

# BIOLOGICAL AND LANDSCAPE DIVERSITY OF CROATIA



An Overview of the State of Biological and Landscape Diversity of Croatia with the Protection Strategy and Action Plans  
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# AN OVERVIEW OF THE STATE OF BIOLOGICAL AND LANDSCAPE DIVERSITY OF CROATIA

WITH THE PROTECTION STRATEGY AND ACTION PLANS

*On the basis of background studies prepared by*  
**Jasminka Radović**

*This book is prepared on the basis of background studies compiled during development of the National Strategy and Action Plans for the Protection of Biological and Landscape Diversity (NSAP) and contains the entire document passed by the Croatian National Parliament ("Official Gazette" No. 81/99 dated 3 August 1999). It also represents the first National Report for the Conference of Parties to the Convention on Biological Diversity. Financial assistance to develop the NSAP and print this book was provided by the World Bank within the framework of the Global Environmental Facility (GEF).*

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Zagreb, December 2000

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# Preface



Natural resources represent the greatest value and development potential for any country. Croatia is fortunate to be among the richest in Europe regarding biological and landscape diversity. Although we have always been proud of our nature and aware of its overall value, it was only through the preparation of the *National Strategy and Action Plan for the Protection of Biological and Landscape Diversity (NSAP)* that we could finally quantify these values in terms of figures and scientific arguments.

NSAP – and this book accordingly, was prepared with the contribution of 110 associates, scientists and experts in the field of biological and landscape diversity study and protection, who were at the same time representatives of competent government bodies, scientific institutions and non-governmental organisations. Their efforts resulted in the first integrated overview of biological and landscape diversity of

Croatia and helped in documenting the extraordinary high value of Croatia's biological diversity in European proportions, particularly considering its relatively small territory.

Today we are aware that in order to preserve such richness of biological and landscape diversity, it is not enough to protect only a few percent of the country as specially protected areas. Even in the last century, an alarming trend of nature degradation was noticed and it initiated a systematic protection of nature. The most valuable areas and the most endangered species were singled out and protected. However, a new stock of knowledge made it clear that such a classical approach to protection was not sufficient and that results of the nature protection could be achieved only through comprehensive understanding of the overall biological diversity of the entire planet and the complexity of human influences. Sustainable development, including its economic, ecological, social and cultural dimensions, has grown to be a priority agenda of an ever-growing number of countries.

The historical United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 was undoubtedly the turning-point in approaching the protection of nature and the environment. On that occasion, 157 countries signed the Convention on Biological Diversity – the most recent global step towards comprehensive protection and sustainable use of natural resources. Its basic objectives were preservation and improvement of the existing biological diversity, as well as the economical use of natural resources on the principles of sustainability.

Owing to its unprecedented response in the world, the Conference gave a powerful encouragement to nature protection and contributed to proper appreciation of this problem area. Still, it is by no means a solution to accumulated problems, but rather a possible framework to solve them on a global scale. Each country should undertake efforts in the protection of its own biological and landscape diversity, respecting the generally accepted principles.

The Republic of Croatia ratified the Convention on Biological Diversity in April 1996, becoming its full party on 5 January 1997. The basic obligation of each party to the Convention is identification of its own biological diversity, its endangerment and problems related to protection, including the development of an adequate national strategy. The result of this obligation is the NSAP, that gives an integrated overview of the diversity of species, ecological systems and landscapes of Croatia, identification of major threats and causes of problems in nature protection and finally strategic guidelines and action plans for protection.

The analysis of the current state has, unfortunately showed that substantial portion of Croatia's biological and landscape diversity is being threatened. Therefore, efforts have been

undertaken to identify the priority issues and propose adequate steps to protect and provide the sustainable use of natural resources.

The adoption of this document on the part of the Croatian National Parliament in 1999 marked a new era in nature protection. Today, this issue is attracting its deserved attention. In the past, protection of nature was frequently considered to be a hindrance to progress, and aimed merely at preserving parts of nature and minimising human influence in them. Nevertheless, the new approach initiated by the Convention on Biological Diversity has not only demonstrated that the protection of nature is a prerequisite for the survival of man on this planet, but also that nature could be used in a reasonable and sustainable manner, provided that its rules are respected.

