendly, nuclear power could do little or nothing in the fight against global warming. Nuclear power is only used to generate electricity. It represents a mere 16% of the world's electricity. Electricity itself only accounts for approximately one third of the greenhouse gases" [25]. Nuclear power already delivers less energy globally than renewable energy, and the share will continue to decrease in the coming years.

23 Source: the European Environmental Protection Agency http://www.eea.europa.eu/publications/2599XXX/page009.html

24 4 Source: Greenpeace International, www.greenpeace.org/international/campaigns/nuclear

25 Greenpeace International, climate change – nuclear not the answer, April 2007.

Energy Efficiency

The largest and most accessible source of energy is simply to save it. In most cases people use more energy than they need. It is a habit formed at times when the problem of climate change was not as apparent, and there were still plenty of fossil fuels, which were also very cheap. At present, wasting energy means extra spending and detrimental effects upon the environment because most of the energy we consume is produced through the combustion of fossil fuels, which results in the emission of greenhouse gases.

Using energy efficiently does not mean depriving ourselves of the right to use it, rather to obtain the same amount of high quality goods and services while using less energy. Although for many people improving energy efficiency seems overly complicated, it is nothing else but good management of available energy resources.

Technological development is the most active driver of energy efficiency. If we enter a shop of household appliances we will see that washing machines, refrigerators and other equipment which use electricity to function, are presented with labels indicating, among other things, their class of energy efficiency, from A (the most efficient) to G (the least efficient). This means that if we, for instance, buy a class G refrigerator, it will consume much more electrical energy for doing exactly what a class A refrigerator does. The energy saved over one year's utilisation fully justifies the choice of the class-A product. Even though the price of such a refrigerator is higher than that of an inferior class product, the energy costs will be sensibly lower and thus the difference in price will be compensated over time. There are also other methods of reducing energy consumption and thereby implicitly improving efficiency: the use of energy-efficient electrical bulbs reduces the consumption of electricity necessary for illumination by 80% because these bulbs ensure the same degree of lighting as the traditional incandescent electrical bulbs (with wire), which spend most of their energy to warm up the wire (energy that is not transformed into light).

Everyone can do simple things to make their energy consumption more efficient, starting with putting the lights out whenever we leave a room and not using the "stand by" position on all our electronic equipment (computers, printers, television sets, music equipment, etc.). Other ways to reduce our energy consumption include: using cooking pots of dimensions that correspond to the heating surface of the stove, using pots with lids for cooking various kinds of food, not putting hot food into the refrigerator, defrosting the refrigerator whenever ice appears inside, placing the refrigerator in places as cool as possible, far from heat sources, and many other things. In the same way the energy consumption necessary for ensuring a comfortable environment can be substantially reduced by improving the thermal insulation of buildings and by using more airtight carpentry, which diminishes heat loss. In the near future all the buildings in the European Union (EU) will be evaluated one by one and will be given certificates of energy efficiency. The energy certificates will be issued by specialists; based on calculations and measurements of the materials from which each building has been made. These specialists will also propose measures to be taken to improve the energy efficiency of each building. Whatever materials have been used for the building, specific for the place in which it was built, steps will have to be taken to make it more energy efficient.

If you leave a house on a warm summer's day you can feel the power of heat and sunlight. Today many buildings are constructed in a way which allows benefiting from solar light and heat. When new buildings are being designed, certain principles of solar energy use should be taken into account. The principle of passive solar architecture mainly means that the building should be oriented facing south, while its northern side should have few, or no windows at all. The windows facing south should be as large as possible to allow solar radiation to get inside the building during winter, which will reduce heating costs. Materials that absorb and accumulate solar heat may be included in the floors and walls that are intensely illumined by the sun. The floors and walls will accumulate heat during the day, and will yield heat during the night. This form of passive collecting is called direct obtaining.

Illumining buildings during the daytime is simple to do with solar light. In order to illumine rooms facing north and on upper floors, windows placed on the roof are used, often together with parts of the floor made of transparent material, which allows for the passage of light.

Of course, too much solar light and heat during an extremely hot summer are harmful. Fortunately, there are several devices, which can prevent excessive warming. For example, shutters can be used to provide shade when the sun is too strong. The surfaces illumined by the sun can be isolated from the rest of the house. A building can also be built to allow ventilation by fresh air.

A short review of the measures, which can be taken to improve the energy efficiency of houses in a mountainous area, makes it necessary to examine the issue of the building materials prevalently used in these areas. In mountain areas wood and stone are the building materials most commonly found. Wood is a building material, which offers good mechanical strength and good thermal insulation, superior to that of brick. Stone, however, provides very good heat accumulation, capable of storing large amounts of heat and acting as an accumulator of heat.
When used properly, these materials can enable a house to achieve such high-energy performance as zero-energy consumption, or to become independent from an energy point of view. Also, building a house using materials that are plentiful in the local area gives it greater sustainability.

Sources of Renewable Energy in Mountainous Areas

Unlike fossil fuels, renewable sources of energy are plentiful, distributed over extensive areas and locally available. Most of them are directly and indirectly provided by the sun, such as light, heat, wind, water and biomass, which are all available in mountain regions. Heating makes up about 40% of the energy needs of a home, including heating of the house and the production of hot water for the household. Sources of renewable energy can be used to produce electricity, the best example being the photo-voltaic cells, which convert solar light into electricity.

The use of renewable sources means low or zero emission of gases. Generating heat or electricity from local renewable sources avoids energy losses associated with transmission and distribution, which may amount to as much as 25%. Another advantage of efficiency is the direct use of heat without converting one form of energy into another, such as the use of solar heat for heating water.

Energy from Water or Hydro-Energy

Converting the energy of water collected in lakes is the oldest commercial way of producing electricity based on the power of water. The water moves a turbine, which in turn, drives an electro-generator.
Even though water is a renewable energy source, the large systems required to use it, such as dams, and barring natural valleys of rivers and streams, are not sustainable. This way of producing electricity pollutes the atmosphere, even though it does not use fossil fuels: flooding large areas covered by vegetation leads to its rotting, a process from which methane is formed (methane - CH_4 – is a gas with a greenhouse effect 24x higher than carbon dioxide - CO_2) in very large amounts for a relatively long period of time. Flooding valleys also means moving populations from the affected areas, destroying biosystems, and this practice also involves a higher risk of disasters in case a dam is destroyed. The optimum, sustainable solution is that of micro-hydro power stations, which do not use dams.

The Mountainous Areas and their Available Biomass

Energy coming from the biomass, or bio-energy (energy gained from organic matter) of a region, has been used for thousands of years, ever since human beings began to burn wood for cooking or heating. Wood makes up the bulk of the energy derived from biomass. Today, however, several other sources of biomass can be used, even plants, residue provided by agriculture and forestry, and the organic components of domestic and industrial waste. Also gases coming from the storage sites of domestic waste can be used as a source of biomass energy.
One of the most common human activities in mountainous areas is the exploitation of wood resources. Cutting trees also means cutting the branches and cleaning the bark, so that only the trunk is transported to the places

where it will be processed. The bark and the branches, which remain in the forest, have no economic value for those who exploit the wood, but they do represent an important source of wooden biomass. In the same way, sawdust, resulting from cutting up trees to obtain timber, may be either used as fuel, or may become raw material for pellets and briquettes – fuels of high energy value and very efficient, especially in automated heating installations for residential buildings.

After extensive research and testing, technologies were developed, which use a proper proportion of sawdust from different kinds of wood, and do not require any additional substances to keep the particles forming the pellet or the briquette together. The adhesive in this case is natural and is contained in the sawdust itself. It consists of small quantities of resin, which, under pressure, are scattered all over the pellet (or briquette), and glue all the wooden particles together. This provides mechanical strength for the packaging, transportation, distribution, stocking and burning of this fuel, starting with the producer and ending with the final user. This way, "green" fuel is obtained, which is not only neutral from the point of view of carbon dioxide emissions, as its burning emits exactly the same amount of carbon dioxide as the plant absorbed during its life, but also doesn't produce any emission of polluting gases, which would result from the use of unnatural adhesives.

The heating systems, which use sawdust pellets, have a working principle similar to that of the installations using natural gas as fuel. Owing to their small dimensions, pellets can be automatically transferred from the deposit to the burner and portioned according to the needs of the heating facility and building. The fact that the user does not have to feed the installation manually is a great advantage.

The use of energy supplied by biomass substantially reduces the emission of greenhouse gases. Biomass generates almost the same quantity of carbon dioxide as fossil fuels, but before the plant is cut, it absorbs a great quantity of carbon dioxide from the atmosphere. The net emission of carbon dioxide will be zero as long as the plants are replanted with the aim of obtaining energy. These energy plantations, such as rapidly growing trees and plants, are called biomass reserves. The use of biomass reserves may also help to increase profits for the agricultural industry. Many laboratories are doing research work to develop and improve technologies for the future use of the energy provided by biomass.

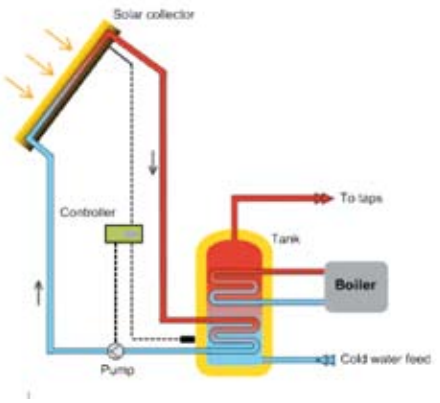
Rotting of biomass produces a mixture of gases. The most representative of these gases is methane (about 60%), which can be used as a source of energy. In landfills pits can be dug for the release of methane resulting from the decay of organic matter. Methane can also be obtained from biomass by a process called anaerobic decay, which means that bacteria decompose organic matter in the absence of oxygen.
Several bio-energy technologies can be used in small, modular systems. For instance, some farmers use animal waste to produce energy for their farms. These systems not only produce renewable energy, but also help the farmers observe environmental regulations.

Bio-fuels are fuels obtained mainly from vegetal or animal produce. Two of the most widely used types of bio-fuels are ethanol and bio-diesel. Ethanol is an alcohol, the same as that found in beer and wine. It is produced by fermenting any kind of biomass rich in carbohydrates (sugar and cellulose) by a process similar to the production of beer. Ethanol is mostly used as an additive substance to fuel, to diminish the emission of carbon monoxide and other gases from motorcars. A large number of vehicles in different parts of the world use a mixed fuel made up of 15% petrol and 85% ethanol.

Biodiesel is generally obtained as the result of the reaction between vegetable oil or animal fat and methanol, in the presence of a catalyst, which is, in most cases, caustic soda [26]. It may be used as an additive substance to reduce the gas emissions by cars (usually by 20%), or in its pure form as an alternative renewable fuel for diesel engines.

26 Catalysis is a modification and especially increases the rate of a chemical reaction induced by material unchanged chemically at the end of the reaction. Source: The Merriam Webster Online Dictionary, www.merriam-webster.com/dictionary

Solar Energy – Sun Shines Everywhere!



Various technologies were developed to benefit from solar energy. They include the following:

1. **Photovoltaic systems**
   (production of electricity directly from solar light). Solar cells directly transform solar light into electricity. Solar energy is usually used for calculators or watches, but now it is increasingly being used for the large-scale production of electricity. Photovoltaic cells are made of semi-conductor materials similar to those used for computer chips.

2. **Heating of water with solar energy.**
   Most devices used for heating water are made up of two main parts: a solar collector and a boiler. The most common collector is the flat collector. It is mounted on a roof and consists of a thin, flat box, covered with a transparent material, and oriented toward the sun. Small tubes are filled with a liquid – water or antifrost liquid – which is warmed up by the sun. The tubes are attached to a metal surface that is painted black in order to absorb the heat. As the collector warms up, the heat is transferred to the liquid passing through the tubes. The last part of the installation is a well-insulated tank, which contains the water to be used by the consumer inside the household. The tubes containing the hot liquid pass through the tank and transfer the heat to the water it contains (this system is called a heat exchanger), which is sent to the tap. The tubes are placed at the lower end of the tank (since the cold water is constantly being fed to the tank to replace the water being used, it always remains in the lower part of the tank). During winter, the solar collector system is used to raise the temperature of the water, but it cannot warm it to the temperature needed for use. This is why solar collector systems are equipped with an additional boiler, which brings the water to the suitable temperature. Still, this solution is effective from the energy consumption point of view, since the boiler (using electricity, gas or other fuels) is only a complementary source of energy and it would consume more if the water was not pre-heated through the solar collector system.

Geothermal Energy

1. **Direct use of geothermal energy**
   When a person takes a bath, the heat of the water will warm up the whole bathroom. Likewise, the reserves of geothermal water located deep underneath the earth's surface, sometimes at a distance of several kilometres, may be used for direct heating. This procedure is called the direct use of geothermal energy. Warm geothermal water may be used for many applications, which require heat. Its use may include the heating of buildings (separately or of whole towns), growing plants in greenhouses, heating the water in nursery ponds, and some industrial processes, such as the pasteurisation of milk. Scientists are researching the most economical ways of using geothermal springs to produce electricity.

2. **Heat pumps**
   At a distance of about three metres underground, the earth has a constant temperature between 10 and 16oC. As in a cave, the temperature of the earth is higher than that on the surface in winter and lower in summer. Heat pumps are installations, which make use of this temperature difference. The geothermal water and the constant temperature zone situated three metres underground may be used within the heat pump for heating buildings in the winter and cooling them in the summer.
   In the winter, the pumps push the heated water through the pipes and into the heating system. In the summer the process is reversed, and the warm water from the system is pumped into the cooling pipes. The heat evacuated from the cooling system of a building during the summer months can be used for heating domestic water.

Heat pumps consume less energy than conventional heating installations, as they "extract" heat from the soil. They are also more efficient when used in the cooling systems. Using heat pumps does not only save energy, but also reduces pollution.

Wind Energy

The power of the wind has been used for thousands of years. The power of the moving air masses (wind power) may cause disasters, but it can also be productively exploited by using contemporary technologies. Throughout the world, in Iran, in Holland during the past centuries, as well as in many farms in the United States, windmills have been used for pumping water or grinding wheat. Today, the modern equivalent of the windmills – the wind turbine – can use the power of the wind to produce electricity.

In the course of time many people have been striving to find the most efficient system capable of capturing as much of the wind energy as possible to transform it into other forms of energy that is useful to people. The turbine with a horizontal axis is the best-known system, as it was the first type made and used by humans. Savonius and Darieus were the two scientists who worked independently to achieve two models of turbines with vertical axes, now bearing their names. The characteristics of these vertical-axis models make them useful not only for the production of electrical energy, but also for other purposes (they are generally used to put pumps or other mechanical equipment in motion).

Wind turbines, like windmills, are mounted on top of a tower to capture as much energy as possible. At thirty metres or more above the earth, the speed of the wind is higher and less turbulent. The turbines capture wind power with the aid of pales resembling those of a propeller. Usually two or three such pales are mounted on a hub to form a rotor. Wind turbines can be used independently or may be connected to a network of electricity. In many cases a combined interconnection is recommended: wind turbine with a photovoltaic system (solar cells). In order to connect to the network, several wind turbines, installed within a limited area, are usually used to form a wind power plant. Single wind turbines are generally used for pumping water or to supply energy to certain communication and signaling systems (radio relays, radio-bearing beacons, etc.). The most powerful wind turbines produce five MW and is installed on a tower over 80 metres high.

The smallest wind turbines are used to produce power below one KW, and are mainly used to charge electrical accumulators. It is interesting to note that a hybrid system (wind pico-turbine and photovoltaic panels) may provide the entire amount of electrical energy needed by an individual household if the users are taught to use their own energy system efficiently.

QUESTIONS:

- What is energy? Give examples.
- What are fossil fuels and what are their main characteristics?
- What are the effects of fossil fuel extraction, transportation, processing and use (burning) on the environment?
- What can you tell about the way of life based on consumption?
- What does good management of resources mean generally, and that of energy resources particularly?

Energy Efficiency

- What is energy efficiency? Can you give examples?
- What is meant by a house that is efficient from an energy point of view? What do you think are the main characteristics of such a house?
- What are the traditional building materials used in mountainous areaa? What are their characteristics? Can buildings made of local materials be sustainable? Why? Under what conditions?
- Could you give examples of unsustainable approaches to building residential houses?
- Could a house have zero-energy consumption? What makes the difference between this type of house and

other houses? What are the advantages of such a house? What are the disadvantages?
- What are the first steps in designing a house with low energy consumption? What are the main things we must keep in mind when we decide to build a new house?
- Can an existing building be rehabilitated from an energy point of view? How?
- What is the role of passive solar energy in designing and using a healthy home with low energy consumption?

Renewable Energy
- Is energy produced by large hydropower stations (dams) renewable?
- Is this a sustainable way of producing electrical energy?
- What are the negative effects of producing energy through large hydro power stations?
- Why are micro- and pico- hydropower stations not dangerous for the environment?

Mountains and biomass:
- What is biomass? Give examples.
- What is forestry biomass? What is forestry waste?
- What waste results from the processing of wood?
- How can sawdust be used?

Solar Energy:
- Where does solar energy come from?How was it used by people throughout history?
- Which are the present-day forms of exploiting solar energy?
- What does the collector mean for the production of domestic hot water? What are the physical principles on which its functioning is based?
- How can we use solar energy in our everyday activities (fruit drier, solar oven, etc.)?
- What is a photovoltaic cell? How can it be used?

Geothermal:
- Which are the phenomena demonstrating that the earth contains large amounts of heat?
- Where does this heat come from and how long will it last?
- How was the heat used by human beings over time? How can we use it today?
- What is a heat pump?

Energy in your community:
- Could you give examples of sustainable and unsustainable approaches to building houses in your area?
- Where does your house lose energy? Let us analyse the house we live in from the point of view of energy consumption.
- What sources of biomass exist in your area? Is it used by the local people? If yes, how? In what other way could they be used? Is the use of this resource sustainable?
- Is the energy of water used in the area where you live? If yes, is it used sustainably?
- Does your house use solar energy? How?If not, how could it?
- Are there sources of Georthermal energy in your area?

Energy in the Carpathians with the aid of a Map:
Refer to the Maps[27]:
- Electricity transmission network to help the discussion (Map 10).
- Hydrocarbon Fields in the Carpathian Region (Map 11)
- Are there hydropower/thermal power plants close to your area? If yes, what do they provide the energy for?
- Which coutrnies in the Caprathians have the greatest number of hydro/thermal power plants? Is the energy

27 See also:
- Map 2.8: Stock of passenger cars in the Carpathians (Carpathian Environmental Outlook, (KEO). Ch. 2)
- Map 3.12 Coal Deposits in the Carpathian region, p.133 (Carpathian Environmental Outlook (KEO), Ch. 3)

http://www.carpathianconvention.org/NR/rdonlyres/573C03A6-18C4-4001-A845-0AF5E12CC516/0/CH_3a.pdf

transmitted to neighbuoring countries/areas?
- What energy resources are avilable in your area? In other Carpathian countries?
- Is it a good sign if many hydrocarbon fields are situated nearby? What are the positive and negative effects on the nearby communities?
- Are hydrocarbons an important source of energy in your community?What do they provide the energy for?

References:
More information on energy in the Carpathians, including on coal deposits, hydrocarbon fields, and the negaative impact of mining in the Carpathians can be found in the Carpathian Environmental Outlook, (KEO). Ch. 2, Ch 3,

Note for those implementing the above locally in a Carpathian country.
Change the Romanian examples and links to the local ones. Modify the structure of the chapter in order to reflect your local energy situation. Emphasize the most relevant local possibilities and problems concerning sustainable energy supply.

ACTIVITIES

Do you have any energy – related Key Points? Is there a water – mill on your trail? Is there a dam? Can you see solar panels anywhere on the Trail? Could you place them anywhere?

1. Introduction to Using Solar Energy in the Form of Heat

Objectives: *to develop research skills through experiential discovery; to develop skills through practical activities; introduction to performing experiments*
Age of pupils: *12-18 years*
Materials: *charts and tables to be filled in; pens, millimetre paper, pencils, rulers, markers, two pieces of 20 x 20 aluminium plate, paintbrushes and mat-black paint, plastic bag or sack, adhesive tape, graded vessel and water, two thermometers and a watch with a seconds hand*
Number of participants: *20-30*
Duration: *2 hours*
Place: *the classroom*
Competencies, skills: *teamwork, communication, experimenting, comparison, synthesis*
Connection with other subject matters: *Geography, History, Physics, Mathematics*

Based on the knowledge acquired in the classroom and with the help of their teacher, the pupils make the equipment necessary for an experiment to demonstrate the ability of materials to accumulate and yield heat, as well as the main characteristics of heat radiation. Based on the data they collect using the equipment, they will be able to draw graphs representing the behaviour of different materials in capturing heat resulting from electromagnetic radiation. The pupils will look for examples of heat use captured from the sun in various applications, and they will explain the impact of these upon the environment.

The activity should be performed in groups of six pupils at the most. Under the careful guidance of their teacher, the pupils make devices from transparent plastic bags, which they attach with adhesive tape to copper, aluminium and steel plates painted in different colors. The same quantity of water should be put into the bags attached to the plates.
The pupils then measure the temperature with thermometers, in order to determine the temperature differences between the liquids.
After the experiment pupils should explain the following:
1. What happens when the water in the bags is replaced by a concentrated salt or sugar solution?
2. What happens when they increase the quantity of water to 200ml in each bag?

3. What happens when 100g pieces of aluminium, bronze or steel are added to the water?
4. How can the heat from a solar panel be used?

The first source of energy used by human beings was solar energy. From the very beginnings of human existence human beings chose their shelters and made their houses to face south, thereby benefitting from the use of solar heat.

Until the use of fossil fuels to provide very high temperatures by burning was discovered, people used solar energy to heat the places they lived in, as well as the places used for growing seedlings, and for the conservation through dehydration of alimentary produces or for making building materials. It is well known that even today many people continue to use solar heat for the production of certain goods.

2.Initiation into the Utilisation of Solar Energy. The Solar Oven

Objectives: *to form research skills through experiential discovery; to develop skills through practical activities; introduction to performing experiments*
Age of pupils: *12-18 years*
Materials:
1. One cardboard box
2.Aluminium foil or mirror
3. Window or polycarbonate foil
4.String
5.Adhesive tape
6.Thermometer or electronic thermocouple multimeter
Number of participants: *24-30*
Duration: *2 hours*
Place: *the classroom*
Competencies, skills: *teamwork, communication, experimenting, skillfulness, comparison, synthesis*
Connection with other subject matters: *Geography, History, Physics, Mathematics*

Activity:

making a solar oven

1. Line the inside of a box with aluminium foil
2. Cover the lid with aluminium foil or a mirror
3. Tie a string with adhesive tape so that the head can be moved in various positions
4. Lay a window or the polycarbonate foil over the open cardboard box and put the oven in the sun, taking care that the lid is bent so that the foil or the mirror reflects the sunlight towards the oven as much as possible.
5. Put a thermometer inside the oven and observe the rise of temperature.
6. How much can the temperature rise?
7. Try to warm up a cup of coffee or boil an egg in the oven!

Make your own experiments and write down the results
How much does a solar oven cost? How much would it cost to cook a meal for your family if you used wood? How much wood would be needed to cook for a family for one year?
Wrap in aluminium foil the other parts of the oven to obtain as much heat from the sun as possible. What do you notice?
In many developing countries the fuel resources are very limited, so to meet the need for fuel, trees, even those that have just been planted, are cut down. This results in environmental problems like soil erosion or landslides. An oven, the functioning of which does not cost anything, can be made of simple materials and could be an excellent alternative.

3. Initiation in the Utilisation of Wind Energy. The Savonius Turbine

Objectives: *the formation of certain skills for doing research work through experiential discovery;*
developing skillfulness through practical activity;
initiation in experimenting
Age of pupils: *12-18 years*
Materials:

1. *Semi-cylinders made of PVC, diameter10-12 cm, length 30-40 cm*
2. *Plywood, thickness 12-15 mm*
3. *Boards and/or pieces of wood (1x1)*
4. *Two bicycle hubs, preferably identical ones*
5. *Nails and screws, narrow straps, washers, screw nuts*
6. *Saw, electrical drill, auger*
7. *Long elastic or transmission belt*
8. *Dynamo*

Number of participants: *24-30*
Duration: *2 hours*
Place: *classroom, outdoors*
Competencies, skills: *teamwork, communication, experimenting, skillfulness, comparison, synthesis*
Connection with other subject matters: *Geography, History, Physics, Mathematics*

Activity:

making the Savonius Turbine

1. Cut the plastic tube carefully into two semi-cylinders of the required dimensions. Make the two pales of the turbine. The two pieces must be identical.
2. Cut out the two pieces of plywood as in the drawing. Their radiuses must be a few centimetres larger than the semi-cylinders. These pieces have to be perfectly round to ensure perfect rotation of the turbine.
3. One of the plywood wheels must have a groove for the transmission belt.
4. Drill the two plywood wheels exactly in the middle to attach them to the bicycle hubs.
5. Draw a diametric line on each of the two wheels.
6. Put the pales on one of the wheels along the line you drew. Mark the position with a pencil.
7. Outline the wheel and the lines you drew on a sheet of paper and transfer the resulting drawing onto the other wheel to create a mirror image on this second wheel.
8. Make signs where the pales will be attached with straps to the plywood wheels. You will use two straps to attach each pale to each wheel.
9. Assemble the wheels and the pales as a rotor.
10. Important: To ensure perfect balance of the device it is essential that the middle of each wheel should be placed exactly one over the other. Pass a perfectly straight wooden axle through the holes of the two wheels at a 900 angle. Make a wooden support for the device.
11. Assemble the bicycle hubs on the two wheels, place the transmission belt of the wheel with the groove, and the rotor of the turbine is ready.
12. Build the frame of the rotor, but do not attach the upper part yet.
13. The two hubs can be attached to the frame with two identical screws.
14. Make a pole for the wind and assemble the frame on it.
15. Balance the whole device.
16. Assemble the dynamo on the frame and ensure connection with the transmission belt.

Make your own experiment and write down your observations:

1. How can you observe the speed of wind by looking at things around you?
2. How fast does the turbine revolve depending on different speeds of the wind?
3. Can the number of rotations be recorded?
4. Is a certain speed of wind necessary for the dynamo to produce energy?
5. Try to modify the angle at which the pales are situated toward each other. Make new attachment holes. Does the turbine move faster or slower? Why?
6. How much electricity is produced from wind power in Romania?

Much work was done until the present-day version of wind turbines was achieved. At first the turbines were made of wood, but today they are made of glass or carbon fiber. As a result of this experiment the pupils will be able to make a simple wind turbine made out of wood. Some basic knowledge of aerodynamics is necessary, as well as a place where the materials can be processed. For safety reasons, the children do not use the electrical tools.

4. Detective's Guide – Case: "Warming up the Wind in our Classroom"

Objectives: *to develop research skills through experiential discovery.*
Age of pupils:
Materials:

1. *Notebook*
2. *Instruments for writing and drawing to illustrate where the heat is lost*
3. *Camera*

Number of participants: *10-15*
Duration: *one week*
Place: *the school building*
Competencies, skills: *teamwork, communication, experimenting, comparison, synthesis*
Connection with other subject matters: *Physics, Geography.*

The problem

Reports from our detectives show that in the winter months a great amount of heat is lost due to the poor insulation of doors and windows. There is draft in the school, which causes discomfort and also requires significant amounts of energy for heating. The energy used for central heating is obtained by burning coal, oil or natural gas. Wasting energy also means polluting the environment, since the production of energy implies high levels of carbon dioxide, sulphur and nitrogen oxides' emissions, large quantities of ashes, etc. The detectives will take action to stop this waste next winter.

Special task:

Code name: "Operation Breeze"

Start an investigation to find out if there is any heat loss in your school. Collect evidence for the identification of the potential problem. Decide whether there is a problem at all. If there is, do something to solve it!

What you should do:

Find evidence! Here are some clues to help you:

- Cracks in doorposts or window frames;
- Insulation tapes around windows are missing or are deteriorated;
- Doors and windows are not properly closed on cold days; or
- Broken-down door handles.

Record your findings:
You must have a notebook in which to put down all your observations:
- time at which you found an irregularity;
- place;
- the way warm air gets out or cold air gets into the classroom; and
- who was the last person in the room before you.

Organise a meeting:
Get all the detectives involved in the operation together and compare your observations.
- When and where did you find heat losses in the school?
- What do these places have in common?
- Who are the witnesses and the suspects?

Come up with a solution!
- What can be done to solve the problem of heat loss in the school?
- How can the pupils, teachers and other persons in the school prevent this phenomenon?
- Create a file where you write down all your observations and ideas.
- Present the file to your superior(s) (teacher or headmaster).
- Explain the advantages of this operation and tell them how it can lead to good results.

Final step:
- When your superiors have time to listen to you, ask them which they think are the best parts of your plan, which they consider to be the most important ones and which they intend to actually implement;
- Begin an "undercover" investigation afterwards, to check if the plan is functioning;
- Note everything you discover;
- Organise another meeting to discuss the progress that has been made; and
- Report your conclusions.

5. My Green Locality

Objectives: *stimulation of the ability of pupils to uphold ideas by finding ways of using them in their own community*
Age of pupils: *10-18*
Materials:
- *drawing paper*
- *coloured pencils and drawing kit*

Number of participants: *15-20*
Duration: *2 hours*
Place: *the classroom*
Abilities: *analysis, comparison, synthesis, negotiation, argumentation*
Connection with other subject matters: *Physical and Human Geography, Biology, Physics, Drawing*

The pupils are given the task to make drawings that represent their locality as a whole (houses, surroundings, nature, farms/industry, the school building, roads, etc.).

After presentating their drawings, the pupils analyse potential sites for renewable energy installations, in all its forms, taking into account the renewable energy sources available in the area (wind, solar, biomass, geothermal, etc.), and place the potential installations on the drawings of their community.

At the end of the activity, an exhibition with all the drawings is organised, and each pupil is asked to comment on the site where s/he placed the installation, and to give his/her reasons for doing so. The different alternatives presented will be discussed so that best options for each type of renewable energy can be identified.

8. Cultural Heritage

Carpathian Convention Article 11 – Cultural Heritage and Traditional Knowledge

The parties shall pursue policies aimed at the preservation and promotion of the cultural heritage and of traditional knowledge of the local people, such as crafting and marketing of local goods, arts and handicrafts. The parties shall aim to preserve the traditional architecture, land use patterns, local breeds of domestic animals and cultivated plant varieties, and sustainable use of wild plants in the Carpathians.

CONTEXT AND GENERAL INFORMATION

The Carpathian Mountains – A Different Perspective

The Carpathian Mountains not only represent the last "reservoir" of biodiversity or a source of raw material, but also a rare collection of unaltered customs, beliefs, of tales and legends, of "God-forsaken" settlements, of fortresses cast over mountain peaks, and monasteries hiding in forests. One wonders which of these characteristics may be the most important or unique.

Development has brought many unsustainable practices with it in societies all across the globe. Overconsumption, as well as short-term and even one-time use of goods are leading to the exhaustion of resources and to environmental degradation. In comparison, certain rural mountainous communities, such as those in the Carpathian area, have been living in harmony with nature for centuries, and have succeeded in developing practices, methods and skills to use existing resources efficiently, without upsetting natural and social balances.

Before we continue, we will provide definitions of some key terms in the following section

Cultural Heritage

Cultural heritage means a legacy of cultural value, or in other words, the moral, intellectual, and artistic goods, values and perspectives transmitted from one generation to another. Cultural heritage refers to both tangible and intangible forms of culture.

The tangible forms of cultural heritage are the material results of human activities, produced by past cultures and civilizations. Among these, the following can be distinguished:

* Monuments – architectural works, art objects, inscriptions, and elements of structures, which are of universal importance from historical, artistic or scientific points of view;
* Groups of buildings – separate or connected buildings, which, due to their architecture, homogeneity or integration into the landscape are of universal importance from a historical, artistic or scientific point of view; and
* Sites – human works or a combination of human works and natural elements, in other words, archeological sites of universal importance from a historical, artistic or scientific point of view.

The intangible forms of the cultural heritage are "means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity [28]."

Traditional knowledge belongs to the intangible forms of cultural heritage and is developed by communities on the ground of century-old experience, adapted to local culture and environment. It is transmitted orally and represents the common goods of communities. Among traditional knowledge, practices of agriculture, forestry, fishing, popular medicine, common law, cultural values, proverbs and many others can be included.

Cultural heritage of both kinds (tangible and intangible) is mainly being negatively impacted by consumerism and globalisation. Tangible forms of heritage are being affected by pollution, industrial or demographic expansion, lack of interest etc. Such effects generally only become visible over a long period of time, and up to a certain point in time it is even possible to stop the degradation and restore the heritage. In the case of intangible forms, losses are often irreparable. Without documentation a traditional way of tilling the soil, a specific way of building

28 Text of the Convention for the Safeguarding of Intangible Cultural Heritage (UNESCO) http://www.unesco.org/culture/ich/index.php?pg=00006 (accessed at 2009. 10. 15.)

a wooden house, of weaving a carpet, a tale or a belief will disappear forever if they cannot be reproduced due to lack of people who are familiar with the practices.

Box 1: World Heritage Sites (WHS)
The international community considers World Heritage Sites 29 to be of remarkable universal value. There is a World Heritage Convention ratified by 186 countries and a World Heritage Committee, which selects sites from national lists of proposals. After a site is selected, the WHS remains in the possession of the respective state, and the site enjoys international protection in regard to conservation and rehabilitation. There are four types of WHS, namely cultural, natural, mixed (cultural and natural sites), and cultural landscapes. To date there are 878 designated sites (679 cultural, 174 natural, and 25 mixed sites) in 145 countries all over the world.
Romania has seven designated WHS, namely the monasteries in the north of Moldavia, the Dacian Fortress at Orastie, the Danube Delta, the historical centre of the town Sighisoara, the Horezu Monastery, the villages with fortified churches, and the wooden monasteries in the Maramures region. Unfortunately, no natural site was designated in the Romanian Carpathians – the only natural site among the above-mentioned is the Danube Delta. The other Carpathian countries have paid more attention to the Carpathian area and succeeded to designate common transboundary sites, such as "The Virgin Beech Tree Forests" (Slovakia and Ukraine), "The Aggtelek Caves and the Slovakian Karst" (Hungary and Slovakia), or cultural sites, such as the "Wooden Churches in the Carpathians" (Poland and Slovakia). An example of a cultural landscape in the Carpathian countries is the historical Tokaj region of viticulture in Hungary 30. No mixed site has been designated to date in any of the Carpathian countries. Romania developed documentation for the Vanatori Neamt area (Vanatori Neamt National Park, which includes the Neamt, Secu, Sihastria, Agapia, and Varatic monastries) to be included in the list of proposals for Romania, a first step towards its subsequent designation as a WHS.

The Carpathian Mountain region represents a common and dynamic space of life (natural, cultural, political and socio-economic), important in terms of cultural and natural heritage. Although each ethnographic region is unique, with specific features, rural communities in the Carpathian Mountains have generally preserved ancient traditions, customs and techniques that are efficient and effective up to the present day. The Carpathian region, however, with its high ecological and economic potential, is undergoing rapid environmental, social and political changes. The technological development of the past few decades has begun to increasingly and rapidly invade the isolated world of mountain villages, bringing with it changes in the way of life of the peasant households. These changes are leading to a loss of traditional knowledge and lifestyle, of customs and values that were preserved through centuries.

