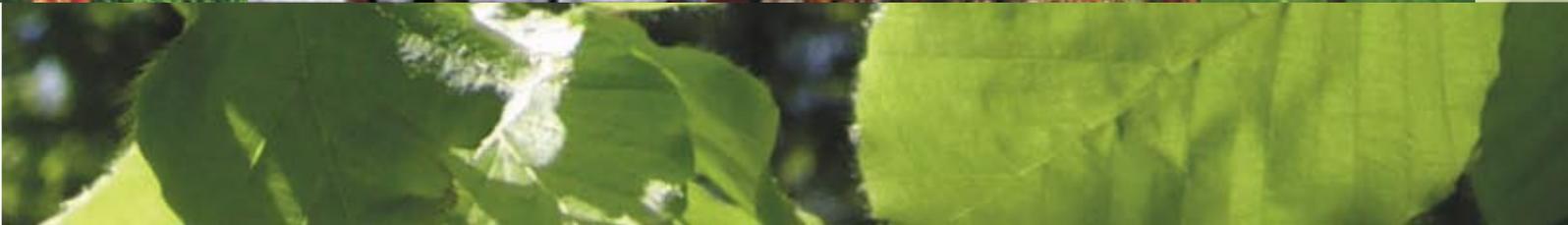




# Carpathians Environment Outlook *2007*





**Published by the United Nations Environment Programme**

Copyright © 2007 United Nations Environment Programme

ISBN: 978-92-807-2870-5

J.No: DEW/0999/GE

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made. UNEP would appreciate receiving a copy of any publication that uses this publication as a source.

No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme.

**DISCLAIMER**

The contents of this volume do not necessarily reflect the views or policies of UNEP or contributory organizations. The designations employed and the presentations do not imply the expressions of any opinion whatsoever on the part of UNEP or contributory organizations concerning the legal status of any country, territory, city or area or its authority, or concerning the delimitation of its frontiers or boundaries.

**Produced by UNEP/DEWA – Europe**

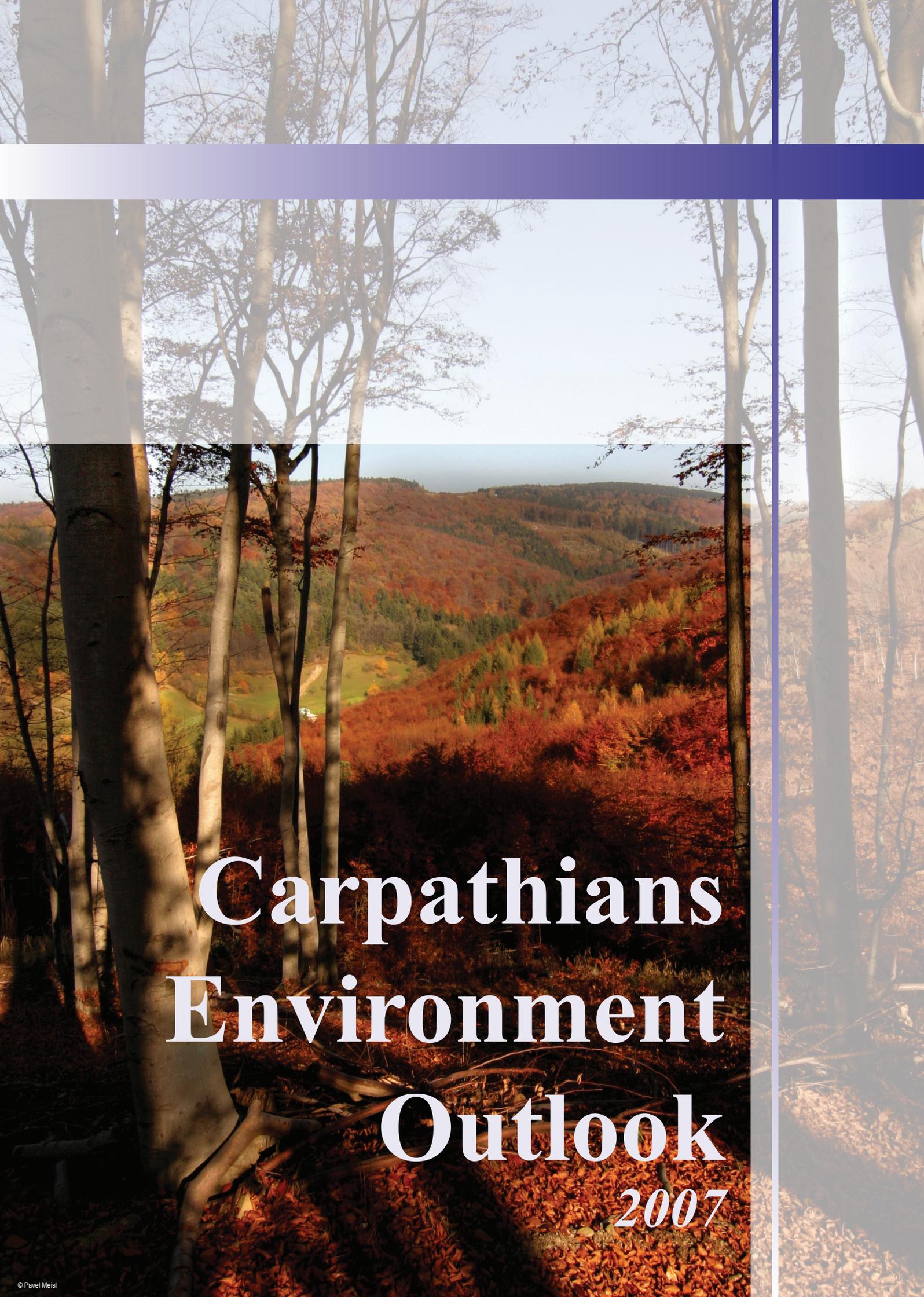
United Nations Environment Programme  
Division of Early Warning and Assessment (DEWA) – Europe  
UNEP's International Environment House  
11, chemin des Anémones  
CH-1219 Chatelaine, Geneva, Switzerland  
<http://www.grid.unep.ch>