The Republic of Croatia is trying to follow the aims and objectives of the Convention on Biological Diversity and other relevant international treaties to which it is a party. The NSAP has set up a new policy of nature protection that is being put in practice through new national legislation, especially the new Nature Protection Act, which is already in the official procedure for enacting. Conservation of biological and landscape diversity is thus becoming one of prevailing tasks of the overall development policy, and natural values are being regarded as the main foundation of Croatia's further progress.

*Božo Kovačević,  
Minister of Environmental Protection  
and Physical Planning*



# Foreword



Let me present the publication, which proves that Croatia, as a party to the Convention on Biological Diversity, fulfils its obligations to evaluate and protect the national biological and landscape diversity. In spite of the hundred years' tradition of nature protection legislation, the National Strategy and Action Plan (NSAP) is the first document in which protection of nature is planned in an integrated and systematic manner. It was adopted by the Parliament in 1999, to promote nature protection as an integrated activity based on species, habitat and protected area conservation. Also, it aims to ensure rational and sustainable use of natural resources by all users.

The World knows and recognized the value of Croatian diversity of plants, animals and fungi. The number of known species in Croatia exceeds 30 000. The estimated number of species is far higher – from 50 000 to 120 000, thus

representing the richness of flora and fauna for such a small country.

Croatia is characterised by a great number of endemic and relict species and subspecies, mostly connected with the karst and karst underground – a globally significant peculiarity of this part of Europe. The diversity of forests goes from vast mountain forests with stable populations of the bear, the wolf and the lynx, to rich alluvial forests with important 'breeding birds' such as the white-tailed eagle, the lesser spotted eagle and the black stork. Various marshland and aquatic habitats, among which there are some of the widest flood areas still remaining in Europe, represent important resting and feeding places for almost all European migratory animals. The wealth of marine biological diversity is accompanied by the immense diversity of islands, small islands and cliffs, many of them having developed special forms of plant and animal species and subspecies as a result of their isolation.

This Strategy defines priority problems and required guidelines for action. The analysis has indicated the following priorities:

Uniqueness and richness of karst ecological systems is of the global value.

Marsh and aquatic ecological systems are endangered mostly due to human activities.

Small habitats are endangered mostly by human activities, and these are: sandy and pebbled beaches, puddles on islands, small marshes etc; or very rare habitats located outside their usual range of distribution, i. e. peatbog communities, sand vegetation.

High protection priority is given to the species that are globally, regionally or nationally endangered, as well as to endemic species and those of great economic and/or educational importance.

At the beginning of the third millennium, the efficient implementation of biodiversity protection in Croatia can be considered insufficiently systematic. The first step in strengthening biodiversity and landscape protection is development of legislative tools at national and local levels, and introducing the principle of conservation incorporated into all sectors in order to achieve sustainable development.

To date, about 9.9 % of the Croatian territory has been protected. The program for conservation of native animal species is supported by a number of ministries. Gene banks of forest tree species have been established, and Croatian original breeds registered. Some of them can be found only in Croatia, while other spread outside its borders in other countries. Considerable efforts being put the participation in and and harmonisation with international activities.

The process of NSAP development has determined the lack of scientific and monitoring systems as a serious obstacle for proper evaluation and efficient implementation of biodiversity protection. The same applies to non-existence of inventoring and mapping programmes.

Unfortunately, there are yet no financing mechanisms for many biodiversity protective activities outside regular budgetary financing.

Insufficient public information about biodiversity and landscape protection also contributes to the problem. The crucial role of scientific and public institutions and non-governmental organisations in overcoming this problem is increasing. The national body that co-ordinates the development and implementation of NSAP at all levels is the Nature Protection Division at the Ministry of Environmental Protection and Physical Planning.

NSAP represents the first complete survey of Croatian natural resources. Data on species and sub-species are structured according to European and global databases, for the first time. The NSAP version in English language is also available.

An important job has been accomplished. On the other hand, it has shown that we are at the very beginning of a systematic and co-ordinated work necessary for achieving the long-term goals.