The challenges that these Carpathian countries and communities now face are similar to those present in countries and communities all over the world: namely, to develop intelligent, credible and sustainable management of biodiversity and of the ecosystems on which the health, lifestyle and economic prosperity of each community depends. It is important to preserve the potential and uniqueness of a region while simultaneously allowing and encouraging it to develop sustainably. For this, well-adapted and responsible actions are necessary, ones that take into consideration the global, regional and trans-border contexts and connections present, as well as the specific environment of the Carpathians and the unique lifestyle of the inhabitants of these mountainous areas.

Depopulation in rural areas poses another threat to the traditional character and landscape of the Carpathian Mountains. It is, therefore, very important to formulate and apply coherent and sustainable policies from a cultural point of view for all the Carpathian regions in order to stop this growing trend before it is too late. It may be necessary to take political measures, and to develop initiatives and incentives for local people to remain in their native villages as preservers of the unique natural and cultural landscapes in these mountain areas.

Education, communication and public participation can greatly facilitate and support environmental protection

29 See more on WHS: http://whc.unesco.org/

30 See more about Tokaj at: http://whc.unesco.org/en/list/1063

and sustainable development in the area of the Carpathian Mountains. A multi-pronged approach, including the preservation and wide application of traditional customs and environmentally friendly technologies, which have been used for centuries, as well as regional policies to support the development of certain sectors, such as the use of unconventional energy sources, sustainable management of forests, sustainable tourism, organic agriculture and improved transportation will ensure a solid basis for sustainable development in the Carpathians.

Preserving cultural heritage is also a key in ensuring the preservation of biodiversity; traditional ways of living have been respectful to the local ecosystem for centuries, as survival used to be more obviously connected to living in harmony with the local plants and animals. Thus by recording, studying, promoting and respecting this cultural wealth present in the Carpathians and using the experiences of our ancestors, we can discover and know how to face the challenges of the future.

The Carpathian Cultural Heritage

Considering that the Carpathian area covers 170,000 km2 and has a population of about 18 million inhabitants spread across seven countries, a complete description of the Carpathian cultural heritage should be a lengthy activity that provides information on important human and financial resources.

The cultural heritage of this vast area can be compared to a piece of cut diamond with many facets, and the whole can be described by looking at the many facets. Each rural community is like a facet, and its thorough description, which is best achieved with your help, will enable the definition, conservation and promotion of the Carpathian cultural heritage in its integrity.

The Carpathian Mountains cross Central Europe, starting from the Czech Republic and continuing through Slovakia, Poland. Hungary, Ukraine, and Romania, all they way to Serbia. The relatively homogeneous character of the natural conditions [31] (only the southern Carpathians are somewhat different from the rest of the Carpathian chain) and the lengthy historical periods during which the Carpathian area had a relatively identical administration encouraged the interaction and blending of the various populations. The "Carpathian curve" represented an "avenue" for the circulation of goods, peoples and ideas. For various historical and demographic reasons, populations migrated over the course of time. Consequently, the Carpathian area of each country is now characterised by minority populations, or at least cultural influences, from other Carpathian countries.

In Romania Hungarian, Ukraine, Serbian, Slovakian and Polish minorities can be identified.

Transhumance was a specific means by which contacts were made between the Carpathian populations. A polish historian, Augustyn Maciey, claims, for example, that the tradition of shepherding in the Polish Carpathians is of Vlach (Romanian) origin. It is thrilling to find that certain words in shepherding such as branza, vatra and sihla are the same in Romanian and Polish, and that in the Polish Carpathians place names of Romanian origin still exist, like Magura, Leurda (Lavorta), and Chicerea (see case study 2). The old architecture of peasant houses as well as the old wooden churches (historical monuments, initially Orthodox) are almost identical to those in the Romanian Carpathian area.

The ongoing interactions between the various Carpathian communities have resulted in the development of a certain common "Carpathian identity". This identity refers to all the natural and cultural characteristics, which distinguish the Carpathian area from others, such as, for example, specific folklore, customs, crafts, building techniques and also practices in agriculture, which have encouraged certain plant and animal species to adapt to the Carpathian environment.

31 The average altitude of the Carpathians is only 850 metres as compared to the Alps, which is 1350 metres, thus rendering the Carpathians more suitable for communication, living and general human activities.

Certain objects of universal interest can only be found in the Carpathians: the wooden churches in Slovakia, Ukraine and Romania, or the virgin beech trees present in Slovakia, Ukraine and Romania. In the case of Romania it is just a question of time until such kinds of sites are declared World Heritage Sites, as Romania has nominated them. (see Box 1).
The tangible and intangible cultural characteristics can be grouped together under the term "Carpathian cultural heritage". The obligations of the Carpathian countries regarding this heritage are crystallised in Article 11 of the Carpathian Convention (see beginning of this chapter).

Several well-known names, such as The Country of Hateg (Tara Hategului), The Country of Oas (Tara Oasului), or The Szeklar Province (Tinutul Secuiesc) are mostly names of specific and significant historical and cultural regions. Even if in some cases these cultural areas are more historically rather than culturally significant, the study and designation of such regions as cultural areas is necessary and beneficial in order to establish the Carpathian cultural heritage in detail, and also to preserve and promote it.

Box 2: Inventory of the Carpathian Cultural Heritage
In some regions among all the Carpathian countries, there has been discussion about elaborating the "Inventory of the Carpathian Cultural Heritage". The following are some examples of proposals for such an inventory for the respective regions:

a) Romania
Consultation in the Harghita Region, March 5, 2008
Intangible cultural heritage (place names are given in italics further below):
Nyikomente: basket weaving, fruit tree growing, fruit processing
Sovidek: salt mining, tinder processing, tile and ceramic plate manufacturing, weaving of wool carpets, charcoal making, carnival customs, customs in connection with young men leaving to join the army
Homorod: painting of furniture, lime processing, wood processing, making use of local mineral waters
Cristur: sieve manufacturing, straw weaving
Hegyalja: tile and ceramic plate manufacturing, carving of gates, making "palinka"(an alcoholic drink), homemade bakery (cakes and breads)
Plaiesti: bottling mineral water, carnival customs, soldiers' songs
Felcsik: wool processing, black ceramics, dying of fabrics, use of medicinal plants, dances, local customs
Ghimes: tannery, making leather and fur coats, sheep breeding, dances, music
Gheorgheni: forestry, dying of textile materials, carnival and burial customs, frontier watch, water rituals

Tangible cultural heritage:
The cultural landscapes generated by traditional animal breeding practices and agriculture on strips of land are considered the most important cultural heritage. The villages, the traditional households, churches, castles, manor houses, and archaeological sites represent other elements of cultural identity for the Harghita area (Romania).

b) Ukraine
Consultation in the Carpathian Area (Ivano-Frankivsk, Lvov, Transcarpatia), February 2008
Intangible cultural heritage:
- authentic dialects
- dances of the "Arcan" highlanders
- legends and tales
- music and songs
- traditional rituals (wedding at Hutuli)

The Polonyna culture has an intangible cultural heritage, which is associated with sheep breeding, including processing of the milk, music and ceremonies that go back to pre-Christianity times.

Tangible cultural heritage:
- churches, especially wooden churches, and surrounding landscapes
- monuments and ancient altars (4,000-5,000 years old) in the Kosiv area
- objects used by craftsmen (e.g. valilas – wash houses needed to obtain the traditional wool products lizhnyky)
- The traditional "story", clothes used at special events, holidays, etc.

c) Poland

Consultation in the Carpathian Area – Malopolska, Podcarpatie, Silezia, March 10, 2008

Architecture: monuments, sanctuaries and places for religious worship, cerkwie – old orthodox wooden churches, synagogues, fortresses, ruins, palaces, castles, manor houses, crucifixes, watering and resting places.

Objects used in traditional activities: tools used in agriculture, equipment for crude oil extraction, blacksmith workshops, mills, stables, haystacks, stone cellars, sawmills, "koliba" (traditional shelters for shepherds), water mills, windmills, wooden carts, and traditional beehives.

Art: icons, sculptures, paintings, metal pieces of art, woodcarving, theatre (e.g. dziady, an old Slavonic ritual commemorating death), symbols (gmerks that mark properties with animal-shaped signs), glass painting, and music.

Music: instruments (gajdy – traditional bagpipe, dudy – regional bagpipe, trombity – long traditional trumpet, heligonka – accordion, flety pasterskie – shepherd's flute), dances (obyrtka, kon, siustany, hajduk, bon, kolo, and czardas), popular music, and patriotic songs.

Written sources about the Carpathians: manuscripts and books.

Traditional methods: sheep breeding, agriculture on strips of land, weaving of wool, wooden tiles, smith's trade, carpentry, and pottery.

Local plant and animal species

Objects for everyday use: dipper – setica (for a drink made of sheep's milk whey), clothes (gunia – a woolen coat), pokers, and casks.

Customs and rituals: koleda (a Christmas tradition), the Jordan (hallowing of water), Holy Vow (the beginning of the pasturing period), Saint Michael's Day (end of the pasturing period), family customs (weddings, Christenings, and funerals), and traditions from the times of the outlaws.

Folklore: popular medicine, medicinal plants, Spiritual life: veneration of local saints (Saint John of Nepomuk), magic, witchcraft, fortune telling, beliefs, phantoms and demons, superstitions.

Historical heritage: vestiges from the times of the empires, historical roads, heroes' cemeteries, places of assembly, commercial roads, crafts associated with a certain population (e.g., Lemka tar producers, Slovakian wire manufacturers).

P**opular culture:** regional popular costumes, ornaments for festivities (Easter, Zielone Swieta The Green Festivities, Christmas), traditional cooking (Sliwowica Lacko – brandy made from Lacko, cheese), decorative art, popular ensembles, songs, oral traditions, and legends.

Place names and symbols: Gwara – a local dialect, Magura – a high hill, Polonina – mountain pasture, Bryndza and Bundz – sheep cheese, Rewasz – a board on which the quantities of milk are marked.

Box 3: "THE PROVINCE OF THE BISONS"

The area around the town called Targu Neamt, which includes the villages of Agapia, Baltatesti and Vanatori (with about 40,000 inhabitants), and overlaps into the Vanatori Neamt Natural Park, is a special area, distinct from its neighbourhood.

The forests, well-administered over the course of times and the first in Romania with a FSC [32] certificate, are characterised by a composition in which the pine tree is well-represented (even in pure arboretums), and the existence of century-old arboretums (more than half of the trees are 100 years old or even older) make

32 Forest Stewardship Council: FSC is a certification system that provides internationally recognised standard-setting, trademark assurance and accreditation services to companies, organisations, and communities interested in responsible forestry. http://www.fsc.org/

up the "background" of the area. Beginning with the fact that there are a great number of topographical names connected to bisons in this area, as well as drawing upon historical sources, it was established that the north-west of Moldavia (and the north-east of Transylvania) offer a last refuge for wild bisons.

The shared history of the four localities is noticeable as far back as the Middle Ages in the distinct feature of the Neamt Fortress (Cetatea Neamtului). This fortress, as well as the market towns, villages and monasteries have passed through history together, in times of distress, cultural emancipation and economic development. Traditions, customs and handicrafts have remained largely unaltered, mainly due to the fact that the basic occupations (agriculture, animal breeding and wood processing) have been preserved, and also because this area has been less exposed to a crowded urban environment. Carpets woven by hand, wooden objects, traditional ways of processing forest fruit and orchard-grown fruit, dairy goods, culinary art, and icon painting are typical, providing a "brand" of this area. As a symbol of Moldavia, bisons' heads are represented on monastery gates, at the Fortress, on wooden objects and many other places.

It would be a mistake to localise the following outstanding personalities of Romanian culture only in their home towns and regions (Eminescu in Varatec, Creanga in Humulesti, Sadoveanu in Manastirea Neamtului, or Grigorescu in Vlahuta at Agapia). Their steps, like those of many other great cultural figures, traversed the whole region, and their works were inspired by the beauty of the entire area. This lends the entire region a cultural aura, ever since the founding of the first places of cult and right up to the present day.

In the course of time monks and nuns with unshakable faith traversed the forests and founded hermitages and monasteries, oases of national culture and faith. Such density of clerical establishments is not to be found anywhere else in the country, thus the town Targu Neamt and the village Vanatori are the localities in Romania with most churches. The numerous famous monasteries and hermitages that are equally distributed over the region constitute its characteristic feature, namely a religious one. Indeed, we can speak of a real Romanian "Athos" [33], where Orthodox spirituality feels very much present and at home.

Recently tourism has become an important source of income for the inhabitants of the area. The need for new tourist attractions, as well as the necessity of an integrated development of the whole region that is complementary to individual development, ensures support from the small business owners and professional tourist associations for the "Province of the Bisons" initiative. The local communities and the civil organizations in the area (through their representatives) view this initiative as a solution to some of their problems, such as: the development of tourism, production of handicrafts, public awareness of environmental problems, and conservation of traditions and customs.

The activities of the Vanatori Neamt Natural Park Administration bring together all these issues/features and highlight the unique and homogeneous character of the region. Reestablishing the presence of the bisons in its natural environment, one of the objectives of the Administration, may be of real benefit for the members of the communities, in addition to its importance for the forest ecosystem.

The bisons – with the historical and cultural potential of expressing unaltered environment, and as measure of man's richness – are a symbol accepted by all the interested parties and characterise this special region as "The Province Of The Bison".

Handicraft And Technologies Present In The Villages Of The Carpathian Mountains

As mentioned already, the cultural traditions in the Carpathians developed over hundreds of years. Traditional customs, such as folklore and cuisine, ways of life, family and economic relations (such as work aided by animals), crafts and technology, were all developed in close connection with nature. Many forms of traditional crafts and technological solutions unique to the Carpathian Mountains can be identified: processing of wood, clay and textile handicrafts, and traditional forms of agriculture. A few of them are described in detail in the Activities section.

33 A mountain on the peninsula of the same name in northern Greece which is home to 20 Eastern Orthodox monasteries and forms a self-governed monastic state within the sovereignty of the Hellenic Republic.

The Carpathian Convention recognises that natural and cultural heritage, including customs and traditional technologies specific to peasant households in each mountain region, contribute essential features to tourism. Indeed, the aesthetic value of the mountain environment plays an important part in attracting tourists, who also have the chance of discovering ancient environmentally friendly technologies in the isolated mountain areas, which are still being used successfully in everyday life. In order to support the sustainable use and preservation of old technologies, local initiatives are key in establishing and observing certain quality standards and environmental indicators.

The efficiency and efficacy of national programmes is based on the application of basic principles, which significantly contribute to the sustainable utilisation of traditional technologies and handicraft:
- sustainable development of peasant farms
- national sovereignty and leadership of each country
- partnership and collaboration
- participation
- holistic and inter-sector approach
- long-term iterative processes
- building up institutional resources
- political and institutional reforms
- consistency and alignment with the national political framework and local initiatives
- increasing responsibility
- national political engagement
- international implications

Schools, through teachers' dedication to their pupils, have the duty to identify, preserve and make good use of the traditions and technologies specific to rural areas. In the complex conditions of the pre-university educational reform, while trying to fulfill its goals, teachers seek answers to questions such as:
- How can high-quality learning be organised?
- How can the contents of a lesson be adequate for and adapted to a constantly changing world?
- What knowledge is necessary for success in life?

Answers to such questions can be found by making use of the specific character of sustainable local and regional handicrafts and traditional technologies when planning learning activities.

DEFINITIONS

- Tangible: of a material nature, palpable
- Intangible: impalpable, cannot be touched
- Consumerism: attitude of encouraging consumption, having only the financial aspects in view
- Transhumance: periodical migration of shepherds and their herds, in the in springtime from the plains to the mountains, or from south to north, and in the autumn from the mountains to the plains, or from north to south
- Virgin forests: intact, unused forests in which the intervention of humans is zero or negligible

- Agro-biodiversity: variety and variability of species of plants, animals and micro-organisms important for food and agriculture, and which are the result of the interaction between the environment, genetic resources and the management system and practices used by humans

QUESTIONS:

- How might nature in the Carpathian Mountains be influenced by the preservation of the area's cultural heritage?

Cultural Heritage in your community:

- Name some tangible and intangible forms of the cultural heritage specific to your area.
- Give some examples of the traditional knowledge you consider characteristic for your area.
- Do you know of any minorities who originally come from other Carpathian countries and now live in your area?
- Based on the examples given in Box 2, try to make up an "Inventory of the Carpathian Cultural Heritage" for your local area.
- Do you know of any local cultivated plant species (including fruit trees) or domestic animals that are typical of your area (please see the map of endemic plant species)?
- What do you think about the following statement? "Practicing handicrafts alongside the usual farming activities is a means of increasing family income, and the specialisation of entire villages in certain handicrafts (pottery, woodcarving, iron processing, leather crafts, etc.) is a characteristic phenomenon of village craftspeople in the mountain areas." Do you know of such examples in your village? Discuss this with your desk mate. Name some trades specific to your village!

Cultural Heritage in the Carpathians with the help of a map:

Refer to the Map 12: Unique Sites in the Carpathians
and Map 13 Cultural Heritage (UNESCO World Heritage sites in the Carpathians)

- Do you know all of the sites located on the map? (Have you read about them? Have you visited them?)
- Are these sites part of the Carpathian Cultural Heritage inventory?
- Are they part of the UNESCO Cultural Heritage?
- Are there sites in your area you think should be added to this map? Are they well known in your community? In your country? In other countries? How could you add them?
- How could you make the cultural sites in your area well-known? What would be the consequences?

- Draw on a map of your area some thematic trails (e.g. "the salt road" or "the route of monasteries").

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ACTIVITIES

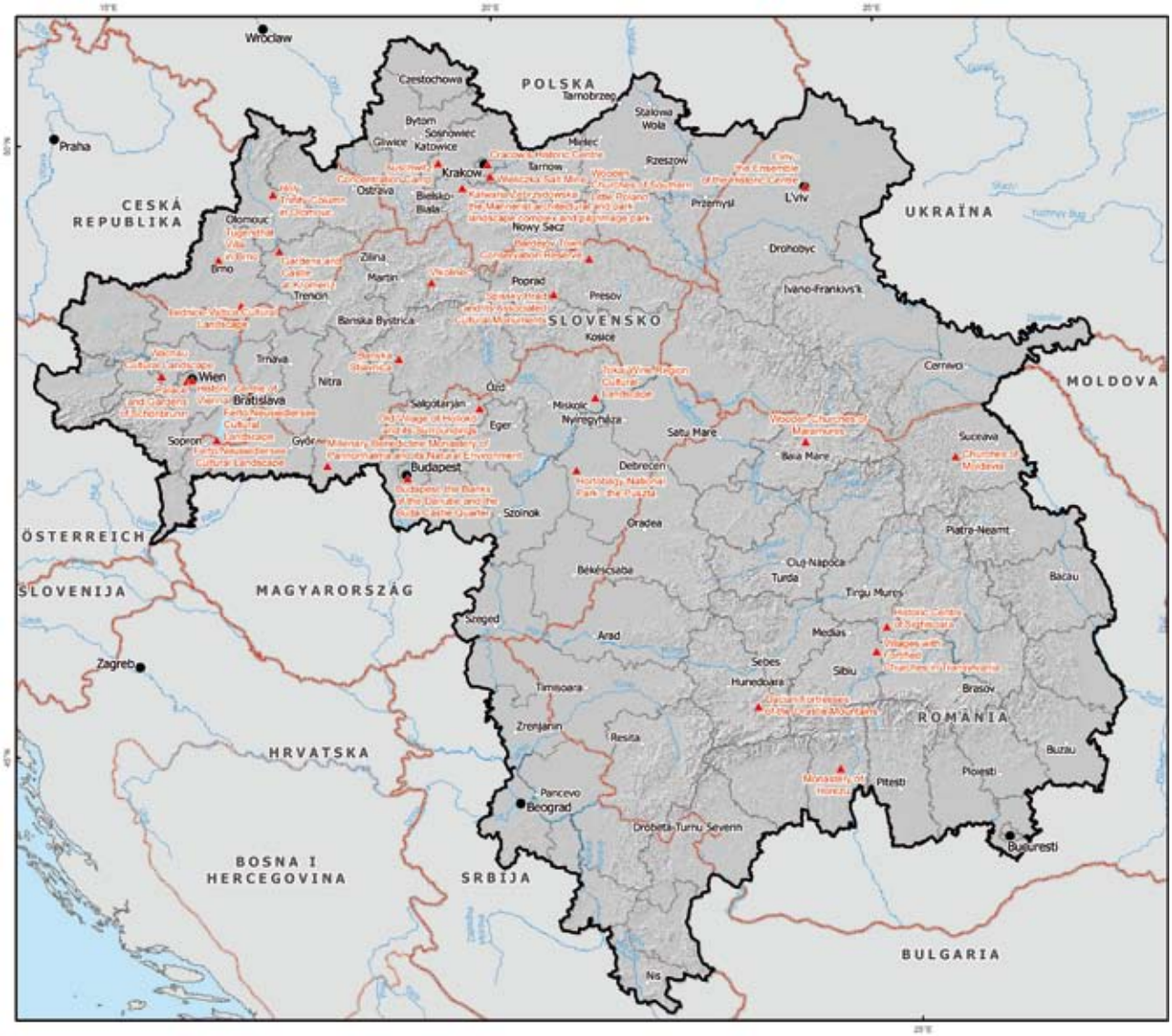
Can you suggest a Key Point in your area which should be added to one of the Cultural Heritage inventories?

1. World Heritage Sites

Refer to Box 1:

- Identify the World Heritage Sites (WHS) on the map of Romania. Discussion: What values do you think these sites were designated for?
- Organise a Trip to the Nearest World Heritage Site

Figure 1: Unique sites in the Carpathians:



2. "Branding" the Cultural Heritage

Duration: *45-50 minutes*
Number of students: *several 4-5 member groups*

Find cultural elements typical for your local area, and suggest a unique name and an attractive symbol for them. The pupils could work in 4-5 member groups. In 30 minutes the groups develop their "brands" and then the groups present their brand to the class.

Note for those implementing the above locally:
Most of the exercises below are focused on the traditional crafts in Romania. They are included here as examples. Perhaps, some of them are similar to those in your area? Integrate examples of traditional crafts in the Carpathian Area of your country and local area. You can refer to the World of Carpathians, referenced in Appendix 3, for some relevant examples.

3. Furrier's Trade in My Village

Refer to Box 4 before you begin the following activity.

Box 4 PROCESSING LEATHER AND FUR
Tools used for making sheepskins:
* scafa to clean the sheepskin right after skinning
* stool with scythe used for the same purpose
* hook for stretching the skin
* tiglici for stretching the sheepskin on a frame
* log for stretching fur caps

Tools for working on bovine skins:
* a rasp for the skins
* knives for the boot-makers
* jilau for making the leather smooth

One obvious distinction between the two trades – the furriers who work with sheepskins and the leather dressers who work with bovine skins – was dictated by the different characteristics of the two kinds of raw material. The technology of working on bovine skins is much more complex, thus the number of village furriers was generally much larger than that of the leather dressers, for whom guild craftsmen represented strong competition.

The Furrier's Trade
One of the basic occupations of the inhabitants of the mountain areas is animal breeding. This naturally results in the development of peasant trades (crafts) that use the raw materials resulting from this activity. One of these is the production of sheepskin coats. Because of the exceptional quality of this handicraft, the furrier's trade is a highly artistic one. Without neglecting its functional aspects, many artistic elements complete pieces of popular costumes which perfectly match the climate in the mountainous area.

In old times the ornamentation of sheepskin clothing represented the social position of the wearer. Nowadays such differentiation has disappeared, and the ornaments on garments are simply decoration. Before analysing the trade itself, it should be mentioned that a shift towards the artistic takes place at the moment when the trade originally practiced only by shepherds during periods when they were not at the sheepfold in the mountains, becomes a guild craft performed by specialised persons who give up other activities and respond

to orders which usually request unique pieces. In addition, further specialisation into specific work phases has taken place, which leads to more and more perfectly realised pieces of sheepskin clothing.
Back to the trade: The first step in working on an animal skin is the tanning. This operation consists of the following: the skinned part is covered with a mixture of corn bran or whey and salt; the skin is rolled up and placed into a tub in a warm place where it is left for about a week. The skin is then washed, dried in the shade, and stretched with hooks. Next it is whitened, using mallow, a kind of plaster, which is spread all over the surface of the skin. Then the skin is scraped with a special kind of rasp, usually made by attaching the blade of a scythe to a wooden handle.

Every furrier had his own recipes for processing skins – a recipe for tanning, which was usually a family custom, and one regarding the optimal time for subsequent processing. As part of the transmission of the trade, these recipes were only revealed to family members. Only as many sheepskins were worked on as strictly needed for immediate orders.

According to history, the 19th century version of the sheepskin vest – the bondita – was long, decorated with an adornment made of black lamb's skin, a prim. It is first mentioned with a prim made of ewe fur in 1848, and was worn by Dumitru Ursu from the village Delut. His descendants described it, saying that, "It was the most wonderful bondita a lad could have at that time." At the end of the19th century the short bondita appears with a broader prim and ornamented straps all around its inner margin. At the beginning of the 20th century the prim made of black textile appears alongside those made of lamb and ewe fur, and it becomes broader and broader. A new bondita is first worn at Easter or at a wedding by the brides, and the sheepskin coat is first worn at Twelfth Night

The furrier also makes other pieces of popular costumes, but only upon order, among others the bondita infundata, which is a vest buttoned under the armpit and worn especially by those who work in the woods. He also makes coats and caps. There were furriers who also made belts ornamented with beads, although this was usually done by belt makers specialised in this trade. Before World War II the belt makers made this piece of the popular costume, not for specific orders, but for sale. The belt makers who ornamented the belts they made with beads had a number of women working for them who specialised in sewing the beads onto the belts by weaving them on with silk thread.

Suman Making
The suman is a traditional piece of clothing, which is worn both by women and men during the cold winter season. It is a long thick peasant's coat. The term suman comes from the Bulgarian word sukman, which means "long" and "dress". The still existing mills in many mountain villages provide evidence that the material for making "sumana" was produced in large amounts. The cloth was woven of sheep's wool and chosen according to the age and race of the animal. According to the age of the animal there were three kinds of wool:
1) lamb's wool called suman de mite;
2) lamb's wool at the second shearing called suman de noaten; and
3) sheep's wool sometimes used in its original colour or black.

In most cases the wool for sumana was dyed black using vegetal substances, a mixture of bark from the alder tree and common marjoram. For the fixation of the colour, turbot was used. The brown colour was obtained by using nutshells.

After the cloth was woven it was beaten in the or 24 hours or more. On beating the material shrank both in length and breadth. The traditional suman was then tailored in triangular inserts (gussets) in order to fit comfortably. These gussets were also called folds. The sumans made to be worn on holy days, especially at Christmas, were richly ornamented. The ornamentation was usually monochromatic, and the most common colour was black, especially for the cords called Saraduri. These cords were made and applied as ornaments on the "sumana" by women specialised in this craft. The black sumana has a floral ornamentation.

Develop a project entitled: "Furrier's Trade in My Village"

Materials:
- *Introduction page (half a page with a general presentation of the furrier trade)*
- *Map of the village with the places where furrier shops, filling stills, "eddies" existed or still exist (a possible route for tourist interest)*
- *Photos of filling stills, "eddies" (names of persons who are working or have worked as furriers, including their short personal histories)*

Connection with other subject matters: *Physics, Technological Education, Geography, Chemistry (making dyes using traditional recipes; writing down the equations for the chemical reactions, recognising types of reactions, and processing various types of substances: acids, bases, oxides)*

Activity:

- Introduce the topic to the students.
- Discussion questions: ? Do you know of a recipe for processing animal skins that was/is used in your village? Compare it with the one described in Box 4. Do some documentation work in your community and write a short monograph about the furriers in your region. Illustrate it with old photos. How much does this technology contribute to the quality of the environment? Think of the chemical reactions you learnt about at school and find similarities to those used in the furrier trade. Find traditional materials that are used as a base, an acid or a salt in the furrier trade. Do you know of any customs or traditions in your village similar to making a bondita (sheepskin vest)?
- Experiment with the "Suman" making recipe. Investigate in your community and discover other recipes. Compare them. What conclusions can you draw?
- Find decorative or household objects in your village. Investigate the techniques with which they were made. Identify the decorative elements, their significance, how they were made, and the plant dyes used. Find out about their history and write a short monograph about them.

4. Wood Processing in My Village

Refer to Box 5 before beginning this activity.

Box 5. WOOD PROCESSING

Village tradesmen dominated the rural market in wood processing due to the availability of high quality raw materials and the ability to overcome the superior technical endowment of guild members through age-old community experience and individual skill. Whole villages were specialised in carpentry, in making furniture, wooden vessels, tiles, and wattles. Individual craftsmen who only sold their goods in their respective villages also existed.

The wood processing trade is characterised by the use of the following tools (used before and after the year 1900): a saw for cutting wood, a hook called tapina used for the handling of whole tree trunks, an axe for carving beams, a rope for lining up beams, an axe for finishing carved surfaces, a stool used to immobilise a piece of wood for finishing its surface with a special knife called cutitoaia, a multifunctional compass, measuring tools for the staves of wooden vessels, a hook for drawing circles, a drill for making holes, and a plane for smoothing flat surfaces.

Examples of different techniques used in the artistic processing of wood in rural Transylvania in the 19th century:
- the Maramures gate made of oak containing the carved rope motif and organised in an archaic geometrical structure (Xs and circles);
- the Saxon locker made of pinewood, decorated with painting, and containing figurative motifs inspired from city culture.

The general tendency of using wood in the Transylvanian rural area, even if using iron would have been more suitable, can be seen in the case of windows with decorative wooden bars (for example, in the village Mera, Cluj County), as compared to those with forged iron bars (in the village Trascau, Alba County), which only well-to-do peasants could afford. Techniques for decorating wooden objects with painting and cutting can be found on salt and spice containers, flasks for liquids, razor boxes, nutcrackers, etc.

Carpentry and Shingle Making

Carpentry is an old and very important trade in which not only tools for carving wood, building houses and animal shelters, and making various goods are needed, but also the technical knowledge on joining, raising, and orienting buildings are required in order to ensure as good a shelter as possible with durable resistance to bad weather. Often the farmers would prepare the necessary wood themselves, and resort to the carpenter's services for building their houses. In addition to the usual constructions, carpenters built a variety of community buildings and constructions, first of all the churches, and also the bridges across rivers.

The raw wood chosen for various types of construction was first prepared for carving. For this, two sawhorses were made to place the logs onto. The first task was to make a line along where the wood was to be carved, called a sfaruit. This was done with a piece of rope soaked in a mixture of coal and water. The wood was first carved with the axe, and then finished with a hatchet. The log was then carved on two or four sides respectively, depending on its subsequent intended use. In the case of very thick logs, they were cut with a large tooth saw called a trasca. Other specific tools were the saw mill, a hand saw, a compass, a variety of drills, planes, chisels, a thread with a piece of lead, a water level with air bubble – called a vaservag – a small hatchet for putting on shingles (called a dranita, which means larger sized shingles made of pinewood).

Joining the beams at the corners was done with a variety of techniques. One of these was the sheepfold-like joining, which means that the ends of the beams are not evenly cut and thus protrude from the building. Another technique is the bonfire-type of beam joining, the difference being that the beams are evenly cut all along the walls. Other procedures of joining the beams are: in slices, in fishtail, or in dents.

A most recent technique building a house, not found in buildings built before 1900, is called "in flint steel". Shingles in four shades were used to cover the roofs of the houses, and in two shades for the roofs of outhouses. Solid scaffolding was needed for roofs made of rafters, which at end each were attached to a beam called costroaba. In the upper part, the rafters were joined end to end by chiseling.

The trees for the wood used for shingles were cut when the "wood was sleeping," that is, in January and February, and only in full moon, because there was a belief that if done then, the wood would not rot or get eaten by the wood borer. The cut trees were cleared of their bark and branches, with just a few branches left at the top for some weeks to extract all the sap out of the trunk. Thus, until not very long ago, popular beliefs preserved the ideas that trees should be cut "when the moon is at the beginning because then it is strong and the wood borers don't eat it", or "when the moon is finished the wood borers are finished, too", or "when the moon's up". These beliefs come from knowledge inherited from our ancestors concerning their observations about the influence of the moon on vegetal and animal life cycles. Scientific research has demonstrated that when there is a full moon, simultaneously with the intensification of the lunar gravitational field, the quantity of sap circulating in the trees increases.

The Joiner's Trade

This trade emerged as a specialised trade in the second part of the 18th century. The regional name stolerie comes from the Ukrainian stoljar, meaning a person specialised in making pieces of furniture. When a new kind of house (with two rooms and a vestibule) first appeared, this new trade became necessary to ensure the manufacturing of doors and windows. Originally, those furniture pieces strictly necessary for a household were made by the carpenters, and it was only later that the two distinct trades emerged. The furniture pieces made by carpenters were made of boards carved with an axe, a hatchet and large knives (cutitoaie), joined with grooves, like the shingles on roofs of houses, and fastened with wooden nails. Compared to the tools used by the carpenters, the joiner had to have a joiner's desk, a hobelbanc (a desk to plane on), various types

of hand saws, planes, and a variety of other tools. The main objects made by the joiner included the following: small shelves for vessels, clothes racks, wardrobes, cupboards, beds, chairs, bottom drawers, benches with or without backs, chests for corn and maize flour, and frames for porches. Once two-storey houses appeared, the joiners also made the stairs.

Artistic processing of wood

The interest in artistic processing of wood has several explanations, but the most plausible one is that wood can be widely used, is easily handled and decorated using simple tools (axe, hatchet, chisel, and pocket knife), and does not require modern technologies. Another reason may be the fact that wood was artistically processed by man before clay, and so it was the first material on which decorative elements were used for the first time.

Making art with wooden objects compensates for the lack of color and makes use of its unique means of expression, thus highlighting the natural properties of wood. Morphologically several categories of elements, motifs and decorative compositions can be differentiated: geometrical and zoomorphic, phytomorphic, cosmic, free drawn and mixed elements. Two anthropomorphous motifs have been found realistically represented on wood from this era at the upper part of shepherd crooks: the hand, mostly in the shape of a fist, and the head. Anthropomorphous compositions made by incisions are frequently found and usually represent the shepherd and his sheep in various positions.

Among the geometrical decorative motifs we can find wolf's teeth, dents, spirals and the cut-out or incised circle, which relates to very old cosmic elements like the wind rose or the solar motif in all its variants. Squares, rhombuses, arcs and the rope motif, which is usually used to represent snakes, can be found. In addition, vegetal ornamentations are represented in a naturalistic manner, but sometimes also in a stylized manner: small pine branches, leaves, pine cones, and flowers are represented. Some objects, especially belonging to shepherds, are made with a lathe and are often subsequently decorated with purely geometrical motifs arranged according to a circular rhythm. The objects made by coopers (someone who makes wooden staved vessels of a conical form), have no particular decorations, as the only ornamentation that supplements these objects is done with pokerwork.
One of the most common and most variably ornamented objects is the spoon, indispensable at any sheepfold (pen for sheep) or in any household; some spoons are more than mere craft works, since their decorations are the result of exquisite artistic talent.

