

LIST OF ABBREVIATIONS

ABBREVIATIONS		
3D	three-dimensional	IUSS International Union of Soil Sciences
4M model	model of the Workshop of the Hungarian Agricultural Modellers	IATE József Attila University
AGROTOPO	National Spatial Soil Information System	KDTVIZIG Directorate of Water Management in Central Transdanubia
ÁNTSZ	National Public Health and Medical Officer Service	KSH Hungarian Central Statistical Office
a.s.l.	above sea level	KvVM Ministry for Environment and Water
ATK	Centre for Agricultural Research	LCA landscape character analysis
BFKH	Government Office of the Capital City Budapest	LGM last glacial maximum
BME	Budapest University of Technology and Economics	LIA Little Ice Age
BP	Before Present	LPA landscape protection area
CFC	chlorofluorocarbon	MAB Man and the Biosphere Programme
CLC50	CORINE Land Cover mapping (1:50,000)	MÁFI Geological Institute of Hungary
CORINE	Coordination of Information on the Environment	MAHAB Hungarian Hydrological Database
COST	European Cooperation in Science and Technology	MARTA Database of Hydrophysical Properties of Hungarian Soils
CSc	Candidate of Sciences (1st doctoral level of scientific degrees in the former communist countries)	MASH Multiple Analysis of Series for Homogenization
CSFK	Research Centre for Astronomy and Earth Sciences	MBFH Hungarian Office for Mining and Geology
DAB	Regional Committee in Debrecen (Hungarian Academy of Sciences)	MBFSZ Mining and Geological Survey of Hungary
DE	University of Debrecen	ME University of Miskolc
DEM	Digital Elevation Model	MEK Faculty of Agricultural and Food Sciences
DKSIS	Digital Kreybig Soil Information System	MÉM NAK Ministry of Agriculture and Food, Section of Plant Protection and Agrochemistry
DMCSEE	Drought Management Centre for Southeastern Europe	MÉTA Landscape Ecological Vegetation Database and Map of Hungary
DNA	deoxyribonucleic acid	MFGI Geological and Geophysical Institute of Hungary
DSc	Doctor of Sciences (2nd doctoral level of scientific degrees in the former communist countries)	MFIR Hungarian Earthquake Information System
DSM	Digital Soil Mapping	MH TÁTI Tóth Ágoston Mapping Institute of the Hungarian Army
DTA-50	Digital Cartographic Database (1:50,000)	MISH Meteorological Interpolation based on Surface Homogenized Data Basis
DTM	Digital Terrain Model	MKK Faculty of Agricultural and Environmental Sciences
EBCC	European Bird Census Council	MNA National Atlas of Hungary
EC	European Community	MODIS Moderate Resolution Imaging Spectroradiometer
EEA	European Environment Agency	MTA Hungarian Academy of Sciences
EGN	European Geoparks Network	mtDNA mitochondrial DNA
EGS	Enhanced Geothermal System	MTM Hungarian Natural History Museum
EKE	Eszterházy Károly University	Mya million years ago
ELC	European Landscape Convention	NAGiS National Adaptation Geo-information System
ELTE	Eötvös Loránd University	NAIK National Agricultural Research and Innovation Centre
EMEP	European Monitoring and Evaluation Programme	NASA National Aeronautics and Space Administration
EMK	Faculty of Forestry	NCA nature conservation area
EMMI	Ministry of Human Capacities	NCI Natural Capital Index
EMS	European macroseismic scale	NDVI Normalised Difference Vegetation Index
E-PRTR	European Pollutant Release and Transfer Register	NEBIH National Food Chain Safety Office
ERTI	Forest Research Institute	NES Hungarian Climate Change Strategy
ESC	European Seismological Commission	NKE National University of Public Service
EszCsM	Ministry of Health, Social and Family Affairs	NP national park
EU	European Union	NVDI Normalized Difference Vegetation Index
EUDEM	Digital Elevation Model over Europe	NYE University of Nyiregyháza
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites	OKI National Institute of Environmental Health
EURIMAGE	European Consortium for Satellite Image Dissemination	OKIR TDR Soil Degradation Subsystem of the National Environmental Information System
FAO	Food and Agriculture Organization of the United Nations	OMMI Institute for Agricultural Quality Control
FFI	Institute of Geography and Earth Sciences	OMSZ Hungarian Meteorological Service
FKI	Geographical Research Institute	OSAP National Data Collection Programme
FM	Ministry of Agriculture	OTH Office of the Chief Medical Officer of State
FÖMI	Institute of Geodesy, Cartography and Remote Sensing	OTyT National Development Plan
FTI	Geographical Institute	OVF General Directorate of Water Management
g	gravity of Earth	OVH National Water Bureau
GGI	Geodetic and Geophysical Institute	ÖBI Institute of Ecology and Botany
GGN	Global Geoparks Network	ÖBKI Research Institute of Ecology and Botany
GHG	greenhouse gas	ÖK Centre for Ecological Research
GINOP	Economic Development and Innovation Programme	ÖVKI Research Department of Irrigation and Water Management
GIS	Geographic Information System	PAI Pálfa's drought index
GKM	Ministry of Economy and Transport	PE population equivalent
GMO	Genetically Modified Organism	PET Physiologically Equivalent Temperature
GPS	Global Positioning System	PFC perfluorocarbon
GWP	Global Warming Potential	pH potentia hydrogeni
HCFC	hydrochlorofluorocarbon	PhD Doctor of Philosophy (academic degree)
HFC	hydrofluorocarbon	PM Particulate Matter
HM	Ministry of Defence	PPRR Ragweed Pollen Alarm System in Hungary
HREX	Hungarian Report on Extreme Events	PTE University of Pécs
IALE	International Association for Landscape Ecology	RBMP River Basin Management Plan
ICPDR	International Commission for the Protection of the Danube River	RegCM Regional Climate Model
IGU	International Geographical Union	SoE University of Sopron
IPCC	Intergovernmental Panel on Climate Change	SOTER Soil and Terrain Digital Database
IUCN	International Union for Conservation of Nature and Natural Resources	SPI Standardized Precipitation Index
		spp. species
		SRTM Shuttle Radar Topography Mission
		SZIE Szent István University