*Ivan Martinić,  
Assistant Minister  
Nature Protection Division  
Ministry of Environmental Protection  
and Physical Planning*

# Introduction

In accordance with obligations arising from Article 6 of the Convention on Biological Diversity, the Government of the Republic of Croatia, by its Decision of April 1997, tasked the government body responsible for the protection of nature with the development of the National Strategy and Action Plans for the Protection of Biological and Landscape Diversity (NSAP). By the same Decision the Government of the Republic Croatia granted for this purpose the finance from the national budget amounting to 500,000 KN (about 90,000 US\$) and a portion of the finance amounting to 102,000 US\$ was provided by the Global Environment Facility (GEF) through the World Bank. The budgetary funds were earmarked for making an inventory of the biological and landscape diversity of Croatia, and the GEF donation for the development of the strategy and action plan for the protection.

Considering the comprehensiveness of the problem area and aiming at the achievement of a participatory approach to the development of the NSAP, a **Steering Committee of the NSAP** was set up, consisting of the representatives of individual government bodies (the Ministry of Environmental Protection and Physical Planning, the Ministry of Agriculture and Forestry, the Ministry of Development and Reconstruction), scientific institutions (the Botanical and Zoological Department, Faculty of Science, University of Zagreb, Croatian Natural History Museum, the Institute for Oceanography and Fisheries in Split), non-governmental organizations (Croatian Ecological Society, Regional Environmental Centre for Central and Eastern Europe – REC, Country Office in Croatia) and public enterprises (the Croatian Waters).

The development of the NSAP is divided into two sections. The first one relates to **making an inventory of biological and landscape diversity of Croatia**, or rather to the overview of the present state of taxa, ecological systems and landscapes. The task was given special attention, considering the fact that Croatia is one of the last European countries without a list of indigenous flora, fungi and fauna, including the classification of habitat types. Despite a generally accepted understanding of the wealth and diversity of the country's nature, nobody has so far attempted to quantify this wealth and to express its value. In the course of the NSAP development 70 scientists and experts made lists of indigenous species within individual plant, fungi and animal groups on the basis of the data available, including the analysis of their endangerment and guidelines for the strategy and action plan for their protection. This is the first attempt to incorporate all the existing data on biological taxa of Croatia that will provide a basis for further research works and actions for the protection of biological diversity. It also pointed to the current deficiencies of knowledge – groups with absolutely no or insufficient data, or rather those groups of organisms for which no adequate experts can be found in Croatia to deal with them.

The results of inventorying were used for the development of the **strategy and action plan for the protection of biological and landscape diversity**, formulated on the basis of reports received from working

groups forces. Each task force prepared a proposal of a thematic strategy and the Ministry of Environmental Protection and Physical Planning, as the competent government body, eventually incorporated all the materials into a synthesized draft NSAP. The draft was submitted to the Steering Committee for the NSAP Development and after harmonization presented for endorsement by the Croatian National Parliament.

The basic purpose of the NSAP after identification of the existing biological and landscape diversity of Croatia is to define objectives and methods of its conservation and sustainable use. It is of vital importance to specify main causes of threats and protection problems and to propose feasible solutions to their elimination or mitigation. In simple terms, the NSAP provides answers to three questions related to conservation and sustainable use of biological and landscape diversity in Croatia: **Where are we?** (the current state); **Where do we want to be?** (strategic guidelines) and **How can that be reached?** (necessary actions by priorities). The NSAP is a “living” document that needs to be completed and adjusted depending on the objectives accomplished and the newly arisen conditions. Particular importance is attached to the **action plan** laying down the priority protection programmes for which in the forthcoming years funding will be solicited both from the government budget and the relevant international funds.