Shepherd crooks are to be handled more attentively, since, in addition to their multiple functions, they are supposed to have at their origin a tally for counting sheep. When the tally sign on a shepherd's crook changes into decoration it is usually an indication of special sentimental value. Various techniques are used for these decorations, and quite often, unexpected motifs are added, such as stars, the sun and the moon. Heraldic stylizations rarely occur. The most frequently used decorating techniques for crooks are indentation, incision, peeling, and singeing. Singeing consists in making the negative of the decorative motif followed by burning until superficial carbonization of the peeled part is obtained, and finally the rest of the crust is removed and in this way the positive of the decoration is obtained. Poker burning means the accomplishment of the decorative motifs with a piece of red-hot iron. A more simple form of singeing is passing the peeled club through the flame of the fire to remove all the roughness and subsequently the luster is obtained by rubbing it with a rough cloth.

The flute with no plug is mostly made of wood, as well as the large flute or long pipe, which is always made of wood obtained from deciduous trees. The ornamentation of these flutes reaches the quality of masterpieces, and the motifs, usually distributed in two non-proportional registers, enchant through their clarity and refinement. Usually motifs from shepherd crooks are copied, but often the purely concentric element is dissociated into a spiral winding among the spaces between the holes and uniting the two registers.

Materials:
1. Introduction page (half a page with a general presentation of the carpenter trade)
2. Map of the village marking the places where old woodwork objects made in the village are to be found.
3. Camera

Activity:
- Introduce the topic to the students
- Measurements: As units of measurement carpenters used fingers, palm breadth, the palm, a step and the elbow. Find out the relation between these units of measurement and those in the international system you learnt at school.
- Compare the old objects with new ones that have the same function.
- Take photos
- Note any influences on the environment (dangers, effects, possibilities of counteracting them, highlighting sustainable aspects/behaviours, the degree to which the discovered aspects and processes are friendly to the environment).

6. Main Stages in the Building of a House

Refer to Box 6 before beginning this activity.

Make a documentation file that includes ideas, beliefs, and customs connected to house building in your village.

This can also contain the following elements: interviews with elderly people living in the village (record responses on paper or audio tape); photos of old houses in the village on which specific building elements can be identified; elaboration of a text presenting the technological process, stages, materials, and ways of processing that take place when building houses in your village; principles and laws which explain the stability and strength of the buildings (elements of statics), including the recognition of specific interactions. Finally, place the old houses and the houses that may be used for tourist purposes on the map of your village.

Box 6: Main Stages in the Building of a House
One of the first steps in building a house is to choose the house site. The primary criteria for this, is to choose a clean spot. The building material – the carved wood – is then prepared. Wood was used to build the house and the sheepfold, the mill, the church, the furniture, as well as weapons, transportation means, musical instruments and tools: this is why it is spoken of as a "civilization of the wood".

When the ditch is dug for the house foundations, the priest is asked to come and say a special prayer in which God is asked to lend his power so that the project may be completed successfully. Once the foundation beams were joined, a knot-shaped cake, a loaf of bread, and a bottle of some drink were placed in each corner of the foundation, and at the joints, money, incense and grains. On the foundation beam where the doorstep would go, the head of a sacrificed hen or rooster was placed. The rooster is generally understood as a solar symbol, because it heralds the sunrise, and protects against the dark influences of the spirits of the night. The hen is a symbol of fertility and abundance. It is also recommended to dig a hole in the foundation to put a live trout in it. If this sacrifice is not done, it is recommended to introduce the live trout into the fire of the hearth, since life would not be possible without the benefit of fire, the "brother of the sun".

An equally important moment is when the struţul (ostrich- a green pine as the symbol of youth) is placed; the craftsmen believed that this was the symbol of a house being half ready. Once the house was ready, and before the family moved in, it was sanctified. For this occasion, four holes were made on each side of the house, beginning with the east side, and in each hole two grains of corn, incense and a small coin placed. It was understood that the family should wait till full moon to move in, in order to ensure a life of prosperity.

After the sanctification of the house, it was preferable that an elderly member of the family would first sleep in the house, so that if the new building needed a human life as a sacrifice, it would be the life of someone who was expecting to pass away in the near future. When food was prepared for the first time in the new house, it was seen as good and important that it be made in a pot given by the godmother of the child for its first bath.
Another interesting belief is that each house has its guardian snake. In fact, in the old traditional houses, when the tick of a clock is heard in the silence of the night, it is understood to be the snake who must be given a pot of milk in order not to feel sick.
To protect the house from evil a horseshoe is nailed on the doorstep or on the stairs. In addition, on the walls of the stables, near the entrance, ox or ram's horns are fixed to keep bad spirits away.

7. Domestic Textile Industry

Make a documentation file containing ideas, beliefs and motifs specific to textiles in your village.

This project can also include the following elements: interviews with elderly people in your village (answers recorded on paper or audio tapes); photos of textiles and textile objects made with traditional techniques on which specific decorative elements can be identified; elaboration of a text presenting the justification/significance of different elements, stages, materials, ways of processing, etc.; specific traditional procedures which explain the stability and resistance of colours; placing the old places which can be used as tourist attractions on your village map; and possibly putting together a museum of the community in your school building or a place provided by the local council.

Box 7 Domestic Textile Industry
A characteristic feature of an old village was that the women made all the fabrics needed by their families. Because all of the stages of the complex technical process were covered in the peasant households (cultivation of linen and hemp, obtaining and processing of wool, spinning and weaving), the term "domestic textile industry" was introduced. This term, however, did not reflect reality, particularly because all the end products were almost exclusively destined for the family and not for sale.

The technical process mentioned above can be subdivided into several stages: the first stage consisted in using some tools, which were used to process the raw material (hemp and wool) and to produce yarn. These tools included: a hemp brake for crushing the hemp stems, carding combs for separating the fibers from the wooden remainders, combs for cleaning the hemp tuft and removing hairs from the wool, combs for carding wool, and the distaff to hold the unspun fibers and keep them untangled, thus easing the spinning process (one for bundles of hemp and another for bundles of wool).

The second stage consists of using certain tools to prepare the yarn for weaving. Social functions, which overlap with practical ones, explain the rich ornamentation of the distaffs. The waist distaff, mentioned by several foreign travellers as being an unusual element, was used for spinning outdoors, while watching the sheep or even while walking. The travellers also underlined how industrious the peasant women in Transylvania were. The other type of distaff was the one used by women inside, and it differed from the waist distaff in that it was shorter and had a support on which the women sat to keep it steady while spinning. Other longer distaffs were held between the knees, leant against a beam or introduced into an opening at the edge of the bench on which they were sitting. The ornamentation of the Romanian distaff was incised, cut or sawn, and consisted almost exclusively of geometrical motifs, while the Hungarian and Saxon distaffs also contain phytomorphic motifs, cut or painted.

Hemp and linen were cultivated near each household, as they were important raw materials for spinning and weaving. The harvested plants were gathered in sheaves, dried and placed into especially arranged places enclosed in nearby rivers, called topile. When the woody part of the plants had rotted, the plants were taken

out and dried in the sun. When the sheaves were completely dry they were braked, first in a large brake to crush the woody parts, and then in a smaller brake to remove the woody parts, leaving only the tufts of hemp and linen fibres. The last operation was combing, which involved combining several tufts into one bundle for subsequent spinning. The combed hemp and linen fibres were then spun and used for warp (the set of lengthwise threads attached to a loom), and the lint resulting from braking was spun for use in the shuttle. From hemp, trousers, called itari, were made. These were close-fitted and white, as well as sometimes black (trousers) for men in the traditional costume. From linen, festive shirts and bedclothes were made.

Wool, the basic raw material for spinning and weaving, was processed in several stages. Shearing was followed by washing the wool in large buckets with hot water and lye made of beech and birch ashes. The remaining oil was often used as a remedy against rheumatism or for the preparation of ointments. After washing the wool, it was then rinsed in the river and dried on a fence round the house. Having been cleaned the wool was manually carded and short yarns of wool which remained in the comb, called canura, were used in the shuttle. Various easy-to-use devices were used for the preparation of the wool and hemp yarns. A variety of textures were obtained from the linen, hemp and wool: cloth for shorts (for everyday and holiday uses), trousers (itari), suman coats, white trousers (cioareci), woolen blankets with long hairs (plocazi), carpets, thick woollen blankets with short hairs (cerga), towels, and belts.

8. Mills in My Village.

Refer to Box 8. Develop a project Mills in My Village, similar to the projects described above.

Box 8 Mills

According to the history of human civilisation, the grinding of corn was the first area of productive activity to respond to any new investment in the field of movement, both in its technological processes and its sources of energy. On the other hand, the persistence of mill stones provides us with a chance to observe how this real "monument princeps" (princely monument) present in all nations with a sedentary, agrarian type of civilisation evolved, beginning with the Neolithic and up until present time.

The archaeological materials discovered in Romania constitute rich original "witnesses" of this historical evolution and reveal the importance of the cultural contacts with the great civilisations of the Greek and Roman Antiquity. These civilisations left their mark on all the instruments and tools of the area around the Mediterranean, both during the ancient Greek period, when the parallelepiped mill with linear movement was widely used, and in the Roman period when the most fundamental types of mills became widespread. Examples of such fundamental types of mills include:

1) The hand mill,
2) The animal-driven mill – the simplest type with direct transmission
3) The hydraulic mill, widespread in two versions – one with direct transmission (the oriental type with a horizontal wheel) and the other with gearing for the multiplication of speed and the vertical wheel (the western type also called Vitruvian after the Roman architect Vitruvius, who described it first in great detail).

In Dacia, the water mill was used, at least in the larger cities and residences of the legions characterised by great demographic density, which required the use of superior technologies in the 2nd and 3rd centuries. Mill stones were discovered in Apulum, Napoca and Micia, and are analogous with similar discoveries all over the Roman Empire. The Latin terminology used for the whole technical structure of hand mills and watermills provides evidence that these devices continued to be used by the native populations throughout the first millennium; some of them even making progress in technical improvements and efficiency. When the Slavs settled down to the north of the Danube and took up more developed forms of farming, the development of the hand mill had already ended. The Slavs took over the improved installation from the local inhabitants and lent it Slavonic names, which were later adopted by the natives.

When water mills became widespread all over Europe (including Romania) in the 10th -12th centuries, milling evolved from being an old domestic occupation to becoming an important part of the feudal system of industry. At first the monopoly of milling was sought out in the great lay and ecclesiastical feuds, with country rulers or princes gradually becoming its owners, the same way as happened in the case of the hydraulic installations and the peasant communities. The introduction of windmills and of huge horse-driven mills, beginning in the 14th century after a new system of harnessing was introduced (the pectoral harness instead of the neck harness used since antiquity) completed the series of mills characteristic for traditional popular civilizations. In time, with each new form of energy source used for mills, a typological diversification took place, for example, in the construction of the wheels, the transmission systems and the construction process itself of water- and windmills.

Certain phenomena specific to Romania illustrate the great importance of milling for the nourishment of the population, and show how decisive milling was for the sedentary character of the nation's civilisation. These phenomena are as follows:

- An extraordinary density of water mills with buckets (there were villages which in the past had 30-40 such mills along a stream of water like a row of beads).
- The most ingenious use of local characteristics of hydrological networks and other natural elements, leading to a great typological variety of milling installations.
- Some localities specialised in using water mills, windmills and horse-driven mills to serve large areas around their villages, and even built and exported such installations. This was the case in some villages in Muntenia (Vallachia), among them Cascioarele, which was mentioned for several years in the Customs Registers at the end of the 18th century as exporting "floating mills" to the Ottoman Empire.

The diversity of instruments found in the field of milling demonstrates another quality of the Romanians: the quality of being open to cultural dialogue with other nations without altering the originality of its own culture. As Constantin Noica also underlines, "When our civilisation grew up to become a culture, it did not create everything again, but it existed, as in front of nature, within given historical cultures. The vain temptation of total novelty did not appear to us. We knew how to bring novelty into what had been historically ours."

9. Other Traditional Arts and Crafts

Refer to Boxes 9 and 10. Develop activities focused on clay processing and Black Smith's trade, based on the structure in the activities above.

Box 9 CLAY PROCESSING

The pottery used in Transylvanian villages came from two sources:

- from potters grouped in villages that specialised in pottery, who were selling mainly customary, enameled ceramics at markets,
- and from guild potters who supplied mostly enameled, decorative, but also customary pottery.

In time, preference for certain shapes, techniques, motifs and colours generated styles characteristic of certain centres of pottery (both guild and village potteries), and their distinct personalities survived after the guilds were abolished.

The technique of decorating non-enameled pottery by using engobe (a paste used on ceramics to hide the original colour of the clay) is illustrated in the mixed Hungarian-Romanian pottery centre in the village Vadu-Crisului in Bihor County. Non-enameled stone-polished black pottery, a pre-historical technical tradition, comes from the Romanian pottery centre Josenii Bargaului in Bistrita-Nasaud County. The colour of this pottery was obtained by using a special burning technique, which consisted in burning the pottery in the last stage with the openings of the furnace closed, in other words, without any oxygen. Graphite-coated ceramics, a Byzantine influence that was present in the Valea Izei and Baia Mare centres respects both the characteristic chromatic scale consisting in yellow and green on a white background, and the more aerated structure of the decoration. Although the Vama centre also preserved the graphite decoration, it adopted a chromatic scale in which red is by far the most important colour. The common forms enameled pottery all over Transylvania are represented in many household objects with different functions: strainers, milk jugs, pots for carrying food to the fields, cooking pots, pans with legs for open fires, and funnels for wine.

High mugs, currently used for decoration purposes and only rarely used for drinking wine, as well as bilaterally-flattened jugs, were introduced to Transylvania by the Saxons. The shape of the neck of the jug was adopted later on, influenced by the oriental brass vessels in the Balkans. The flower and bird motifs characteristic for these pieces, as well as the crowded character of the decorations, demonstrate a baroque influence coming from central and western Europe.

The habana pottery of the 17th and 18th centuries (delicate white ceramic, characteristic for Transylvania), renowned in its time for its exquisite quality and refinement of the figurative decorations, was made by the haban potters, who belonged to an Anabaptist sect and were colonised from Moravia to Transylvania between 1621-1629, and then settled in Vintul de Jos. The haban potters brought along with them superior ceramic technologies and adornments typical of for central and western Europe, providing a strong impulse to Transylvanian guild potters. They encouraged a greater variety of shapes and influenced decoration styles and colours used. This resulted in, for example, mugs with metal lids, (mostly decorated with floral, but also with anthropomorphic and zoomorphic motifs on white background), cobalt ceramics with blue background and cylindrical shapes characteristic for central Europe. The Saxon ceramics of the 18th - 19th centuries made at the guild centres Bistrita, Saschiz, Chirpar, Sibiu, Brasov and Satu Nou stand out as having a unique style of their own, and the quality of the materials used as well as the execution of the pieces are impeccable. The graphite coating, the cobalt background and the elegant drawing in white gave a specific character to the centre Saschiz, while Chirpar stands out because of the elegant shape of its mugs, Sibiu due to its elegant, aerated decoration, and Brasov because of its rich baroque decorations.

Examples of typical tools of this trade are as follows: a hoe to obtain the clay, a shovel to manipulate the clay, a ramer to obtain homogeneity by beating the clay, knives for cleaning the clay of impurities, cleaned clay balls ready for modeling, a potter's wheel, a pot for water, combs for modeling the profile of the pot, plates with various colours, and paintbrushes.

Box 10. THE BLACKSMITH'S TRADE

In contrast to regular blacksmiths who limited their work to shaping iron (raw or derived with the help of tools) by forging, the blacksmiths in specific villages, such as Trascau in Bihor County, had the additional knowledge necessary to obtain iron from iron ore.

Examples of tools specific for obtaining and processing iron are as follows: a miner's pick-axe, a bushel for measuring the ore, bellows for heating the charcoal, pliers for manipulating the iron "bread"(loaf), and an anvil and a sledge hammer for modelling red-hot iron held in place with the pliers and the axe-wearing master signs and illustrates the end-product.

Products made by blacksmith craftsmen include: fireplace "horses" (cai de vatra), which support logs as they burn in an open fireplace and, in pairs, provide support for pots cooking over an open fire, stirrups for saddles, and crampons for winter boots. Another category of products includes objects, which illustrate the processing of tin by peasants (casting in moulds, inlays) in the area around Padureni, and finished decorative pieces specific for the area. Examples of these include: pans for melting tin, stone moulds for buckles and other decorative elements used on belts, wooden moulds for the metal tips of spindles, spindles with inlays, knives and sheaths with inlays, and belts hooped with tin elements. The instruments used to extract gold from gold ore are equally important: pieces called dude that carry the wicks used for explosions, pieces for the fixation of candles needed in the mining drifts, a horn to keep gunpowder in, two earthen lamps with oil or suet used in the drifts, horns for keeping gold in, a balance scale for weighing gold, and a capacity measure converter for the gold.

For the procedure of extracting gold underground in the Apuseni Mountains, the following tools were used: a drill to pierce the rock, fuituitorul (a stick-shaped tool) used to clean the hole to be filled with gunpowder for the explosion, a pin for the introduction of the cartridge into the hole, a sheath for keeping the gunpowder in, a pick axe for detaching rocks, a hammer for crushing rocks, a grinder for the ore, and saitroc – a device for separating gold from the sterile part of the ore by washing or by steamp, a device with hydraulic action.

9. Sustainable Tourism

Carpathian Convention Article 9: Sustainable Tourism

1. The signing Parties will take measures to promote sustainable tourism in the Carpathians for the benefit of the local inhabitants based on the exceptional cultural inheritance and will co-operate with that end in view.

2. The signing Parties aim to develop policies, which have the goal of promoting cross-frontier co-operation in order to facilitate the development of sustainable tourism, such as coordinated or joint plans of management for areas of tourist interest as well as for cross-frontier areas or protected ones close to the frontier.

CONTEXT AND GENERAL INFORMATION

Many different definitions for tourism exist, among them:

- Tourism includes travel away from a person's place of residence area for purposes of business, rest or pleasure, as well as activities carried out while at the place of destination.
- Tourism includes those travels which are further than 50 km and must include passing a night in the area of destination, but not exceed a stay of more than 12 months (WTO).

Box 1. Specific features, data and definitions of the tourist phenomenon are described by the World Tourism Organisation (WTO) [34] :

- Tourism is one of the economic areas with the greatest growth in the 20th century and the beginning of the 21st century.
- In 2003, 523 billions of dollars were spent in the world tourist industry.
- Every year 691 million international arrivals are registered in different corners of the world.
- Up until the year 2020 the number of international arrivals will increase to 1.6 billion arrivals.
- The most significant increase in the numbers of international arrivals is foreseen to take place in the key eco-areas around the globe.

The Tourist Phenomenon

The tourism phenomenon includes the following major components:

1. **The tourism demand.** The objective/subjective necessity to spend free time leads to the development of a tourist demand. Categories of tourists – external guests or national tourists – make up the tourist demand, which is influenced by demography; social, economical, and motivational aspects; categories of age; socio-professional activities; means of transportation; tourist motivation, etc.
2. **The tourism supply.** The diverse tourist potential polarises and directs the tourist demand, in other words, it helps and determines the building up of the tourism demand.
3. **Travelling from place of residence to a tourist destination.** The tourist phenomenon includes two important pillars: 1) the tourist's area of origin and 2) the destination (where the tourist offer with its components is formed)

4. Consumption of tourist products

The tourist market represents the economic interface between tourist offers and tourist demand. Some key elements of the tourist market are:

- As tourists usually have to travel to a destination (we are rarely tourists in our hometown), the tourist offer generally coincides with the place of consumption, but not with the place that makes up a tourist demand.
- The tourist demand is flexible and subject to fluctuations; it has a high degree of complexity, dissimilarity; it implies a high degree of tourist mobility; and it has a seasonal character.

Several factors influence the tourist phenomenon [35]:

1. **Tourist potential:** natural and cultural
2. **General and tourist-specific infrastructure** (arrangements, roads, equipment, tourist services, transportation etc.)
3. **Factors which influence tourist traffic** (demographic, political, social, economical etc.):

34 For more information, see the web-site of WTO: http://www.unwto.org/index.php (August 2009)

35 WTO, Irecsson courses 2004 (Cornel Tudose, Mădalina Argăseală).

- The demographic factor:
  - the increased tourist demand due to a growing lifespan that results in a wider participation of seniors in forming the tourist demand.
  - higher birth rates, more developed educational systems, and a general increase in living standards results in a higher participation of youth in forming the demand for tourist offers.

- Socio-economic factors:
  - The income of a population: it is considered that tourism becomes a sustained activity when the per capita income rises above 500 dollars/month.
  - The availability of spare time has increased over the last 30 years.
  - The amount of holidays has increased, especially in Europe (holidays between 12 to 40 working days in Europe).
  - Prices of the tourist market: reasonable and stable prices result in an increasing number of visitors in the long run.

- Political factors: political stability, national politics when organising and developing tourism

4. Internal factors specific to the tourist phenomenon:
The quality of tourist services should correlate with the cost, and with the demand and needs of the tourist market; this is a very important decisive factor.

Some classifications of tourism [36]:

Organised and semi-organised tourism are the two tourism types where the planning and organising of a trip (visit) is done by specialised tourism entrepreneurs, who organise the tourist programmes. Currently, they represent 30% of the tourist flow in Western Europe (tourists with mid- and low-range income). This figure, however, is decreasing due to a rise in incomes and an increase in the use of internet as a means to reserve tourist services independently etc.

Non-organised tourism is the type of tourism where the planning of the destination and services is done directly by the customers during or before their trip.

Tourism can also be classified as:
- permanent: when tourist activities take place throughout the entire year
- seasonal: such as winter tourism or summer tourism
- occasional: based on certain events, such as festivals, celebrations, concerts, etc

A sustainable tourist destination must have a permanent character to the degree possible, in order to provide continuous income for the local manpower.

Travelling to tourist destinations in Europe can be classified as follows:
- Road transportation makes up a share of about 50% (Switzerland and Austria above the average with 70-80%)
- Railway transportation accounts for only 5% of all international arrivals, with a higher share (20-25%) in Eastern Europe
- Air transportation currently accounts for 40% of the international arrivals, and is rising.
- The share of sea transportation is quite low, with higher figures in northern countries.

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36 WTO, Irecsson courses 2004 (Cornel Tudose, Mădalina Argăseală).

Accommodation structures specific to tourism

Two types of accommodation structures can be outlined:
- **Hotels 37:** about two million accommodations (hotel groups) operate in Central and Eastern Europe (such as Holiday Inn - 1692 hotels, Best Western - 3351 hotels, Accor Group - 2098 hotels).
- **Other:** holiday dwellings, apartments in buildings with co-proprietorship or multi-proprietorship, accommodation in private dwellings, apartments hired out for self catering, accommodation capacities in the countryside (boarding houses), and social accommodation units (hostels).

The tourist product

The essential elements of the tourist product are:
- natural components (landscape, clean air, wildlife, viewscapes)
- general human components (language, culture, traditions, customs, folklore, hospitality, art, religion, history)
- tourist infrastructure (accommodation, sport resorts)
- general infrastructure (roads, sewage, electriticy, communication systems)
- institutional background (travel agencies)

Marketing of the tourist product

The so-called 4P-4C relationship demonstrates that a correlation between the tourist offer and the tourist demand determines to a great degree the success of a destination or a sustainable tourist product. The 4 Ps represent the features of a tourist product or offer, and the 4 Cs represent the customer or tourist demand.

BOX 2 : The 4P-4C correlation

4P	4C
Product	Customer and his/her demands
Price	Cost supported by the customer
Placement (distribution)	Comfort of the purchase
Promotion	Communication

Tourism And The Environment

Tourism is an important sector of many countries' economy and can bring many benefits for the local communities.
Overall, the consumption of resources by the tourism industry is significant globally: it uses building materials (such as wood and stone), water and energy, contributes to greenhouse gas emissions [38], and produces waste material.
- It uses energy equivalent to 80% of Japan's energy consumption (5000 million Kwh per year).
- It produces a large quantity of waste material, equivalent to that of France (35 million/tons per year).
- It uses a water quantity three times more than that of Lake Superior located between Canada and the USA (10 millions of cubic metres).

Conventional tourism practices often treat cultural and natural amenities as sources meant to be exposed and exploited to a point of exhaustion. Conventional tourism is a short-term industry: a tourist season is considered a long period of time in tourism. Conventional tourism survives through continuous development, and considers marketing a solution to many problems. Marketing policies always aim at increasing the number of visitors, rarely taking into account the environmental impacts. At the same time, mass tourism often occurs in sensitive natural and cultural areas, where it can have a strong negative impact and lead to irreparable degradation.

37 Refer to the Map Tourism Development, 2005: Total number of bed places(Map 14)

38 Such as emissions due to transportation to tourist destinations (more details on climate change in Appendix 2).

Tourism can have a strong physical impact on the places visited. Woods and farms are sometimes destroyed to make place for the construction of airports and roads, and hotels are often built right in the middle of picturesque areas. The physical impact can be complex and extensive. Changing of beach profiles can cause silting and erosion in other places, cleared skiing slopes can cause landslides or potential other major disasters (like avalanches). Very intensely visited areas can suffer erosion due to the large number of visitors (mountain erosion in the Alps, in the National Parks of the United States and Himalaya are classical examples).

Poorly managed tourism can also have a serious cultural impact. The development of a tourism industry, if not done carefully, can cause the loss of local customs, lead to a decline of local languages, and significantly change the value of land and the employment marketplace. It can also change the political balance in favour of multinational tourist companies, that are disinterested in the local problems. The loss of property at a local level can lead to loss of profit and local control over activities.

The transportation to and from tourist destinations can have detrimental effects on the quality of air and on the terrain. Air and road transportation burn great quantities of fossil fuel and release noxious pollutants into the atmosphere. Travelling by car and even parking cars can seriously damage the landscape and nature in protected areas. (See the chapter on transportation for further details).

Sustainable tourism – a friendly and efficient solution

Box 3. Sustainability.
The origins of the sustainability concept and sustainable development [39] are described in the Brundtland Report, written in 1987 by the World Commission of Environment and Development (WCED, 1987).

The Brundtland Report pinpointed four crucial principles for the concept of sustainability:
(1) The idea of holistic planning, crossed planning between sectors, and drawing up of coordinated s trategies.
(2) The importance of preserving main ecological processes.
(3) The need to preserve both valuable human heritage and biodiversity.
(4) Recognition of the fact that area development should be produced so that no resource exhaustion is achieved in the long run.

Sustainable tourism is (defined as part of the draft protocol for tourism, worked out within the framework of the Carpathian Convention): any form of tourist development, management or tourist activity, which maintains the integrity of the environment, as well as the social and economic integrity, and maintains the well-being of built, cultural and natural resources in the long term.

Of major importance within the concept of sustainable rural tourism is the need to preserve host communities and natural habitat.

While some types of tourism can destroy communities and habitats, sustainable tourism aims to use the income and opportunities provided by tourist activities for conservation. For example, the income resulting from millions of tourists who practice bird watching around the globe can be used to help conserve specific habitats, which otherwise would be intensively cultivated or deforested. Profit coming from selling traditional foods and non-food products can similarly become part of conservation efforts.

Key-elements of sustainable tourism:
- The needs of nature are respected; biodiversity is conserved and respected.

39 More information on the sustainable development concept is provided in the introduction to the Tool Kit, and at: http://www.iisd.org/sd/

- Visitors are conscious of their impact on the environment and tend to have a neutral impact.
- A positive or neutral impact on the environment lies at the basis of all decisions.

Requirements of sustainable tourism:

1. It should contribute to the welfare of local communities, and improve social uprightness, cohesion and respect for the rights and sovereignty of local communities.
2. It should facilitate accurate interpretation or an educational experience.
3. It should include responsible actions by tourists and the tourism industry.
4. The scale of development should suit the local conditions.
5. It should require reduction in consumption of non-renewable resources to the degree possible
6. It should respect the physical and social limits of the destination.
7. It should be owned and managed locally (providing local participation, and local property and business opportunities on a local level).

1. Contribution to the welfare of local communities, and improve social uprightness, cohesion and respect for the rights and sovereignty of local communities

According to this concept, which represents the essence of sustainable tourism, the control of tourism and the profits resulting from tourism must focus on the local communities. In this way it can help conserve local values, provide income for areas facing degradation, and reactivate political-social life in areas where hope has been lost. Local control implies developing a variety of skills and knowledge within the local community. Successful development implies constant training, education and a continuous informing of the communities and their members.

Tourism can be seen by many rural communities as well as by their leaders as a universal remedy for their problems, but there are dangers connected to the development of tourism as the only source of economic activity and revenue. Tourism is a competitive industry with a "fashion" that can change very quickly. Rural communities can come across serious problems if they only rely on the tourist market. In order to maintain its rural character, tourism has to encourage an authentic rural economy with successful farmers, a functional rural life, and an authentic and original cultural scene.

The goal of sustainable tourism should be to diversify the local economy and not replace traditional activities such as animal breeding with tourist activities. Such substitution would involve the following risks: it could produce a dependency upon a single activity, and cause the loss of unique natural and cultural features, which form an integral part of the countryside; the degradation of agriculture may lead to the destruction of landscape and habitats. The loss of traditional landscapes and habitats implicitly means the loss of a community's unique selling point for tourism and can cause irreparable loss of cultural and natural values.

Key elements: to prevent negative impacts, local communities and agents interested in tourism should jointly participate in the tourism planning process right from the start.

2. Including a technique for accurate interpretation or an educational experience

Accurate Interpretation: "An educational activity which aims to reveal meanings
and relationships through the use of original objects, by first-hand experience, and by illustrative media, rather than simply to communicate factual information" [40]

Key element:
Interpretation means to add value to an experience due to increased interest created about an attraction

40 More on this issue by Freeman Tilden at http://www.heritagedestination.com/freeman-tilden.aspx

or experience when more is known about it. Interpretation can be personal or non-personal. The personal interpretation is done by specialised guides, while non-personal interpretation is offered through infrastructure and informative materials.

3. Including responsible actions by tourists and the tourism.

Types of activities, marketing, way of promotion, and tourist behaviour should take into consideration the demands of the host area (nature and culture).

4. The scale of development should suit the local conditions.

Those developments are preferred, which perfectly complement natural-cultural landscapes and do not generate a negative environment, socio-economic impact, etc.

- Typical rural activities are low-scale, local and individual. Sustainable rural tourism should therefore suit the dimensions of the rural area where it takes place.
- Normally, but not always, ecotourism should be limited in regard to the number of tourists, but this depends a lot on local circumstances. In sustainable tourism the proximity to people is very important, and this is possible due to activities performed on a low scale of impact.

5. Reducing consumption of non-renewable resources

This is possible by using public transportation to and from destinations, saving energy and resources in accommodation facilities, and using renewable energy sources [41].

6. Respecting the physical and social limits of a destination.

Tourism development should take into account the physical limitations of a destination (number of visitors during the time unit, number of boarding houses, and number of tourist routes.
Key element: Marketing should not rely excessively on an increase in the number of visitors.

7. Local ownership and management (providing local participation, and local property and business opportunities on a local level).

- Ownership by locals of the tourist facilities, developed as a result of restoration of the traditional houses or by building new ones, includes a number of additional advantages:

Locals would be strongly motivated to stay in their area and continue the traditional activities. They would increase their horizons, acquiring new skills and knowledge; they would require training, which would diversify their activities. A community that is interested in renewing the existing buildings instead of building new ones, which would likely would not fit into the existing rural context as well, can decide for itself and make choices that suit its character.

Guide to Creating of an Ecotourism Product

Step one: get familiar with the concept (see the section above)
Step two. Identification of tourist opportunities in our area
Step three: Establishment of the uniqueness and competitive capacity of the tourist destination, tourist programmes, tourist routes

Certainly, tourist activities are economically yielding activities and must be sustainable from this point of view too. In the area of the Carpathian Mountains, there already exist tourist routes, sustainable tourist programmes,

41 More information on renewable energy resources can be found in Chapter 7 Energy,

ecotourism, and areas identified as sustainable tourist destinations. There is competition between different tourist destinations, especially in order to attract foreign visitors.

What do we choose as a priority area to carry out a tourist programme we want to create?

The existence of a **National Park**, for example, and generally the existence of protected natural areas, certifies the existence of some special natural elements, known and protected on a national or regional level, in accordance with the assigned conserving status.

Thus the **existence of a protected natural area** represents an advantage for developing sustainable tourism activities in the long term, and in the meantime an acknowledged brand at the national and even global level. There are probably already visitors in a protected natural area, which is an advantage for the development of a new tourist product.

The existence of specific infrastructure to inform and educate visitors in national/natural parks (visiting centres, information points, thematic routes, rest places, camping places, etc.) also represent a definite advantage for creating and developing tourism products in protected natural areas.

In addition, **the existence of managing authorities of protected natural areas** that employ specialists in tourism, specialists in communication, rangers, qualified guides for sustainable tourism and ecotourism, represents an important element which assures both the quality of tourist experience in a protected natural area as well as the safety of visitors.

The park management knows in detail the potential for developing tourist activities in a specific area, has databases of tourism agents and tour operators who work in the general region of the protected natural area, know the private tourist facilities of the area (boarding houses, motels, camping, etc.), and are part of partnerships with all actors implied in tourism.

In the Carpathian Mountains there is quite a large number of protected natural areas, of which those over 100 hectares are part of the protected natural area network of the Carpathians (CNPA), organised within the Carpathian Convention. This network includes 36 national parks, 48 natural parks, 20 reservations of the biosphere, 86 natural reservations, and 90 protected areas in other categories.

Examples of elements, which can be unique and attractive:
Protected natural areas, virgin woods, special mountainous landscapes, big carnivorous species that are disappearing and very rare in Europe, unique Romanian traditional habits, traditional villages, local food products, curiosities of nature, churches, painted historical monasteries, fortress ruins, discovery trips and experimental immersion into different traditional activities or prospecting, etc... .. **it really depends on your imagination!**

Even in the case of protected stunning natural areas the competition between tourist destinations is very high; there are over 30,000 protected areas in the world which compete as tourist destinations for nature lovers.

Natural and cultural elements must have **a unique character** in order to assure the success of a future tourist destination.

It is also necessary to develop and spread **"legends"** of a destination or of a tourist programme, in order to make it even more attractive for visitors, but without promoting attributes which the visitor cannot find (accurate marketing).

The Carpathian Mountains offer unique elements in Europe, with still existing virgin woods, a wealth of biodiversity, special landscape big carnivorous animals, special cultural-traditional elements, etc.

Step four. Identification of the actors in tourism and of possible partners

The success of sustainable tourism activities is closely connected to the involvement of all interested actors in the local community, starting with the local authorities, the management of the protected natural area, of tourist operators and the future owners of tourist boarding houses. In order to promote common interests regarding the development of sustainable tourism, organising local tourism associations is recommended.

Step five: planning and the actual establishment of the tourist programme, assembling of ideas and elements of the sustainable tourism programme:

As part of sustainable tourism a specific market niche is represented by ecotourism, and in the following we will discuss the development of a tourist programme based on ecotourism experience.

BOX 4. Principles of the ecotourism:
1. Focusing on natural areas
Ecotourism is centred around the direct and personal experience in nature; it takes place within nature and is based on its geomorphologic, biologic, physical and cultural characteristics.

2. The interpretation of the ecotourist product. Ecotourism stands for responsible travel to natural areas, which provides a special experience, protects the environment, and contributes to preserving and increasing the living standards of the local community.