Printed and bound by Dimograf Printing House, Bielsko-Biala, Poland,  
for and on behalf of the United Nations Environment Programme



Project part-financed  
by the European Union

UNEP promotes environmentally sound practices globally and in its own activities. This publication is printed on 100% recycled chlorine-free paper using other eco-friendly practices. Our distribution policy aims to reduce UNEP's carbon footprint.



# Carpathians Environment Outlook *2007*

## Foreword

The Carpathian Mountain region is an excellent example of why the United Nations and its environment programme are of increasing relevance in the 21<sup>st</sup> century. Seven countries – the Czech Republic, Hungary, Poland, Romania, Serbia, Slovakia and Ukraine – share the natural and nature-based resources found within this mountain range.

The region, including the surrounding lowland plains represents a centre of extensive biological diversity and at the same time a unique and well-preserved cultural heritage in a locale that, while in the heart of the European continent, remains relatively under-developed and ‘unspoiled’.

However, it is also inescapable that the Carpathian Mountains are increasingly coming under pressure from encroaching economic and infrastructural developments ranging from new roads, holiday homes and ski resorts, to the exploitation of the region’s abundant water, minerals and timber resources.

The challenge facing the countries and communities of the Carpathians is the challenge facing countries and communities world-wide: namely the delivery of sensitive, sustainable and intelligent management of the biodiversity and ecosystems upon which so much wealth, livelihoods and economic prosperity depend.

The Carpathian Mountain region also faces the other major and common challenge of our age – climate change – alongside the urgent and pressing need to “climate-proof” economies against the likely impacts.

The United Nations Framework Convention on the Protection and Sustainable Development of the Carpathians, in which UNEP and its Regional Office for Europe has played an important role, is designed to meet these challenges.

The Convention has been signed by all seven Carpathian countries and ratified by six, and is now moving into the implementation phase. In order to support the Convention and its various agreements or Protocols, UNEP in cooperation with the seven countries has developed the *Carpathians Environment Outlook* or *KEO*.

The Outlook brings the most accurate and up-to-date science available on the status of the environment in this region and has also helped initialise a “KEO database” developed by the UNEP/GRID-Warsaw Centre. The KEO report is a source of knowledge that can evolve to support the new and developing needs of the Carpathian countries and relevant organizations in their quest to deliver common and concrete solutions to the challenges and opportunities now and in the years to come.



*Achim Steiner*

Achim Steiner, UN Under-Secretary General  
and Executive Director United Nations  
Environment Programme (UNEP)

# About this Report

## Who can use KEO?

Given that the development of the Carpathians Environment Outlook (KEO) was initiated and requested by governments of the Carpathian countries, it therefore follows that one of the main **target audiences** (i.e. users and beneficiaries) of KEO should be decision- and policy-makers working for the governments, especially Ministries of the Environment, of the Carpathian countries. Governmental authorities at all levels within the Carpathian region are further considered to be key target audiences. This also includes regional environmental instruments such as the Carpathians Framework Convention, one of the main reasons for embarking on the KEO project.

Additional key target audiences include the European Commission, international organizations (e.g. UNEP, UNECE, Ramsar Convention Secretariat), international financial institutions (e.g. World Bank, EBRD), private sector business leaders and associations, non-governmental organizations (NGOs) and academia (e.g. professors, scientists and students at universities within the Carpathian region).