The Croatian National Parliament adopted the **Strategy and Action Plan for the Protection of Biological and Landscape Diversity of the Republic of Croatia (NSAP)** in June 1999 (Official Gazette No. 81/99 dated 3 August 1999). The NSAP is the first document by which the Republic of Croatia is trying to chart systematically and to plan comprehensively the nature protection activities. It also means the turning-point in defining this activity which has so far focused on the protection of particularly valuable areas or species. The NSAP defines the nature as an **overall biological and landscape diversity** which is protected **on the 100% of the territory of the Republic of Croatia** – both in the areas of the conserved and “wild” nature and in the built-up and

## Box 1. What is biological diversity and what is its importance?

### WHAT IS BIOLOGICAL DIVERSITY?

**biological diversity = diversity of life**

- diversity within species
- diversity among species
- diversity of ecological systems

### IMPORTANCE OF BIOLOGICAL DIVERSITY

- interdependence of all living organisms and their balanced co-actions are the key to the health of the planet as a whole

## Box 2. Objectives and obligations of the parties to the Convention on Biological Diversity

### OBJECTIVES

- conservation of biological diversity
- sustainable use of its components
- equitable and uniform distribution of benefits arising from the use of genetic sources

### OBLIGATIONS OF PARTIES

according to Article 6a of the Convention

- Each Party to the Convention shall: "...develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity..."

economically used areas. In this way it necessarily becomes an **integral** activity based as much as ever on the protection of species, their habitats and protected areas, at the same time trying, in co-operation with all natural resource users, to ensure their reasonable and sustainable use.

This book was prepared on the basis of the NSAP as an official document and pertaining background studies. The first part describes the state of biological and landscape diversity in Croatia and gives an

overview of its protection. It is followed by the analysis of threats causes and protection problems, and finally the document itself – the strategy and action plan.

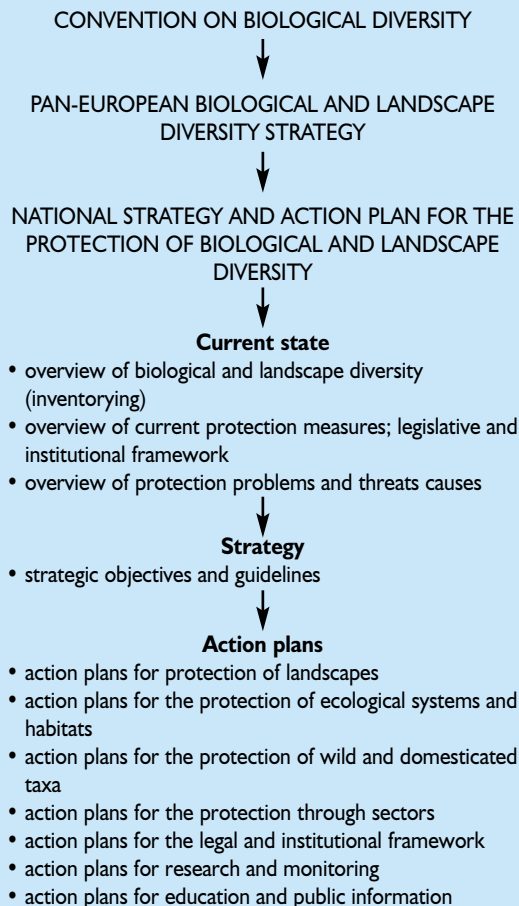
The book is lavishly illustrated with photographs, most of them published for the first time. The majority of cartographic contributions was also specially prepared for

this purpose. The selection of photographs aimed at presenting the most valuable and most characteristic components of biological and landscape diversity of Croatia, keeping particularly in mind that the book is expected to be used at the international level too. One of its purposes being to serve as the first national report on implementation of the Convention on Biological Diversity that all parties to this international agreement are bound to submit.