SZTE	University of Szeged
TAKI	Research Institute for Soil Science and Agricultural Chemistry
TESZIR	Municipal Sewage Information System
TIM	Soil Information and Monitoring System
TIR	Nature Conservation Information System
TTIK	Faculty of Science and Informatics
TTK	Faculty of Science (DE: Faculty of Sciences and Technology)
UBB	Babeş–Bolyai University (Cluj-Napoca/Kolozsvár)
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	US Department of Agriculture
USLE	Universal Soil Loss Equation
VINGIS	Vineyard Geographic Information System
VITUKI	Water Resources Research Institute
VÍZDOK	Documentation Centre for Water Management
VTT	Improvement of the Vásárhelyi Plan
WFD	Water Framework Directive (EU)
WMO	World Meteorological Organization
WRB	World Reference Base
WTO	World Trade Organization
WW	World War

MEASURES	
°C	degree Celsius
cm	centimetre
GW	gigawatt
h	hour
ha	hectare
kg	kilogram
km	kilometre
km <sup>2</sup>	square kilometre
kPa	kilopascal
kt	kiloton
l	litre
m	metre
M <sub>0</sub>	seismic moment
m <sup>2</sup>	square metre
m <sup>3</sup>	cubic metre
mg	milligram
mm	millimetre
MPa	megapascal
MW	megawatt
mW	milliwatt
M <sub>w</sub>	momentum magnitude
Nm	newton metre
nT	nanotesla
PJ	petajoule
ppm	part per million
s	second
t	ton
TW	terawatt
W	watt
µg	microgram
µmol	micromol

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Transdanubian Range

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PREFACE

The reader is holding the English version of the *Natural Environment* volume of the *National Atlas of Hungary (MNA)*. A national atlas is the given country's 'identity card,' one of its most significant national symbols in addition to its flag, coat of arms and national anthem. Like the previous undertakings, the present volume is the outcome of wide-ranging professional collaboration: 19 editors, 137 authors, 220 map authors, 17 cartographers, and several dozen professional and language proofreaders, translators have made their valuable contributions to it. Understanding the special significance of the Atlas, in addition to the staff of the Hungarian Academy of Sciences (MTA), colleagues from Hungarian universities and other organisations and institutions (e.g. the Ministry of Agriculture, the Mining and Geological Survey of Hungary, the Hungarian Meteorological Service, and the General Directorate of Water Management) have made their selfless effort in order to assist this national project.

Prior to a more detailed introduction to the first volume of the symbol of the Hungarian state and nation as embodied in maps, it is my great pleasure to guide the esteemed reader along the virtual international and local path that has led to this publication and its digital version.

A national atlas is usually a series of maps complemented with textual explanations and various illustrations, which show the given state's natural, economic and social features through logically and proportionally constructed maps using a well-defined scale and fairly uniform cartographic iconography. It is intended for the country's inhabitants as well as for interested foreigners. The national atlases issued so far all share the *principal feature* that they refer to the given state's territory. They introduce a country's natural, social and economic structure and its spatio-temporal data with an almost *encyclopaedic* scope, in a complex and *structured* form, applying a *logical sequence of maps*. The *main expectations* concerning national atlases are that they should serve the *representation of the state and the nation, public policy planning and decision-making, scientific research, as well as public and higher education*, and due to their user-friendliness, they should also meet the requirements of the *wider educated public*.

In our days, most countries in the world have national atlases as far-reaching national symbols. They were generally compiled during their strife for national independence or shortly after achieving it, and are usually updated every two or three decades. The first atlas was published in 1899 by *Finland*, the country that intended to get rid of Russian control. Up to the mid-20th century, most atlases were issued in a *single volume*, although their size varies considerably, their *methodology* is mostly *unsystematic*, and *in content they tend to concentrate on geography*. After WWII, several developed countries launched their first (or revised) national atlas project, which already aimed at *regional development*.