The producers of KEO also encourage all members of the public (especially in the Carpathian region) to use the KEO Report and become more informed about environmental trends, policies and solutions that may affect them and their communities, as well as their decisions and actions.

## How should one use KEO?

The KEO Report is divided into five main chapters that are preceded by a number of shorter sections.

KEO begins with a **“Foreword”** written by Achim Steiner, Executive Director of UNEP, highlighting

the relevance of KEO for future sustainable development in the region. The section **“About This Report”** presents the structure and main themes developed within KEO, and **“About the KEO Process”** explains how the Report was developed and by whom. An **Executive Summary** then summarizes the entire contents of the Report.

Following these opening sections, **“Chapter 1: Background and Introduction”** begins with a description of the Carpathian region’s main geographical attributes. This includes various interpretations of the region’s area and boundaries, altitudinal zones, water bodies, climate, geology and biodiversity. This is followed by an examination of human influences in the region, with a retrospective look at its historical-political background and cultural heritage. The Chapter ends with a brief overview of the main pressures impacting the Carpathian environment as well as current responses.

**“Chapter 2: Socio-Economic Driving Forces”** begins with an overview of macro-economic and structural policies affecting the region, including issues such as economic growth, employment and structural change. This is followed by a detailed look at the economic driving forces and pressures related to the following sectors: agriculture, forestry, energy and industry, transport infrastructure, tourism and traditional livelihoods. An examination of societal driving forces and pressures ends this chapter with analyses of population trends, rural de-population and land abandonment and environmental democracy.

**“Chapter 3: State of the Carpathians’ Environment and Policy Measures”** represents the longest chapter in KEO. It is divided into nine sub-chapters, each concentrating on one key environmental component or theme in the Carpathian region. These include: species, habitat and landscape diversity; forest resources; land

resources; mineral resources; water resources; atmospheric pressures; waste and hazardous chemicals; environment and security; urban development and cultural heritage. Within each sub-chapter, the state and trends of the environment, as well as human impacts and responses are analysed and described. The first sub-chapter on Species, habitat and landscape diversity has been given particular attention due to its high environmental significance for the Carpathian region, countries and UNEP.

**“Chapter 4: Outlook 2005 to 2020: Three Scenarios for the Carpathian Region’s Future Development”** is meant to help government policy-makers and other stakeholders identify key environmental challenges faced by the Carpathian region, and to understand the economic and environmental impacts of the policies that could be used to address those challenges. It develops three main scenarios of environmental, social and economic developments up to 2020 – “Business as Usual”, “EU policy first” and the

“Carpathian Dream” – as well as the underlying economic and social factors that drive these developments. The scenarios are roughly analogous to those developed for UNEP’s GEO process, beginning with the GEO-2000 report.

**“Chapter 5: Conclusions and Options for Action”** is divided into three sub-chapters. The first and longest presents KEO’s overall conclusions with a focus on the region’s unique characteristics, socio-economic considerations and environmental issues. This is followed by a survey of current policies in the region and policy gaps and limitations. Finally, based on the contents of the Report, some “options for action” are provided to strengthen the future policy framework affecting the Carpathian region.

References for each chapter are included within the chapter texts, as well as in a full list of references at the end of each chapter. The KEO Report ends with lists of **“Acronyms and Abbreviations”** and **“Acknowledgements”**.

## About the Carpathians Environment Outlook (KEO) Process

The process to prepare the Carpathians Environment Outlook (KEO) was initiated by UNEP in March 2004, following a government's ministerial request for such a report. From the very beginning of the process, UNEP and the seven governments involved put great emphasis on assuring a participatory and "bottom-up" approach, to give both the process itself and the end product the greatest legitimacy possible within the timeframe allowed for the preparation and publication of this integrated environment assessment.

The KEO process is closely linked to and draws inspiration from its parent process which is UNEP's Global Environment Outlook (GEO), an integrated environment assessment (IEA) approach undertaken since the mid-1990s at the global scale, that involves hundreds of participants from all sectors: governmental, academic, civil society and NGOs, business/industry and other private sector, youth representatives and others. UNEP presents GEO as its "flagship series" on environmental state-and-trends reporting, and is constantly improving and refining the GEO process. Many other GEO-like reports have been prepared for various regions and countries of the world, including the Caucasus Environment Outlook (CEO; UNEP 2002). The fourth global GEO report "GEO-4" is to be published and launched in October 2007.

In terms of leadership, the entire KEO process was coordinated by UNEP's Division of Early Warning and Assessment (DEWA) European office in Geneva, along with UNEP's Regional Office for Europe (ROE) and its outposted Vienna-based office, which serves as the Interim Secretariat for the Carpathians Framework Convention (ISCC).