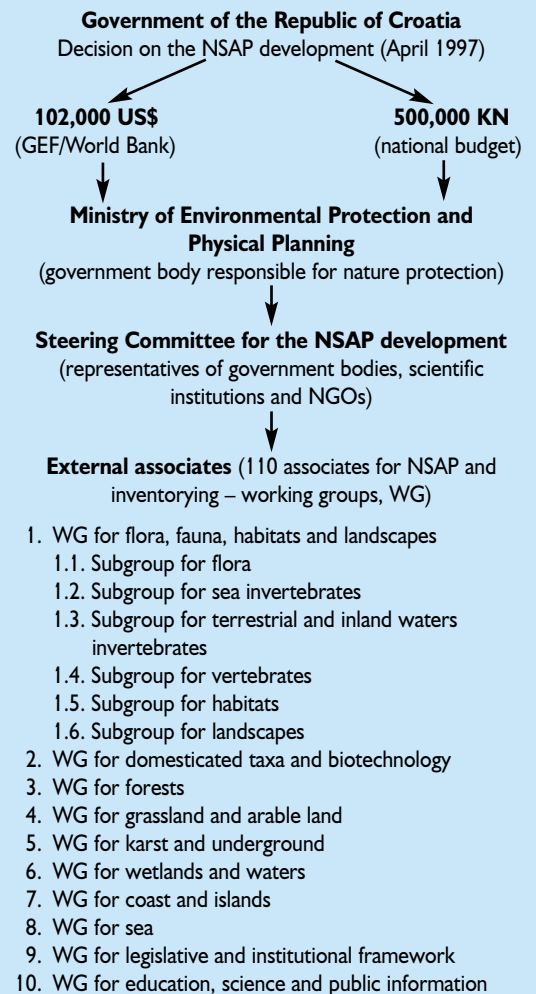
Much credit for appearance of this book goes to numerous associates who, working for two years on the project, demonstrated their readiness for co-operation and wish for success and thus contributed to creation of the first integrated, professional review of Croatia's natural values. On this occasion many scientists dusted off data on certain plant, fungi and animal groups collected for many years and still not published. Some of them tried their skill in analysing the threat status and proposing possible measures for the protection of threatened taxa for the first time. This review certainly has deficiencies, but as the first of the kind it will serve as a foundation for a comprehensive work to follow. The NSAP revision which is expected after five years will undoubtedly present much ampler data and a more integral picture of the nature in Croatia.

The most important role in formulating the strategy and action plans themselves was played by the Steering Committee for NSAP Development. During long and sometimes exhausting meetings Committee members

## Box 3. Foundations of the biological diversity protection at the global, European and national level



## Box 4. Organisation chart and sources of finance for the NSAP development



presented their comments and proposals to supplement and upgrade numerous NSAP versions. In this connection there were often, predictably enough, conflicts of opinion in view of the fact that the Committee consisted of representatives of government bodies, scientists and non-governmental organisations. However, it is precisely this participatory approach that resulted in numerous new and, eventually, harmonized solutions.

Our special thanks are due to the World Bank that within the framework of the Global Environment Facility initiated the process of securing the necessary finance for this project, made a donation and provided considerable assistance of its experts in setting out the methodology for the NSAP development.

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21. freshwater algae	Assist. Prof. Anđelka Plenković-Moraj, Ph.D.	Department of Botany, Faculty of Science, University of Zagreb

22. higher plants	Assist. Prof. Ljerka Regula- Bevilaqua, Ph.D.	Department of Botany, Faculty of Science, University of Zagreb
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35. <i>Nematoda, Copepoda</i>	Ana Travizi, Ph.D.	Marine Research Center, Ruđer Bošković Institute, Rovinj
36. <i>Protozoa, Ameria, Annelida</i>	Elvis Zahčila, Ph.D.	Marine Research Center, Ruđer Bošković Institute, Rovinj
37. <i>Protozoa, Cnidaria, Ameria, Crustacea, Arthropoda, Echinodermata, Tunicata</i>	Prof. Dušan Zavodnik, Ph.D.	Marine Research Center, Ruđer Bošković Institute, Rovinj

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44. <i>Ephemeroptera, Plecoptera</i>	Ivančica Krulik, M.Sc.	Department of Zoology, Faculty of Science, University of Zagreb
45. <i>Diptera, Apterygota</i>	Stjepan Krčmar, Ph.D.	Teacher Training College, Osijek
46. <i>Lepidoptera, Trichoptera</i>	Mladen Kučinić, M.Sc.	Department of Zoology, Faculty of Science, University of Zagreb
47. <i>Diptera, Apterygota</i>	Enrih Merdić, Ph.D.	Teacher Training College, Osijek
48. <i>Rotatoria</i>	Stjepan Mišetić, Ph.D.	Elektroprojekt, Zagreb
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55. <i>Diptera - Chironomidae</i>	Prof. Vladimir Tavčar, Ph.D.	Department of Zoology, Faculty of Science, University of Zagreb
56. <i>Coleoptera, Neuroptera, Opiliones</i>	Snježana Vujčić-Karlo, M.Sc.	Department of Zoology, Faculty of Science, University of Zagreb

