

BIOSPHERE RESERVES AND CLIMATE ADAPTATION

Volume 1/3: "Natural Ecosystems"

Svitiaz, 2019

SHATSKYI BIOSPHERE RESERVE NATURAL ECOSYSTEMS SET THE SCENE

Nature consists of units that perform work and process scarce resources - the ecosystems.

Ecosystems are complex systems that use energy, which is primarily received from the sun and circulated in the system. Energy is captured, transmitted, transformed, stored and, above all, used to do work with it. They therefore perform work in the physical sense. They are created by living beings interacting with each other and with non-living resources as system components. Thereby, ecosystems develop properties that sustain or even promote their continued existence as self-organizing bioreactors through the interactions of their components.

Results of ecosystem work are, for example, the production and growth of biomass, cooling and moisturing of the landscape, and the creation of resources for many species of plants and animals. These processes and functions are an inherent need for the existence of the ecosystem itself, but also are the foundation of human existence and well-being. Therefore, the conscious preservation and development of **ecosystem services** is one of the most important goals of modern nature conservation.

An **ecosystem-based approach** to the Shatskyi Biosphere Reserve for the benefit of humans is therefore grounded on an appropriate assessment of the locally relevant ecosystems and their condition as well as the inclusion of people and institutions who dispose of local knowledge and hold stake in the sustainable development of the area.

Edited by



**Succow
Stiftung**

Eberswalde University
for Sustainable
Development

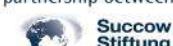


Under the auspices of the



biosphere.center

a partnership between



Hochschule
für nachhaltige Entwicklung
Eberswalde

BIOSPHERE RESERVES

SPECIAL PLACES FOR JOINT LEARNING



Biosphere Reserves are places where nature and culture connect.

Therefore, they are internationally recognised for their biodiversity and cultural values and are important "living laboratories" for the preservation of ecosystems by promoting eco-sustainable human and economic development models as well as by ensuring the continuation of research, education and the provision of information.



A Dynamic World-Wide Network

As early as 1971, the United Nations Educational, Scientific and Cultural Organization (UNESCO) established the Man and the Biosphere Programme (MAB) as an international, interdisciplinary programme with the aim of creating a scientific basis for improving relations between people and their environment. In 1974, a task force of the MAB programme developed the concept of biosphere reserves, recognising that the conservation of biological diversity, the promotion of economic development and the preservation of the associated cultural values are often

contradictory objectives.

Since the 1970's UNESCO has designated areas throughout the world as biosphere reserves (BRs). When designated, these regions are commissioned to serve as learning sites and role models for sustainable development, **crafting local solutions to global challenges**. As a result, a network of biosphere reserves was established that currently comprises 701 areas in 124 countries of the world (status 2019), including 21 trans-boundary sites, and that is constantly growing.

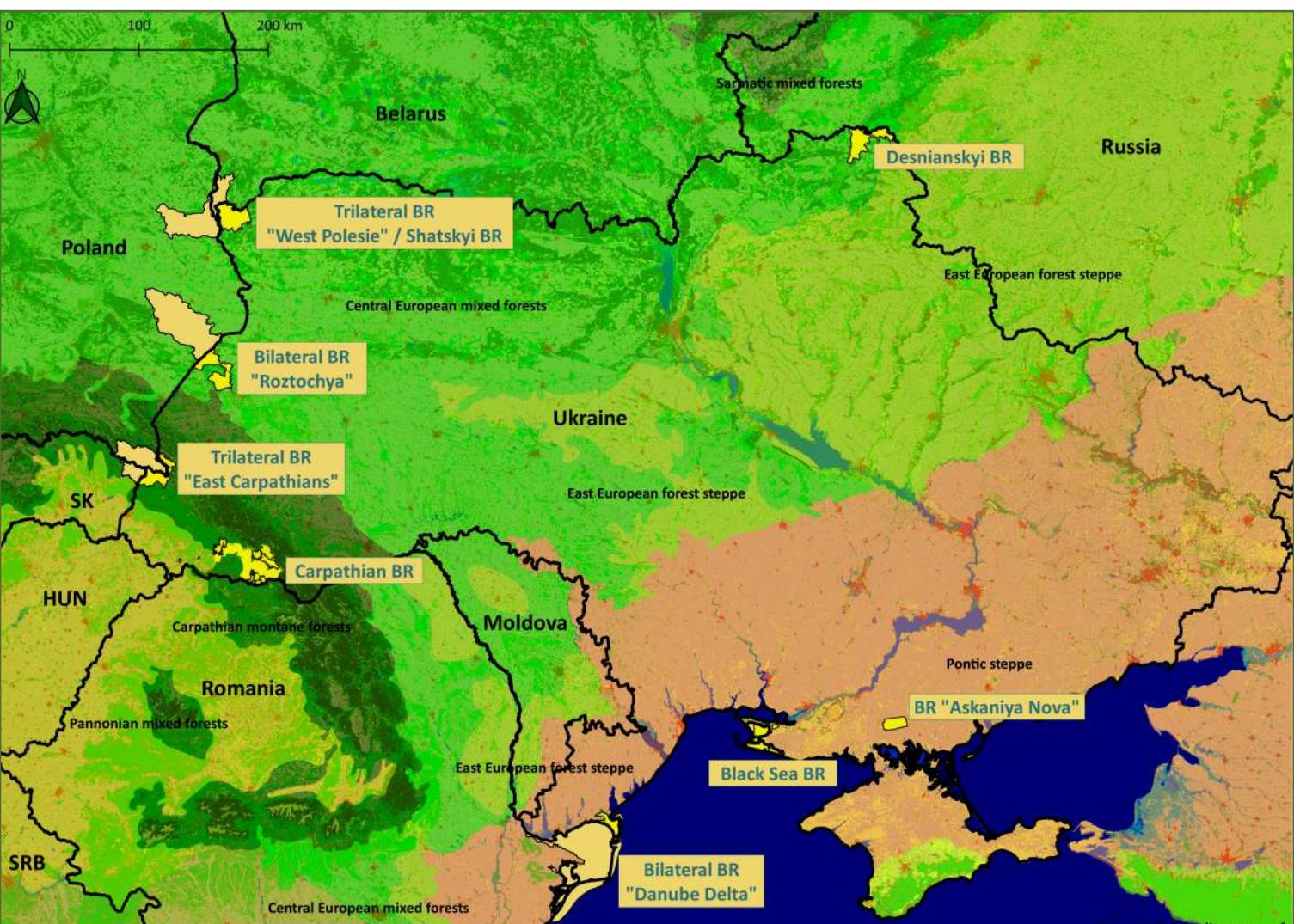
What does a Biosphere Reserve do?