3. The principle of sustainability from the point of view of protecting the natural environment
The tourism activity has to be planned and developed so that it decreases the impact of the product upon nature. The tourist product takes place and is managed in such a way to preserve and capitalise on the natural and cultural environment where it takes place by recognition and application of practices characteristic to sustainable tourism.

4. Ecotourism contributes positively to the conservation of natural areas. Ecotourism implies participation in conserving visited natural areas, by offering constructive ways to support beneficial management and the conservation of these natural areas.

5. Constructive contribution to the development of local communities
The local community is often an integral part of the ecotourist product. The profit of ecotourism should return mainly to the local communities. Local profits can result from the use of local guides, purchase of local goods and services, and the use of local facilities.

6. The tourists' degree of satisfaction
Ecotourism answers to the tourists' expectations. In the development of ecotourist products, it should be taken into account, that potential tourists in this domain generally have a higher education and level of expectations. The visitors can appraise the quality of the consumed ecotourist products and ensure the necessary feedback to correct any shortcomings.

7. Correct marketing. Correct and accurate marketing should be pursued, which leads to realistic expectations.

Activities to include in our ecotourist product:

- An experiential taste of nature and traditional culture based mainly on "one's own muscles" that respects the principles of ecotourism. Examples of this include: hiking on tourist routes; trips specially focused on observing

nature (flora, fauna), which evaluate ahead of time any long-term impact on the various species and their habitat (ethology, stress, reproduction, health, state of conserving); road trips on arranged routes; equestrian tourism on pre-established routes; trips with chariots or horse-led sledges; trips to local communities (visiting cultural, traditional objects, visiting traditional farms, purchasing of non-food traditional products, etc); and winter trips on touring skis or cross-country skis.

All ecotourist activities have as a central pillar a guided trip or at least a means of interpreting and experiencing nature firsthand.

A disputed subject is classical Alpine skiing, whereby a specific tourist product involves the development of protected areas, which can have negative long-term effects when it expands to mass tourism.

The characteristics of Alpine skiing tourism are well-known (development and complex infrastructure, which affects some natural areas by way of ski tracks and afferent equipment, a generally high number of visitors, its seasonal character, annex facilities, bars, restaurants, shops, etc.). Alpine ski resorts are also strongly being affected by climatic changes, which are becoming more prevalent recently.

Such tourist development in protected natural areas, if ever done, must take into account the potential negative impact on the environment, local communities and the traditional way of life.

An ecotourist product should include some important components:

I. Planning of an ecotourist programme

Planning is the most important stage and must take into consideration all aspects, starting with the identification of tourist attractions, possible restrictions and special requirements of an area from the point of view of the environment and cultural inheritance, the implication of local communities, the issue of public transportation to and within a destination/tourist programme (using as much as possible public transportation and only to areas without restrictions), choice of the type of potential visitors, training of guides, preparing the programme, responsibilities, working out the promotion, selling and carrying out the tourist activities.
Thus, if our destination is in a protected natural area, we have to consider the planning of tourist activities together with the managers or the caretaker of such an area.

Key elements:
1. **Involvement of all interested parties and elements**
2. **The type of visitors who we are developing the programme / route for is created** in vain if it is hard-to-access and the most frequent visitors of the area are likely to be pensioners or first-grade children.

A management plan for visitors is a visit concept, which establishes the necessary objectives and actions to ensure optimal visiting conditions, specific to protected natural areas in accordance with the local region's needs and management guidelines.
Such a management plan is an instrument which, once practically applied, will guide the right type of visitors to the right areas, offering the best opportunities to ensure a satisfactory experience of nature for each visitor type, producing a minimal impact on nature and the local communities, and at the same time creating the best chances for the sustainable development of business on a low scale by members of the local community.
As part of the management plan, a designation of protected natural areas is communicated to the tourists, developed on the basis of the management plan of the protected natural areas, taking into consideration the different areas within the protected region. Thus, for example, in a strictly protected core area of a natural park activities other than hiking on existing tourist routes are probably not permitted (in some cases there may be exceptions for periods of time, and only accompanied by specialised guides).

II. Establishing the themes of the route/visiting programme

A tourist product has to be attractive, special, and centred on a main attraction. The product is and interpretation of important elements to conserve nature along the route are pointed out. For example, the final point and main attraction of a thematic route we create could be a well-known natural element (mountain peak, waterfall, special rocks, area with unique flora and fauna, etc.)

Selecting of routes and final areas of interest in relation to the proposed visiting themes

Routes to be visited within the tourist programme are selected, as well transportation to the access area, a way of crossing these routes, activities that take place are determined and must take into account the environment and specific requirements concerning the cultural inheritance. If the area is a national or natural park the choice of routes is done together with the park management and according to the management plan for the visitors. Checking up routes, preliminary observations are inevitable for preparing an ecotourist activity.

III. Description of the tourist programme/tourist route

This involves determining the details of the programme, starting with the welcome and reception of the tourists, as well as providing them with a detailed description of the activities throughout their trip, right up to their departure.

IV. Preparing necessary interpretative materials/techniques:

Non personal interpretation techniques (booklets, folders, self-interpretative posters) need to be developed and prepared.
In addition, personal interpretation techniques (verbal descriptions, presenting of natural, cultural elements by specialised guides who escort the visitors) are prepared and made readily available.

Logistical preparations of a tourist programme include accommodation agreements, organising transportation, travel schedules, etc.

Tourist product marketing – promoting and selling a tourist programme:

The quality of the tourist programme services is extremely important. Sustainable tourism and its niche of ecotourism rely on a positive personal relationship with each visitor/customer. This is a decisive element, which determines the sustainability and implementation of a destination programme or tourist route.
The tourist product must meet or surpass the visitors' expectations, be in accordance with the promises and descriptions laid out in the promotion and take place under conditions of absolute safety and responsibility.

Feedback in regard to the tourist product

Visitors should be able to express their opinions in regard to the tourist programme. This is a great benefit for the organisers so that visitor opinions and experiences can be integrated and the programme continuously improved when organising future trips.
If all the above is running well, a last step is the certification of a tourist programme or even of a tourist destination.

The Ecotourism Association of Romania has adjusted a certification system of products, operators, and ecotourism destinations under the logo "Discover Eco Romania" on the basis of a well-established set of criteria, which include responsibilities for the environment and culture, nature interpretation, and respect for visitors.
The ecotourism certification system is recognised by the Ministry for Tourism in Romania.

A contribution of our tourist product is to create a Tourist Brand for the Carpathian Mountains

The created tourist product has the chance to contribute through its uniqueness and specific character to the variety of tourist programmes created in the Carpathian Mountains.
Under the umbrella of the Carpathian Convention, there exists in the future the possibility that individual tourist products, chosen from seven countries – the signatories of the Carpathian Convention – cooperate to create a common tourist product: visiting the Carpathian Mountains, which would be promoted on the international level as the most representative route through the Carpathian Mountains.

QUESTIONS:

- Think of "tourism" examples which do not harmonise at all with the definition of tourism provided in this chapter.
- Give examples of tourist demand and tourist offers. Could you think of examples specific to your area?
- Which transportation options have a lower impact on the environment? (Please see the chapter on transportation to help you answer this question.)
- Give an example of sustainable tourism.
- Why do you think the non-sustainable forms of tourism are so popular?
- Do you have any idea what could be done in order to make sustainable tourism more popular?

Tourism in your community:

- Are there tourist attractions in your area?
- Are there sustainable tourism options in your local area? Could they be organized?
- What could you do to develop sustainable tourism in your community? Is it a good idea in your view? What do your classmates/family/neighbours think?

Tourism in Carpathians with the help of map.

Refer to Map 14 Tourism Development, 2005: Total number of bed places
And to Map 15 Tourism Development, 2005: Total number of arrivals

- Which areas in the Carpathians have most beds? What does that indicate about the tourism in those areas? Is this consistent with the number of arrivals in the same areas?
- Has the situation changed until today?

Further suggested readings:

Sustainable Tourism Journal, http://www.tandf.co.uk/journals/rsus
Romanian Ecotourism Association
http://www.eco-romania.ro/en/aboutecotourism.php

Note for those implementing the above locally:
Integrate an example of sustainable tourism in the Mountain Area of your country. Present the local dilemmas of tourism, and refer to some well-known cases of conflict of interests in regard to this topic.

ACTIVITIES

Encourage visitors to see your local Study Trail!

For all activities:

Objectives: *To develop the local awareness and local attachment of student. To present the role and opportunities of tourism in the local life.*
Age of pupils: *14-18*
Materials: *pencils, paper. maps*
Duration: *30-50 minutes*
Number of participants: *20-30*
Place: *Classroom*
Competencies, skills: *system thinking, analysis, comparison,*

1. Discussion about tourism

Students are separated into two working groups.

Working group 1: Discuss which of the socio-economic, political, specific internal factors could help tourism in general and specifically in your local area.

Working group 2: Discuss which of the socio-economic, political, specific internal factors could obstruct tourism in general and specifically in your local area Criticise and debate with arguments and examples against the other working group 1.

Conclusions of the Activity: Each one of the enumerated factors can have a decisively negative influence on the tourist phenomenon.

2: Development of a tourist product

Working group 1 establishes the characteristics of the tourist product **(4P)** "Holiday in the countryside close to my village/town"

Working group 2 establishes independently from working group 1 what an ideal holiday in the countryside should mean, what it should cost, where the easiest access would be from, and the means of communication **(4C)**. Finally, the results obtained by both groups are discussed and compared.

3: Let's develop a sustainable tourist product

Where and how can we create a tourist product which has a minimal negative impact on a region's environment and its cultural values? What conditions should a sustainable tourist destination fullfil? Discuss these question with pupils than collect ideas for sustainable tourist products

4: Local sustainable tourist product

Present the students, who are divided into two working groups, with an identical photo of a natural local landscape and ask them to interpret what they see, and to "explain it" to a hypothetical group of tourists. Compare the results of the groups. Imagine an experience through which hypothetical tourists can better understand a natural phenomenon.

Try to identify elements from 1 to 6 that are present in the area you are studying:

1. Are there beautiful natural landscapes, mountains, woods, hayfields, lakes, streams, everglades, and any other special natural elements?
2. Are there traditional local communities, folklore, traditions, food and non-food traditional products?
3. Are there any protected natural areas? If yes, what kind? A national park, a natural park, or Natura 2000 sites?
4. I s the area acknowledged and known locally, nationally, and even internationally? Are there any visitors to the area?
5. Do accommodation facilities exist? If yes, what kind?
6. Is the general infrastructure adequate?

Although there may seem to be no close connections, all these elements work together to ascertain an opportunity to work out successful tourist routes / products within a successful sustainable tourist destination.

5: Strategy for sustainable tourism

Each national or natural park, which is well taken care of has a strategy for sustainable tourism or at least a management plan for visitors already in place. If there is a national or natural park near you, pay a visit to its management and find out more about the tourist possibilities present. Find out which parks/protected areas are located in the vicinity. Who manages the park? Get in touch with the park administration and inquire about the tourist potential of the park. Ask if the park is currently cooperating with nearby localities to support tourism programmes. Organise a class trip to the park.

Analyse and discover any unique elements in your area of study, then create a "legend" of the destination, as well as a thematic route that covers the most important natural and cultural elements of the area. Identify actors who you consider should be involved in the development of sustainable tourism in your area of research.

Each of the students should come up with an element which can be considered a key element for planning tourist programmes!

6: Ecotourism

Choose an area which you think should become a tourist destination for ecotourism, then create a tourist programme based on a tourist hiking route to discover the natural and cultural values of the area. The study trail developed with the help of this toolkit could form the basis for the ecotourist route. Examine theoretically all the necessary stages, including the identification of unique attractions, planning and developing the programme, its promotion and sale, and the involvement of partners within the local community to turn the area into an ecotourism destination.

In addition, create a vision for the proposed destination for ecotourism.

By working on possible future local ecotourist products in the school, the educational work and the sustainable development of the local community can be embedded within each other. This is advantageous for both sides. School activities get connected with real life, which is very motivating, and the local community receives creative ideas and work from the pupils, and even more importantly, the pupils' commitment to co-create the future of their community.

Appendices

1. Methodology

METHODOLOGICAL TOOLS FOR EDUCATION FOR SUSTAINABILTY

1. Project method

What does a project mean in the field of education?
This approach begins with the idea that life itself is action, and thus education should not only use and take place in artificial situations. W. Kilpatrick [42] states that "a project" represents an activity thought-out beforehand, and the predominant intention of which is a real purpose to give direction to the pupils' activities and offer them authentic "motivation". A project is a purposeful, deliberate and well-understood activity, with a number of tasks aimed at the individual and social adaptation spontaneously accomplished by the pupil (Planchard, 1976). For example, a child wants to know how the costs of electricity, water or gas consumption in a household can be reduced, how the rapid deposition of dust in the classroom or in the room where s/he lives can be explained, or how the shop at the corner of his/her street organises its provisions. S/he will find the answer to these questions by doing research, asking for information on the spot, reading, and making calculations. The answers to such questions will provide opportunity for various exercises to acquire further knowledge. The child will be dedicated to the activity if it has a concrete objective established by his/her own will and interest. Knowledge and techniques are the means by which a project is done; they are not the aim of it.

A project is an educational process limited in place and time; it has a well-defined beginning and end, the structure of its specific activities is clearly different from the usual educational activities characterised by a linear structure.

42 An American pedagogue (1871-1965), one of the founders of the project method in education.

Different types of educational projects can be identified:

- Projects centered on a process: the results are generally unforeseen, attention is focused on stages, such as deciding on the theme, design (planning of the stages), carrying out the project, and teamwork. Research, analysis and data interpretation make an important difference. Example: The environment of a school may be studied in regard to the road traffic in the vicinity of the school, the structure of green spaces, ways of collecting domestic waste, waste produced by the pupils of a school, or the inhabitants of the residential district where the school is, etc.
- Project oriented toward one product: in this case the final aim is established right at the start by describing an object or establishing a result we wish to obtain at the end. Example: To finance a trip to the mountains we collect and sell waste paper, or we organise a cultural entertaining activity that includes an entrance fee or we sell lottery tickets, etc. What themes would be well-suited for the purpose of these projects?

- Projects with proposed themes:
- pupils organising their own places of work
- analysis of the soil, water, and air in the area around the school
- determining the noise level at school
- study of the community's evolution through time
- problems created by traffic

Projects realised through field activities:

- Projects designed to acquire knowledge, to discover and analyse with a focus on understanding a phenomenon, which can be observed in nature (e.g. determination of the acidity of acid rains, measuring ozone near to the crust of the earth, finding the sources of river pollution, etc.)

- Demonstrative projects: these give access to information (e.g. filling in a data base, demonstrations, making a newspaper)

- Mobilising projects: getting acquainted with a problem is realised through actual participation in solving the problem. It does not only mean actual work, but also a deep knowledge of the context in which the problem is solved (e.g., planting saplings, collecting waste, acquiring objects made from re-used materials, etc.)

- Creative projects: ideas are formulated on the ground of impressions resulting from direct contact with the environment (e.g. organising exhibitions, presentation of one-act plays, role-plays)

- Experiential projects: since the essence of the project is the experience itself, the activity is aimed at developing identity in the context of the environment (e.g. activities at birthdays or activities devoted to holidays)

- Projects for solving conflicts: the task is to simulate a problem in which the pupils are directly interested, for example, what would we do if there was a bus stop in front of the school? How can we make a classroom more pleasant? How should the school garden look?

PROJECTS in Education for Sustainable Development

Basically, we can distinguish between two types of projects in education for sustainable development:

- A. Educational projects, activity programmes for certain groups;
- B. Science research projects carried out by pupils/students, partaking in a form of education/self-education

A. Educational Projects

The term "educational project" is commonly used to denote activities that accomplish objectives meant to improve certain existing situations in a school, for example, changing interior aspects of the school, organising the classrooms, improving the condition of the schoolyard, developing a system of collecting waste produced by the pupils, improving the living conditions of certain communities and groups, or any other aim determined by the actual needs of a respective group. Educational projects are clearly and concisely elaborated so that their progress can be followed. Since a possible funding source will require a clear description of the project, the project proposal and outline generally have to provide answers to the following questions:

- What will be accomplished?
- Why?
- How will it be accomplished, and what steps are necessary?
- Who will accomplish what is proposed?
- What funds are necessary and how are these funds being allocated?
- What are the expected results?

Why are such educational projects done with the pupils?

Educational projects tackling environmental problems often increase pupils' awareness of our dependence on the environment and how sustainable development is necessary for the survival of the human race. Participants in such a programme are guided on how to deal with various situations, and participation is also a good opportunity to gain insight and information about the environment. Educational projects are also an excellent opportunity to collaborate, to accomplish connection between school life and the rest of the world. By being connected to real life, they support pupils' integration of what they are learning into the realities of everyday life.

Here are some ideas, which facilitate the elaboration of a successful educational project connected to education for sustainability:

- It is an advantage if the programme tackles a local problem or if it is based on concrete realities of the school
- The degree of intellectual and educational development of the group must be taken into consideration
- The aims and objectives of the programmes are in accordance with the curricula

It is recommended that innovative teaching techniques are used in such programmes in order to encourage cooperation between pupils, the ability of creative, critical thinking, and the ability to ask questions and to develop evaluation techniques.

B. Research projects for pupils used as part of their education/self-education process. In our country this kind of organised learning has only begun being used a few years ago and is less known in pre-university education. By working on a project the pupils become actual participants in the learning process. Instead of verbal abilities, emphasis is laid on creativity and action. It is a modality of education/self-education that prepares pupils for real life. When working on a project the pupils learn to think independently, to elaborate their own ideas, to plan and evaluate their activities, to manage their material resources judiciously, and to collaborate with others. When working on a project the pupil does research work directed toward very clear objectives. The project ends by making a product. Elaboration of the project gives an opportunity for field investigations, for the investigation of secondary sources of information, for the development of the ability to communicate with others, for acquiring knowledge about reality and interpretation of results, which, at times, can be unexpected. Such a project has several stages: first, the intention emerges, an initiative resulting from curiosity and inquiry, an attitude of children or young people who find themselves in a real situation which brings up a question. This stage is followed by preparation, research and discussion about the means by which an answer can be found. The implementation phase follows, which means applying the working method that has been chosen. After the activity has been carried out, an assessment of the work follows: a discussion will take place as to whether the project attained its goal or not. The essence of this project method is to connect education to life, to authentic problems, and to engage in programmes designed according to subject matters with a global reach.

Objectives of using such projects:
- independent learning, effective participation;
- to recognise and develop individual abilities;
- to develop responsibility towards the environment and the wish for taking action;
- to develop sensitivity towards nature and promote a motivation for change;
- to recognise problems and to develop strategies for solving them creatively;
- to develop the ability to communicate and collaborate, as well as to solve conflicting situations; and
- to recognise dependences within a system, and to promote open mindedness.

Stages of a research project that are feasible for pupils:

1. **Choice of the subject** by clearly defining the problem to be analysed. Although the most interesting subjects generally prove to be those based on observations made by the person who carries out the activity, this stage does not exclude consulting a teacher or other members of the community.
2. Formulation of the problem or of the working hypothesis, which will be checked in with throughout the project. Anything may be analysed, but it is more practical to study a local problem, or a problem, which can be pursued on the ground locally. For instance, from the wide subject of the study of waters, several hypotheses can be formulated, such as: "There is a change in the quality of water below a sewage canal" or, "Why are there changes in the conductibility of water downstream from the locality?" or, "What kinds of living beings are to be found in the river upstream from the village and downstream from the village?" and many others.
3. **Looking for possible answers:** Planning and designing the various working stages requires clear articulation of the ideas, and of the stages in relation to the aim of the project. The timeframe must be considered, as well which instruments and support are needed, where the project will be carried out, accessibility of location, and possible discussions with the project supervisor. Projects can be done collectively, by two or three participants. It is useful to know the project evaluation requirements beforehand, as well as the measures that need to be taken to prevent any accidents.
4. **Progress proper of the project:** collecting of data, and measurements. The pupils/students will be instructed to collect data in an exact and rigorous way, and to collect sufficient data for the interpretation of the results. If necessary and helpful, pupils should also make classifications, drawings, sketches, take photos, and then include these in their interpretations. Appropriate techniques are chosen, and proposals are made for solving the problems. The location where measurements are made should not in any way be negatively impacted by the act of making the measurements.
5. **Presentation of the results:**
   a) First, the method of data collection is described. The results are presented in the form of tables, drawings, graphics, diagrams, maps, photos, and video films. Secondary sources may also be used, such as data published in newspapers, magazines or broadcasted. It is important that the materials have titles that correspond to the subjects they represent, and that their presentation is logical. When two graphs are compared, for example, they should be at the same scale.
   b) The tables, graphs and diagrams should be accompanied by explanatory texts.
6. **Discussions, evaluation:** By giving careful consideration to the findings, conclusive results can be clearly established. A connection is made between the results and the initial hypotheses, and possible differences are explained. If unexpected results occur, they have to be explained. Auxiliary sources may be used to emphasise the results. When possible, the implications of the studied problem can be discussed both from the point of view of the local environment as well as its implications on a national or international scale.
7. **Conclusion:** What could be done further on the ground of the current analysis of the results as compared to the hypotheses is presented in the conclusion. In addition, any connection between other problems and the one that has just been studied is discussed. And finally, emphasis is given to what the next step could be for the completed project and what its implications could be for other problems and inquiries.

The project method has proven to be a useful instrument in the current American and Western European educational systems. According to present-day conception, a real on-the-ground project puts the subject into an authentic position of research and action, confronted with an authentic problem, with a concrete task to be carried out. Documentation, visits to the scene of the project, forming hypotheses, laboratory work, workshop and field activities, the finding of solutions and verifying them, as well as formulating conclusions are all necessary when engaging in a project. Being confronted with real situations leads to brainstorming, and urges one to search, while the implementation of the project intensifies the spirit of responsibility, and brings the pupil/student closer to the complex world s/he will meet later in life.

SCHEMATIC PRESENTATION of the stages of a PROJECT made by pupils/students:

1. Choice of the subject
2. Formulation of the problem or of the working hypothesis
3. Designing method(s), planning the progress
4. Project progress, data collecting, finding solutions to the problem
5. Presentation of results
6. Discussions, explanations
7. Evaluation, Conclusion

The project method stands out as a global method with an interdisciplinary character, likely to stimulate and develop student personality on multiple levels. In spite of all the advantages and successes of the project method, it also has some disadvantages.

Advantages of using the project method:

- It improves the pupils'/students' motivation, develops imagination and the wish to work, supports action problem solving, encourages confidence and provides empowerment, and develops skills which are not sufficiently emphasised in traditional education.
- It supports learning by discovery, based on action and personal responsibility.
- It encourages students to learn working methods that are based on cooperation (by using group-work).
- The teacher becomes the facilitator of the pupils' activities, which characterises a changes in the traditional hierarchical structures. A partnership emerges in which the pupils choose and plan the subjects together with their teacher. The pupils/students actively participate in the process of their own training. Working on the project means establishing a relationship with the community and receiving recognition of their work from the outside.

Disadvantages of the project method:

- The time to work on the project is not continuous, and integration into the traditional programme can be a problem. The project method requires special preparation, unusual timetables, and the class in its usual form of organisation is broken up. Sometimes the project method is considered a waste of time by certain pupils because some of them are working in groups, in which some individuals may remain rather passive. Some pupils may become excessively involved and neglect other subject matters. In an educational project, there is also the possibility that each group ends up knowing about only one part of the project, and may not be interested in the other parts presented by the other groups, since time limitations do not allow for a thorough study of the respective subject. The project method is most successfully used in combination with traditional methods of education.

2. Games

In classical pedagogy and conventional thinking, playing games is generally considered to be strictly reserved for early childhood. According to this conception, learning is considered to be an activity characterised by "being serious", an activity that gains its respect through its planning, its well-determined aims, its valuable contents, and a clear system of demands. In contrast, playing games is looked upon as fun, self-indulgence, something relaxing, and perhaps even frivolous. At school, playing games is considered to be a means to relax and recuperate, and is used for relatively short periods of time during the school programme.
Playing games is, however, a tried-and-true means for transmitting knowledge, which can be used all the way from early childhood to the grave. Pupils and even adults often prefer games to serious academic lecturing. Among the basic forms of human activities, playing games and learning should enjoy the same weight and value.

By playing games, complex messages, even complicated relationships, can be transmitted and understood, so there is no reason why it would only be used with pre-school children. Playing games is an activity that accompanies humans their entire life long, since its essence consists in creating a state of activated joy. Pleasant feelings do not only occur when results are evaluated, or when an individual is oriented towards its requirements; the act of playing is in and of itself rewarding. While playing, the learning activity progresses, and the image of reality is intensified. Things are learned with ease, and we can create standards and commitments within a group. The wide variety of games helps us to clarify, to interpret and to live the experience of our relationship with our fellow creatures, to practice solving conflicts and puzzling situations. Playing games is gaining more and more ground in education that concerns the environment, owing to the fact that it offers the possibility of performing actions that are controllable from within the individual, as well as the possibility of personal, profoundly motivating activities. The open, spontaneous character of the learning process, the joy offered by situations experienced in community makes the effect of learning through games stronger.
At the pre-school age, learning is almost exclusively accomplished through playing games. The pebbles and seeds used in such games, the tale of the drop of water, all these are miraculous elements that can continue weaving their way through a child's imagination. In preschool children, through modelling and role-play, future habits and actions are practiced. With schoolchildren team games, computer games, and games with any other instruments guide the pupils' feelings in the direction of their learning conditions. A teacher who does not know a game, or does not respect it, cannot be in harmony with his/her pupils.
During adolescence the attraction to games becomes stronger, but the character of the games changes. Dramatic games that touch on problems and real-life questions, projects, emotional situations created through psycho-spiritual adventures, simulated and solved conflicts, lived situations, tensions reduced by humor... all these give the adolescent great joy and also valuable insight. Education for sustainable development includes among its pedagogical instruments an increased number of elements of games.
The ongoing human desire to play games throughout a lifetime on one hand, and, on the other hand, the serious challenges and questions of life and death each of us face support the method of playing games as a tool in the process of any learning concerned with the environment.

Simulation Games, Memory Games, Situation Games, Combined Games, Drama, and Role Play are the games most frequently used as learning methods for sustainable development.

The possibility of using games in various situations within the process of education for the environment:

Simulation games. Roles are selected from the elements of real systems (e.g. a tree, an ecosystem). The facilitator has the task to denote the system, which is going to be simulated (imitated) and to follow the way in which each part fits within the system. By a simulation game, **modelling** reality is accomplished. For instance, solving a conflict between two persons can be simulated through pantomime.

Situation games. These are organised based on real situations, and the roles are prepared by the participants (as actors). Most situation games have a script written beforehand, and the characters identify with the events.

The play goes on, it develops based on the participants' imagination. It does, however, have the disadvantage that it may, in the end, move away from reality. It is very important to choose a situation from the pupils' own environment, that it reflects an actual problem existing in the community, and is, therefore, a pertinent and "hot" topic. Such games develop the ability to make decisions, to negotiate, and to develop problem-solving and conflict-resolution skills; they help students acquire new knowledge. Learning activities through situation games become interesting because their aim is not to apply the acquired knowledge in practice, but to collect knowledge needed for solving problems. This type of learning is very interesting and efficient, enabling the knowledge to become more profoundly integrated.

Example:
In the locality of M. a conflict occurs in connection with the place of waste deposit. Using the method of making a newspaper report beforehand facilitates understanding the complex nature of the problem, as well as the multitude of interests presented by the various conflicted groups. When a problem actually exists in the local community it gives life to it, and the participants are stimulated and motivated, which is an important element from a methodological point of view. Choosing a "hot" subject is much more effective than any interesting, but artificially created situation. Much knowledge is needed in this particular activity about the soil, geology, weather conditions (e.g. wind direction), quantity of waste, composition of the waste, and sociological problems. Understanding and analysing all these elements is necessary in order to solve the problem and in this way the knowledge is integrated while working with the situation.

Memory games: For this game the ability to concentrate, to be disciplined and to persevere are necessary. Between 20-25 pupils/participants form a circle, and each participant tells his/her name together with a phrase connected to a formerly established subject. Each participant repeats what the participant before him/her said, then tells his/her name and the phrase s/he has chosen. The twentieth pupil/participant will have to repeat all the names/phrases enunciated by the nineteen before him/her, and finally add his/her own name and a phrase. Notions, such as ones acquired during a day's fieldwork or ones met during a day in a camp, are remembered and integrated more easily in this way.
Another alternative of the same game is obtained by making a slight change: a ball is randomly thrown around from one person to the next until it reaches all the participants. The throwing of the ball is then repeated so that the ball goes around in the same order as before. The participants can be stimulated by timing the period within which the ball reaches the last participant. The game develops participants' memory, mobility, and their dexterity in throwing/catching a ball.
Combined games: Based on field observations this form of game is used to intensify and deepen knowledge. During a field activity the pupils may come across a great number of new notions in one day. Each member of the group/class chooses one of the new notions. A classification criteria is chosen (e.g. classification of plants according to the habitat they belong to); at a signal all the pupils belonging to the same habitat, for instance "forest", crouch down; those belonging to "steppe" stand on one foot; and those belonging to "river" raise a hand. The pupils in the circle form a characteristic image of the respective area. A system is made up on the ground of the given criteria. The configuration of the pupils in the circle reflects the configuration of the analysed system. A similar game can be made up by with playing cards; the notions, species and names encountered in a day are put down on the cards (the species are drawn, and the notions are represented by symbols). After this the game can be played according to the rules of a card game. Different combinations of games can be invented. In certain countries engaging methods through which young people are encouraged to grow fond of their surrounding forests are quite common. Examples of such methods include: walking barefoot on leaves, looking at trees in a mirror placed under the nose while walking in the woods, careful observation of different noises, identification of plants through smell and with their eyes closed, and recognising flying birds.

Games based on the combination of senses: A pair, one blindfolded, the other leading the way, go to a tree blindfolded. They take their steps with care and attention so that the one being led can memorise the route. After s/he had touched, smelled and embraced the tree with both arms, the pupil is led back to the initial spot and the blindfold is removed. S/he now has to find the route and identify the tree.

Drama – a form of play

Drama can be considered both a method and an instrument, a model of organising the teaching/learning activity. Teaching through drama is a process of development in groups, by which individuals are stimulated through learning, making decisions in groups, and through continuous common evaluation. This way of learning and thinking is based on the theoretical finding that learning that takes place through an attitude of cooperating with others, greatly favours the development of cognitive capacities. This theoretical background is the social-cognitive theory elaborated by Bandura (1986), who defines learning as the result of specific complex dynamic interactions between various factors. The system of knowledge acquired using the possibilities of drama comprises information, the individual's experience, feelings, imagination, and attitudes.
In the classical pedagogical system, teaching and learning are mostly done through verbal communication, with actions being governed by rational laws. The knowledge communicated, "given" by the teacher, is not contested by the child. The teacher evaluates and critiques the final result, instead of the effort and work that goes into reaching the result.
Although teaching through drama is still the subject of many research studies, it is known that a pedagogy based on drama is built on the following conditions:

- it takes place after co-creating and developing favourable emotional conditions for the purpose of working collectively;
- children perceive a theme emotionally and become related to it by mobilising their personal experience(s);
- children generalise, make abstractions, draw conclusions, act, and check in with each other and the facilitator;
- the participants activate each other as partners; and
- the teacher participates, helps, and encourages with much care and love.

In conclusion, stress is not laid on the outcome, but on the learning process. There are different types of games using drama (also known under the name of role-play). The following types of role-play are examples of various kinds:

Collecting information – "The role of the expert": For example, a topic is formulated in the following way: "An action is being organised to save tropical forests. Within an hour you will meet the representatives of the companies, which are users of wood. How will you convince them that it is necessary to reduce the clearing of forests?"

Presentation of sketches: Carry out an interview as an newspaper reporter with the manager of a factory that produces toxic substances.

Games based on group interaction: The pupils are asked to write an article about an environmental problem, using a given number of words. Those pupils who choose an identical or similar problem will formulate an article together. In the end the articles are presented in front of the group. Some articles may later be published in a local newspaper.

Expressive games with drawings and collages: For example, the class is asked to represent how they imagine the environment across different stages of human history: one group does this for the prehistoric age, another for our era, and another for the possible future. A leader chosen from each group presents the papers of the respective group to everyone.

Improvisations – "slide evenings": Groups are asked to make up events fixed images, successive static images, and mimed images without specific rules.

Mimed improvisations of possible actions as a way to explore problem solving. Example: arriving at a national park pupils are asked to mime in groups the following:
1) What could we do here?

2) What should we do here? How can we protect this place?

Short games to initiate active attention to each other: E.g.: Pairs are formed. The pairs speak with each other and after a while, each member of the pair introduces him/herself to the group as if s/he were the pair. Exploring situations through drama offers the possibility to perform splendidly moving activities, which have a lasting effect on the participants.

3. Case Study

A case study consists of analysing and debating a "case", a particular situation, which is occurring or has occurred in the environment. The case study must be prepared beforehand, which requires quite a bit of work: relevant cases need be found and selected from the multitude of cases offered by reality. Also, a particular environment in an area needs to be specified. This method enables the training/teaching process to be much closer to real life, to everyday practice, and to study a typical situation from several points of view and to find multiple solutions for some of the problems. It helps develop decision-making capacity, the ability to examine situations and phenomena critically, and to anticipate the evolution of certain events. The pupil/student, having been stimulated to find the best solutions, is challenged to participate actively in the solution of the problem while being confronted with the opinions of others, and s/he will have to compare his/her opinions with those of others.

Following the oral or written presentation of the case, the teacher will facilitate discussions by presenting as many possible solutions as s/he can, but without trying to anticipate the solutions or to influence the opinions of the participants. The teacher is not the "wise, omniscient" person; rather, s/he has become the facilitator of the process, s/he asks exploratory questions, makes connections between different opinions, and appreciates the contributions of each participant.

The presentation of the case is followed by a period in which the necessary information is collected (through asking colleagues or the teacher questions, from, field documentation, or documentation from newspapers or other printed material). After systematising and analysing the situation, various possible solutions are decided upon. These are further discussed and challenged, and the best solution of all is proposed.
Various situations may occur: the facilitator may find, for example, that there are no correct answers, or s/he may find that there is no significant evaluation of the facts, either because additional information is needed, or because there simply is no perfect solution A decision, however, has to be made. The exchange of information among the participants helps them better perceive, receive and adapt to varying orientations, and new points of view, which they had never even considered at the onset. As the case study progresses new relationships develop among the participants, and between the participants and the facilitator. It often happens that the pupils/students, who were initially reluctant to take part in the discussions, end up becoming actively involved. If at a certain point the discussions spread in too many directions, the many ideas can be put down on sheets of paper and stuck on the wall, the blackboard or any other visible site, so that they can be taken up again later.
In the end the facilitator (teacher) reflects and summarises the way in which the group members participated in the activity. S/he also comments on how they succeeded in intervening, in formulating their own ideas and reaching a point of actually taking a decision. It is possible that the final accepted solution will not be arrived at with the consent of all the participants. The selected case must be thoroughly analysed beforehand so that no crucial data for understanding the situation is left out. Also, the case must involve a problem situation for which a solution needs to be figured out and decided upon. And finally, the case must be based on a real situation

When a decision is made about the change of use of a piece of land it will affect a great number of people who it may seem often have no connection with that location. Today' pupils – tomorrow's citizens – need to get acquainted with the process of planning. They need to learn about the kinds of conflict that can occur in connection with the use of specific pieces of land, and how these can be solved. The following activity will give the pupils the opportunity to develop a proposed solution to a conflict connected with the use of a particular piece of land.