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59. freshwater fishes	Prof. Milorad Mrakovčić, Ph.D.	Department of Zoology, Faculty of Science, University of Zagreb
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64. habitats	Prof. Mladen Kerovec, Ph.D.	Department of Zoology, Faculty of Sciences, University of Zagreb
65. habitats	Assist. Prof. Toni Nikolić, Ph.D.	Department of Botany, Faculty of Sciences, University of Zagreb
66. habitats	Prof. Ivan Šugar, Ph.D.	Faculty of Pharmacy, University of Zagreb

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# PART 1.

## An overview of the state of biological and landscape diversity in Croatia



*Figure 1. From a collection of the Croatian Natural History Museum in Zagreb*  
(photo by M. Šašić)



# Basic geographical and biological features of Croatia

## Box 5. Basic information on the Republic of Croatia (according to the *Physical Planning Strategy of the Republic Croatia, 1997*)

**Total surface area:** 56,610 km<sup>2</sup> (0–200 m above sea-level 53.4%, 200–500 m above sea-level 25.6%, > 500 m above sea-level 21%)

**Maritime zone:** 31,067 km<sup>2</sup>

**Population:** 4,784,265

**Population/km<sup>2</sup>:** 84.51

**No. of settlements:** 6,694 (≤ 500 inhabitants 80%, 20% in four largest towns)

**Largest towns:** Zagreb (800,000), Split (190,000), Rijeka (170,000), Osijek (105,000), Zadar (80,000)

**Mainland border length:** 2,028 km

**Sea border length:** 950 km

**Length of coast (including islands):** 5,835 km

**Islands:** 718 (+ 389 cliffs and 78 reefs)

**Greatest islands:** Krk (405.8 km<sup>2</sup> and 189 km of coast), Cres (405.8 km<sup>2</sup> and 248 km of coast), Brač (394.6 km<sup>2</sup>), Hvar (299.7 km<sup>2</sup>), Pag (284.6 km<sup>2</sup>)

**Rivers (km of watercourses within boundaries):** 3,500

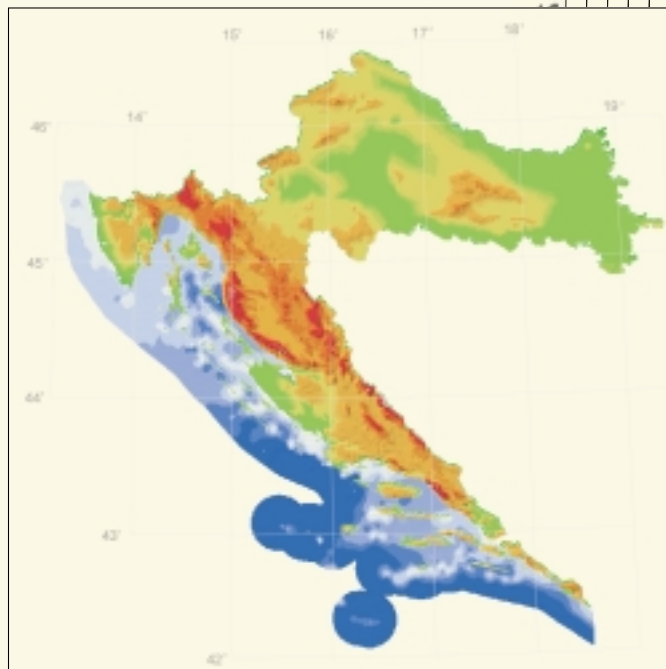
**Longest rivers (km of watercourses within boundaries):** the Sava (518), the Drava (323), the Kupa (293), the Bosut (151), the Danube (135)