The first meeting to explore preparation of what became the "KEO Report" was held at the Hun-

garian Ministry of Environment and Water (MoEW) in Budapest, on 3-4 March 2004, with representatives of six of the seven Carpathian countries. Labelled as the "kick-off" meeting, it was used to discuss the concept of an IEA report for the Carpathians, and seek advice from mainly governmental participants as to their interest in, and the feasibility of having, such a report. Following this first exploratory meeting, it was always very clear that one of the main reasons for embarking on such a project, and the countries' direct interest therein, was to provide scientific support and underpinning to the UN Framework Convention on the Protection and Sustainable Development of the Carpathians (hereafter, the CFC). It is not an exaggeration, therefore, to state that the CFC was the *raison d'être* for the KEO report.

Following approval of the concept to develop such an IEA report for the Carpathians, all seven governments of the region were asked to formally name National Focal Points (NFPs) for the process, whose role was to act as advisors, participate in meetings and assure collection of relevant data from their countries to support the reporting process.

At the same time, a KEO Steering Group (S.G.) was established to guide and support the process, plan all aspects of the KEO Report and handle related logistical issues. The SG was composed of key persons from Carpathian governments (environment ministries), several major regional NGOs and UNEP. During the lifetime of the KEO process, the Steering Group met four times: in Warsaw (17-18 September 2004); in Vienna (7-8 July 2005 and 6-7 July 2006); and lastly in Poiana Brasov, Romania (19-23 March 2007).

The KEO Report was prepared in its entirety by scientific and governmental experts from the Carpathians countries. Different chapters and sections

of the Report were drafted by Chapter Lead Authors (CLAs), who were persons recommended by NFPs and selected by UNEP; all were from well-known scientific institutions or universities, or had direct experience with their assigned topics through work in government or academia.

In mid-2005, a Lead Data Centre (LDC) to assure the proper harmonisation, integration and dissemination of data sets provided for KEO analytic purposes was designated. For this role, UNEP's Global Resource Information Database (GRID)-Warsaw centre was selected and henceforth began development of the KEO Database, the forerunner of what is ultimately expected to grow into the KEO Information System, for future Carpathian regional reporting purposes and to support the CFC.

Finally, in early 2007 as the KEO reporting process entered its late stages, an Editor and Design specialist were selected, both of whom also have Carpathian regional roots.

During the lifetime of the KEO Report preparation, several key meetings of Carpathian stakeholders were held as milestone events in the

process. These meetings were: the First National Experts and NGOs Workshop held in Zakopane in the Polish Carpathians, (11-13 April 2005), which served to plan and reach agreement on the detailed contents of the KEO Report and related data/indicators; the Chapter Lead Authors (CLAs) Orientation meeting, held in Geneva (27 February 2006); the Regional Stakeholders' Consultation held in Banska Bystrica in the Slovakian Carpathians (18-20 October 2006), which served as a general review meeting with a broad range of regional participants from all seven countries, international organizations and NGOs; and the Final Authors' (and Steering Group) Meeting held in Poiana Brasov, Romania (19-23 March 2007), which mainly served to finalise most chapter drafts and plan for the launch of the KEO Report.

To summarise the KEO process, it was rich and varied and involved many participants, some of whom were involved from beginning to end, and some of whom changed along the way. For those persons from the region who may believe that "the journey is half of the pleasure", we would hope to welcome you on board for a second KEO report!

# Executive Summary

The Carpathians Environment Outlook (KEO) is a geographically integrated report on the state of, and trends related to, the environment of the Carpathian Mountains region, retrospectively over the past 30 years and forward to 2020. For KEO, an integrated environmental assessment (IEA) approach was carried out using the Driving Forces-Pressure-State-Impact-Response (DPSIR) methodology, a framework used to organize and classify environmental information in terms of the causal chain of human-environment interactions. The study is based on analyses of socio-economic and environmental processes and focuses on sustainable development issues, notably the economic efficiency and environmental effectiveness of policy actions. A certain level of diversity and flexibility in applying the DPSIR framework is apparent in different KEO chapters/sections, demonstrating the authors' own varying perspectives on and use of IEA.

## Physical characteristics

The Carpathian Mountains are the largest, longest and most twisted and fragmented mountain chain in Europe. Stretching like an arc across Central Europe, they cover parts of seven countries starting from the Czech Republic in the northwest, then running east and southwards through Slovakia, Poland, Hungary, Ukraine and Romania, and finally Serbia in the Carpathians' extreme southern reach.

A characteristic feature of the Carpathians' landscape is the typically small scale of land use patches. Except for large forest patches, areas of other land use types such as grasslands, pastures, agriculture and urban settlement are small. Together, these patches form a unique landscape 'grain pattern' with 'coarse' forest areas and 'fine' areas for other uses.