It supports innovative ideas and projects that aim towards sustainability by promoting:

- **Development** – fostering a sustainable economy and society for people living and working in the region
- **Learning** – facilitating education, training and research to support conservation and sustainable development
- **Conservation** – protecting biodiversity and cultural diversity

To be able to address all these functions a system of three different zonings was developed, which is one of the characteristics of biosphere reserves:

- **Core zone** – a zone with strictly protected ecosystems / no use
- **Buffer zone** – surrounds the core areas – used for scientific and educational activities
- **Transition zone** – largest area – socio-ecologically sustainable land use practices



Overview map of all Ukrainian UNESCO Biosphere Reserves and, if available, the corresponding transboundary areas in neighbouring countries
Terrestrial Ecoregions of the World 2.0: World Wildlife Fund (WWF) - US 2004; Landcover data: Copernicus Global Land Service 2015; Land Cover 100m; Data on Biosphere Reserve areas: WDPA 2018;
Produced by: A. Dichte

The Ukrainian Network of Sites of Excellence

In Ukraine, there are currently 8 UNESCO biosphere reserves, of which four are created as transboundary biosphere reserves, together with neighbouring countries (see map). Further ones are in the planning. During times of the Soviet Union only three biosphere reserves existed inside the territory of Ukraine.

The Ukrainian biosphere reserves cover a wide range of ecological and cultural conditions – from alpine and wooded ecosystems to steppe areas with

relatively intensive land use to even river, floodplain and delta areas. This also means that very different challenges and development opportunities emerge depending on the area. Nevertheless, a constant exchange between the areas is very fruitful, as different possible solutions can be tried out and best-practice experiences can be exchanged – the best prerequisite for fresh ideas and new perspectives by learning from each other!

Page 1

1 Expert workshop in Svitiaz
(© A. Schick)

2-4 Shatskyi Biosphere Reserve
(© 2 & 4 - A. Schick, 3 - Shatskyi BR administration)

Page 2

1 Desnianskyi Biosphere Reserve
(© A. Dichte)

2 Shatskyi Biosphere Reserve
(© A. Schick)

3 Desnianskyi Biosphere Reserve
(© A. Dichte)

4 Carpathian Biosphere Reserve
(© L. Strixner)

5 Desnianskyi Biosphere Reserve
(© A. Dichte)

6 Biosphere Reserve "Roztochya"
(© J. Kloiber)



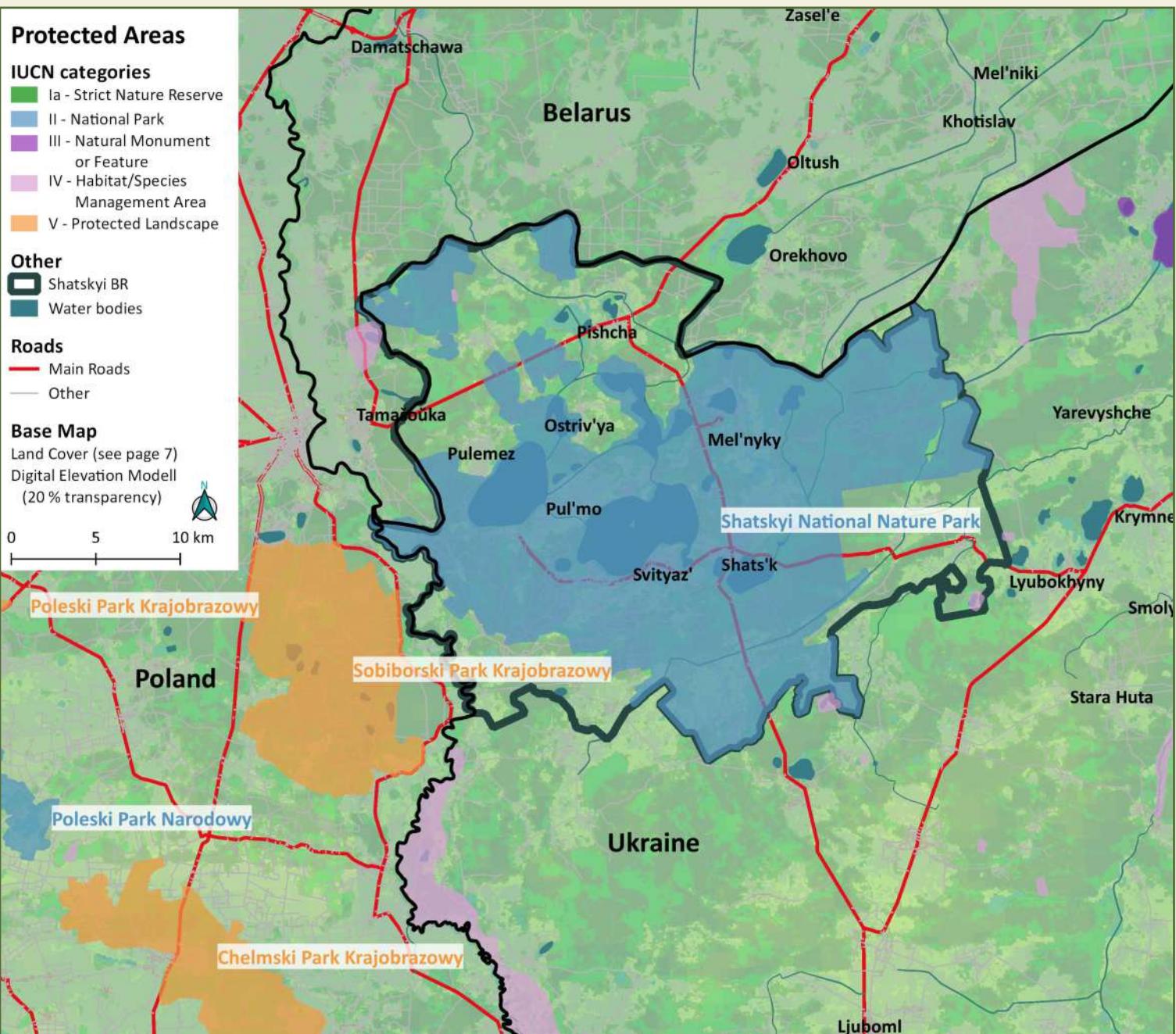
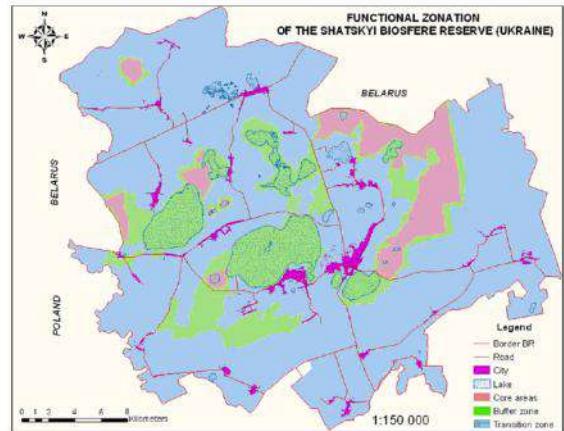
"To be a biosphere reserve means to be able to help restoring the eco-balance while developing organic farming, tourism and engaging in various types of economic activity. In addition, it is a strong contribution to the implementation of the strategy for sustainable development and rational nature resources use in Ukraine."