The use of a piece of land for a particular purpose may affect citizens where they live, work, or in other ways. In town planning the long-term needs of the community, as well as the rights of landowners and the future development of the population have to be considered. Well thought-out plans reflect the aim, objectives and policy of a community's overall development. There are usually areas where certain activities are restricted. In some areas there are parks, in another a business area is located, and again others are residential areas. Usually it is the community that decides about the use of land, and also about the guidelines and regulations to solve and conflicts that may occur in connection with the use of any particular piece of land. Three models are known for making decisions in such cases: the authoritative model, the legislative model, and the consensual model. The meaning of each of these is explained in the following. For instance, in the authoritative model, the authority as the town council is informed about the existence of a problem, usually due to public input, and several possible solutions are looked at and analysed. The authority collects information about alternative solutions and possible consequences, and then implements what it perceives as the best solution.

Description of a case

A file describing the case is made and presented to the pupils.

Mr. Smith owns the piece of land in question. He wants to sell cars, to cut down an oak tree, and does not want to plant any trees on his piece of land.
The Neighbours do not want the oak tree cut down, and they also don't want cars sold right beneath their noses.
The Local Council wishes to have trees along the road and to respect the town planning.
The "RHODODENDRON" Group wishes to save the oak tree as a monument of nature.

One pupil's file: "The Dilemma of the Oak Tree – a Monument of Nature"
(an imagined example)

Mr. Alexander Smith has become the owner of a house lot in the centre of town. He has recently obtained some more money and wishes to open an agency for selling luxury motorcars. He has asked the council for approval to build a small office, and he wishes to exhibit the cars in the open. Mr.Smith is convinced that this central site will attract customers. In the middle of the lot there is a huge oak tree that is over 150 years old. The oak tree would have to get cut down because falling leaves and branches might endanger the cars being exhibited in front of the sales office. According to town planning, car sales are forbidden in the area where the house lot is located. Also, according to a recent decision by the Local Council, a tree will be planted every six metres along the side of the road in that particular area in order to provide shade and fresh air in the town centre.
Mr. Smith is against the planting of trees in the area where his lot is, since his lot is 42m long, and this would mean the planting of seven trees, which would endanger the cars around his sales office.
The neighbouring residents are against the car business because they are concerned about the noise. They like the green area with the oak tree and don't want it cut down.
"RHODODENDRON", the local group for the protection of the environment, is determined to protect the oak tree as a monument of nature. It puts great effort into convincing the Local Council that this living piece of history, the oak tree – a veritable monument of nature – as well as the land around the tree (to ensure that its roots are protected) remain untouched. The "green" group supports the decision to plant trees in the town centre.

Stages:

- The pupils are asked how a decision will be made if their wish differs from that of their friends. A list of their answers is written on the blackboard (e.g. by drawing of lots, voting, someone is asked to decide, a compromise is reached, or any other ideas they come up with). After the various modalities of making decisions have been explained, the pupils are asked to pay great attention since their next task is to simulate a group of citizens, for example, for the authoritative model. The "Groups of Citizens" will present various solutions, and the "Local Council" will "vote" on the final decision.

- The files are distributed to the pupils, and each pupil reads the case.
- The pupils are asked to reflect upon possible solutions. Questions such as, "What parties are in conflict?" "What does each one want?" The wishes of the two conflicting sides are written down. Further questions, like, "Can they think of any alternatives?" "Is it possible for the parties to come to a shared understanding? are also explored.
- The class is divided into groups of 4-5 pupils, lots are drawn for the roles each group will take on. The groups are given paper and pens and are asked to write down their ideas and suggestions for a solution to the presented situation. They have 20 minutes to do this, and are told that two from each group will then present for two minutes each in front of the "Council" on the solution they came up with.
- After 10 minutes of work one representative from each group is chosen to form the group called the "Local Council". This group withdraws and are given the task to listen to the solutions proposed by each group. First, however, they have to decide what their criteria will be as they make a decision in adopting one solution over the others (e.g. to agree with the residents, to protect the environment, or to observe the law).
- Five minutes before the end of the time given to finishing the proposals, the pupils are told that they have five minutes left to complete their task.
- The council is then called in front of the class and listens to the proposal of each group. A volunteer ensures that each "presenter" stays within the two-minute timeframe).
- After each group has presented their proposed solution(s), the council convenes for five minutes to come to a final decision. In the meantime the others discuss and brainstorm on the criteria they suppose the council previously adopted for making their decision.
- The council returns and reports its decision.
- The following items are discussed among the various groups: Do they agree with the decision? If yes, why? If no, why? What criteria did the council choose? Do the other groups agree with these criteria? What would each pupil have changed in the decision-making process? Have they ever encountered similar situations in real life? Do they know how are certain restricted areas in towns are formed in regards to construction?

4. Group Activities

With the term "group activities" (or group work) activities performed in small groups of two to seven participants is meant. Group activities encourage pupils to participate and to learn from each other. Certain tasks are divided among the members of the groups. This encourages those who are hesitant to speak in front of the whole class (or a larger group of pupils) to participate and engage more fully. The work in small groups is planned carefully, with clear articulation of what is to be accomplished, in how much time, and how the work of each group will benefit the whole class.

Suggestions for this type of activity:

- The groups should know exactly what is expected from them (e.g. to formulate a definition, to draw up a letter or an article, to develop a plan for an experiment, etc.). It is best to write up the task for them so that they know exactly what they need to do.
- They should know how much time they have for the task so that they can organise their time. It is better not to give them too much time, as some of them could get bored.
- The groups can be made up of two, three or more persons. The ideal number of members depends on the nature of the task, on the timeframe and place where these tasks are carried out (classroom, laboratory or field). Usually it is best to work with a minimum number of persons in a group; best cooperation is obtained with no more than five members. The formation of a group is up to the person who guides the activity. The structure of the group may vary from one activity to another.

In this way learning is the result of cooperation among the members of a group.

Observation of the group: during an activity it is important that we answer any questions that arise and, if needed, help the pupils clarify certain tasks. If they deviate from the subject, they should be reoriented. The facilitator observes who is working and who is standing by. At a given moment s/he can remind them how much time is left to finish the task. Working with group formations the same results can be obtained as with a whole class or a larger group. The advantage of a small group is that the individual contribution of each group member is encouraged.

- How can the facilitator ensure that each member will first think for him/herself, then in pairs or as a whole group? A question is posed, and the pupils are left to think about the answer individually. Following this, each will share their response with someone else. A discussion within the smaller group or with the whole class ensues.
- Exercise to stimulate attention: The group is asked a question and each pupil answers in turn; each speaker has to repeat briefly the answer given by the previous speaker, followed by the answer formulated by him/herself.
- Each group has to prepare lists according to various criteria, like: advantages, disadvantages, similarities, differences, etc. When the lists are presented before the class, the groups are asked to choose only the most important elements on their lists.
- Observing the rule of gradual development: certain skills can be practiced gradually, step-by-step. The groups may be asked to carry out a task and then move on to another task to practise the respective skills at a more complex level.

Analysis of group work: before a group project begins, the way in which the results of each group will be used is kept in mind. Modalities of processing the results:

- The results are put down on a large sheet of paper, which is attached to the blackboard and presented to the other groups.
- The conclusions are transferred onto a poster. The posters are displayed in the classroom; each pupil reads the posters, after which they are discussed with the whole class. Some aspect from the work of each group will be emphasised.
- Groups discuss the conclusions (more than one room is needed).

Group work is used in both classroom and field activities.

5. Nature trails/ nature experience trails

Nature trails (NT), also called nature experience trails, are called "Naturlehrpfad" in German, "sentier didactique" in French, "naturleerphad" in Dutch, and "tanösvény" in Hungarian. NT encourages sensitisation through the development of deepening knowledge of certain areas from the point of view of their natural characteristics or their cultural history, for a large spectrum of target groups (Kiss, 1999). A nature trail is an area/place endowed with trail markings, which offer visitors orientation, as well as the possibility of sensitisation and getting acquainted with the special characteristics of the area, the values of the natural environment, and/or the characteristic elements of the history, culture and human civilization in that particular area.

What are the main characteristics of NT? What are the educational possibilities they offer? How are these NT realised? Developing and using nature trails is a modality of integrating the values of nature into the educational process concerned with the environment.

Nature trails, according to educational experiences in England, Germany and Hungary, are trails marked similarly to tourist trails that are easy to reach, and which usually offer, in addition to the emotional effect of the surprise of discovery, identification of sometimes less well-known, unsuspected values of the natural or human-made environment through direct contact, through impressions, information and new knowledge about the specific character of the area.

NT have a special role in developing "local patriotism" for an area, and at the same time they can offer those who walk the trails a deeper understanding of the connections with the global challenges we face on our planet. They

are realised by local authorities, non-governmental organisations, private or state companies (independently or in partnership), whose activities include the protection of the environment and education for sustainable development.
The length of existing nature trails generally varies between 800m and 8km, and the time to cover them usually varies between one hour and a whole day (8-10 hours). In addition to the NT in the Piatra Craiului Mountains, there are now several other nature trails in Romania; most of them are managed by non-governmental organisations.

Characteristics of a Nature Trail:
- A natural trail has a place that functions as the access point to the trail, a central panel, generally large in size, comprising general information, a map of the whole trail, the estimated time to cover it, and practical advice for visitors.
- The markings are similar to tourist markings and are meant to offer orientation and make walking the trail easy.
- In addition to the markings, panels are set on the trail to explain elements that are characteristic to the area. These panels offer insight into specific elements met on the trail with the aid of maps, photos, sketches, and explanatory texts. In cases where there are no such panels, the visitor is given a brochure containing information about what s/he can learn by covering the nature trail. This information refers to those areas where a numbered pole, easy to identify, is placed. If the NT is part of a learning activity regarding the environment for school classes, a brochure can be made in the form of a workbook by the teacher, who knows the essential interests of the group, and the objectives s/he wishes to accomplish by using the NT. Such a workbook can be based on the guide elaborated by those who developed the NT. Workbooks or work files elaborated by a teacher or by the authority which manages the NT may have an interactive character and may be used for the evaluation of the pupils' progress as they cover the NT. (Evaluation in this context does not necessarily mean giving a mark to the pupils/students, but the assessment of the progress they are making.)

Subjects frequently used in nature trails:
- geo-morphological formations, mines, ores, different types of soil;
- hydrological elements: springs, streams, lakes;
- specific plants, animals, living organisms, interdependences within natural systems;
- important values regarding the history of human culture; and
- connections among natural factors in the evolution of natural systems and the interventions of humans and their consequences, etc.

Along most NT the subjects mentioned above are combined, as in real life, as they result from the character of the environment in the area of the NT.

Two nature trails are described below as examples:

1.The nature trail marked and administered by the North-West Water Company in Great Britain, called the "Woodsfold Experience" is conceived for pupils between 4 and 11 years of age (age corresponding to primary school in England). The use of the trail is free; a visit just has to be announced and an appointment made by phone. One can start going through the trail at any point along its course. In this way, the trail can be used by several different age groups at the same time. The time to cover the trail will vary according to the stops chosen by the teacher for the objective s/he has in mind for the group/class.

An interactive workbook prepared for field activities comprises the following: description of the areas with sketches, photos, explanatory texts, description of the equipment to be used during field activities, and directions regarding possible activities while visiting the trail. Each stop is described in the following way: identification of the chapters in the curriculum with which the activities on the trail are connected; possible themes to have in view; and sub-chapters, such as discussion ideas (what questions to ask pupils), what practical investigations can be made in the area, and how observations made during the field activities can be used upon return to the classroom.

The trail could comprises e.g: (1) waterfall with lake – for the study of living beings, (2) natural lake, (3) area with wild flowers, (4) tree plantation, (5) clearing for group resting place, (6) river area with a model of a mill with water turbine, (7) wood building with narrow lateral openings (which serves as a hiding place for the pupils as they watch living beings near the observation point), (8) a rocky area, (9) workshop for wood processing, and (10) playground near the classroom or study area.

The groups accompanied by a teacher can use the interactive workbook (which not only informs, but also requires field research), as well as the equipment offered, which is necessary for certain practical field activities like the study of water quality or plant classifiers, etc. At Woodsfold the proposed activities are inspired by requirements from the National Curricula for sciences, geography, art, technology, and English.

2. The nature trail called "Lilies of the Valley", marked and administered by the Joined Stock Company for Studies of Forestry at Sopron, Hungary (Szabo, 1997) is located near the town Sopron. It can be visited from May through October, and there are buses from the town. The authors and administrators of this trail are specialists in forestry and offer information for exploring the area from the point of view of natural resources. The trail can be used by teachers for explorative field, as well as by visitors, and the public.

The names of the eight stops with information panels are chosen from among the elements specific for the area: (1) Quercetum Petraeae-Cerris; (2) Euphorbio-quercetum; (3) Cleistogeni-Festucetum Rupicolae; (4) Area of the Kecske Tower (15m high); (5) Querco- Petraeae Carpinatum; (6) Pinus Nigra; (7) Steppe Clearing with Anemone (pulsatilla); and (8) Protection for Amphibians and Reptiles.
The length of the trail is about 3.5km, and it takes about 1-1.5 hours to cover the whole distance. The distance between the first five panels is about 800m. The trail has information panels at all the eight stops, which contribute to a more thorough knowledge of the flora and fauna of the area, as well of the consequences of human presence in the area.
Each panel briefly describes a tree, a shrub, a bird or other living being in the area, several plants that can be classified through more attentive analysis by those who are interested in getting to know the area better. The panels also have colour photos of those species, which can be identified along the trail. The guidebook contains information about how the area was formed, about its geological characteristics, hydrological data, the local climate, characteristics of the soil, the contents of the information panels about the fauna and flora of the region, and other. The guidebook can serve as an information base for teachers to make up files and workbooks for their students.

6. Organisational Forms and Modalities of Education for Sustainable Development through Field Activities

Although we distinguish between thematic trips, thematic days, thematic weeks, field studies, field practice, and field school, field activities may vary and are not always easy to differentiate from each other. As part of field activities, for example, thematic trips can take place, in which both field studies and field practice are done. Field school offers several possibilities for short thematic trips, field studies, learning or research projects, field practice, and so on.

- **Thematic trips:** The aim of thematic trips is to get acquainted with areas near to, or farther from the school, to discover important places and persons, interesting aspects of the places, which become important through personal experience. The pupils may be given tasks: to make a brief presentation of their impressions under one form or another; the presentations will be about a subject chosen by them or previously communicated. The tasks may be useful for practicing certain techniques of expressing, for practicing group activities (the duration may be one or several days).
- Thematic days, thematic weeks: An activity (generally prepared for parallel classes) is organised around one theme or issue. These activities can take place in the school building (if it is a local theme or issue, or a school-related one) or in other locations, such as the schoolyard, the school garden, in the school district, or in

any other part of the city/locality or other towns/regions. Thematic days and thematic weeks may conclude with an exhibition of an object or other accomplishments by the pupils in connection with the respective theme. Thematic days are a good opportunity for interdisciplinary and multidisciplinary activities, enabling the organisation of contests on various themes. Within thematic days/weeks, the project method is also successfully used.

- **Field studies, field practice:**
  In field activities, instead of knowledge being taught, the pupil finds him/herself facing reality. Students encounter environmental problems through their own experience, and this stimulate them to develop an active attitude of exploring of their environment, which changes their attitude toward learning. Field practice works really well as an educational approach to develop the following skills: ones related to measuring, recognition of certain phenomena, practicing species identification, determining the characteristics of water and soil, measurements in connection with weather conditions, and practicing various methods for obtaining information.
  Field studies often resemble thematic trips, except that they offer something more. Whether they take place via a visit to a water-cleaning station, a national park, or a locality, they are extremely useful for environmental education, because activities for the study of the environment are added to mere impressions. At any age humans learn more and easier through experience, when we can see something for our selves, or discuss a matter with others. Personal experience can not be substituted by anything: it is a crucial component to sensitise pupils/trainees, to acquire knowledge about the environment, as well as to develop skills, values, attitudes and the capacity to act in favour of the environment.
  Field studies take place outside the school building or schoolyard in a natural environment. They can also take place in the precincts of the school if an internal school problem becomes the focus of the study and thus the school is transformed into the "field" for the activities. Field studies are generally organised in a different place than where lessons usually take place (the aim being that pupils learn in a locality that is best suited to the topic at hand).
  Learning is thus based on direct knowledge and experience of a particular content. Field studies can take place within thematic trips and be embellished by field practice or research, or under the form of some work project, such as cleaning the surroundings of a spring, making bird houses, or selective collection of waste. Such actions also have the power to form and consolidate a community. Motivation provided by some concrete environmental problem around human settlements can be put to good use by means of a thematic day or week dedicated to that subject. This is especially the case with organising training and education in regards to the environment. The content of a field activity may be connected to the history of a place, its geography, the aesthetics of a building, or any environmental problem in a specific location.
  The methods used in field studies as well as how the pupils are organised may vary; it is recommended, however, that teaching is generally based on projects and activities that take place in small groups.

Field studies formed the basis for activities that were part of an experiment that took place in Cluj-Napoca with groups of pupils from secondary schools and high schools under the name of "Prietenii Somesului - Friends of the Somes River" (Tóth, 1997).

Aim of the activities:
- to develop interest, abilities, knowledge and skills needed by future citizens to maintain the quality of the water in rivers; and
- an attempt to integrate the following subject matters into education and to bring school closer to the problems of everyday life: physics, chemistry, biology, geography, native language, foreign languages, computer science, ecology, and drawing.

Contents of the activities: the pupils are taken to a river bank and are asked to observe in turn various aspects of the area from as many points of view as possible. They can make observations from the point of view of the aesthetics of the area, from a geographical point of view, or from the point of view of which human activities are taking place in the area. The pupils measure and determine certain physical and chemical characteristics in regards to the water quality, and make biological observations about all the living beings in the water.

Ways of organising the activities:
- Work meetings for the group leaders
- Activities with pupils in each school (groups of 5-20 pupils) during the school year
- Common activities, at least twice during a school year, in which the leader and four or five representatives of each group take part. These meetings can be documented, and made more attractive and varied by the group leaders, teachers from different subject areas (biology, chemistry, physics, geography or other), or by guests and experts who are invited to the activities. Such joint activities provide:
  - opportunities for improvement by using structured observation ;
  - exchange of experience between the groups, and developing the ability to communicate with other participants; and
  - a common framework for deciding upon future actions and activities.

Duration of the activities: from two hours to one full day. There is also the possibility to organise a one-week camp that focuses on this subject.

Stages of the activities:
- arousing enthusiasm – stimulating the group to begin an activity;
- capturing attention by concentrating on certain perceptible aspects previously unknown by the participants;
- discussions among the participants, exchanging impressions about the new pieces of knowledge acquired during the activities; and
- individual actions by participants or small groups of participants in relation to the acquired knowledge.

Actions to protect the environment: field studies have the distinctive quality of involving pupils in the solution of real environmental problems. The pupils may initiate, collaborate in, and even complete certain actions, such as planting trees, creating green areas, or taking care of animals. Cleaning streets in certain urban areas that are not being managed by the residents themselves is not the job of the students. The pupils are responsible for their own actions, and it is good and important to develop their sense of responsibility to care for the environment, but they are not expected to clean up after others. The educational practice undertaken by many teachers and their students to organise vast actions of cleaning up certain areas, shortly afterward ended up looking the same as before the action. Thus it became clear that such actions do not attain their intended goal.

School in the field:
In various European educational systems (England, Holland, and Hungary) schools have the opportunity to organise activities outside the school, in another locality, during their half-yearly programme for a period of one day, several days or a week, thereby breaking up the habitual structure of the classical succession of lessons in a classroom.

Characteristics of a school's field programme:
- It is a constitutive part of the compulsory programme that lasts several days during the school year in order to realise certain contents prescribed by the curriculum.
- The subject of learning is the natural, constructed and/or socio-cultural environment of the area where the progamme takes place.
- It is founded on actions by the pupils in which they actively participate, and thus contributes to the development of the pupils' personalities.
- The acquiring of knowledge is obtained on the ground of learning techniques based on cooperation, working within a particular project method.
- The study is connected with the location, in which it takes place, and there is an organic connection between "the subject matter" covered at that place and the development of the pupils' abilities, and their personality development.
- Simultaneously the study ensures the development of small communities.
- In contrast with teaching/learning centered on notions, special emphasis is laid on the sensual side of learning.

School in the field **is a way of organising learning, not a new** learning/teaching method. It may be considered an environmental field study. Personal confrontation with real situations forms an active exploratory attitude, which changes the pupils' traditional relationship with learning.

Aim of a school in the field (field school) may be:

- to improve knowledge in the field of natural sciences, social sciences, arts, technical cultures, or sports; the activity is based on the fulfillment of requirements in several domains;
- to develop some abilities of movement, working with one's senses, communication, intellectual abilities, and attitudes;
- to activate motivation that is centered around activities designed to acquire knowledge, creativity, self-expression, environmental improvement, development of human relationships, and others.

The place where a field school is organised may be in nature or a settlement, town or village ideal from the point of view of cultural history which can be studied by the pupils, or it could take place in an industrial, agricultural, or social setting, or any other environment that would support the project aim.
Learning begins with the environment with which the pupils come into direct contact and is founded on direct experience during the progress of the field school. In the present usage we distinguish between two modalities of realising school in the field:

A. Field school based on units of distinct subjects:

- In this case the activity of learning a subject is continued, but in different conditions; knowledge acquisition is complemented by direct contact and experience in the field. Using time more liberally than in the classroom, the length of a learning unit may vary according to the interests manifested by the pupils.
- A single subject is focused on, but this is done intensively. For example, only biology or only English is learnt, but the subject is connected to the field, to the place where it is taking place.
- This approach emphasises the development of specific skills. It may contribute to developing the ability to observe and analyse, the ability to orient oneself in the field, and it may also be a means of improving the ability to communicate, to dramatise, etc.

B. Field school based on units of complex subjects:
Autumn, the forest, life in a village or other wider subject matters facilitate a complex study in which the geography, sciences, technology, social sciences, languages and arts are blended, and each subject matter offers its particular point of view to the study. The activities are concentrated around the same overarchings topic, which is dealt with from the different perspectives of the various subject matters.
The curriculum of a field school integrates lessons into the development of competencies such as the ability to observe, to make abstractions, to form new notions, or the ability of orientation in space. In such a case, the field school curriculum does not emphasise the acquisition of new knowledge, rather and exclusively the actual practice and experiential dimension of learning; focus is on those actions that apply existing knowledge. Emphasis is also placed on the process through which pupils have to solve tasks that they sometimes choose themselves from a wide range of possibilities offered by the field. Learning is best integrated through educational projects or research projects accomplished by groups or individually (in the higher grades).
Field school makes school more human; it challenges teachers to reconsider their methods, which need reconsideration anyway in the era of the Internet.

7. Utilisation of computer-assisted learning, participation in international networks

The emergence of computers in education has been met with both favor and resistance. Today the dispute is pretty much over, the winners being those who voted in favour of computers.

International educational networks, which are still developing, are a valuable means in the education for sustainable development. The number of such networks is still increasing. The aim and hope is that one day, in the not too far-away future, the network of Carpathian schools will enrich the list of already well-functioning networks.

Two of the main important networks from the beginning of the nineties are:

"Science across the World" http://www.sciencescross.org
GLOBE Project, http://www.globe.org.uk/news/index.htm.

The project "Partnership and Participation for Sustainable Future" SUPPORT 2007-2010

Aim
Promotion and improvement of the quality of education for sustainable development via communication among schools, research institutes and the community through a web network. SUPPORT aims to increase the number of those engaged in the study of sciences; it works towards making the study of sciences more attractive by promoting initiative, an innovatory spirit, and the quality of being enterprising by encouraging and sustaining a creative atmosphere and sense of responsibility in school.

Activities:
Materials and activities are created and offered on computers to facilitate experimentation and participatory learning. Thus, the pupils are stimulated and supported in developing critical thinking capacities about their role in the creation of a sustainable future. Through the acquired knowledge, skills, values and understanding of complex subjects they will continue to learn all their lives, becoming active citizens capable of assuming responsibilities and initiative.
SUPPORT will generate and spread knowledge about four main ways of improving education for sustainable development:
- collaboration between schools
- collaboration between schools and the local community
- collaboration between schools and research institutes
- innovatory collaborations facilitated by computers

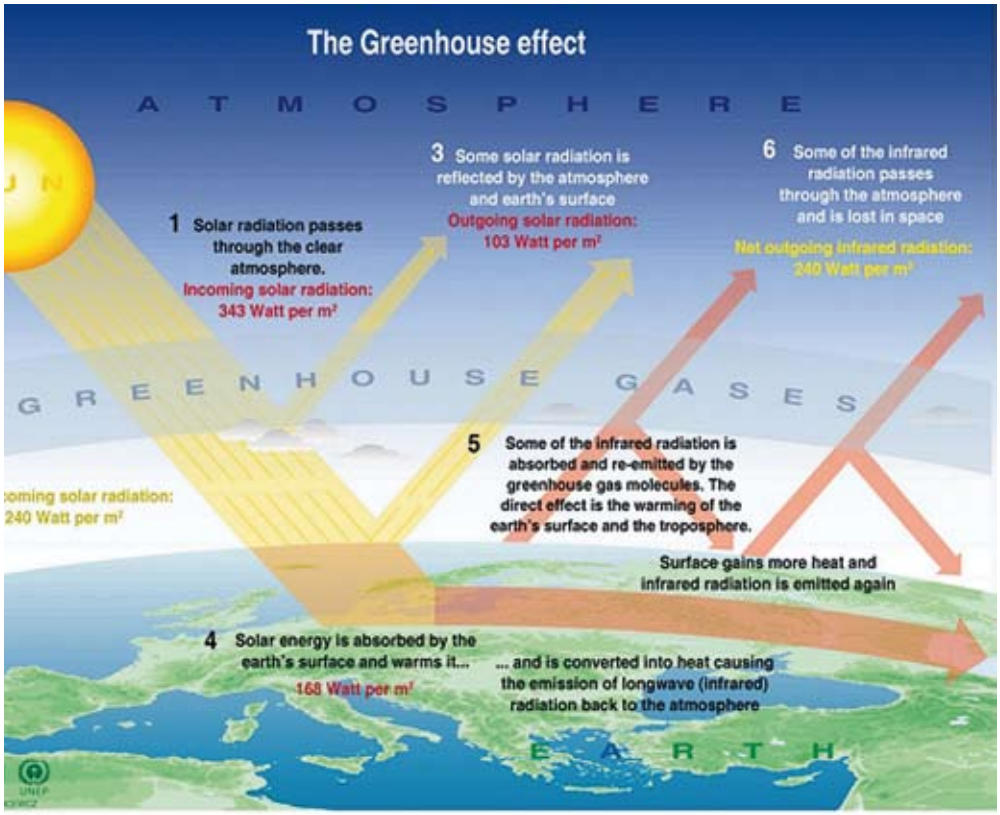
The participants will meet at several events and in this way interact, co-operate, and exchange good practices. The events comprise: thematic conferences, workshops Comenius contact seminars, study visits, a campaign for the climate on the web Co2nnect in March 2009 (www.Co2nnect.org), and other.

Expected results:
SUPPORT activities will result in the following:
- trans-national comparative studies
- guidebook for collaborative activities between schools, research institutes and the local community
- reports about the activities and results of the network
- innovatory didactic materials and pedagogical approaches
- development of the present website www.sustain.no
- quality criteria for the use of computers in EDD
- web page for the SUPPORT network: www.support-edu.org

2. Climate Change

What is Climate Change?

Our climate is mainly influenced by the sun and the earth's atmosphere. The gasses forming our atmosphere allow solar radiation to pass towards the earth, but prevent the heat reflected by the earth's surface to go back into space. This natural process that keeps the earth's surface warm is called "the greenhouse effect".

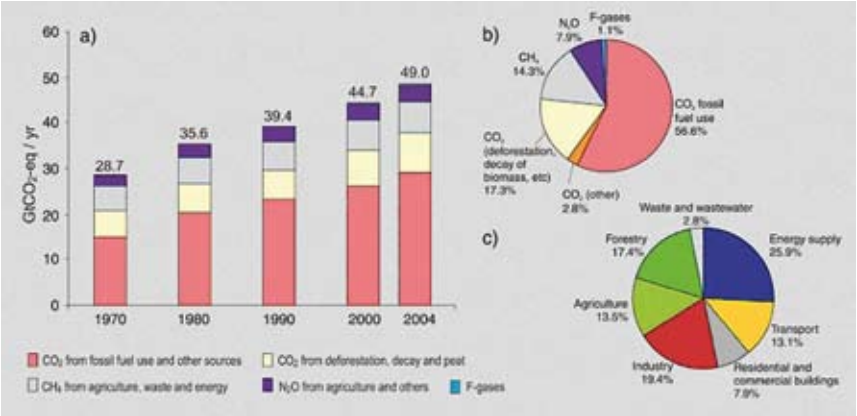


an university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), ate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, Cambridge university press, 1996.

The gasses that generate the greenhouse effect – mainly carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_x) and water vapours – are called greenhouse gasses (GHG). They remain in the atmosphere for a long time (carbon dioxide for about 100 years, methane for 10-12 years, and nitrous oxide for 114 years).

There is now a global consensus on the fact that humans are responsible for accelerated climate change. Human society has been producing high levels of GHG ever since the industrial revolution in the nineteenth century.

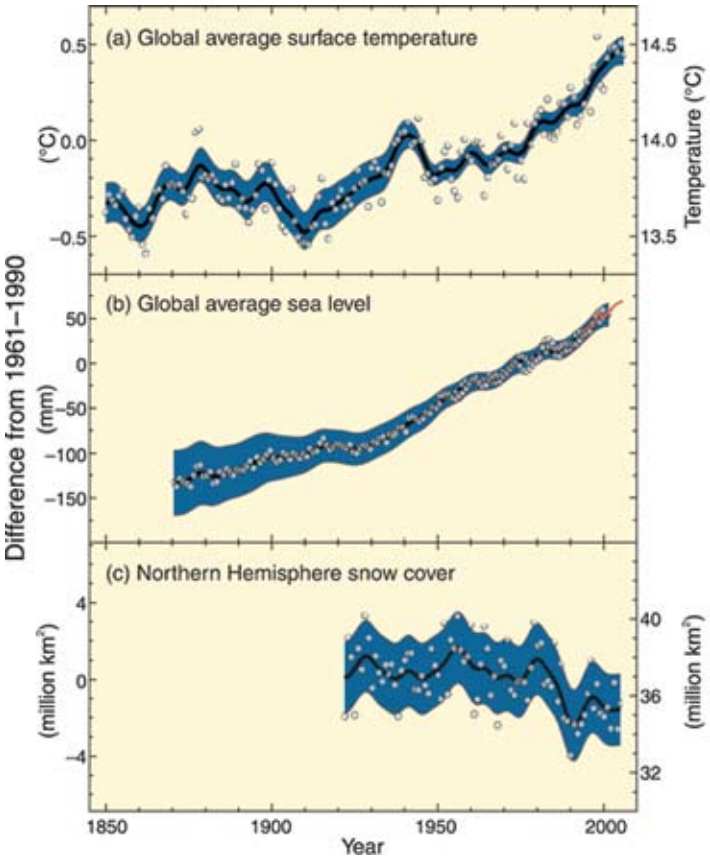
Our past and current emissions mainly come from:
- burning fossil fuels to produce energy and using energy inefficiently;
- transport;
- deforestation;
- intensive agriculture and animal breeding; and
- the deposit of waste.



Source: Intergovernmental Panel on Climate Change, 4th Assessment Report, Synthesis report, Figure 2-1: (a) Global annual emissions of anthropogenic GHGs from 1970 to 2004, (b) Share of different anthropogenic GHGs in total emissions in 2004 in terms of CO2-eq., and (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO2-eq. (forestry includes deforestation).

According to the 4th Assessment Report by the Intergovernmental Panel on Climate Change, using data up to 2004, the global temperature already increased by 0.75 degrees Celsius since the XIXth century [43] and continues to grow at an alarming rate.

What are the effects of climate change? Many of them are already becoming visible and tangible: changes in precipitation patterns, extreme meteorological events (heavy rains and floods, droughts, tornadoes, hurricanes etc.), rising sea levels, etc. All of this is affecting economic activity (industry, agriculture, transport etc.) and people (loss of human lives, health risks, migration and war related to the availability of food and resources).



Source: Intergovernmental Panel on Climate Change, 4th Assessment Report, Synthesis Report, Figure 1.1. Observed changes in (a) global average surface temperature; (b) global average sea level from tide gauge (blue) and satellite (red) data; and (c) Northern Hemisphere snow cover for March-April. All differences are relative to corresponding averages for the period 1961-1990. Smoothed curves represent decadal averaged values, while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties (a and b) and from the time series (c).

43 Intergovernmental Panel on Climate Change, Climate Change 2007 Synthesis Report, p. 30.

Further Climate Change Resources:

United Nations Framework Convention on Climate Change: www.unfccc.org

COP 15: United Nations Conference on Climate Change: http://en.cop15.dk/

Intergovernmental Panel on Climate Change: www.ipcc.ch

European Environmental Protection Agency: www.eea.europa.eu

European Commission, DG Environment: www.europa.eu

Climate Action Network Europe: www.climnet.org

Greenpeace International: www.greenpeace.org

WWF International: www.panda.org

The Heinrich Boell Foundation: www.boell.org

World Meteorological Organisation: http://www.wmo.int

3. Annotated further references

The aim of this Tool Kit is to raise the awareness of environmental education resources and possibilities in the Carpathians. We hope that using this Tool Kit encourages educators in the Carpathians to integrate more environmental education activities into their teaching practices. This toolkit is by no means comprehensive, which is why we have included below some of the most important and useful international resources for environmental educators, many focused on the Carpathians. These can help teachers take next steps in the development of their own environmental educational teaching practices.