## Biodiversity

The Carpathian Mountains represent a link between the taiga of Northern Europe and the Mediterranean ecosystems of the south. They exhibit the largest pristine forests in Western and Central Europe, with the broadest primeval forests found in the Southern and Eastern Carpathians and in the Tatra Mountains. The great variety of endemic plants and animals characteristic of Carpathian ecosystems is an essential biodiversity component in Europe. The Carpathians have the richest community of large carnivores in Europe, including all of the large European predators, and their populations are still numerous and vital.

Many landscapes, habitats and flora and fauna show characteristic and unique features occurring solely or mainly in the Carpathian region. Many of these – endemic, alpine and relict habitats and species – are the result of long-term evolution, migration and adaptation processes that existed well before humans came to occupy the Carpathians. Among plant species, the most common and interesting group are the glacial relicts – species characterized by their alpine-arctic distribution pattern. Other interesting groups include species living on the edge of their geographical range, and 'archaeophytes' – migrants that entered the Carpathians following human settlement and agriculture. Similarly to vascular plants, there are also many endemic species of Carpathian fauna (mostly invertebrates).

The most important changes in nature were a consequence of the human presence in the Carpathians. Climate change is now resulting in changed habitats, a regression in the range of some species and an increase in that of others. Mass tourism favours the introduction of new invasive species into native habitats. Air and

water pollution, new infrastructural developments and the abandonment of traditional forms of land management are all having adverse effects on biodiversity in the region.

## History and Culture

The Carpathians have since centuries ago been at the contact point of empires, ethnic groups and cultures. The Carpathian area has been part of several states and empires. The current ethnic mix (Czechs, Germans, Hungarians, Poles, Romanians, Ukrainians, Slovaks and Serbs) is the reflection of a turbulent history.

Many traditions, artefacts, ruins, archaeological sites and monuments have been preserved from these earlier empires, cultures and peoples inhabiting the Carpathians since prehistoric times. Interestingly, the multitude of passes, depressions and valley corridors among the mountains facilitated inter-ethnic contacts and highlighted common ethnographic elements.

The first elements of a Carpathian culture date back to the Paleolithic and Neolithic Ages. Lower Paleolithic stone items such as chopping tools, as well as pottery, bronze and iron objects have been discovered in various mountainous and inter-montane sites. Highlights include the 22,000 year-old Venus of Mosavany statuette found carved into a mammoth tusk in Slovakia, and Sarmizegetusa in the former Geto-Dacian capital located in the Southern Carpathians, home to a solar monument similar to the one found at Stonehenge. In addition, many remnants from Roman times have been preserved, including the ruins of Roman settlements and roads. In the Northwestern, Southern and Southwestern Carpathians, Roman fortified cities (davae), mines and spas can be found.

The Carpathians and their surroundings have proven to be an environment attractive to settlement and human economic activities for ages. Major economic activities have been wood processing, mining, animal husbandry and agriculture, the latter mostly practiced in lowlands and mountain depressions.

Carpathian countries inherited significant and severe environmental problems from more than

40 years of communist rule. Their economies were much more polluting than economies in Western Europe. Many 'hot spot' areas existed with extreme pollution loads, environmental degradation and human health risks.

With the rise to power of the communist regimes, the natural resources of the Carpathian countries were forcibly exploited by Soviet-dominated enterprises. The collectivisation of agriculture, intense deforestation and implementation of centrally-based joint plans within the former Eastern Bloc's Council for Mutual Economic Assistance (COMECON) framework had profound negative effects on the Carpathians' environment. Over many decades under the centrally-planned system, a major and rapid conversion of farmland took place for the expansion of human settlements, industrial, mining activities and infrastructural development. Today, the seven Carpathian states are experiencing various forms of transition from the former centralised, communist system to a free market economy.

## Economy

Economic activity within the Carpathian region was determined in the last centuries by the natural environment, local customs, trade relations between tribal groups and the economic policies of the governments controlling the region. As in the past, the economy today is based on farming (closely associated with animal husbandry), forestry and mining, which remain predominant land uses. Compared to that of neighbouring lowlands, the economy of the Carpathians is far less developed. However, the situation varies considerably from region to region.

## Agriculture

Traditional agriculture based on seasonal pasturing in mountain meadows remains well-preserved in the Carpathians. However, cattle and sheep stocks have decreased significantly during the past decade. Since 1990, agricultural production experienced an overall reduction in intensity in terms of both crops and livestock. This was due in part to reduced domestic consumption following economic decline combined with the withdrawal of subsidies for fertilisers and other inputs. In many parts of the Carpathians,

much farmland was abandoned and large areas became fallow. The structure of the agricultural sector is now rapidly being reformed. This includes changes in land ownership and major shifts in traditional land use, even in marginal agricultural areas.