Mariia Khrystetska, Director of the Shatskyi National Nature Park and main representative of the Shatskyi Biosphere Reserve

SHATSKYI BIOSPHERE RESERVE



WEST POLESIE





1

Page 4
Small map - Zoning of the Shatskyi Biosphere Reserve (red - core, green - buffer, blue - transition zone)
 Provided by the biosphere reserve administration

Large map - Shatskyi Biosphere Reserve in a regional nature conservation context
 Base map: Landcover data: Copernicus Global Land Service 2015; Land Cover 100m; Digital Elevation Model GTOPO30 (USGS); PA data by WDPA and OSM; Roads and settlement data: OSM 2019; Produced by: A. Dichter



2

Page 5
1-3 Impressions from the Shatskyi Biosphere Reserve
 (© Shatskyi BR administration)



3

Page 6
1 Forest in the Shatskyi Biosphere Reserve
 (© Shatskyi BR administration)
2 Wetlands in the Shatskyi BR
 (© Shatskyi BR administration)
3 Rural settlement in the Shatskyi BR
 (© A. Schick)

The Shatskyi Biosphere Reserve promotes the preservation of cultural and natural heritage in the region, which is famous for its lakes and recreational opportunities. This attracts many tourists and supports the social and economic development of local communities. It is also a melting pot of different cultural and religious influences between Western and Eastern Europe.

The UNESCO Biosphere Reserve Shatskyi was created in 2002. It covers an area of about 75,000 hectares. The territory is located in the watershed between the rivers Western Bug (a tributary of the Vistula River, Baltic Sea basin) and Prypiat (a tributary of the Dnieper River, Black Sea basin) and lies in the north-western part of the Polissia region. Shatskyi Biosphere Reserve is a unique and the largest swamp-lake-forest landscape complex throughout whole Polissia ecoregion within Ukraine. A great number of forests, lakes, mires, and meadows with

peculiar flora and fauna highlight this area among other parts of Polissia. The Ramsar Convention recognizes the lakes of the biosphere reserve as important resting and breeding places for migrating waterfowls. Hence the area was identified as an Important Bird Area (IBA).

The biosphere reserve was created on the basis of Shatsk National Nature Park, which is existing since 1983. The stated aim of the Shatskyi Biosphere Reserve is to protect and restore the natural ecosystems while in parallel support the recreational use of nature and enable a sustainable development in the region. It was also created to strengthen the cross-border cooperation with the protected areas in the border triangle of Ukraine, Poland, and Belarus. Together they form the Transboundary Biosphere Reserve West Polesie since 2012.

The Coordination Council of the Shatskyi Biosphere Reserve realizes the coordination and management of the

area. The director of the Shatskyi National Nature Park serves as the head of this Council. Further members are representatives of local authorities, forest and agricultural enterprises, sanatoriums, NGOs as well as private persons.

Local communities in the region are in favor of being part of a UNESCO Biosphere Reserve and support the idea of enhancing the life standard while maintaining the unique nature and landscape values of the region. Traditional forms of agriculture are still present here, and provide a good basis for developing modern forms of ecological and bio-dynamical agriculture. About 17,000 people live in the area of the biosphere reserve (2019), which are mainly engaged in agriculture, tourism, and services. Additionally, about 100,000 tourists visit the area annually. The number of visitors was increasing during the last years.