The 1980s saw the *beginning of a new era* in the history of national atlases, which is primarily due to reasons of *marketing*. The increasingly sophisticated national atlases were now intended for the *educated public* and *actors of public and higher education*. As a sign of targeting wider audiences, in order to be more comprehensible, more popular and more marketable, atlases started to include more explanatory texts,

photographs, and various visual elements at the expense of maps. At the same time, maps were simplified, and themes shifted towards areas more relevant for society and users in general. Still based on scientific research, since the late 1980s the more market-oriented, more mass-consumable atlases have been issued *electronically* as well as in hard copy. The birth and fast spread of personal computers revolutionised cartography, including atlas cartography, all over the world. Thanks to the changes in production and information technologies, modern atlases issued *since the 1990s* have been able to fully meet all of the various functions emphasized in different periods of the past century of atlas making. The first electronic development was the appearance of *CD-ROM versions* accompanying conventional print atlases. Subsequently, *the first internet and web-based national atlas* was marketed in Canada.

In the case of national atlases published over the past two decades, traditional print atlases have definitely been pushed to the background compared to their electronic versions, which contain almost unlimited amounts of multimedia elements (e.g. photos, videos, animation, and World Wide Web hyperlinks). However, *paper-based atlases*, that 'we can still use at times of blackouts,' a specimen of which the reader is holding in their hands, have not disappeared as outstanding *period documents* of the given state's geographic environment. Instead, they have been completely *revived*, becoming more interesting and more fascinating in the course of their competition with electronic mass communication. Meanwhile, *electronic atlases have become primary sources and tools of obtaining and analysing regional information*. The *easy access to and up-to-the minute nature of web-based atlases on the internet* make them attractive because of their practically *unlimited capacity to store data and maps*.

*Hungarian geography and cartography* have always played a decisive role in developing *our knowledge of the nation and the homeland*, in building the image of Hungarians and their country. Following World War I, especially geographic and cartographic pieces were produced mainly in French, English and German, with maps, map series and atlases among them, reflecting the impact of the Trianon Dictate and justifying the demand for a full or partial restoration of the country's former territorial unity.

In 1945, the *Atlas of Central Europe* issued both in Hungarian and in English was compiled by the *Institute of Political Sciences*, the organisational predecessor to today's *Geographical Institute* Research Centre for Astronomy and Earth Sciences of the Hungarian Academy of Sciences, already meeting all the requirements for national atlases. However, rather than focusing on the territory of one state (Hungary), it represented as well as the *Carpathian Basin and its wide environment* (12 countries).

Following the fundamental political, social and economic changes of 1948, 1967 saw the *first edition of the National Atlas of Hungary*, which was to propagate the new socialist Hungary. Based on the recommendations of the International Geographical Union's (IGU) Commission on National Atlases, work on the map collection was launched in 1959. The atlas, whose birth was assisted by the scientific contributions of MTA (especially its Geographical Committee) and the



cartographic projects of the Cartographia Ltd. Company, intended to facilitate 'economic management and planning' as well as to *offer general information* about the country. Again funded by the Government, in 1983 MTA in cooperation with the Ministry of Agriculture and Food decided on a revised edition of the National Atlas. *Coordinated by the Geographical Research Institute of MTA* and with the contribution of 87 (mainly) state-run institutions and organisations, as well as 183 authors, *the second edition of the National Atlas* was issued *in 1989*, shortly before the democratic regime change. In order to be more open to the outside world, the still one-volume atlas, *which had grown four-fold in size compared to its earlier version*, was now bilingual (*English and Hungarian*).

The country's fundamental post-1989 social and economic transformation compelled the Geographical Research Institute to continue in 1994–1995 the publication of the National Atlas in its *supplementary map lift-out series*, in order to provide the public with fast and accurate information. The National Atlas managed to *catch up with international trends*. Thus, it broke with the tradition of producing one huge uniform volume; it changed its orientation by *turning to the general educated public and opening its vista to education*; it selected *problem-centred issues* of interest to a wide range of the population; and for working with maps and geographic information, *it switched to digital technology* (ArcGIS).

In preparation for a further edition of the National Atlas, *in 2009* our legal predecessor, the *MTA Geographical Research Institute* issued its relatively small-sized information atlas called *Hungary in Maps* in English, and subsequently in *2011 also in Hungarian (Magyarország térképekben)*. With the help of numerous maps, this publication intended to give a quick overview of the Hungary of the 2000s and of the Carpathian Basin.

Nearly a quarter of a century following its second edition, in 2013 preparations for *the new (conventional) edition of the Atlas of Hungary* were started – again under the coordination of the *Geographical Institute of the MTA Research Centre for Astronomy and Earth Sciences (CSFK)*, enjoying the support of József Pálinskás, former president of the Hungarian Academy of Sciences.

It is a unique *novelty* of our aims that the 2018 edition of the Atlas of Hungary wishes to present the *dynamic spatial structure of nature, society and the economy* not merely for Hungary, but wherever the required data are available, for the entire Carpathian Basin and its neighbourhood (the Carpatho–Pannonian Area), thus covering a territory of some half a million km² and 34 thousand settlements in twelve countries. It is