**Surface area of lakes:** 103.5 km<sup>2</sup>

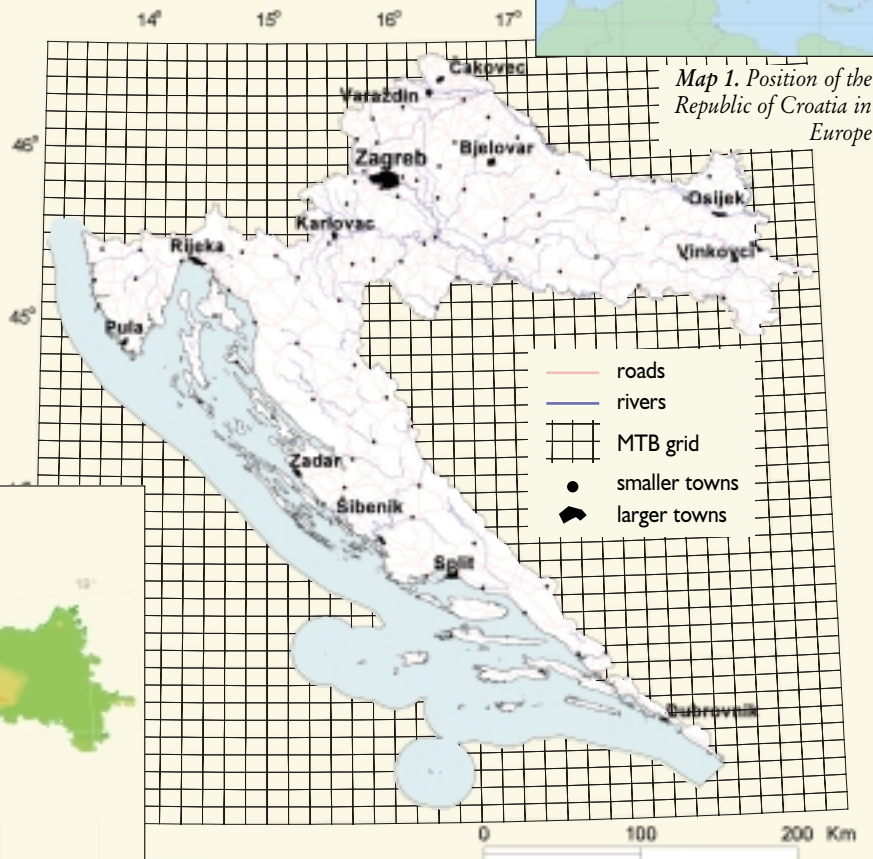
**Greatest lakes:** Vransko Lake (30.7 km<sup>2</sup>), storage lake of Dubrava (16.6 km<sup>2</sup>), Peruča (storage lake of Cetina, 13 km<sup>2</sup>), storage lake of Čakovec (11.9 km<sup>2</sup>)

**Highest peak:** 1,831 m (Dinara)

*Map 2. Croatia's relief  
(according to data by OIKON d.o.o.)*



*Map 1. Position of the Republic of Croatia in Europe*

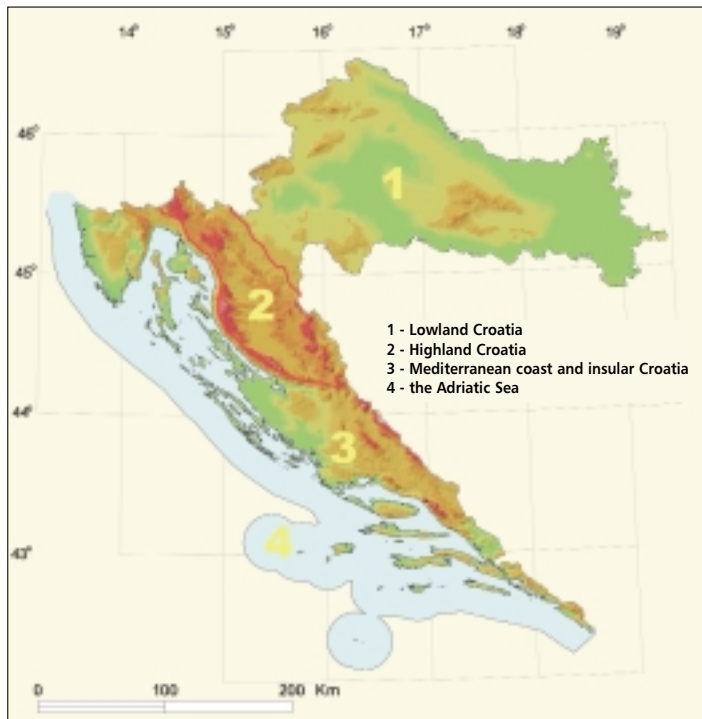


*Map 3. Main towns, watercourses and roads*



*Figure 2. The Sava river basin, characteristic low-land landscape*

(photo by M. Schneider-Jacoby)