Functional Zoning

Total area: 75,075 ha

Core Zone (strict protection): 5,732 ha

Buffer Zone (scientific & educational use): 12,325 ha

Transition Zone (area of cooperation / sustainable land use): 57,018 ha



"The Western Polissia recreation cluster, with its center in Shatsk, has significant tourism potential, represented by unique natural, historical and cultural resources! In the future, I would like to see the Shatskyi region as a territory where nature and recreation are harmoniously combined."

Volodymyr Kubai, Head of local touristic-recreational NGO "Shakovel"

ECOSYSTEMS

THE EVER CHANGING HOUSEHOLD OF LIFE



Ecosystems are the precious natural environments we are all living in and depend on. They are dynamic systems. If they would be static, they would be dead. Energy is constantly flowing through a functional ecosystem and chemical nutrients are continually being recycled.



"Ecosystem" is a scientific term that describes the natural structures in which the various components interact intensively and perform a wide variety of services. An ecosystem is a husbanding system which not only gains, stores and converts energy, but also efficiently processes other resources such as water and nutrients (the prefix "eco-" [oikos] comes from Greek and refers to this household). The individual parts are all in dynamic interaction and development, are exchanged, multiply and make the bigger whole more and more mature.

However, this only happens under certain conditions: 1. energy must be constantly supplied from outside (sunlight!); 2. there is a certain availability of water – a basis for life; 3. the system is not disturbed in an extreme way; 4. the system can increase biomass, information content (e.g. the information stored in genes) and internal networking, so that more and more parts can work together effectively. These conditions can be described as key ecological attributes – the essential ingredients for ecosystem functioning.



Ecosystem Types

Ecosystems can only be separated from each other to a limited extent, since they have no closed borders and are in exchange with each other. They can be very small like a pond or big like a forest or even the earth. The different ecosystems of the earth share the same atmosphere in which water and energy are transported from one place to another by weather phenomena. Running waters, while themselves being

an ecosystem, are always an important connecting element between different ecosystems.

Which ecosystem type we find at a certain place depends on many natural factors such as soil conditions and water availability as well as other climatic conditions. But also through human use ecosystems have changed and even completely new ones have emerged – like agricultural lands and settlements.



Ecosystems of Shatskyi Biosphere Reserve

The territory of the Shatskyi Biosphere Reserve belongs to the ecoregion of Central European mixed forests (see map page 3) with a domination of pine forest stands and admixture of oak. The climate can be described as temperate continental with mild winters and relatively warm and humid summers. The average annual temperature between the years 1991 and 2018 was about + 8.5 °C and the average annual rainfall was 600 mm. The relief of the park is characterized by flat and hilly lowlands. The major ecosystem types reflect the typical Polissian landscape

with forests, lakes, meadows, marshes and dunes. The ecosystems are characterised by a wide range of human influences – from natural forests and unspoiled moors to fallow open land, drained peat and a network of drainage channels as well as farmland.

The area consists of 55.2 % forests, 6.8 % meadows, 14.2 % water bodies and 4 % wetlands and mires. The remaining areas comprise mainly agricultural and settlement areas.

For the purpose of this project we distinguish the following categories of ecosystems:

FORESTS

Pine forests with blueberry, moss and eutrophic sedge bogs are the most characteristic form of forests.

WATER BODIES (LAKES, PONDS, RIVERS)

The many lakes are the special feature of the region. In total, we find 28 lakes in the Biosphere Reserve area. They are different by their characteristics and origin, and create one of the largest systems of lakes in Europe. Natural masterpiece and the largest lake in the region is Svitiaz, which is also considered as the deepest lake in Ukraine (58.4 m).

OPEN LAND SYSTEMS (ARABLE LAND, PASTURE)

In the area we still find a substantial part of small-scale subsistence agriculture in and close to settlements. But also large fields of the more industrialized agriculture developed historically especially in the southern part.

(SMALL-SCALE ECOSYSTEMS IN) URBAN AREAS

There is one small town in the Biosphere Reserve, which is Shatsk with about 5,300 inhabitants. Additionally, we find many small villages and settlements that can be viewed as ecosystems too – the least natural ones of course.

WETLANDS (SWAMPS, BOGS)

In the lowlands between the lakes, both eutrophic and mesotrophic moors are concentrated. Occasionally and rarely for Polissia oligotrophic bogs can be found.

To enable agriculture and forestry on damp areas, most of the swamps were drained. Some eutrophic bogs were turned into peat meadows.

Land Cover (Ecosystems)

- Forest, evergreen needle leaf
- Forest, deciduous broad leaf
- Forest, mixed
- Forest, unknown
- Shrubs
- Herbaceous vegetation
- Cropland
- Urban / built up
- Bare / sparse vegetation
- Permanent water bodies
- Herbaceous wetland