"World of Carpathians" – Handbook for Environmental Education of the Carpathian EcoRegion Initiative:
The Carpathian EcoRegion Initiative (CERI) is a unique international coalition of NGOs and research institutes working towards a common vision for conservation and sustainable development in the Carpathians.
http://www.carpates.org/
In December 2009 CERI produced a publication "World of Carpathians" – Handbook for Environmental Education, which focuses on building awareness and promoting Carpathian mountain curricula, specifically in the field of Biodiversity, throughout the region. The project supports the preparation of methodical teaching materials for teachers and other educators, and information for the public and is a recommended addition to several chapters of the Tool Kit, namely: Water, Biodiversity (including, among all, a variety of exercises focused on lichens) and Cultural Heritage.
More information on this project is available at: www.daphne.sk/dbu-project08

Best environmental education practices from ALPARC:
ALPARC is the Alpine Network of Protected Areas and has published a best practices in environmental education in mountain areas, based on a collection of best practices and experiences in protected alpine areas. It is regularly updated with new experiences and insights. The collection of best practices is available at:
http://www.alparc.org/resources/the-resources-library/communication-education/education-and-environmental-awareness-raising/best-practices-in-environmental-education-in-mountain-areas

Carpathian Convention:
The web site of the Carpathian Convention is a comprehensive information portal on sustainable development issues, partnerships and initiatives throughout the Carpathian region.The web site also contains information about related projects and publications. Among them, the Carpathian Environmental Outlook is a great resource of relatively recent environmental data, including a collection of maps, a selection of which is also included into this Tool Kit. In addition, a recently completed **Carpathian Project** resulted in a compilation and analyses of recent data on various aspects of protection and sustainable development, including the Carpathian Atlas (available online on the project website - below).
http://www.carpathianconvention.org/documents.htm
http://www.carpathianproject.eu/portal/

Quality Criteria for ESD-Schools:
This publication by the Environmental and School Initiatives Network (ENSI) targets schools and educational authorities engaged in Education for Sustainable Development (ESD). It presents a proposal for a non-exhaustive list of 'quality criteria' to be used as a starting point for reflections, debates and further development in regards to future work on ESD. The publication is available in more than thirteen languages at:
http://www.ensi.org/Publications/ENSI_publications/

Tools for ESD-schools:
This booklet by the Environmental and School Initiatives Network (ENSI) is intended to serve as a guide for teachers involved in school partnerships and school networks that are considering the use of exchange and dialogue amongst schools for school development through Environmental Education. It offers methods to investigate classroom issues that may pose particular concerns in regards to running a project on Education for Sustainable Development and international partnerships.
http://www.ensi.org/Publications/media/downloads/195/Tools%20for%20ESD-Schools.pdf

Central and Eastern European Citizens Network:
This network was created to provide opportunities for grassroots citizens' initiatives from the CEE region to learn, exchange experiences and ideas, as well as to enhance their organisational growth through establishing and managing a collaborative relationship among themselves.
http://ceecn.net/

Co2nnect Project: CO2 on the way to school:
The CO2nnect „CO2 on the way to school" project provides schools with activities that can be adapted to various age groups. It is designed to provide pupils with skills, attitudes and awareness, as well as knowledge and understanding of climate change and energy issues.
http://www.co2nnect.org/

The CO2nnect contact in Romania is the Move4Nature partner organisation HERO, Cluj - Napoca:
http://herocluj.ro/lista.aspx?t=Informatii-Co2nnect

Green Pack:
Green Pack is a multi-media environmental education curriculum kit to teach children about environmental protection and sustainable development. It was developed by the Regional Environmental Centre for Central and Eastern Europe. The Green Pack is primarily intended for European primary school teachers and their students. More information about Green pack and an on-line version of Green Pack are available at:
http://www.rec.org/REC/Programs/Greenpack/

Danube Box:
Danube box is an inspiring, informative and exciting teaching material. It is a comprehensive educational tool about the Danube for teachers and educators working with children between ages 9 and 12. The Danube Box was developed within the framework of the „Green Danube Partnership" between The Coca-Cola Company, Coca-Cola Hellenic, and the International Commission for the Protection of the Danube River (ICPDR).
www.danubebox.org

European Federation of City Farms:
A City Farm provides a link between the urban and rural life. City Farms are environmental and agricultural projects where children, young people and adults can, on a daily basis, learn about urban and rural environments and their inter-relationship with plants and animals, the importance of the seasons, and the relationship between these.
http://www.cityfarms.org/

R.A.V.E. – Space-Raising Awareness of Values of Space through the Process of Education:
www.rave-space.org
The project R.A.V.E. (Space-Raising Awareness of Values of Space through the Process of Education) deals educationally with problems of spatial planning and sustainable spatial development in primary and secondary schools.
The R.A.V.E project has developed a space toolkit for teachers. The toolkit is available at:
http://www.rave-space.org/RaveSpace/Default.aspx//Home.html?qry=NewsDet&PageID=474

The Environmentally Sustainable Transport goes East project:
This project functions as an information portal and aims to facilitate the exchange of experience and knowledge on sustainable transportation projects and initiatives in European countries, including Romania and other Carpathian countries. The web site contains transportation projects by country, good international practices, as well as relevant contacts in each participating country.
http://esteast.unep.ch/
Contact list: http://esteast.unep.ch/default.asp?community=est-east&page_id=4E9CA681-316C-449D-92E1-DC3BB1A4331B

UNECE Collection of Good Practices in ESD:
The United Nations Economic Commission for Europe has compiled a collection of "Good Practices in Education for Sustainable Development" by collecting the experiences and concrete examples of implemented ESD projects by governments, international organisations, research institutions, NGOs and other stakeholders.
The practices submitted to UNECE are published on their web site, where they are accessible to provide examples and facilitate adaptation and use:
http://www.unece.org/env/esd/GoodPractices/index.html

UNEP DTIE – Sustainable Production and Consumption Branch:
The United Nations Environment Programme Division of Technology, Industry and Economics (UNEP DTIE) offers a host of learning materials on sustainable consumption and production in various languages:
http://www.unep.fr/scp/education/materials.htm

Among them, the youthXchange training kit on responsible consumption, assists educators with useful information on sustainable lifestyles in a practical and interactive way, and highlights the global importance of personal attitudes and behaviours.
http://www.unep.fr/scp/youth/

UNEP Youth Publications:
To engage more young people in environmental thinking and activities, UNEP has developed a Tunza Youth Strategy. The TUNZA web site offers many resources for youth and children, including a number of publications, which are helpful and interesting for both students and educators.
http://www.unep.org/tunza/Publications/tabid/723/language/en-US/Default.aspx

Among them, the Tunza Magazine is devoted to urgent global environmental issues. The contents are available in English, French and Spanish, and can be downloaded at the magazine's web site:
http://www.unep.org/publications/search/title_search.asp?search=tunza

UNESCO educational KIT for cultural heritage sites:
Used at the grassroots level in UNESCO Associated Schools in all five continents, the KIT is:
- based on an interdisciplinary approach, and seeks to involve teachers across subject areas and curricula in raising awareness in young people of the importance of World Heritage;
- strives to incorporate World Heritage into the curriculum as a way of delivering core subjects and transverse themes in the classroom, as well as through extra-curricular activities;
- focuses on creative and participatory methods of teaching, involving students in research, in collecting and analysing data, in role-play and simulation exercises, in information and communication technology, in taking part in well-planned field trips, and in conducting preservation campaigns.

http://whc.unesco.org/en/educationkit/

World Wildlife Fund:
WWF is involved in ESD at various levels. For the European programme it is focused on training teachers at the secondary and high school levels from Eastern and South-Eastern Europe to design projects focused on biodiversity protection and sustainable development. The web site presents both results of the project and some e-learning tools:
http://www.wwf.at/elearning/
http://schools.foralivingplanet.eu/downloads/cms_uploaded/application_form.pdf
http://www.wwf.at/europeanschools

The WWF Danube-Carpathian programme, with its office in Romania, provides advice and guidance in the development of the Move4Nature project.
http://www.turismosustentavel.org.br/what_we_do/where_we_work/danube_carpathian/our_solutions/romania/

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6. The Project Partners and Supporters

OMV – the main donor of the project - one of the biggest listed industrial companies in Austria and the leading energy group in the European growth belt.
The international social program OMV Move & Help was established in 2004 and concentrates on current, socially relevant concerns.
With Caritas, SOS Children's Villages and UNEP (United Nations Environmental Programme) as partners, OMV Move & Help programme focused on the environment and energy efficiency.
http://www.omv.com/

The United Nations Environment Programme (UNEP) is the voice for the environment in the United Nations system, provides leadership and encourages partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.
http://www.unep.org/

The Framework Convention on the Protection and Sustainable Development of the Carpathians is an international agreement concluded by the Czech Republic, Hungary, Poland, Romania, Serbia, the Slovak Republic and Ukraine, providing a framework for cooperation and policy coordination, a platform for joint strategies for sustainable development, and a forum for stakeholders. The United Nations Environment Programme Vienna – Interim Secretariat of the Carpathian Convention (UNEP Vienna ISCC), hosted by Austria in Vienna International Centre, services the Carpathian Convention. As such, it provides a relevant base for coordination of the Move4Nature project and involving relevant regional and international stakeholders.
http://www.carpathianconvention.org

The Environment and Schools Initiatives Network (ENSI) is an intergovernmental network on education for sustainable development (ESD), which provides a unique international umbrella for national activities and innovation in the field of environmental education/ESD and school development, to share learning and experiences and to help advance international and national agendas on ESD.
ENSI has a strong track record, dating from 1986, of an effective partnership with the OECD Centre for Educational Research and Innovation and is now in official relationship with UNESCO, with intensive cooperation around the UN Decade on Education for Sustainable Development.
www.ensi.org

The Ministry of Education, Research and Innovation of Romania provided the necessary support and guidance for the project in Romania, including ensuring participation of and cooperation with the county school inspectorates in every training location.
http://www.edu.ro/

CASALEN

The Carpathian Sustainable Learning Network (CASALEN) was launched in autumn 2007 as an informal learning network and as a Carpathian regional project of ENSI. The aim of the network is to facilitate social and economical change towards sustainable development in the society through shared learning in the Carpathian area. The website of CASALEN is available on Polish National UNESCO committee's portal www.unesco.pl/edukacja/casalen.

The Healthy Environment Regional Organization (HERO) has been working on environmental issues in Romania, including those of Evironmental Education, since 1993. The principal goals of "HERO" are: protection of the natural and man-made environment, initiation of environmental studies, organization of environmental education, education for sustainable development activities for different target groups, for the maintenance of a healthy environment, to estimate the quality of environment and to evaluate the risk of the pollution, to organize workshops and meetings in these issues.
HERO worked as the Romanian coordinator of the Move4Nature Teacher Training and the Romanian Tool Kit production and editing, as well organization of the training in Cluj-Bihor.
www.herocluj.ro

The Transylvanian Carpathian Society – Brasov Branch (TCS BB) is an environmental NGO, founded in 1893 in Brasov , as a subsidiary of The National TCS, founded in 1891 in Cluj Napoca. The goal of the TCS BB is to promote all forms of tourism, the protection of the natural environment and the preservation of biodiversity. Moreover, it focuses on the ecological education of the young and old generation. TCS-BB co-organized the Teacher Training in Brasov.
www. erdelyikarpategyesulet.ro

The Green Echoes Association is an environmental NGO from Cluj-Napoca, formed by a group of young nature enthusiasts, including biologists, ecologists, geographers, teachers, psychologists, IT specialists, economists and students – with the main aims to manage the Râpa Roşie Nature Reserve, to contribute to the management of other natural protected areas, to develop a model nature education center in the Trascău Mountains, to support the sustainable development of rural communities in the Apuseni Mountains and to promote the responsible tourism as a tool for sustainable development in Transylvania. The Green Echoes contributed to the Tool Kit development and organized the Teacher training in Maramures.
www.ecouriverzi.ro

Kogayon Association is an non-governmental association for environmental protection founded in 2003 by a group of students from the Faculty of Geology and Geophysics within the University of Bucharestand consisting today of 135 members and volunteers. The most important accomplishment of the association was the establishment of the 12th National Park in Romania - Buila – Vanturarita. Today, Kogayon is administrating this protected area in cooperation with The Romanian Forest Administration (RomSilva) and all its projects are located in the park's area. Including research, public awareness and education projects.
Kogayon organized the Teacher training in Valcea.
http://www.kogayon.ro

The National Association for Mountain Rural Development
"ROMONTANA" has been founded in 2000 as a non-governmental organization based in Vatra Dornei – Suceava county, with 4 other branches established in Romania (Alba, Gorj, Harghita, Hunedoara) and 2 branches under construction (Braşov and Cluj), gathering together representatives of organizations and corporate bodies working on sustainable development of the mountain regions of Romania. The main objective of ROMONTANA is supporting the overall development of the mountain rural communities, increasing population's capacity to promote and sustain the interests of the mountain producers.
Romontana organized the Teacher training in Vatra Dornei, Suceava in cooperation with C.E.F.I.D.E.C. – Training and Innovation Centre for Development in the Carpathians - Vatra Dornei.
www.romontana.org

"Climate Action Network – Romania" (RAC-RO) is a network of 10 Romanian NGOs devoted to reducing the impact of human activities on climate change and to mitigate climate change though raising the public's and decision-makers' awareness, increasing public participation in the prevention and mitigation of climate change, improving the quality of education and increasing the involvement of civil society in developing relevant policies.
RAC-RO contributed to project development and provided several chapters for the Tool Kit. Inn addition, two member – organizations took a more active part in the project: Amoeba Eco Center and Earth Friends (Prietenii Pamantului), described below. http://rac-ro.ngo.ro/

The Amoeba Eco Center's main objective is to preserve a clean and healthy environment for the coming generations through Educational activities with children and teachers, information and engagement of local population in environmental problem solving, working to reduce the impact of human activities on the climate and to mitigate climatechange. The Eco Center contributet to the Tool Kit development, and was the organizer of the teacher training in Harghita.
http://rac-ro.ngo.ro/index.stm?x=29793; amoeba@hr.astral.ro

Earth Friends - Prietenii Pamantului (PP) is a non - governmental environmental organization, engaged in raising public awareness of environmental issues and building the capacity of local environmental and community-based organizations to mount effective local programmes. Earth Friends has carried out over 50 informational, educational and training projects -primarily in Romania, but also neighboring Bulgaria, Croatia, Macedonia, Moldova, and Ukraine.
Earth Friends has provided valuable inputs into the development of the Tool Kit.
http://rac-ro.ngo.ro/?x=34508

ROMSILVA is the Romanian state forest organization, which is responsible for development and implementation of the national strategy and national forest policies, sustainable management and monitoring of Romanian forest resources, and works on protection, preservation, eco-tourism, and sustainable development issues. Representatives of ROMSILVA authored Cultural Heritage and Tourism chapters in the Tool Kit.
http://www.rosilva.ro

The Parliamentary Commissioner For Future Generations is an environmental ombudsman in Hungary, whose principal responsibility is to safeguard citizens' constitutional right to a healthy environment. The Office of the Commissioner investigates complaints relating to a broad range of environmental issues, and acts as a policy advocate for sustainability issues. The Office of the Commissioner contributed to the toolkit development and authored the Public Participation chapter of the Tool Kit. www.jno.hu

Carpathian Network of Protected Areas (CNPA) coordinates joint projects designed to facilitate exchanges between the protected areas; raise awareness of the fragile ecosystems, and realize practical measures, to ensure the survival of endangered species. The Romanian members of CNPA provided help and guidance in coordination of the teacher training with the National Parks.
http://jmphoto.free.fr

Environmental Information Centre UNEP/GRID-Warsaw (Global Resource Information Database), established in 1991, is a specialized centre in charge of collecting and processing environmental information concerning Poland and Central and Eastern Europe. UNEP/GRID-Warsaw provided the maps used for trainings and the Tool Kit.
http://www.gridw.pl

The European Academy in Bozen/Bolzano (EURAC) is an institute for applied research and further education, and a seat of the permanent secretariat of the Alpine convention. EURAC provided maps used for the training and the Tool Kit.
http://www.eurac.edu

We also want to thank the following organizations who provided advice and inputs into the project:

WWF Danube Carpathians Romania Association, created in 2006, belongs to the international network of World Wild Fund for Nature and it represents a desk of the Regional Danube Carpathians Programme in Vienna. World Wild Fund has been active in Romania since 1998 developing a variety of projects in the fields of: conservation and improvement of wetlands in the Danube basin, responsible conservation and management of the forests, development of the NGOs, lobbying and advocacy for legislative modifications and legal measures for environment protection and improvement of the administration system of natural protected areas, rural development, public awareness and nature conservation campaigns.

The Northern Alliance for Sustainability (ANPED) is a network of NGOs working to empower civil society in creating and protecting sustainable communities. ANPED's Carpathian Working Group supports and promotes public participation in the implementation of the Carpathian Convention." ANPED provided material for and feedback on several chapters of the Tool Kit.
http://www.anped.org

Administration of several Parks in Romania provided support during the trainings, and will continue cooperation with the schools and NGOs in the region to promote Education for Sustainable Development in Romania

Braşov: Piatra Craiului National Park
Piatra Craiului Massif was declared as natural reserve as early as 1938, due to the unique character, and the beauty of the landscape, home to several rare species of plants and animals. In 1990 Piatra Craiului was declared a national park to maintain the biodiversity, landscape and species conservation, to promote and encourage tourist activities, public awareness and education.

The parks activities involve promoting tourism, facilitating the development of specific income-generating activities for the local communities, public awareness, education and scientific research.
http://www.pcrai.ro/

Vâlcea: Buila-Vânturariţa National Park
The Buila-Vânturariţa National Parkwas established by in 2004 and is the smallest national park in Romania, with a total area 4186 ha. The Park is located in the southern corner of Căpăţânii Mountains, on the territory of the Costeăti and Bărbăteşti villages and the city of Băile Olăneşti. The park is a site of the European Ecologic Network Nature 2000. Many elements of the natural heritage: virgin forests, numerous protected species of flora and fauna, mineralogical and paleonthological sites and caves were preserved in the park.

Activities in the park, in addition to tourism, include educational activities for local communities, as well as species monitoring.
http://www.buila.ro/

Harghita Bicaz Gorges National Park - Haşmaşul Mare Mountain
Bicaz Gorges National Park is of a great interest due to its landscapes, biological diversity and a great variety of geoclimactic conditions. The Red Lake, formed through the natural blocking of the Bicaz river, offers a lovely view. The park is located located in the central - north - eastern region of Romania, in the Hasmas mountains - the central group of Oriental Carpathians, and is divided into a special conservation zone (78 %) and a protection zone (22%). The towns and villages located in the vicinity of the park host historical architectural monuments and vibrant cultural traditions

An educational trail "The Red Lake in its Four Seasons" – was proposed by the Amoeba Eco Center in collaboration with the Administration of the Hasmas-Bicaz Gorges National Park
http://cheilebicazului-hasmas.ro/

Suceava: National Park Calimani – thematic trail "12 Apostles"
The Calimani National Park, stretching across 24,041 ha, is the largest volcanic massive in Romania, with a volcanic crater 10 km in diameter. The Park is officially a protected area, category II IUCN managed for ecosystem protection. The Park lies on the territories of 4 counties: Suceava, Bistrita Nasau, Mures, and Harghita, home to different landscapes, cultures and people. There are 3 zone types of conservation management included in the national park: a strictly protected, an integral protected, and a sustainable management area,
The main objectives include preservation of wildlife, habitats and landscapes and sustainable development of the neighborhood area; education and research are encouraged, and recreational activities are allowed. The protected area does not include any human settlement, but is surrounded by a few villages and towns.

The "12 Apostles" thematic trail was developed by the part in cooperation with ROMONTANA as a tribute to the local traditions
http://www.calimani.ro/

Cluj - Bihor Natural Park Apuseni

The Apuseni Nature Park is situated in Western Romania, in the Central-North-Western side of the Apuseni Mountains, on the administrative territory of three counties: Cluj , Bihor , and Alba .The limits of the Park were established in 2003.As opposed to other parts of Carpathians, the Apuseni Mountains are populated up to the highest altitudes in Romania. Low intensity agriculture is practiced by the inhabitants up to an altitude of 1,200 m. The local inhabitants, the Moți, are traditional craftsmen in timber processing, cooper handicraft, as well as making of traditional alphorns and other traditional craft. The unique feature of the Apuseni Mountains is its spruce woods. The park is engaged in the project: „Romanian-Hungarian corridor for biodiversity conservation", aimed at creation of a Romanian-Hungarian transboundary „green corridor',' consisting of a network of protected areas on both sides of the border.

http://www.parcapuseni.ro/

7. Maps

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Map 4. **Richness of fish species in the Carpathian River Basins**

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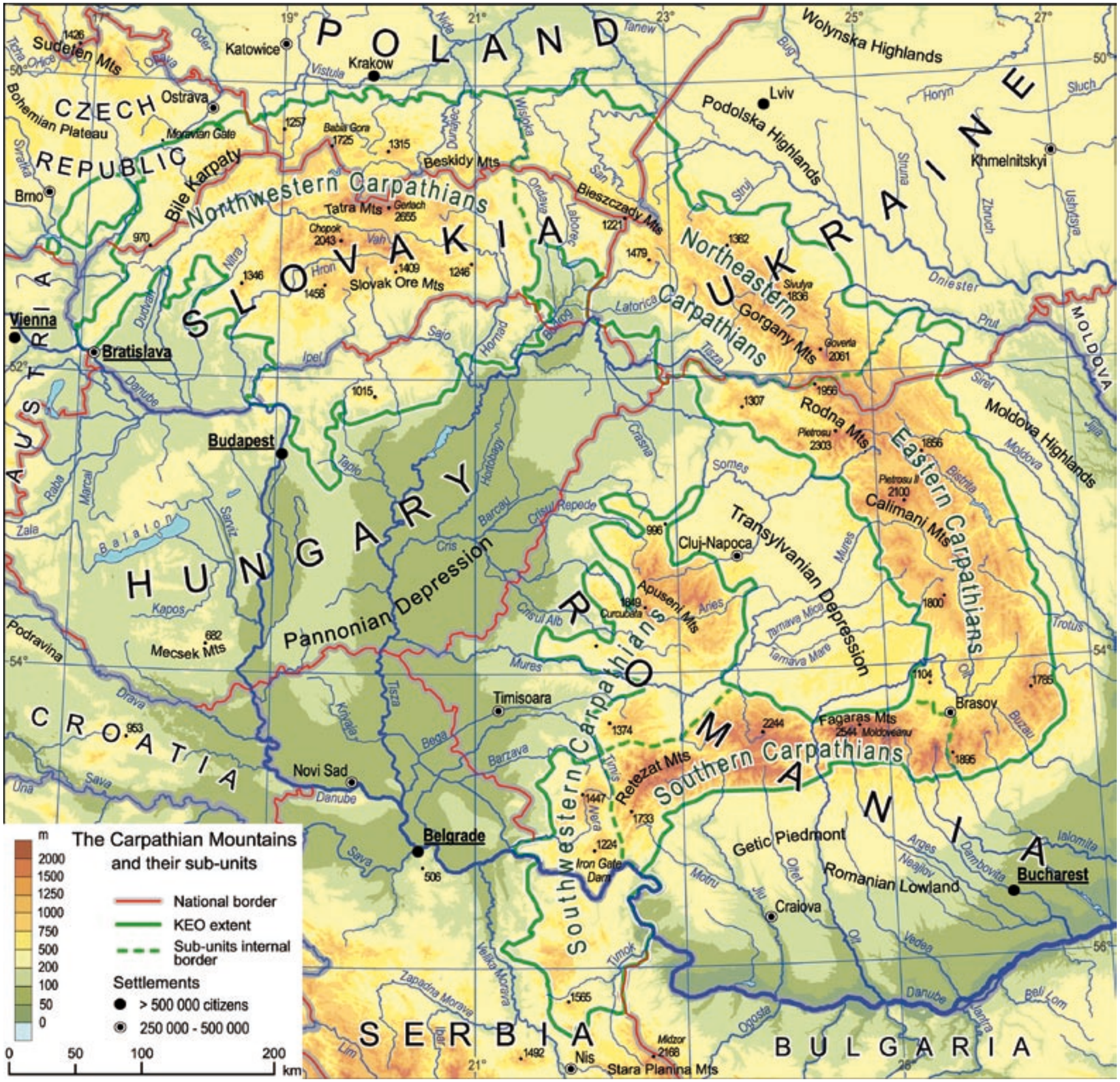
Map 1.
The Carpathians and Their Sub-Regions


POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
HUNGARY
ROMANIA
SERBIA
BULGARIA
AUSTRIA
MOLDOVA
Sudeten Mts
Katowice
Krakow
Ostrava
Bohemian Plateau
Moravian Gate
Babia Gora 1725
Beskidy Mts
Bile Karpaty
Northwestern Carpathians
Tatra Mts
Gerlach 2655
Chopok 2043
Vah
Slovak Ore Mts
Bieszczady Mts 1221
Wolynska Highlands
Podolska Highlands
Lviv
Khmelnitskyi
Brno
Vienna
Bratislava
Budapest
Northeastern Carpathians
Gorgany Mts
Hoverla 2061
Rodna Mts
Pietrosu 2303
Eastern Carpathians
Calimani Mts
Moldova Highlands
Transylvanian Depression
Cluj-Napoca
Apuseni Mts
Curcubata 1849
Pannonian Depression
Mecsek Mts 682
Timisoara
Brasov
Fagaras Mts
Moldoveanu 2544
Retezat Mts
Southern Carpathians
Southwestern Carpathians
Iron Gate Dam
Getic Piedmont
Romanian Lowland
Craiova
Bucharest
Novi Sad
Belgrade
Nis
Stara Planina Mts
Midzor 2168
Danube
Vistula
Oder
Tisza
Sava
Drava
Mures
Olt
Jiu
Prut
Siret
Dniester
Bug
Horyn
Sluch
Struna
Zbruch
Ushytsya
Dunajec
Wisloka
San
Orava
Vah
Hron
Nitra
Hornad
Laborec
Latorica
Bodrog
Ipel
Sajo
Slaná
Crasna
Somes
Barcau
Crisul Repede
Crisul Alb
Aries
Tarnava Mica
Tarnava Mare
Timis
Bega
Barzava
Kriveln
Moldova
Bistrita
Trotus
Buzau
Arges
Dambovita
Ialomita
Neajlov
Motru
Vedea
Danube
Beli Lom
Jantra
Ogosta
Timok
Velika Morava
Zapadna Morava
Lim
Ibar
Una
Kapos
Zala
Rabca
Marcal
Sarviz
Balaton
Podravina
Svratka
Dudvah
Ipel
Cris
Hortobagy
Tapio
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1479
1307
1956
1856
1800
1104
1765
1895
2244
1374
1447
1733
1224
1565
1492
996
1849
953
682
506
Tatra Mts
Gerlach 2655
Chopok 2043
Slovak Ore Mts
Iron Gate Dam
Midzor 2168
Pietrosu 2303
Pietrosu II 2100
Fagaras Mts
Moldoveanu 2544
Hoverla 2061
Sivulya 1836
Gorgany Mts
Calimani Mts
Curcubata 1849
Retezat Mts
m
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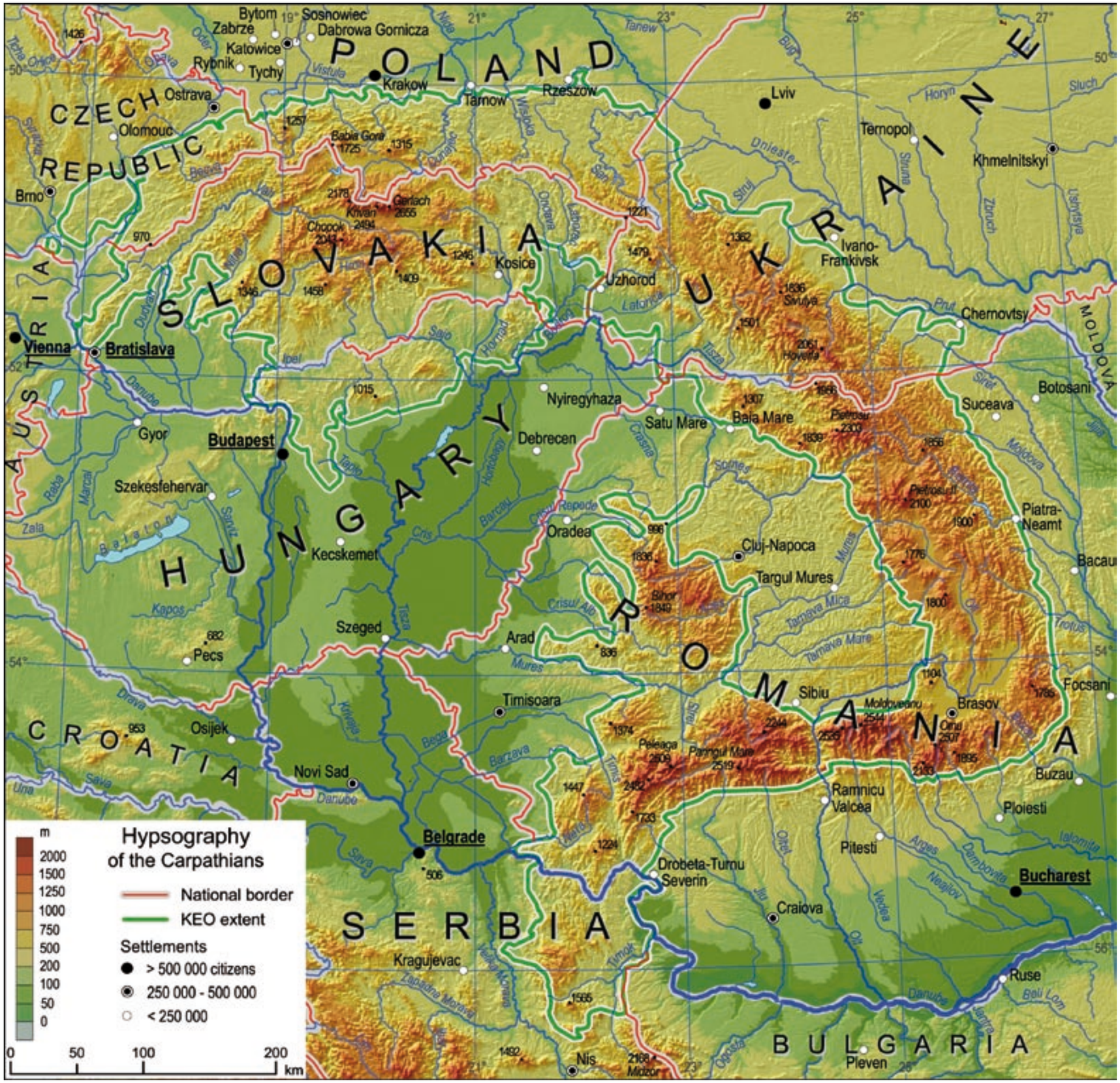
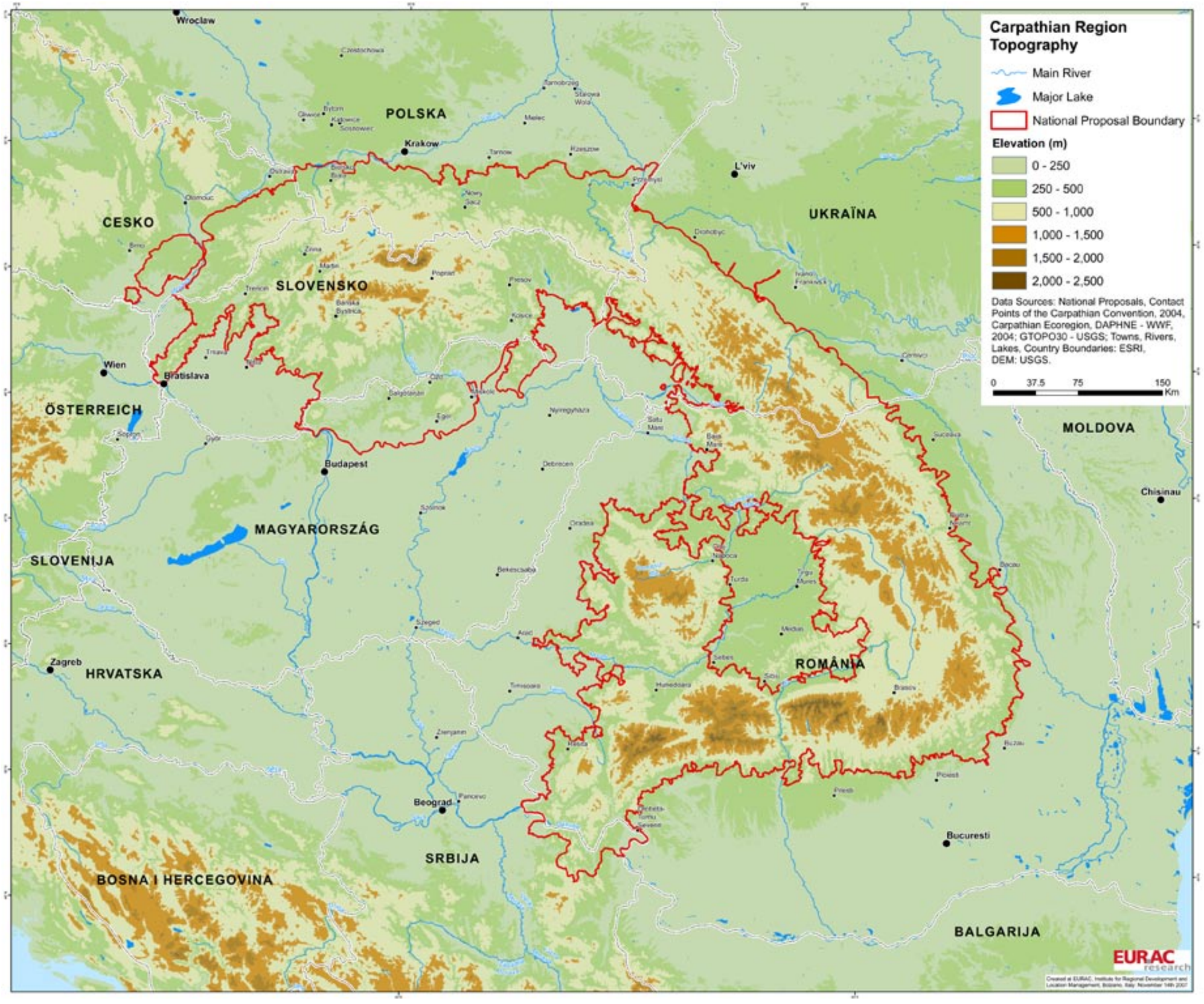
1500
1250
1000
750
500
200
100
50
0
The Carpathian Mountains and their sub-units
National border
KEO extent
Sub-units internal border
Settlements
> 500 000 citizens
250 000 - 500 000
0
50
100
200
km