*Map 4. Division of Croatia according to natural features*

(source MEPPP)

*Figure 3. Jobbing carters in Gorski kotar*

(photo by A. Frković)



### Box 7. Highland Croatia

High karst strip from mountain to pre-mountain stretch, a section of Dinaric mountain region

#### Peculiarities:

- the highest mountain: Dinara (1,831 m)
- forests of beeches and firs – significant populations of carnivore (wolf, brown bear, lynx)
- great wealth of endemic and relict mountain flora and fauna (unique vegetation and fauna of rocks and screes: Velebit degenia, Martino's snow vole)
- remnants of the most southern European moors
- geomorphological diversity (8,000 registered phenomena: caves, pits, rocks, ravines, karst valleys)
- natural lakes
- karst watercourses (unique and threatened living communities of travertine downstream beds; endemic fishes)
- karst underground (the wealth of endemic fauna: olm, cave leech, crustaceans, aquatic isopods, snails, beetles, pseudoscorpions; significant winter quarters for bats).

### Box 6. Lowland Croatia

Primarily lowland region bordered by the Sava, the Mura, the Drava and the Danube river

#### Peculiarities:

- wide areas of wet oak-woods with the greatest biological diversity (significant populations of species threatened all over Europe: white-tailed eagle, lesser spotted eagle, black stork)
- rivers, marshes and carp ponds, important habitats for migratory water-fowls (significant populations of species threatened all over Europe: ferrugineous duck, beaver, mixed colonies of herons and spoonbills)
- wet meadows and pastures (significant populations of species threatened all over Europe: blackbird, stork, large blue butterfly)
- remnants of free sand grassland and the most western elements of steppe flora and fauna.



In relation to the majority of European countries Croatia distinguishes itself by a great diversity of ecological systems and habitats reflected also in a considerable wealth and diversity of its flora, mycoflora and fauna. Such a wealth is due to Croatia's being situated on the dividing line between several biogeographical regions, of the indented relief, geological, pedological, hydrological and climatic conditions, as well as human activities.

According to its natural features Croatia may be divided into four sections:

- the lowland Croatia - the lowland Pannonian section bordered by the Sava, the Drava and the Danube river, including Pannonian hills on the edges (54.4% of the mainland area)

- the highland Croatia - the high zone of karst with "islands" of impermeable rocks, karst fields and river valleys; a section of the Dinaric mountain region (14% of the mainland area)
- the coastal and insular Mediterranean Croatia - the narrow coastal zone separated from the hinterland by high mountains (31.6 % of the mainland area);
- the Adriatic sea.

*Figure 4. The southern littoral, vicinity of Makarska*  
(photo by T. Nikolić)



### Box 8. Coastal and insular Mediterranean Croatia

Littoral area with islands - the most indented Mediterranean coast

#### Peculiarities:

- 5,835 km of the coastal line, 1,200 islands and reefs; habitats of griffon vulture, Eleonora's falcon, dusty-miller
- forests and their degradation stadiums (evergreen holm oak; deciduous forests of pubescent oak and others)
- mostly stony limestone coast, gravelly and rare sandy beaches, endemic flora of coastal rocks
- endemic flora and fauna of the islands
- rivers of the Adriatic catchment area with endemic fauna
- submarine springs, karst river mouths, Mediterranean marshes (the Neretva Delta) and natural lakes.

### Box 9. The Adriatic Sea

Great biological diversity of the sea

#### Peculiarities:

- Mediterranean monk seal, dolphins, marine turtles
- submarine caves with deep-sea and relict fauna
- depths of the Jabuka hollow and the southern Adriatic



*Figure 5. Submarine slope in the Great Lake on the island of Mljet*

(photo by D. Zavodnik)