Other

- Shatskyi BR

Rivers

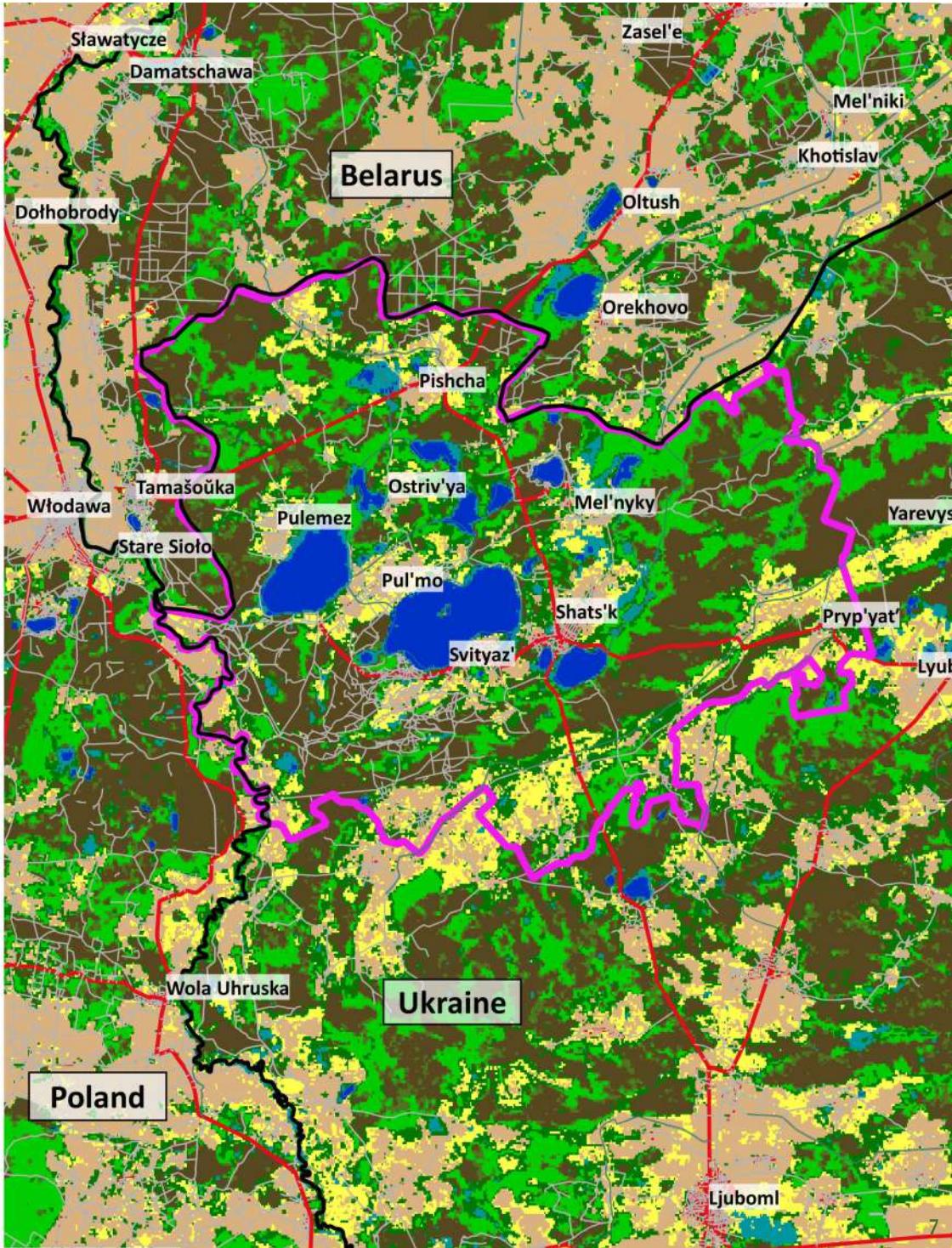
Roads

- Main Roads

- Others

Map of ecosystems in the Shatskyi Biosphere Reserve region

Landcover data: Copernicus Global Land Service 2015; Land Cover 100m; Roads and settlement data: OSM 2019;
Produced by: A. Dichter



ECOSYSTEM SERVICES

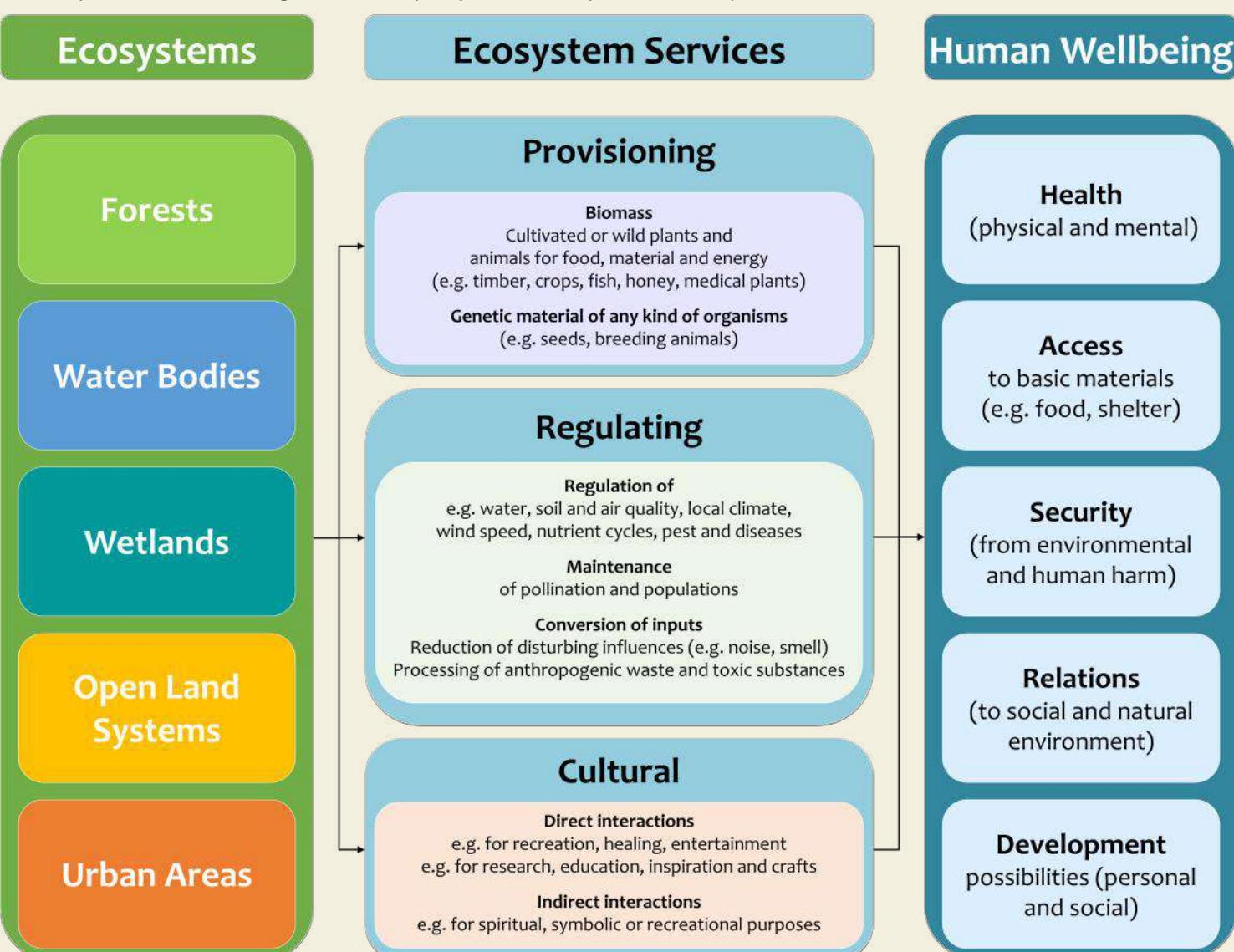
THE PREREQUISITE AND BASIS FOR A GOOD LIFE