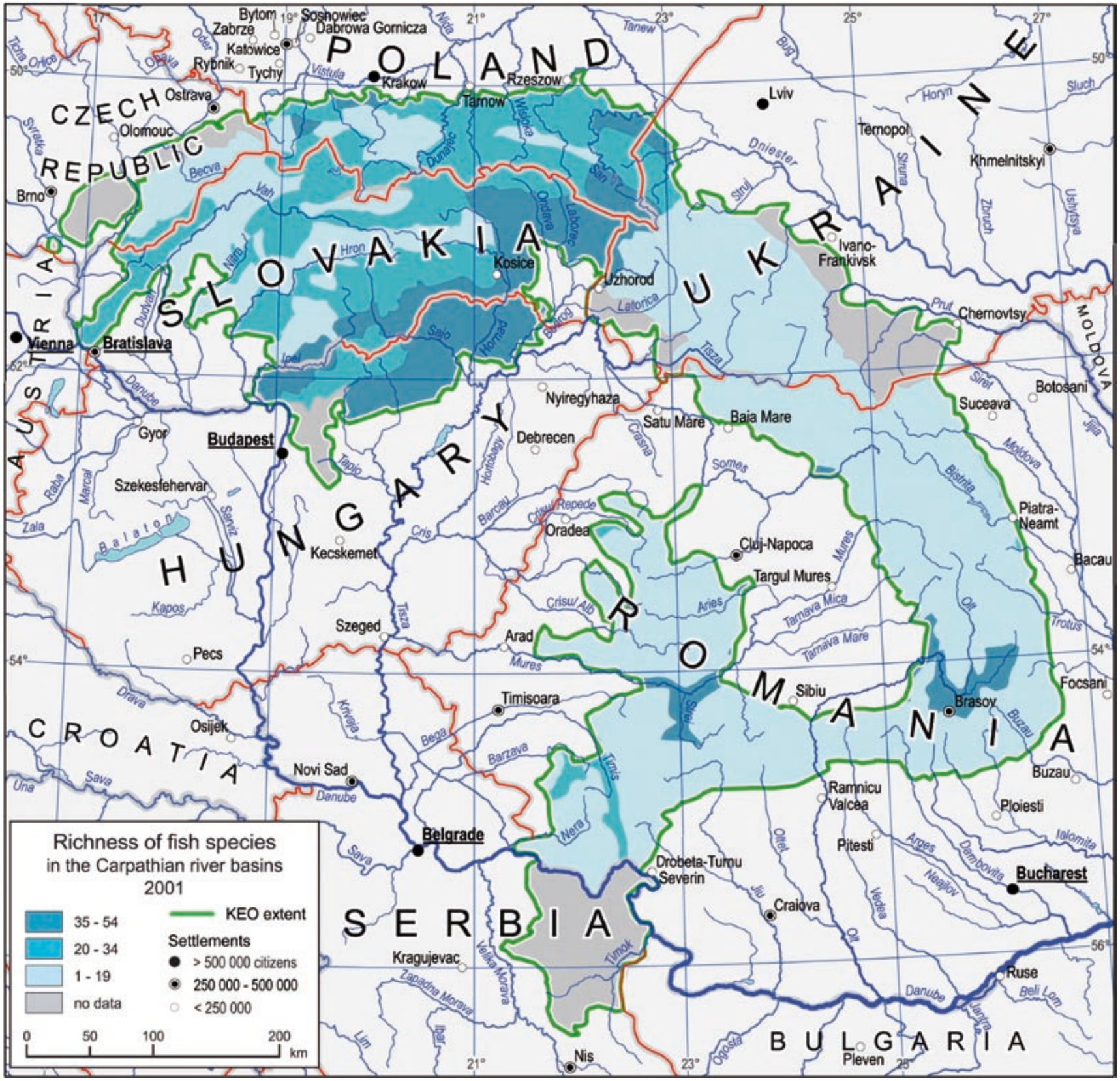
Map 2.
Hypsography of the Carpathians


POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
AUSTRIA
HUNGARY
ROMANIA
SERBIA
CROATIA
BULGARIA
MOLDOVA
Bytom
Zabrze
Sosnowiec
Dabrowa Gornicza
Katowice
Rybnik
Tychy
Krakow
Tarnow
Rzeszow
Lviv
Ostrava
Olomouc
Brno
Babia Gora 1725
Ternopol
Khmelnitskyi
Ivano-Frankivsk
Kosice
Uzhorod
Chernovtsy
Vienna
Bratislava
Nyiregyhaza
Satu Mare
Baia Mare
Suceava
Botosani
Gyor
Budapest
Debrecen
Szekesfehervar
Oradea
Cluj-Napoca
Piatra-Neamt
Kecskemet
Targul Mures
Bacau
Szeged
Arad
Timisoara
Sibiu
Brasov
Focsani
Pecs
Osijek
Novi Sad
Buzau
Ramnicu Valcea
Ploiesti
Belgrade
Pitesti
Drobeta-Turnu Severin
Bucharest
Craiova
Kragujevac
Ruse
Nis
Pleven
Hypsography of the Carpathians
National border
KEO extent
Settlements
> 500 000 citizens
250 000 - 500 000
< 250 000
m
2000
1500
1250
1000
750
500
200
100
50
0
0
50
100
200
km

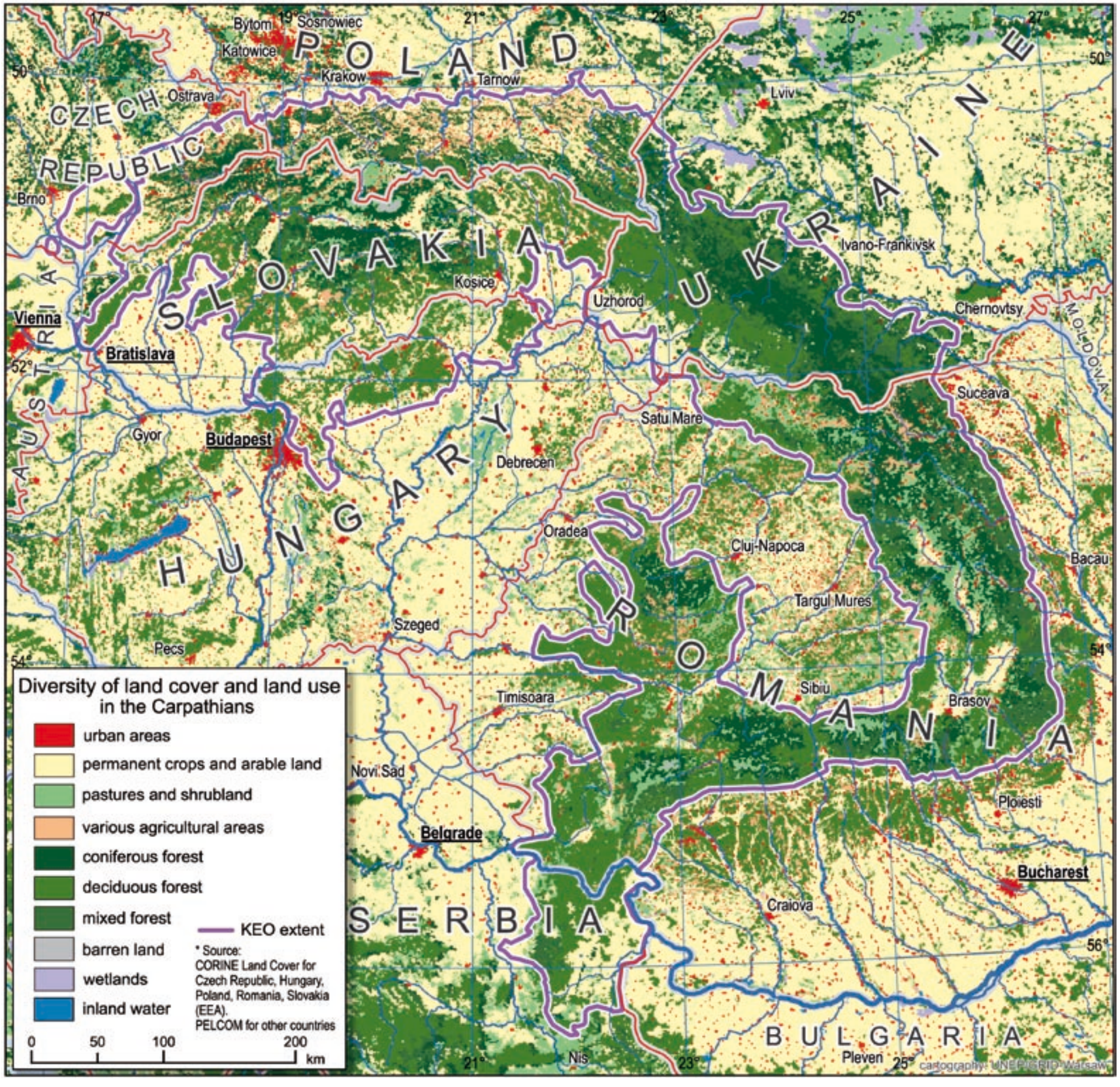
Map 3.
Carpathians Region Topography


Carpathian Region Topography
Main River
Major Lake
National Proposal Boundary
Elevation (m)
0 - 250
250 - 500
500 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 2,500
Data Sources: National Proposals, Contact Points of the Carpathian Convention, 2004, Carpathian Ecoregion, DAPHNE - WWF, 2004; GTOPO30 - USGS; Towns, Rivers, Lakes, Country Boundaries: ESRI, DEM: USGS.
0 37.5 75 150 Km
POLSKA
CESKO
SLOVENSKO
UKRAÏNA
ÖSTERREICH
MAGYARORSZÁG
SLOVENIJA
HRVATSKA
SRBIJA
BOSNA I HERCEGOVINA
ROMÂNIA
MOLDOVA
BALGARIJA
Wroclaw
Krakow
L'viv
Wien
Bratislava
Budapest
Zagreb
Beograd
Bucuresti
Chisinau
EURAC research

Map 4.
Richness of fish species in the Carpathian River Basins


POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
AUSTRIA
HUNGARY
ROMANIA
SERBIA
CROATIA
BULGARIA
MOLDOVA
Bytom
Soshowiec
Dabrowa Gornicza
Zabrze
Katowice
Rybnik
Tychy
Krakow
Rzeszow
Tarnow
Lviv
Ostrava
Olomouc
Brno
Ternopol
Khmelnitskyi
Ivano-Frankivsk
Kosice
Uzhorod
Chernovtsy
Botosani
Suceava
Vienna
Bratislava
Budapest
Nyiregyhaza
Satu Mare
Baia Mare
Debrecen
Gyor
Szekesfehervar
Kecskemet
Oradea
Cluj-Napoca
Targul Mures
Piatra-Neamt
Bacau
Szeged
Arad
Pecs
Timisoara
Sibiu
Brasov
Focsani
Osijek
Novi Sad
Buzau
Ramnicu Valcea
Ploiesti
Belgrade
Pitesti
Drobeta-Turnu Severin
Bucharest
Craiova
Kragujevac
Ruse
Nis
Pleven
Richness of fish species
in the Carpathian river basins
2001
35 - 54
20 - 34
1 - 19
no data
KEO extent
Settlements
> 500 000 citizens
250 000 - 500 000
< 250 000
0
50
100
200
km

Map 5.
Diversity of Land Cover and Land Use in the Carpathians


POLAND
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SLOVAKIA
UKRAINE
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HUNGARY
ROMANIA
SERBIA
BULGARIA
MOLDOVA
Bytom
Sosnowiec
Katowice
Krakow
Tarnow
Lviv
Ostrava
Brno
Vienna
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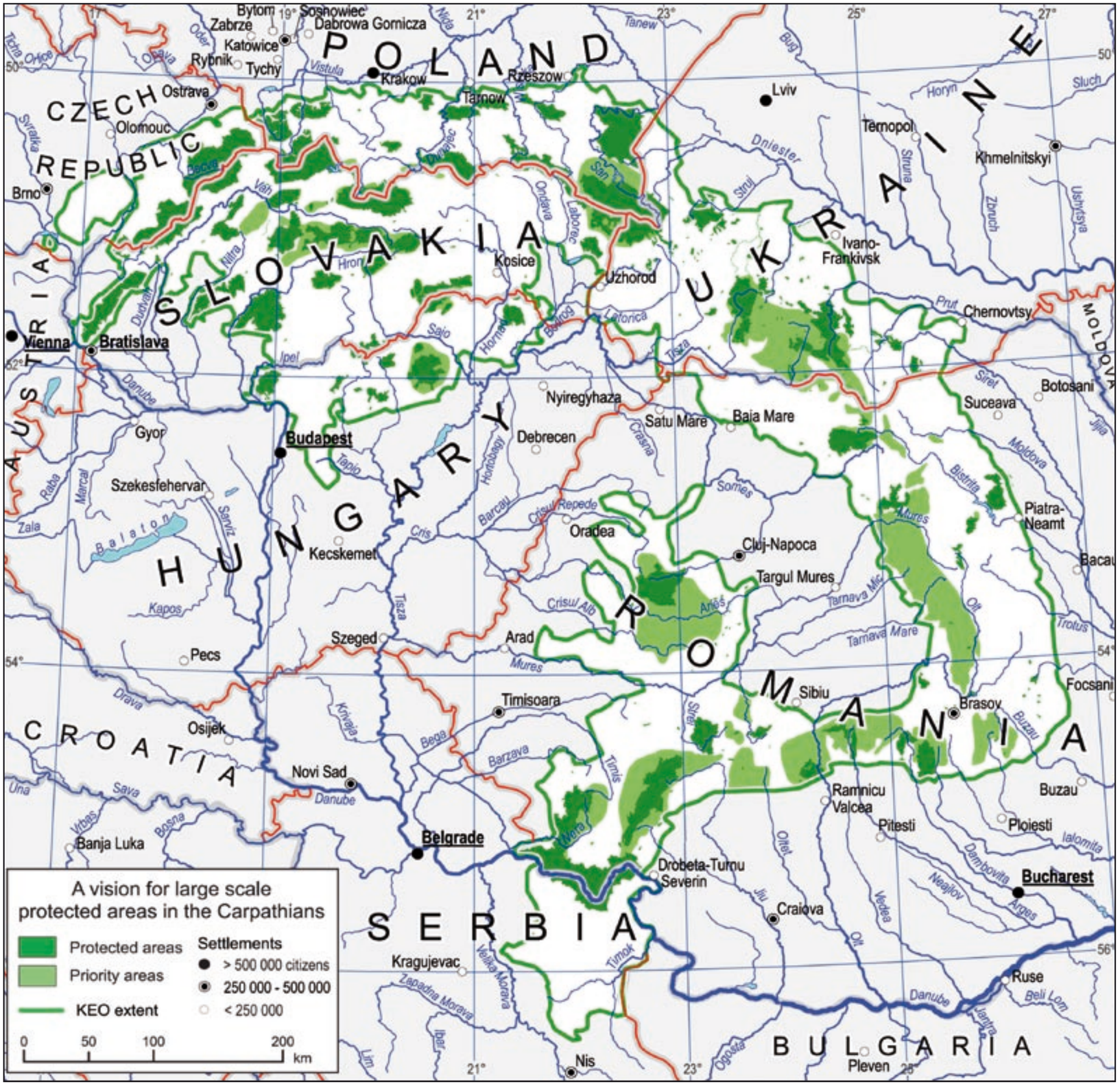
Uzhorod
Ivano-Frankivsk
Chernovtsy
Suceava
Satu Mare
Gyor
Budapest
Debrecen
Oradea
Cluj-Napoca
Bacau
Targul Mures
Szeged
Pecs
Sibiu
Brasov
Timisoara
Novi Sad
Belgrade
Ploiesti
Bucharest
Craiova
Nis
Pleven
17°
19°
21°
23°
25°
27°
50°
52°
54°
56°
Diversity of land cover and land use in the Carpathians
urban areas
permanent crops and arable land
pastures and shrubland
various agricultural areas
coniferous forest
deciduous forest
mixed forest
barren land
wetlands
inland water
KEO extent
* Source:
CORINE Land Cover for Czech Republic, Hungary, Poland, Romania, Slovakia (EEA).
PELCOM for other countries
0
50
100
200
km
cartography: UNEP/GRID-Warsaw

Map 6.
Vision for Large Scale Protected Areas in the Carpathians


POLAND
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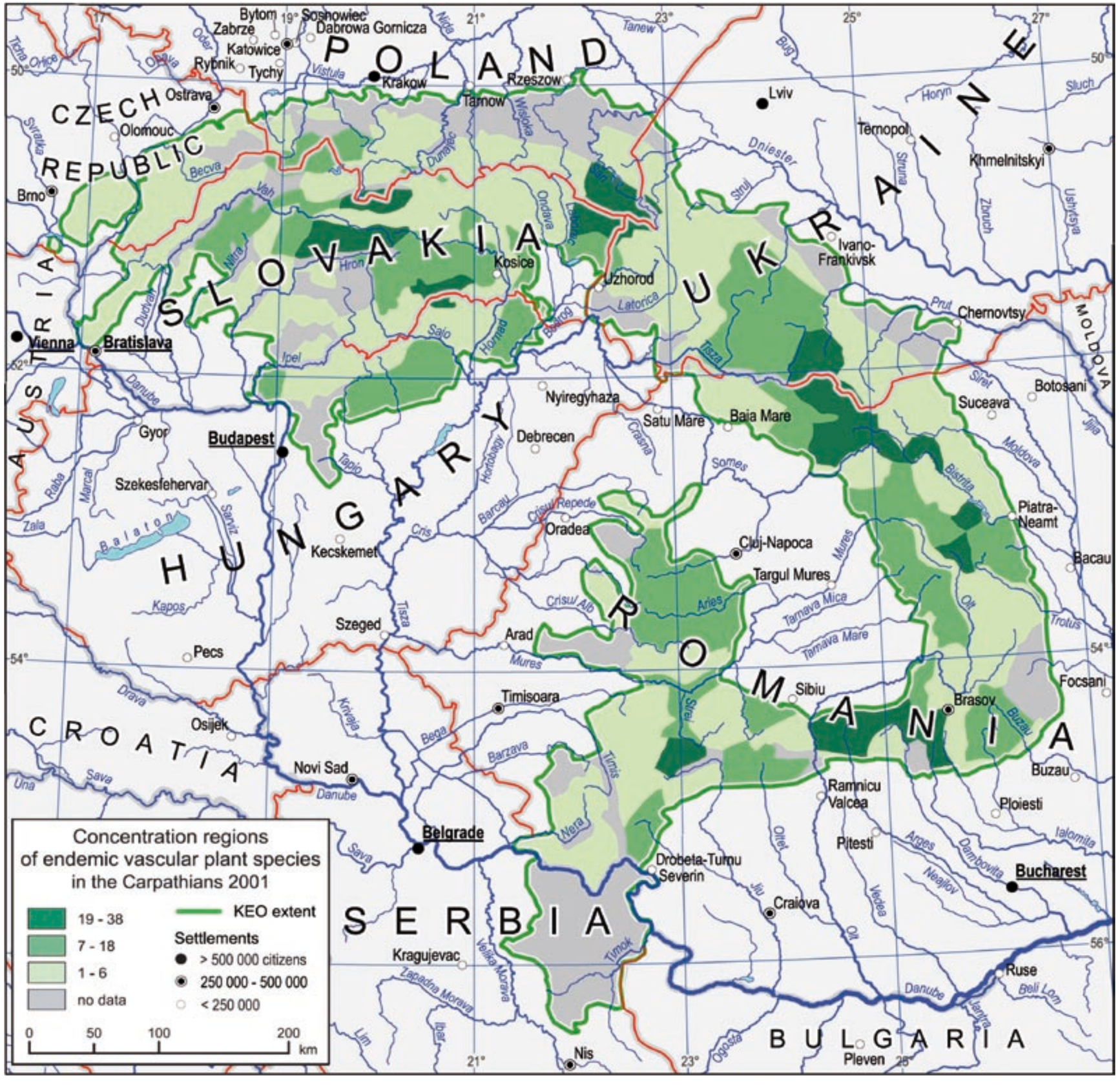
BULGARIA
Bytom
Zabrze
Sosnowiec
Dabrowa Gornicza
Katowice
Rybnik
Tychy
Krakow
Rzeszow
Tarnow
Ostrava
Olomouc
Brno
Lviv
Ternopol
Khmelnitskyi
Ivano-Frankivsk
Kosice
Uzhorod
Chernovtsy
Vienna
Bratislava
Nyiregyhaza
Satu Mare
Baia Mare
Suceava
Botosani
Budapest
Debrecen
Gyor
Szekesfehervar
Oradea
Cluj-Napoca
Targul Mures
Piatra-Neamt
Bacau
Kecskemet
Szeged
Arad
Pecs
Timisoara
Sibiu
Brasov
Focsani
Osijek
Novi Sad
Ramnicu Valcea
Pitesti
Ploiesti
Buzau
Belgrade
Drobeta-Turnu Severin
Craiova
Bucharest
Kragujevac
Ruse
Nis
Pleven
Danube
Tisza
Mures
Prut
Siret
Dniester
Bug
Vistula
Oder
Sava
Drava
Tamnava Mare
Tamnava Mic
Crisu Alb
Crisu Repede
Somes
Jiu
Olt
Arges
Dambovita
Ialomita
Moldova
Bistrita
Timok
Velika Morava
Zapadna Morava
Ibar
Lim
Una
Vrbas
Bosna
Drina
Kupa
Kapos
Raba
Marcal
Zala
Balaton
Sarviz
Cris
Barcau
Hortobagy
Crasna
Ondava
Laborec
Hron
Nitra
Vah
Dunajec
San
Sanok
Sluch
Horyn
Strune
Zbruch
Ushytsya
Dniester
Sinul
Jalomita
Neajlov
Vedea
Oltet
Timis
Barzava
Bega
Krivaja
Ipel
Saio
Hornad
Bodrog
Latorica
Tisza
Siret
Moldova
Bistrita
Mures
Tarnava Mare
Tarnava Mic
Olt
Trotus
Buzau
Arges
Danube
Jantra
Beli Lom
Ogosta
Timok
Velika Morava
Zapadna Morava
Ibar
Lim
Una
Vrbas
Bosna
Sava
Drava

Map 7.
Concentration Regions of Endemic Vascular Plant Species in the Carpathians


POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
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ROMANIA
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CROATIA
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Bytom
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Soshowiec
Dabrowa Gornicza
Katowice
Rybnik
Tychy
Krakow
Rzeszow
Tarnow
Lviv
Ternopol
Khmelnitskyi
Ostrava
Olomouc
Brno
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Ivano-Frankivsk
Chernovtsy
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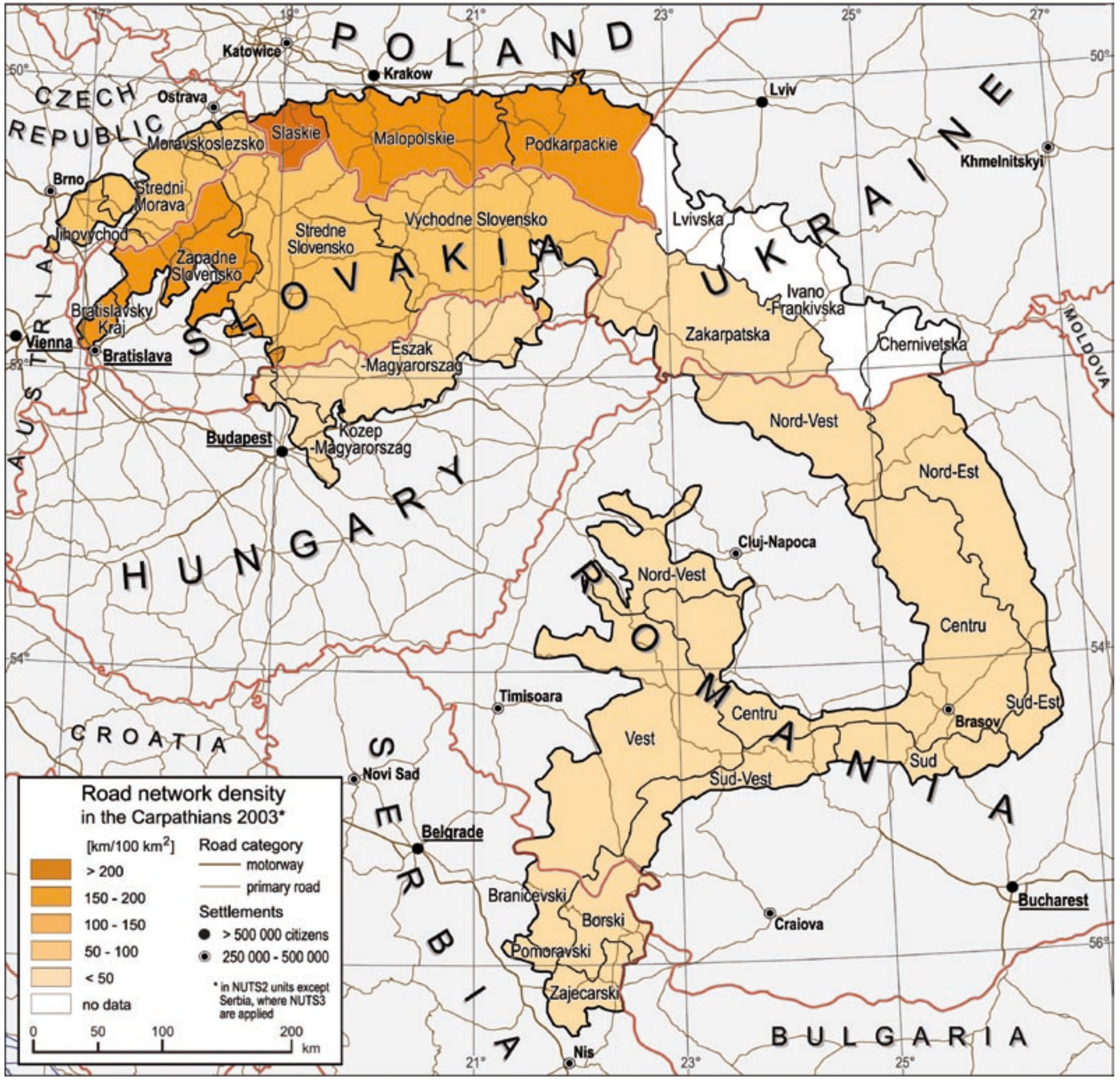
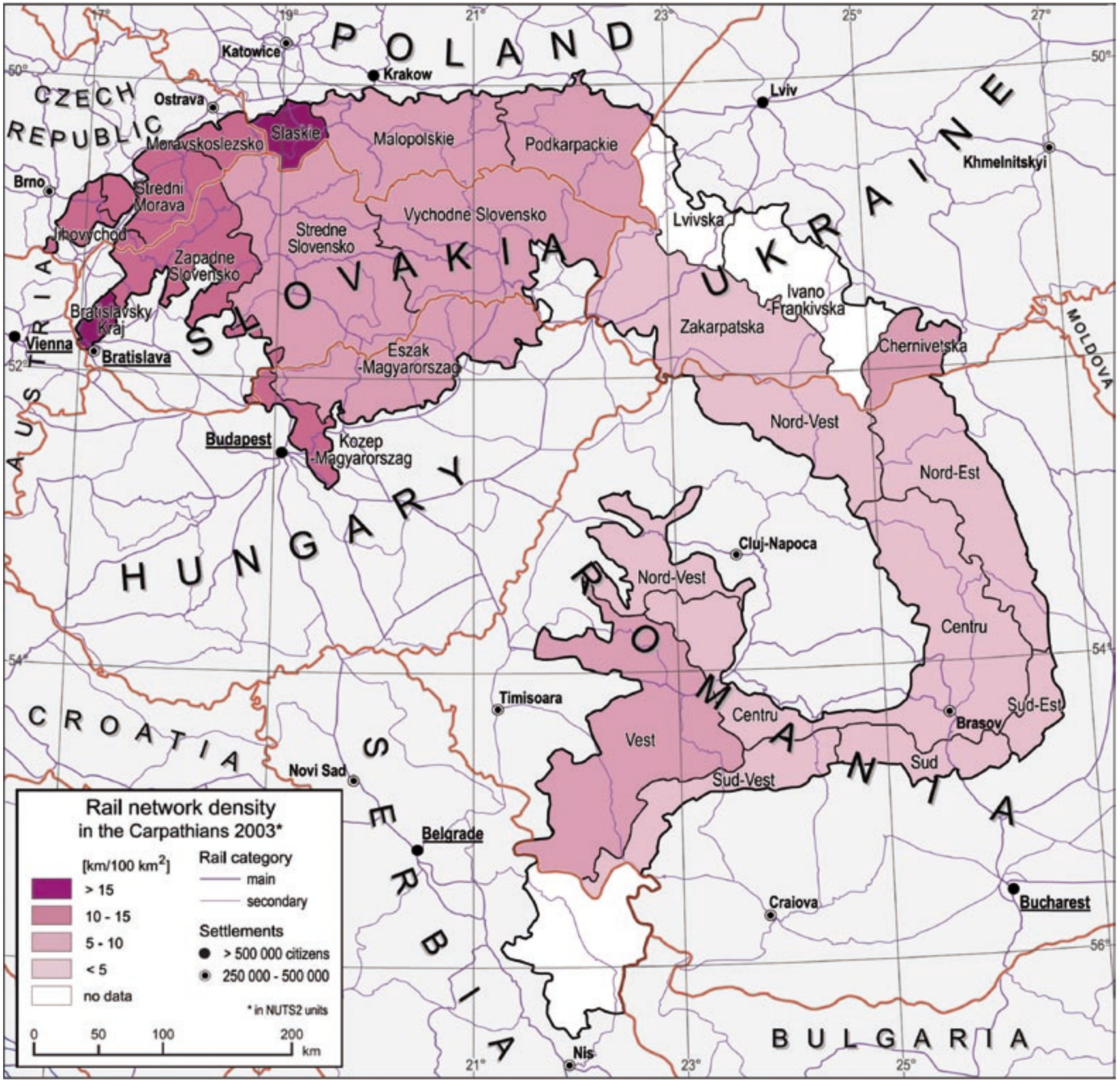
Debrecen
Satu Mare
Baia Mare
Gyor
Szekesfehervar
Oradea
Cluj-Napoca
Targul Mures
Piatra-Neamt
Bacau
Kecskemet
Szeged
Arad
Pecs
Timisoara
Sibiu
Brasov
Focsani
Osijek
Novi Sad
Buzau
Ramnicu Valcea
Ploiesti
Belgrade
Pitesti
Drobeta-Turnu Severin
Bucharest
Craiova
Kragujevac
Ruse
Nis
Pleven
Danube
Tisza
Dniester
Prut
Siret
Concentration regions of endemic vascular plant species in the Carpathians 2001
19 - 38
7 - 18
1 - 6
no data
KEO extent
Settlements
> 500 000 citizens
250 000 - 500 000
< 250 000
0
50
100
200
km

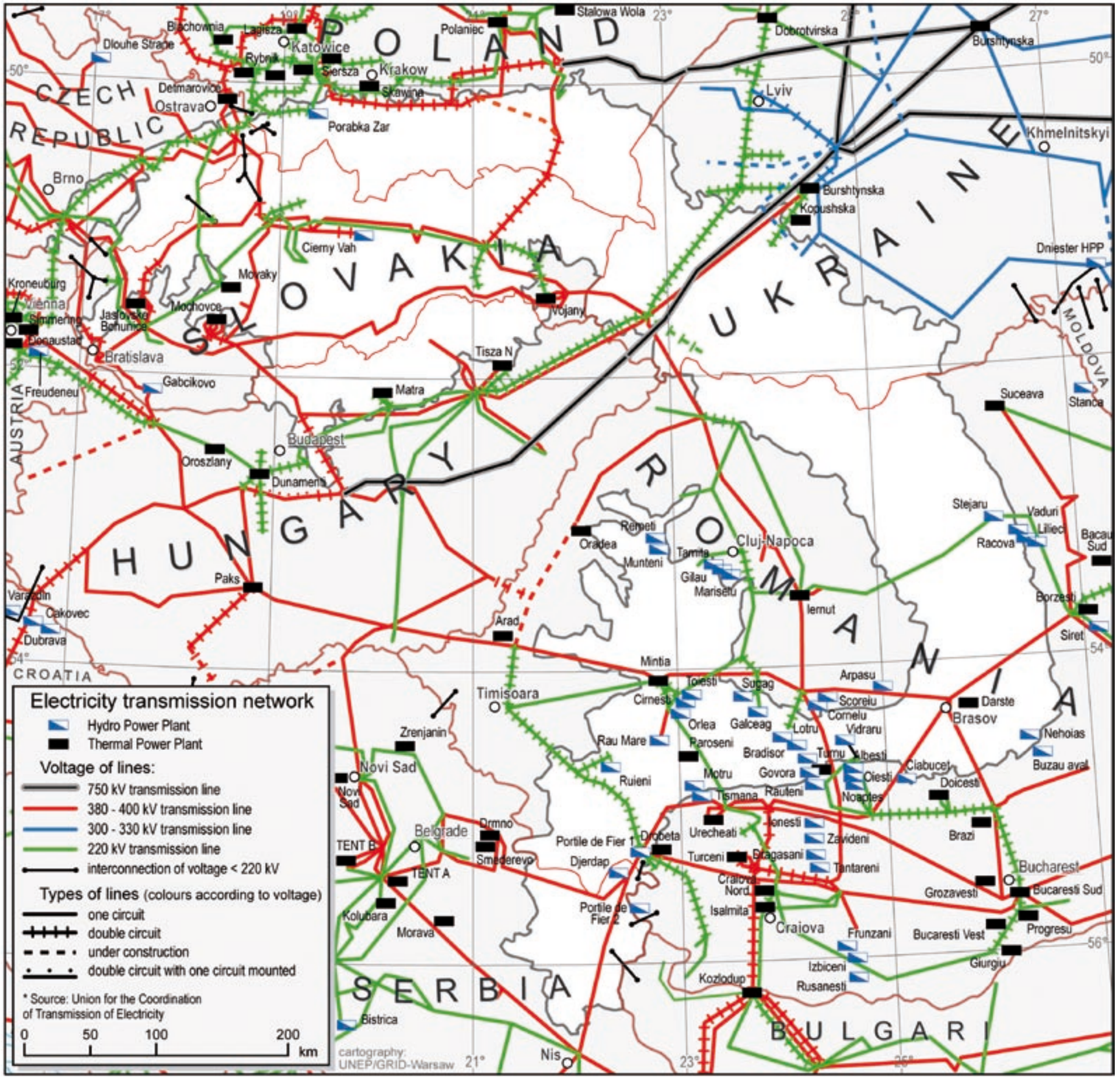
Map 8.
Road Network Density in the Carpathians


POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
AUSTRIA
HUNGARY
ROMANIA
SERBIA
CROATIA
BULGARIA
MOLDOVA
Katowice
Krakow
Lviv
Ostrava
Khmelnitskyi
Brno
Vienna
Bratislava
Budapest
Timisoara
Novi Sad
Belgrade
Cluj-Napoca
Brasov
Craiova
Bucharest
Nis
Slaskie
Malopolskie
Podkarpackie
Moravskoslezsko
Stredni Morava
Jihovychod
Zapadne Slovensko
Stredne Slovensko
Vychodne Slovensko
Bratislavsky Kraj
Eszak -Magyarorszag
Kozep -Magyarorszag
Lvivska
Ivano -Frankivska
Zakarpatska
Chernivetska
Nord-Vest
Nord-Est
Centru
Sud-Est
Vest
Sud
Sud-Vest
Branicevski
Borski
Pomoravski
Zajecarski
Road network density in the Carpathians 2003*
[km/100 km2]
> 200
150 - 200
100 - 150
50 - 100
< 50
no data
Road category
motorway
primary road
Settlements
> 500 000 citizens
250 000 - 500 000
* in NUTS2 units except Serbia, where NUTS3 are applied
0 50 100 200 km
17° 19° 21° 23° 25° 27°
50° 52° 54° 56°