### Forestry

The forests of the Carpathians are a patchwork of deciduous, coniferous and mixed stands. The largest forest complexes are found in the Eastern Carpathians. In the Western and Southern Carpathians, substantial areas were deforested and converted to other land uses. In the foothill areas, forests are small and scattered and the landscape is dominated by other types of land use (agriculture, residential, infrastructure, etc.). Overall, young forests and deforested areas constitute over 50 percent of total forest area, while mature forests account for scarcely 11 percent.

Forestry remains an important economic sector in the Carpathian countries, particularly in Romania, Slovakia and Ukraine, although there are significant national and regional differences. Centuries of evolution and human impact changed the initial natural species composition, forest stand structure, size scale and character of the Carpathian forests. The forests, however, are still vital, with many virgin stands that are rich in species and are of high social, environmental and economic value for local people. Changes observed recently are in three main directions: the attitude of people to forest use, privatization, and the conservation status of forests. Significant restructuring of the sector is taking place, including the fragmentation of ownership.

One of the most important consequences of inappropriate agriculture and forest management (e.g. large clear-cuts) in mountain areas is soil erosion. Threats to soil cover in the Carpathians include those caused by natural processes, such as slope processes (erosion and landslides), and human activities such as pastures, forest management, tourism and recreation. Natural threats mainly affect areas above the forest zone where one can observe the highest intensity of geomorphologic processes.

### Energy

In general, power production in the Carpathian region relies mainly on fossil fuels, followed by nuclear, hydropower and renewable energy sources. Some Carpathian countries hold important fossil fuel reserves, although total proven oil and natural gas reserves are limited. The Carpathian countries remain highly dependent on imported oil and natural gas, mainly from Russia. The geo-strategic importance of the Carpathian region lies largely in the oil and natural gas pipelines traversing many of these countries on their way to Western Europe.

### Mineral Resources

Mining is a major economic activity in the Carpathians. The first impacts caused by large metallurgical mining sites date to antiquity, and have progressively expanded since feudal times. In the 19<sup>th</sup> century, the exploitation of industrial minerals, coal and hydrocarbons became very common, and such activities have continued to expand, but at a slower rate up to the present day.

Soils are the main receptor of mining contamination by the infiltration of residual and degraded industrial waters, as well as sedimentation of particles from the air. These deposits increase the soil's content of highly toxic chemicals, especially in the close vicinity of manufacturing sources. Their negative effects are propagated in the associated biotope, and sometimes even in the upper levels of underground waters. Among pollutants, residual water has proven to be the most polluting agent, with the greatest transport and contamination capacity through the extended river network.

### Water Resources

The common sources of water pollution are industrial wastewater, solid waste dumps and residues from the processing of mining ore and smelting operations. After 1991, as a result of pollution reduction measures, the percentage of "good-quality" rivers increased significantly in the Carpathians. Seepage from agricultural lands is responsible for most of the polluting elements identified in lakes and rivers. Excessive enrichment of soils with nitrogen, phosphorus and

ammonia leads to increased eutrophication of water bodies.

Generally, the Carpathians are situated in recharge areas, having potable waters of bicarbonate, calcium and/or magnesium types. Over 80% of human water consumption in the Carpathians is supplied by groundwater. Some of the main springs are bottled here as medicinal waters or used as carbonate-sparkling waters for spa cures.

### **Waste**

The amount of waste produced in the Carpathians is currently increasing, accentuating environmental damage such as water and soil pollution and the destruction of aesthetic and landscape values. In many places, uncontrolled dumping of wastes is greatly increasing, as old refuse dumps are full and there is a lack of acceptance of new sites being placed in or near local communities.

The greatest waste problem appears to be municipal waste, generation of which has significantly increased since the communist period. The import and mass utilization of non-recyclable materials has increased problems associated with waste management, especially at the local level, including a significant rise in the total amount of municipal waste. The existence of obsolete hazardous chemicals also remains a major issue. One emerging problem concerns new types of hazardous chemicals and the new unofficial 'hazardous waste market'.

### **Urban environment**

Since the fall of communism and over the last 18 years of transition, changes to the urban environment and its forms and structures have been significant. Cities and towns in all Carpathian countries have faced a variety of negative effects from urban development.

The most visible challenge is related to the processes of 'suburbanisation', urban sprawl and car use expansion. The common denominator for all these changes is the rapid shift from public transportation to individual cars, as mobility becomes a high priority at the individual level. Changes are most notable in the larger cities, but

the same tendencies have emerged in other municipalities. Transport is now the main cause of both air and noise pollution.

### **Emerging issues**

Current threats to biological and landscape diversity include climate change and anthropogenic impacts such as pollution, infrastructure development, unsustainable use of natural resources, loss of traditional livelihoods and mass tourism.