Ecosystem services are of central importance for human well-being. Ecosystems provide for example water, food, protection from natural disasters or good air quality, as well as recreational opportunities in nature and a variety of cultural and scientific stimuli.

In recent years, the understanding of ecosystem services has changed significantly. On the one hand, they are no longer understood carelessly as virtually inexhaustible "free products of nature", but as values that need to be preserved and developed. On the other hand, the one-sided concentration on provisioning services is being replaced by a more comprehensive appreciation.

Findings to the questions: "How do we use nature and how does it contribute to human well-being?" provided and discussed among local citizens who participated in a workshop series in the Shatskyi BR in November 2018.





1



4



7



2



5



8



3



6



9

Provisioning ecosystem services are those goods that are produced by ecosystems and used by humans. Food (such as fruit and vegetables), drinking water, timber (e.g. as building material) and fuel are provided by ecosystems.

Regulating ecosystem services are now receiving increasing attention and are of utmost importance to adaptation to climate change. These include services that result from the fact that the work of ecosystems positively influences the quality of the environment. Air and water purification, pollination, fertile soils, flood prevention (e.g. through soil and plant water retention), climate regulation and storage of the greenhouse gas carbon dioxide or biological control of pest infestation are important examples.

Cultural ecosystem services are of high relevance, especially in a modern, technology-oriented society. Varied and semi-natural landscapes offer a high recreational, educational and adventure value. The typical features and the condition of ecosystems have a complex effect on the human psyche. In this way they also create identity and contribute to people feeling connected to their habitat.

1 Wood for heating in the BR "Roztochya"
(© I. Khomin)

2 Haying in the Carpathians
(© A. Dichte)

3 Erosion control through vegetation in Desnianskyi BR
(© S. Panchenko)

4 Grazing in the Carpathians
(© A. Dichte)

5 Fishing in Shatskyi BR
(© J. Kloiber)

6 Religious tourism in the BR "Roztochya"
(© I. Khomin)

7 Subsistence farming in the BR "Roztochya"
(© A. Schick)

8 Water tourism and recreation in Shatskyi BR
(© Shatskyi BR administration)

9 Water retention in Shatskyi BR
(© A. Schick)

There are interactions between many ecosystem services. If the human promotion of one service weakens another, this is called a trade-off. In contrast, if the promotion of one service also strengthens other services at the same time, this is called a synergy effect. A trade-off, for example, could be the large-scale planting of fast-growing tree species. This promotes the supply of large quantities of biomass. However, this comes along with the loss of biodiversity, soil formation processes and many other regulating services. It increases the risk for calamities and negatively affects microclimate and landscape water budget.

Trade-offs as well as synergies can be managed in the course of well-

considered and adaptive management in such a way that they reduce disadvantages for society and improve the functionality of ecosystems and thus the well-being of the people living in them. For example, nutrient runoff from agriculture can be reduced by minimising the use of fertilisers and conservation tillage, or by maintaining riparian zones. This can be done without excessive losses in food production. At the same time, improving a service, such as increasing nutrient storage by promoting vegetative riparian zones, can also improve landscape beauty, wind protection, water quality, biodiversity and plant production, thereby increasing the benefits to society.

REGULATING SERVICES



In the past, people prioritized the supply and cultural offers of nature. In view of accelerating climate change, however, the focus is increasingly on regulating ecosystem services. The (self-)regulation of ecosystems is ultimately also a prerequisite for their household and basic functioning.

This is the only way to safeguard all other services, especially the provisioning services. In this respect, the regulating services actually deserve the greatest attention and to do so ecosystem-based climate change adaptation is of utmost importance.