Map 9.
Rail Network Density In The Carpathians

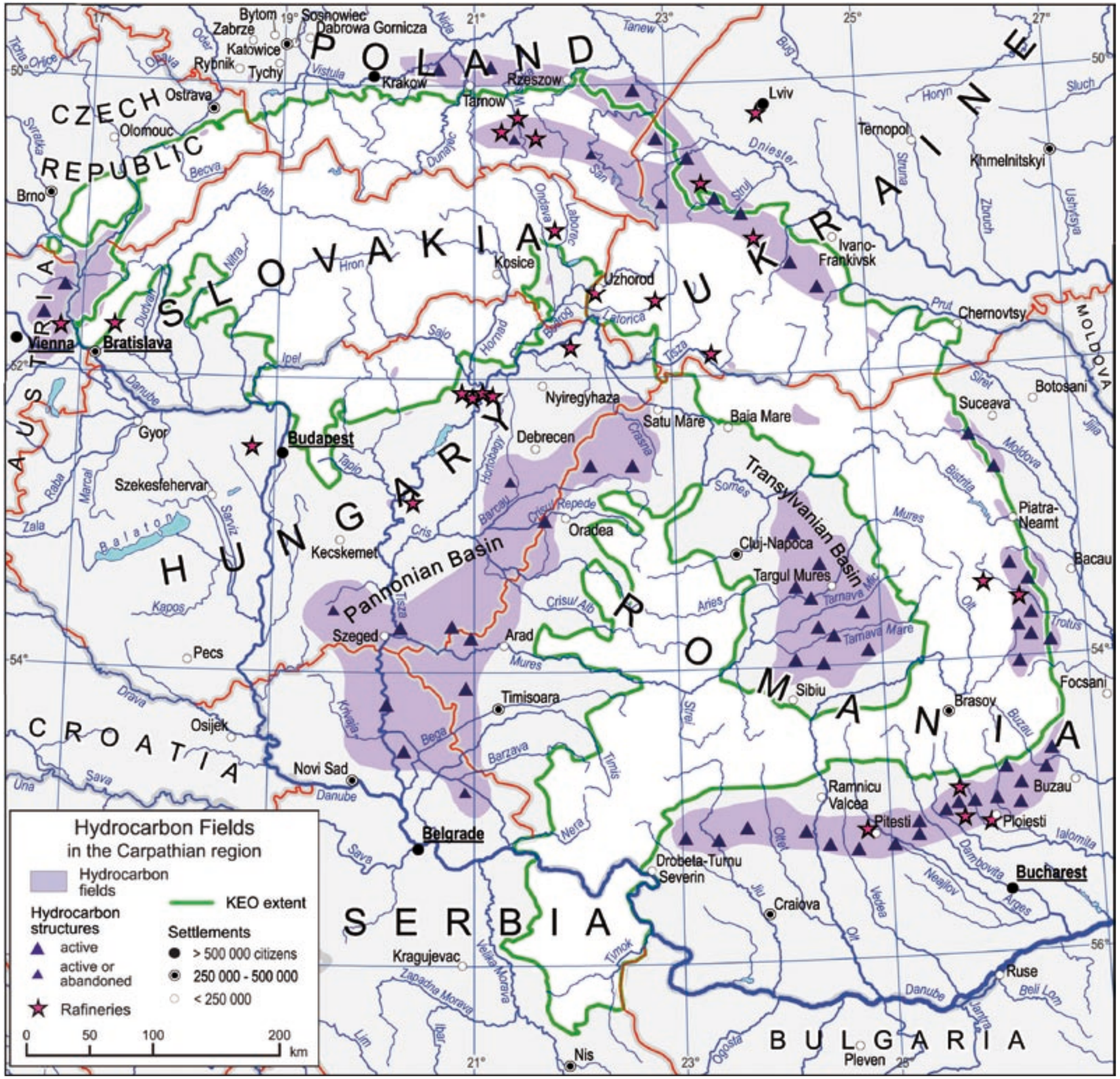

POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
HUNGARY
ROMANIA
SERBIA
CROATIA
AUSTRIA
MOLDOVA
BULGARIA
Katowice
Krakow
Lviv
Ostrava
Khmelnitskyi
Brno
Vienna
Bratislava
Budapest
Timisoara
Novi Sad
Belgrade
Nis
Cluj-Napoca
Brasov
Craiova
Bucharest
Slaskie
Malopolskie
Podkarpackie
Moravskoslezsko
Stredni Morava
Jihovychod
Vychodne Slovensko
Stredne Slovensko
Zapadne Slovensko
Bratislavsky Kraj
Eszak -Magyarorszag
Kozep -Magyarorszag
Lvivska
Ivano -Frankivska
Zakarpatska
Chernivetska
Nord-Vest
Nord-Est
Centru
Vest
Sud-Est
Sud
Sud-Vest
Rail network density
in the Carpathians 2003*
[km/100 km2]
> 15
10 - 15
5 - 10
< 5
no data
Rail category
main
secondary
Settlements
> 500 000 citizens
250 000 - 500 000
* in NUTS2 units
0
50
100
200
km

Map 10.
Electricity transmission network



Electricity transmission network
Hydro Power Plant
Thermal Power Plant
Voltage of lines:
750 kV transmission line
380 - 400 kV transmission line
300 - 330 kV transmission line
220 kV transmission line
interconnection of voltage < 220 kV
Types of lines (colours according to voltage)
one circuit
double circuit
under construction
double circuit with one circuit mounted
* Source: Union for the Coordination of Transmission of Electricity
0 50 100 200 km
cartography: UNEP/GRID-Warsaw
POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
HUNGARY
ROMANIA
SERBIA
BULGARI
AUSTRIA
CROATIA
MOLDOVA
Katowice
Krakow
Ostrava
Brno
Vienna
Bratislava
Budapest
Lviv
Khmelnitskyi
Bucharest
Craiova
Brasov
Timisoara
Novi Sad
Belgrade
Nis
Cluj-Napoca
Dnieper HPP
Dobrotvirska
Burshtynska
Kopushska
Stalowa Wola
Polaniec
Lagisza
Rybnik
Siersza
Skawina
Porabka Zar
Dlouhe Strane
Detmarovice
Cierny Vah
Movaky
Mochovce
Jaslovske Bohunice
Kroneuburg
Simmering
Donaustad
Freudeneu
Gabcikovo
Matra
Tisza N
Vojany
Oroszlany
Dunamenti
Paks
Varazdin
Cakovec
Dubrava
Arad
Oradea
Remeti
Munteni
Tarnita
Gilau
Mariselu
Iernut
Stejaru
Vaduri
Lilieci
Racova
Bacau Sud
Borzesti
Siret
Suceava
Stanca
Mintia
Toiesti
Sugag
Cirnesti
Orlea
Galceag
Rau Mare
Paroseni
Ruieni
Motru
Tismana
Bradisor
Lotru
Turnu
Albesti
Govora
Rauteni
Ciesti
Noaptes
Ciabucet
Doicesti
Arpasu
Scoreiu
Cornelu
Vidraru
Darste
Nehoias
Buzau aval
Brazi
Zrenjanin
Novi Sad
TENT B
TENT A
Kolubara
Morava
Drmno
Smederevo
Portile de Fier 1
Djerdap
Portile de Fier 2
Drobeta
Urecheati
Turceni
Ionesti
Zavideni
Bragasani
Tantareni
Craiova Nord
Isalmita
Frunzani
Izbiceni
Rusanesti
Kozlodup
Grozavesti
Bucaresti Sud
Bucaresti Vest
Progresu
Giurgiu
Bistrica

Map 11.
Hydrocarbon fields



Hydrocarbon Fields
in the Carpathian region
Hydrocarbon fields
KEO extent
Hydrocarbon structures
active
active or abandoned
Rafineries
Settlements
> 500 000 citizens
250 000 - 500 000
< 250 000
0
50
100
200
km
POLAND
CZECH REPUBLIC
SLOVAKIA
UKRAINE
AUSTRIA
HUNGARY
ROMANIA
CROATIA
SERBIA
BULGARIA
MOLDOVA
Pannonian Basin
Transylvanian Basin
Vienna
Bratislava
Budapest
Belgrade
Bucharest
Lviv
Krakow
Tarnow
Rzeszow
Ostrava
Olomouc
Brno
Kosice
Uzhorod
Ivano-Frankivsk
Chernovtsy
Ternopol
Khmelnitskyi
Nyiregyhaza
Debrecen
Satu Mare
Baia Mare
Suceava
Botosani
Gyor
Szekesfehervar
Kecskemet
Oradea
Cluj-Napoca
Targul Mures
Piatra-Neamt
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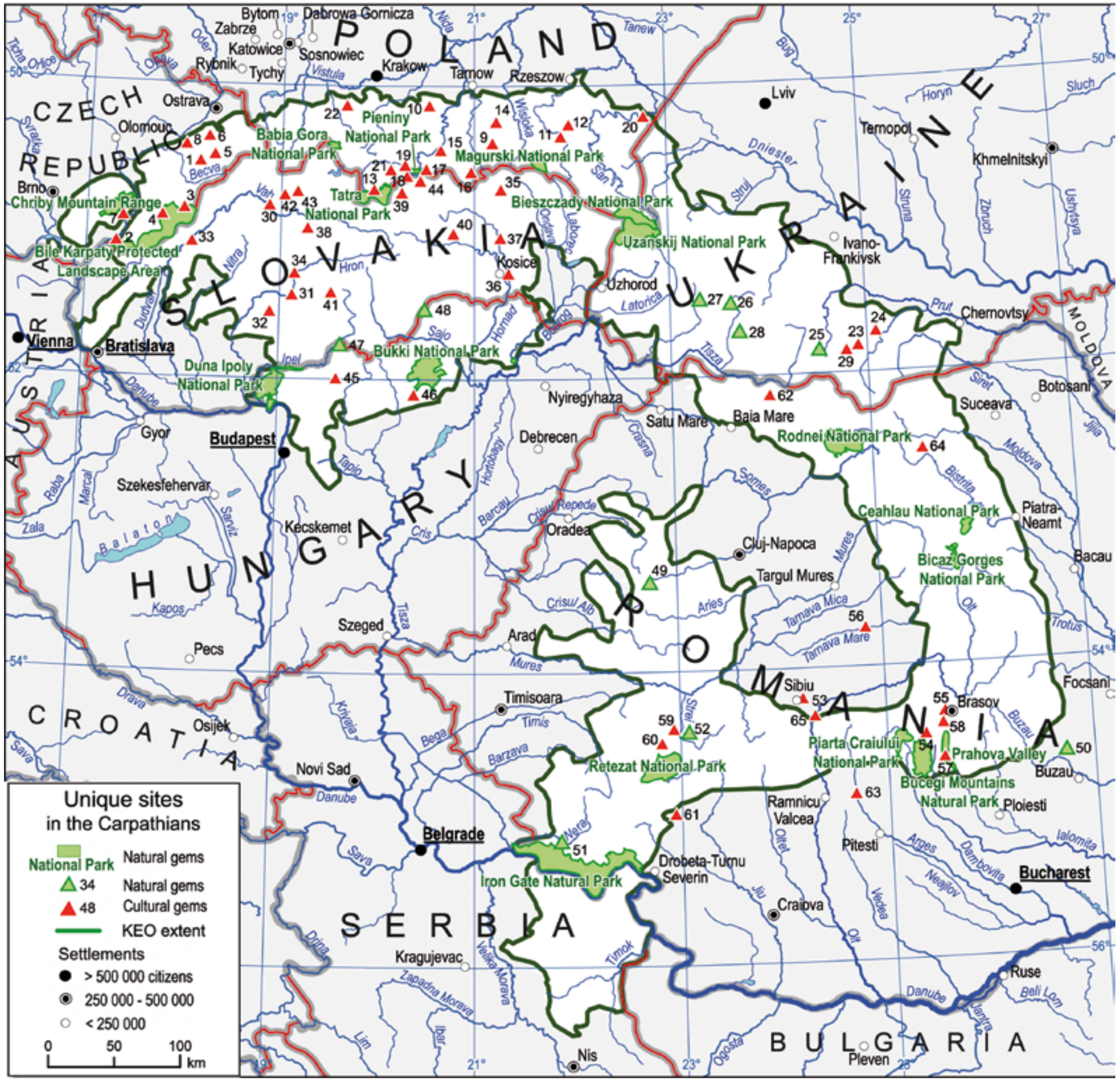
Timisoara
Sibiu
Brasov
Focsani
Osijek
Novi Sad
Ramnicu Valcea
Pitesti
Ploiesti
Buzau
Drobeta-Turnu Severin
Craiova
Kragujevac
Nis
Ruse
Pleven

Map 12.
Unique Sites in the Carpathians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Olomouc
Brno
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Khmelnitskyi
Ivano-Frankivsk
Chernovtsy
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Szekesfehervar
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Targul Mures
Arad
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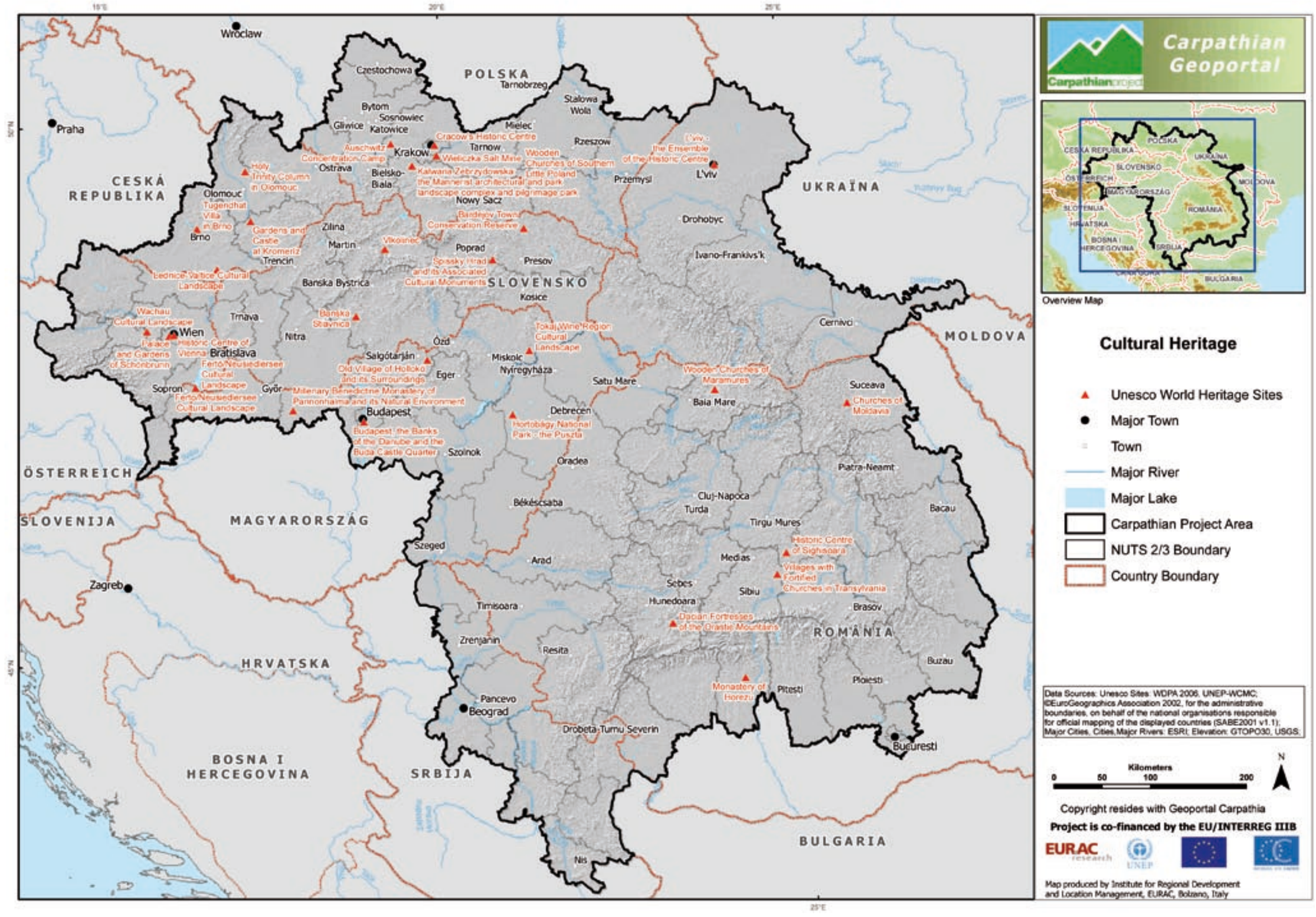
Brasov
Focsani
Buzau
Ploiesti
Ramnicu Valcea
Pitesti
Bucharest
Drobeta-Turnu Severin
Craiova
Ruse
Pleven
Kragujevac
Nis
Belgrade
Novi Sad
Osijek
Piatra-Neamt
Bacau
Pieniny National Park
Babia Gora National Park
Magurski National Park
Tatra National Park
Bieszczady National Park
Uzanskij National Park
Bukki National Park
Duna Ipoly National Park
Bile Karpaty Protected Landscape Area
Chriby Mountain Range
Retezat National Park
Iron Gate National Park
Ceahlau National Park
Bicaz Gorges National Park
Rodnei National Park
Piarta Craiului National Park
Prahova Valley
Bucegi Mountains Natural Park
Danube
Tisza
Dniester
Prut
Siret
Mures
Olt
Arges
Jiu
Somes
Crisu Repede
Crisu Alb
Tamava Mica
Tamava Mare
Barcau
Bistrita
Moldova
Trotus
Buzau
Ialomita
Dambovita
Neajlov
Vedea
Timok
Danube
Jantra
Beli Lom
Ogosta
Iskar
Vit
Struma
Mesta
Maritsa
Arda
Unique sites in the Carpathians
National Park
Natural gems
34 Natural gems
48 Cultural gems
KEO extent
Settlements
> 500 000 citizens
250 000 - 500 000
< 250 000
0 50 100 km
1 Roznov pod Radhostem (CZ)
2 Strazinice (CZ)
3 Valasske Kolobouky (CZ)
4 Luhacovice (CZ)
5 Radhost Hill (CZ)
6 The Hukvaldy Castle (CZ)
7 Buchlov (CZ)
8 Valachian region (CZ)
9 Wooden Church in Sekowa (UNESCO) (PL)
10 Wooden Church in Lipnica Murowana (UNESCO) (PL)
11 Wooden Church in Haczow (UNESCO) (PL)
12 Wooden Church in Blizne (UNESCO) (PL)
13 Zakopane (PL)
14 Wooden Church in Binarowa (UNESCO) (PL)
15 Stary Sacz (PL)
16 Krynica Gorska (PL)
17 Szczawnica (PL)
18 Castle in Niedzica (PL)
19 Castle in Czorsztyn (PL)
20 Przemysl (PL)
21 Cave in Obazowa (PL)
22 Kalwaria Zebrzydowska (UNESCO) (PL)
23 Krivorimya (UA)
24 Kosiv (UA)
25 Hoverla Mountain (UA)
26 Synevyr Lake (UA)
27 Virgin Forest (UA)
28 Virgin Forest (UA)
29 Verkhovyna (UA)
30 Ruins of the Castle in Strecno (SK)
31 Ruins of the Castle in Zvolen (SK)
32 Banska Stiavnica (UNESCO) (SK)
33 Trencin, also ruins of the Castle (SK)
34 Banska Bystrica (SK)
35 Bardejov Town (UNESCO) (SK)
36 Kosice (SK)
37 Presov (SK)
38 Vlkolinec Village (UNESCO) (SK)
39 Zdiar (SK)
40 Ruins of the Castle in Spis (SK)
41 Hrinova (SK)
42 Terchova (SK)
43 Zazriva (SK)
44 Zamagurie (SK)
45 Holkso (HU)
46 Eger Castle (HU)
47 Ipolytarnoc European Diploma (HU)
48 Aggtelek Karst (UNESCO) (HU)
49 Crastic Plateau Padis (RO)
50 Mud Volcanoes (RO)
51 Nera Gorges (RO)
52 Cioclovina Cave (RO)
53 Sibiu (RO)
54 Bran Castle (RO)
55 Brasov (RO)
56 Sighisoara (RO)
57 Peles Castle (RO)
58 Poiana Brasov Tourist Resort (RO)
59 Hateg Geopark (RO)
60 Sarmizegetusa Regia (RO)
61 Tismana Monastere (RO)
62 Wooden Churches of Maramures (UNESCO) (RO)
63 Curtea de Arges (RO)
64 Bucovina Region (UNESCO) (RO)
65 Etnographic Region Marginimea Sibiului (RO)

Map 13.
Cultural Heritage (UNESCO sites in the Carpathians)


Carpathian Geoportal
Overview Map
Cultural Heritage
Unesco World Heritage Sites
Major Town
Town
Major River
Major Lake
Carpathian Project Area
NUTS 2/3 Boundary
Country Boundary
Data Sources: Unesco Sites: WDPA 2006, UNEP-WCMC; ©EuroGeographics Association 2002, for the administrative boundaries, on behalf of the national organisations responsible for official mapping of the displayed countries (SABE2001 v1.1); Major Cities, Cities,Major Rivers: ESRI; Elevation: GTOPO30, USGS;
Kilometers
0 50 100 200
N
Copyright resides with Geoportal Carpathia
Project is co-financed by the EU/INTERREG IIIB
EURAC research
UNEP
Map produced by Institute for Regional Development and Location Management, EURAC, Bolzano, Italy
POLSKA
CESKÁ REPUBLIKA
UKRAÏNA
SLOVENSKO
MOLDOVA
ÖSTERREICH
SLOVENIJA
MAGYARORSZÁG
HRVATSKA
BOSNA I HERCEGOVINA
SRBIJA
ROMÂNIA
BULGARIA
Wroclaw
Praha
Czestochowa
Tarnobrzeg
Stalowa Wola
Bytom
Sosnowiec
Gliwice
Katowice
Mielec
Rzeszow
Krakow
Tarnow
Ostrava
Bielsko-Biala
Przemysl
L'viv
Olomouc
Nowy Sacz
Drohobyc
Brno
Zilina
Martin
Poprad
Presov
Ivano-Frankivs'k
Trencin
Banska Bystrica
Kosice
Trnava
Wien
Nitra
Bratislava
Ózd
Salgótarján
Miskolc
Nyíregyháza
Eger
Sopron
Győr
Budapest
Debrecen
Satu Mare
Baia Mare
Cernivci
Suceava
Szolnok
Oradea
Piatra-Neamt
Cluj-Napoca
Turda
Bacau
Békéscsaba
Tirgu Mures
Szeged
Arad
Medias
Sebes
Sibiu
Hunedoara
Brasov
Timisoara
Zrenjanin
Resita
Buzau
Pancevo
Beograd
Pitesti
Ploiesti
Drobeta-Turnu Severin
Bucuresti
Nis
Zagreb
Cracow's Historic Centre
Auschwitz Concentration Camp
Wieliczka Salt Mine
Wooden Churches of Southern Little Poland
Kalwaria Zebrzydowska the Mannerist architectural and park landscape complex and pilgrimage park
L'viv - the Ensemble of the Historic Centre
Holy Trinity Column in Olomouc
Tugendhat Villa in Brno
Gardens and Castle at Kromeriz
Bardejov Town Conservation Reserve
Vlkolinec
Spissky Hrad and its Associated Cultural Monuments
Lednice-Valtice Cultural Landscape
Wachau Cultural Landscape
Palace and Gardens of Schönbrunn
Historic Centre of Vienna
Ferto/Neusiedlersee Cultural Landscape
Banska Stravnica
Tokaj Wine Region Cultural Landscape
Old Village of Holloko and its Surroundings
Millenary Benedictine Monastery of Pannonhalma and its Natural Environment
Budapest, the Banks of the Danube and the Buda Castle Quarter
Hortobágy National Park - the Puszta
Wooden Churches of Maramures
Churches of Moldavia
Historic Centre of Sighisoara
Villages with Fortified Churches in Transylvania
Dacian Fortresses of the Orastie Mountains
Monastery of Horezu

Map 14.
Tourism Development, 2005: Total number of bed places

Carpathian Project

Overview Map

Tourism Development, 2005

Total Number of Bed Places

- no data
- < 2,500
- 2,500 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- > 20,000
- Town
- Major Town
- Major River
- Carpathian Project Area
- Country Boundary

Data Sources: Statistical Data: Eurostat, 2005 except UA (National Statistical Office). Data at Nuts Level 3, except UA (NUTS2). Administrative Boundaries: ©EuroGeographics Association 2002, on behalf of the national organisations responsible for official mapping of the displayed countries (SABE2001 v1.1); Major Cities, Cities, Major Rivers: ESRI.

Kilometers 0 50 100 200

N

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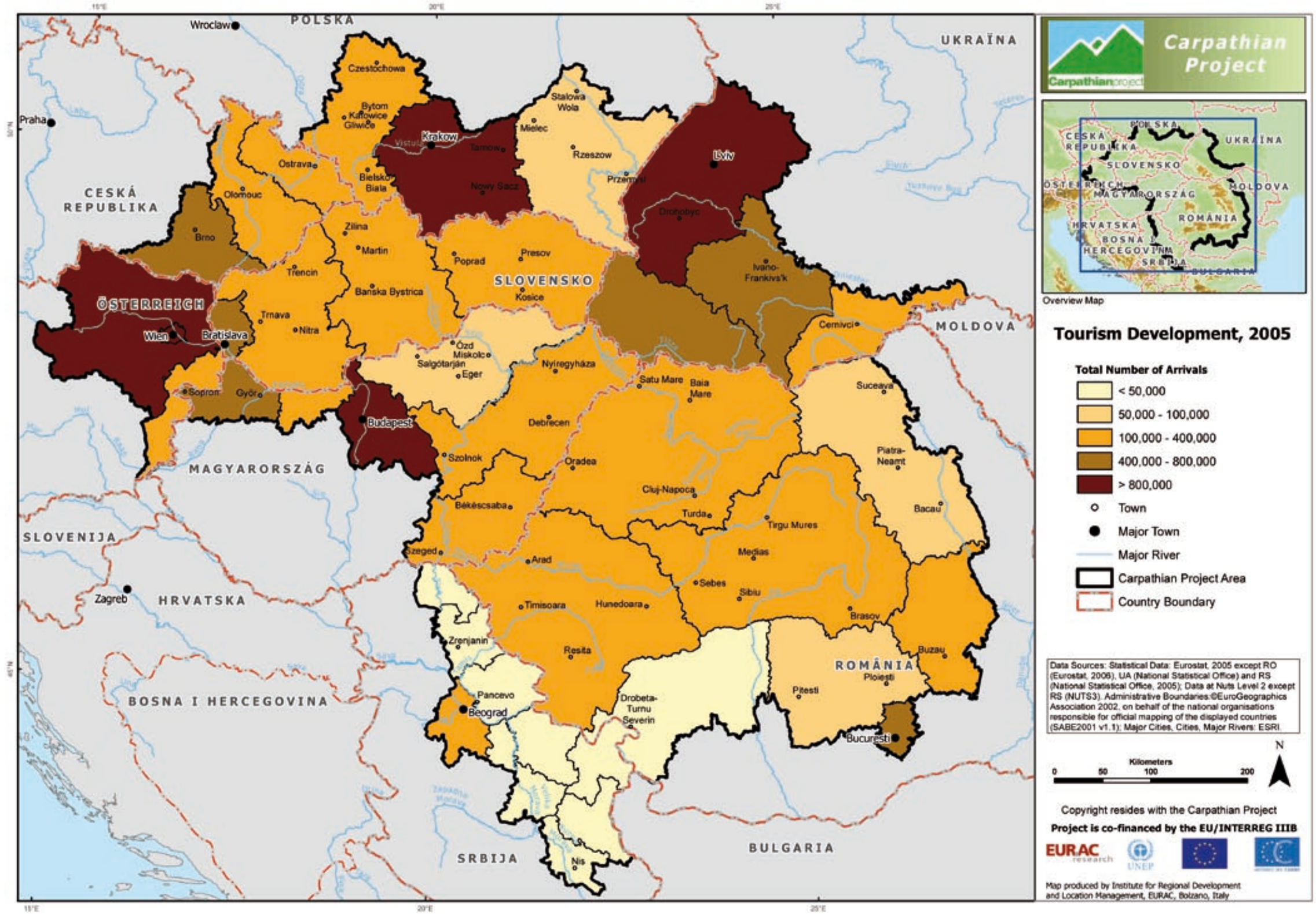
EURAC research UNEP

Map produced by Institute for Regional Development and Location Management, EURAC, Bolzano, Italy

Map 15.
Tourism Development, 2005: Total number of arrivals


Carpathian Project
Overview Map
Tourism Development, 2005
Total Number of Arrivals
< 50,000
50,000 - 100,000
100,000 - 400,000
400,000 - 800,000
> 800,000
Town
Major Town
Major River
Carpathian Project Area
Country Boundary
Data Sources: Statistical Data: Eurostat, 2005 except RO (Eurostat, 2006), UA (National Statistical Office) and RS (National Statistical Office, 2005); Data at Nuts Level 2 except RS (NUTS3). Administrative Boundaries:©EuroGeographics Association 2002, on behalf of the national organisations responsible for official mapping of the displayed countries (SABE2001 v1.1); Major Cities, Cities, Major Rivers: ESRI.
Kilometers
0 50 100 200
N
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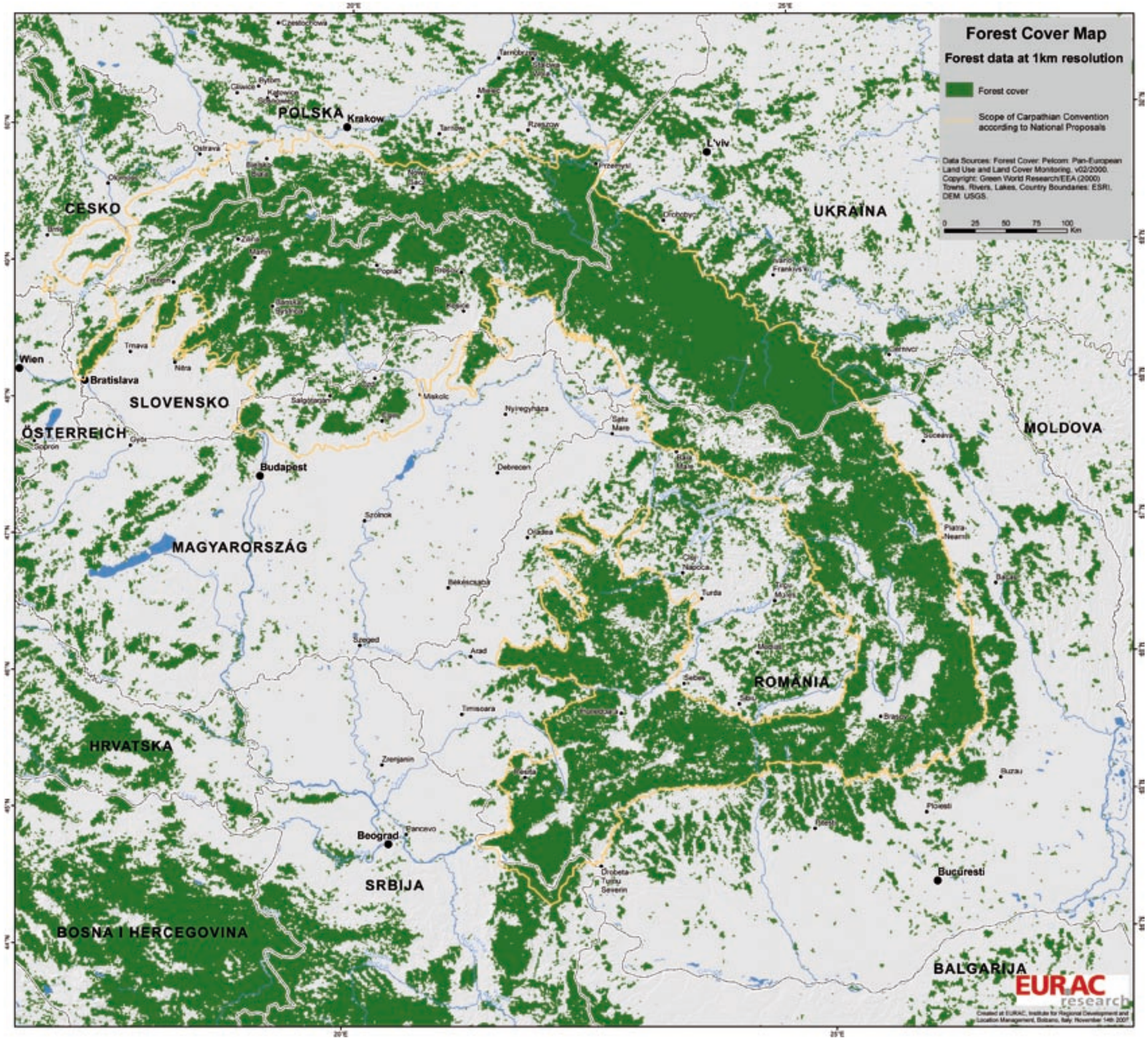
EURAC research
UNEP
Map produced by Institute for Regional Development and Location Management, EURAC, Bolzano, Italy
POLSKA
UKRAÏNA
CESKÁ REPUBLIKA
SLOVENSKO
ÖSTERREICH
MAGYARORSZÁG
MOLDOVA
ROMÂNIA
HRVATSKA
BOSNA I HERCEGOVINA
SRBIJA
BULGARIA
SLOVENIJA
Wroclaw
Praha
Czestochowa
Bytom
Katowice
Gliwice
Krakow
Tarnow
Mielec
Stalowa Wola
Rzeszow
Przemysl
Lviv
Drohobych
Ostrava
Bielsko Biala
Nowy Sacz
Olomouc
Brno
Zilina
Martin
Trencin
Poprad
Presov
Kosice
Banska Bystrica
Ivano-Frankivs'k
Trnava
Nitra
Wien
Bratislava
Cernivci
Ózd
Miskolc
Salgótarján
Eger
Nyiregyháza
Satu Mare
Baia Mare
Suceava
Sopron
Györ
Budapest
Debrecen
Szolnok
Oradea
Piatra-Neamt
Cluj-Napoca
Békéscsaba
Turda
Tirgu Mures
Bacau
Szeged
Arad
Medias
Sebes
Sibiu
Timisoara
Hunedoara
Brasov
Zagreb
Zrenjanin
Resita
Buzau
Ploiesti
Pancevo
Beograd
Drobeta-Turnu Severin
Pitesti
Bucuresti
Nis

Map 16.
Forest Cover in the Carpathians


Forest Cover Map
Forest data at 1km resolution
Forest cover
Scope of Carpathian Convention according to National Proposals
Data Sources: Forest Cover: Pelcom: Pan-European Land Use and Land Cover Monitoring, v02/2000. Copyright: Green World Research/EEA (2000) Towns, Rivers, Lakes, Country Boundaries: ESRI. DEM: USGS.
0 25 50 75 100 Km
POLSKA
CESKO
UKRAINA
SLOVENSKO
ÖSTERREICH
MAGYARORSZÁG
ROMÂNIA
MOLDOVA
HRVATSKA
SRBIJA
BOSNA I HERCEGOVINA
BALGARIJA
Krakow
L'viv
Wien
Bratislava
Budapest
Beograd
Bucuresti
EURAC research

Move4Nature

CARPATHIAN MOUNTAINS ESD TRAINING TOOL KIT

The Carpathian Mountains ESD Training Tool Kit - a mountain-oriented educational guide - aims at encouraging approaches to sustainable management of the mountain areas in the long-run through enabling the mountain communities to develop the attitudes, skills and knowledge to make informed decisions for the benefit of themselves and others, and to act upon these decisions, in preserving the unique cultural and natural features of their surroundings.

The English version of the Tool Kit was developed on the basis of the original Romanian version, adjusted and restructured to be relevant in a regional context. The main aim of the English version is to provide basis for the development of further adapted local version of the Tool Kit in the Carpathian countries and in other mountain regions. The editors invite comments, suggestions and inputs from regional and international experts, to further contribute to the elaboration of a more equipped and helpful teaching instrument.

Developed and edited by

enSI environment and school initiatives

In the framewok of

CARPATHIAN CONVENTION

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