Climate change is likely to strongly affect hydrological and terrestrial biological systems through increased run-off and earlier spring peak discharge in many glacier- and snow-fed rivers; warming of lakes and rivers in many regions, with effects on thermal structure and water quality; and earlier timing of Spring events, such as leaf unfolding, bird migration and egg-laying. Biodiversity will also be affected by such changes. Furthermore, climate change would induce the migration of species and current life zones towards higher altitudes.

Environmental problems related to inefficient and unsustainable consumption of natural resources and accumulation of waste are also a major issue in the region. In many places, waste dumping is on the rise, sometimes dramatically. Key issues related to waste management in the Carpathian countries are the predominance of landfilling as a waste management option, and the problem of low recycling rates.

As for natural and technological risks and hazards, their diversity and importance is very high in the Carpathian region. Floods are the most challenging phenomenon for environmental security in the region. Several risk factors contribute to increased flood hazards in the Carpathians. One of the most important is the shape of the hydrographical network. The geological substrate consisting of rocks with low permeability, and the character of the relief caused by the young tectonics of the mountain range, are additional natural factors that contribute to the occurrence of floods in the region. Their negative impacts (economic and environmental) have a trans-boundary, regional or even macro-regional character.

## Future Development Scenarios

Many of the major environmental challenges Carpathian countries face in the early 21st century are of global or trans-boundary nature, including climate change, biodiversity loss, management of shared water resources, trans-boundary air pollution, and trade in endangered species and waste disposal. As a result, there is an increasing need for countries to work together in partnership to tackle these challenges.

The economic, political and/or social choices that are being made today will have effects on the environment far into the future. For many of these, the full environmental impacts will not be felt until long after such choices have been taken. KEO emphasizes that the next 15 years will be as crucial as the past 30 for shaping the future of the environment, and underlines three scenarios to explore what the future could be, depending on different policy and societal approaches.

The “Business as usual” scenario describes a future development/state in which globalisation and liberalisation forces are strong and propagate throughout the Carpathians. Multi-national enterprises with active government support dominate the division of power. Government policies are driven by the promotion of sustained economic growth, and the only measurement tool is profit maximisation. Due to rapid globalisation, traditional values gradually disappear. The cultural, ethnic and language diversity and the integration of the Roma population of the Carpathians are not acknowledged as important, and therefore local cultural associations do not survive due to cultural homogenisation. Regional disparities increase, and the depopulation of rural areas, especially the most remote ones, accelerates. The over-exploitation of natural resources, air and water pollution, and a lack of commitment to mitigate climate change cause major catastrophes within the region. Weather extremes (e.g. storms, heavy rains, heat waves) become more frequent, and cause great damage to both the economy and human health.

The ‘EU Policy First’ scenario considers the successful implementation of EU environmental regulations in the entire Carpathian region. Carpathian governments recognise the need for

stronger coordination of policy efforts and structural reforms. EU policies aim at maintaining and strengthening regional and social cohesion for the budget period 2013–2020; huge funds are available for sustainable, rural and agricultural development of the Carpathians, helping to decrease the social divide between rich and poor people, and decreasing regional disparities. Energy diversification and energy mix are a great concern, and particular attention is given to renewables and biofuels. Traditional air pollutant emissions are further reduced, while some improvements occur in urban air quality. Forest cover stabilises or slightly increases, and the share of unsustainable logging decreases. Trans-regional cooperation at all levels becomes stronger in environmental protection and nature conservation. The Natura 2000 network and other protected areas grow in size.

The ‘Carpathian Dream’ scenario assumes that pro-environment and anti-poverty policies are given highest priority and at a nearly unlimited cost. Policy-makers recognize that achieving environmental sustainability relies on a multitude of potential interventions undertaken by individuals, groups, organizations and institutions across different levels and sectors of society. Three broad categories of approaches to environmental sustainability are widely pursued, namely: the implementation of technological innovations; changing the structure of government, laws and/or the education system; and changing consumer behaviour. Behavioural changes lead to changed production and consumption patterns. Zero-energy houses and energy-efficient villages increase widely, as does the use of renewable energy sources (e.g. solar, heat pumps, wind, biomass). The economy of the region is characterised by qualitative growth accompanied by regional convergence. In the agricultural sector, organic farming and small-scale ecological and traditional agricultural methods are promoted, along with traditional/domesticated animal and plants species, old varieties and local products, and through local branding and advanced marketing systems. Nature conservation is deeply integrated into agricultural sectoral policies. Formerly indigenous but extinct species are resettled or reintroduced with support from local NGOs and governments. The total extent of protected areas

increases, green/migration corridors are established and strongly protected, along with gene banks which operate to preserve endangered species. Effective measures are taken to decrease habitat fragmentation.