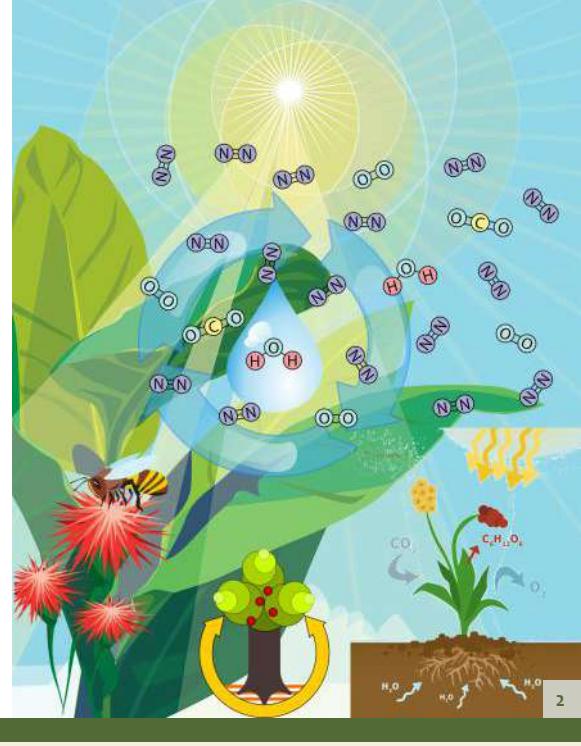


1 Old-growth forest with great structural variety
and a large stock of biomass
(© A. Dichte)

2 Illustration of a selection of regulating
ecosystem services
Produced by: A. Dichte



1



2

Regulation of the Energy Balance

The formation of plant biomass and the enlargement of the surface area of all green leaves strengthens the capacity of ecosystems to convert and store light energy. This thermal mass can warm up and cool the environment as well as **damp fluctuations**. Neighbouring ecosystems often influence each other: water bodies and forests cool themselves and their surroundings. Cooling air flows from areas where fresh air originates via cold air paths to other areas, especially in settlements. In cooler, buffered and more humid ecosystems, the risk of extreme energetic events such as forest fires decreases. The efficiency in dealing with additional incoming energy increases in more mature ecosystems rich in biomass.

Regulation of the Water Balance

Mature ecosystems rich in biomass **retain water** particularly effectively and contribute to their own **humidification**. Especially in drought periods, but also during heavy rainfall events, the ability to seep, retain, store and slowly release water is of great value. Important factors for the effectiveness of ecosystems in this case are also **biomass** and the structures or organic matter formed from it in soils. Reduced surface runoff and reduced flow velocity are also important for the **prevention of water erosion**. The corresponding

regulating services are often provided across ecosystem boundaries (e.g. water flows out of the forest into open land). Structurally rich and humid vegetation also seems to attract precipitation - a typical positive feedback in ecosystems.

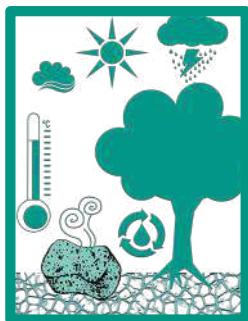
Regulation of the Mass Balance

Mature, functioning ecosystems also reduce losses of critically needed substances, e.g. by root systems and soil-covering vegetation slowing wind drift and leaching. The interaction of vegetation and soil-forming organisms with the soil also promotes the purification of water. Above-ground vegetation can have a filtering effect both on the input of substances (e.g. harmful substances) and on the discharge. Corresponding barrier and filter effects of substances and dust particles become particularly relevant in very dry conditions and in the case of uncovered soils.

Regulation of the Interplay of Species and Biological Control

Mature ecosystems with native communities and a large structural diversity are characterised by a strong biological regulation, i.e. the mass reproduction of individual species and the strong occurrence of non-native invasive species are rather suppressed. This is of great importance in terms of pest and disease control and prevention in agriculture and forestry.