### Policy options

The existing sustainable development strategies which are in place in each country cover the whole area of the country, and do not focus on mountain regions as such. Regional sustainable tourism strategies thus need to be designed and developed, taking into account the specificity of the mountain region and particular threats to which the mountain environment is exposed.

A main concern will be to preserve or develop a high-quality environment by means of sustainable natural resources and heritage management. In particular, this should be carried out by: developing joint incentives and actions for managing natural areas, protected areas and landscapes; developing joint actions for improving environmental quality (e.g. air, soil, water); developing and implementing joint strategies and policies for the sustainable use of natural resources and heritage; rehabilitation of degraded areas such as former mining sites, contaminated sites and brownfields; and sustainable development strategies, which should put more emphasis on assuring sustainable transport and energy-efficient transportation systems.

The EU's common policies and legislation will considerably influence the national policies of the Carpathian countries. Particular actions should be introduced by implementing sub-national and local plans, programmes and projects. A useful guideline for the creation of policies related to the Carpathian Region could be the "Policy Guiding Principles" in the renewed EU Sustainable Development Strategy.

On the sub-regional level, the Carpathian Framework Convention already unites the seven Carpathian countries in a unique partnership, and thus can be used as a vehicle to provide a trans-national framework for cooperation and multi-sectoral policy integration, an open forum

for participation by stakeholders and the public, and a platform for developing and implementing trans-national strategies, programmes and projects for environmental protection and sustainable development.

### Conclusion

The Carpathian Mountains region represents a unique and dynamic common living space (natural, cultural, political and socio-economic), both ecologically valuable and important in terms of its human heritage. The region has enormous ecological and economic potential and currently faces rapid environmental, social and political changes. The challenge is to preserve and fulfill the region's potential and specificity (uniqueness), while increasing its sustainability. This will require adapted, responsible actions, taking into account global, regional and trans-boundary contexts and linkages, in order to enhance both the Carpathian environment and human livelihoods.

The current development pattern in the Carpathian region is leading to losses of traditional knowledge, livelihoods, practices and values. It is therefore critically important that culturally sustainable and coherent policies be formulated and implemented for the Carpathians, in order to halt and reverse this trend before it is too late. Rural de-population menaces the traditional character of the Carpathians countryside. Policy measures must be implemented, and incentives developed, so that people remain in their villages as guardians of the landscape, traditional knowledge and livelihoods. Education, communication and public participation, together with environmental democracy, could represent a basis for a sustainable environment and development path in the Carpathians.

In order for Carpathian regional development to become sustainable, more environmentally-friendly practices and technologies will need to be implemented, along with appropriate policies to support sectoral developments such as renewable energy sources, sustainable forest management, sustainable tourism, organic farming and improved public transport.



# Table of Contents

<i>Foreword</i>	2
<i>About this Report</i>	4
<i>About the KEO Process</i>	6
<i>Executive Summary</i>	8
<i>Table of Contents</i>	15
<b>Chapter 1: Background and Introduction</b>	<b>17</b>
1.1 Main Geographical Features	22
1.2 Human Influences in the Carpathians	29
1.3 Modern-day Impacts on Environment and Current Responses	37
<b>Chapter 2: Socio-Economic Driving Forces</b>	<b>43</b>
2.1 Macro-Economic and Structural Policy Overview	45
2.2 Economic Driving Forces and Pressures	55
2.3 Societal Driving Forces and Pressures	77
<b>Chapter 3: State of the Carpathians' Environment and Policy Measures</b>	<b>89</b>
3.1 Species, Habitat and Landscape Diversity	90
3.2 Forest Resources	107
3.3 Land Resources	114
3.4 Mineral Resources	124
3.5 Water Resources	137
3.6 Atmospheric Processes	146
3.7 Waste and Hazardous Chemicals	157
3.8 Environment and Security	163
3.9 Urban Development and Cultural Heritage	172
<b>Chapter 4: Outlook 2020: Three Scenarios for the Carpathian Region's Future Development</b>	<b>189</b>
4.1 Methodological Approach	191
4.2 Driving Forces, Critical Uncertainties, Challenges and Fundamental Assumptions	193
4.3 Three Scenarios for the Carpathian Region	195
<b>Chapter 5: Conclusions and Options for Action</b>	<b>211</b>
5.1 Overall Conclusions	212
5.2 Current Policy Approaches	217
5.3 Future Policy Framework – Options for Action	220
<b>Annexes</b>	<b>225</b>
<i>List of Figures</i>	226
<i>List of Boxes</i>	227
<i>List of Tables</i>	228
<i>List of Maps</i>	229
<i>Acronyms and Abbreviations</i>	230
<i>Acknowledgements</i>	231