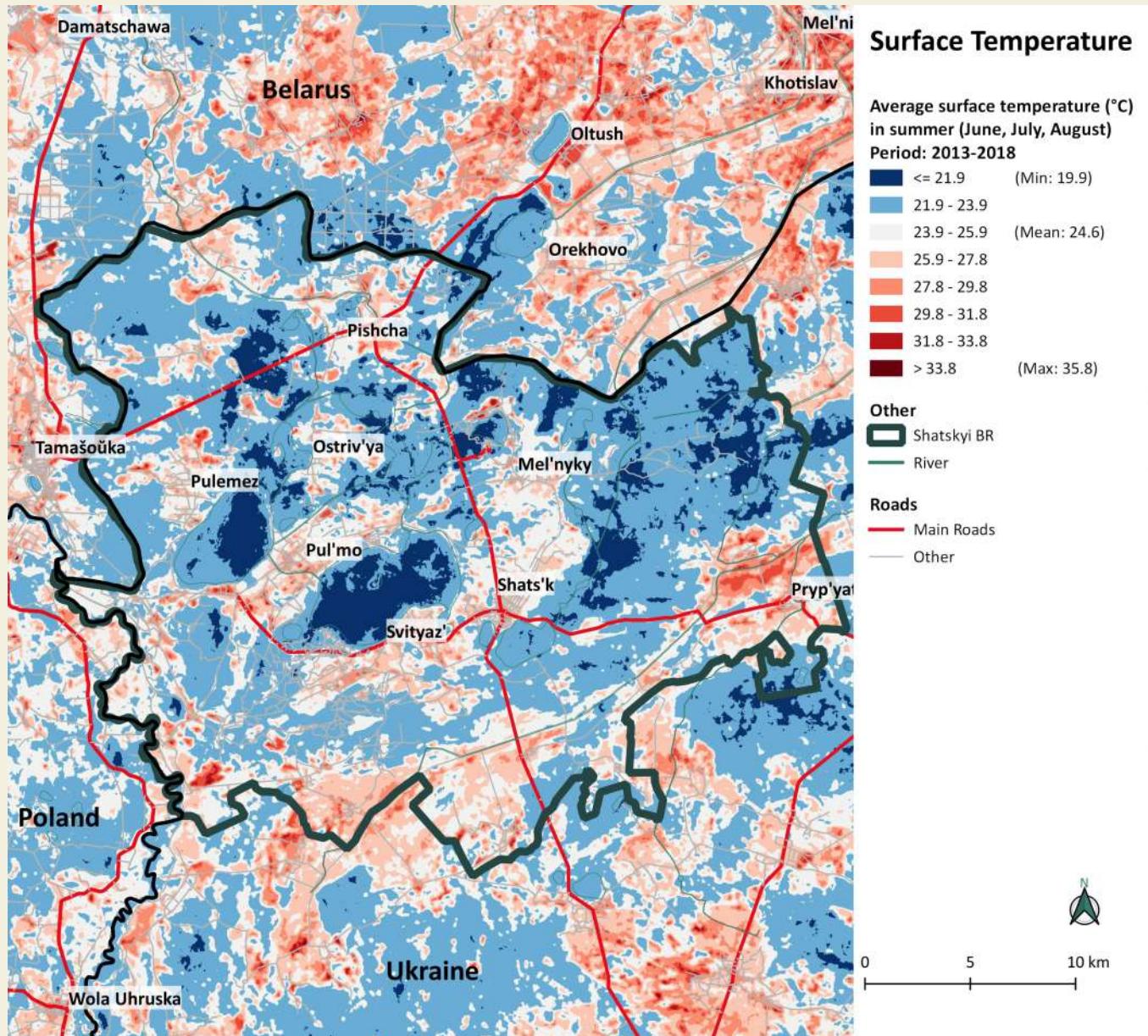
MICROCLIMATIC EFFECTS

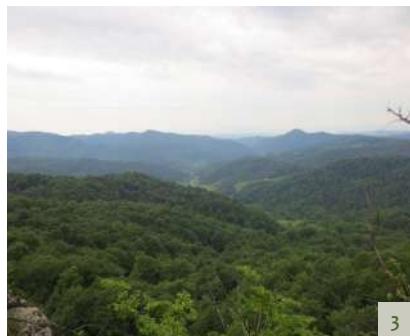


The weather, which results from large climatic conditions in specific locations, is influenced by a variety of properties such as the nature of the land surface and the vegetation. For example, steeper southern slopes are warmed more by prolonged exposure to sunlight, shady northern slopes are cooler, and lower basins or depressions in the terrain may accumulate colder air masses. Valleys and hills influence the climate just as much as forests and water bodies.

The Surface Temperature Map shows land surface temperature patterns in the Shatsk region obtained by the Landsat 8 satellite every two weeks from 2013 till 2018 with a high spatial resolution of 30 m. Reviewing the map on page 7, it appears that settlement and arable land produce the warmest (red) areas and, on the other hand, large areas of forest, wetlands and water bodies are the cooling centres (dark blue) of the region. Therefore, the map allows conclusions about the ability of different ecosystem types and their state to handle increased incoming energy, buffer it and to cool down themselves or even surrounding areas.

Sources: Landsat 8 OLI & TIRS; US Geological Survey, Roads & settlements: OSM 2019; Data processing and analysis by: S. Kriewald (PIK); Map produced by: A. Dichte





Requirements for a functioning self-regulated microclimate

1 Accumulation of biomass - living and dead in Uhinka old-growth Beech forest (Carpathian Biosphere Reserve)
(© A. Dichte)

2 Intact wetlands in the Biosphere Reserve "Roztochya"
(© BR "Roztochya" administration)

3 Large spatial extent of undisturbed forests in Uhinka old-growth Beech forest (Carpathian Biosphere Reserve)
(© A. Dichte)

4 Large and deep waters with natural vegetation growth and water regime in the Desniansky Biosphere Reserve
(© A. Miskov)

5 Extensive floodplains in the Desniansky Biosphere Reserve
(© S. Panchenko)

6 Richly structured landscape in a swamp area in the Shatskyi Biosphere Reserve
(© Shatskyi Biosphere Reserve administration)

satellite-based remote sensing data for the reflection of heat radiation now make it possible to estimate surface temperatures worldwide (see map). Taking into account information on land use, water vapour in the atmosphere and cloud cover, the temperature can be determined with a resolution of 30 meters. The map shows selected data on the summer average temperature (June-July-August; only daytime) in the years 2013-2018.

Clear temperature differences of up to approximately 7 °C can be observed. The spatial temperature patterns are not coincidental, but are clearly related to properties of the land surface. The

coolest spaces in the Shatskyi region are the bigger and deeper lakes as well as the forested areas, which are big and rather dense. The heat poles of the region are located in the settlements. The so-called "heat island" effect in cities has been well known for a long time. On hot days, heat stress is particularly severe for people, animals and plants in settlements. Accordingly, it is important that cool air can flow in and that cooling areas are also taken into account in urban planning.

There are various mechanisms that contribute to cooling in the landscape. Dense vegetation literally shades itself; water bodies and biomass containing

water can absorb certain amounts of heat and contribute not only to cooling but also to buffering temperature fluctuations. In productive vegetation, the conversion of light energy into biomass and the evaporation of water are also important factors for cooling. Cooler temperatures and lower fluctuations also mean higher and more balanced humidity and a reduction in heat stress. Richly structured landscapes regulate their own microclimate to a considerable extent and thus secure their own living conditions.



"Ecosystems are the basis of our economic activities - which we often forget, because they are simply there and their services are seemingly unassailable and free."

Prof. Dr. Pierre Ibisch, Biologist, Professor for Nature Conservation and Co-director of the Centre for Econics and Ecosystem Management at the Eberswalde University for Sustainable Development, Germany

UKRAINIAN-GERMAN COOPERATION



Project Aim

Michael Succow Foundation and the Centre for Econics and Ecosystem Management at Eberswalde University for Sustainable Development joined forces for proposing a project that would benefit three Ukrainian biosphere reserves: Desnianskyi, Roztochya and Shatskyi (West Polesie). The goal is to integrate an EbA-informed approach to national and regional planning and action, leading to better adapted land-use and wide-ranging sustainable development.



The International Climate Initiative of the German government is funding this project since July 2018. The duration of the project, now implemented by the partners and under the auspices of the Biosphere.Center, is three years.

Ecosystem-based Adaptation (EbA) to climate change and regional sustainable development by empowerment of Ukrainian Biosphere Reserves

The expected outcome is to empower the three biosphere reserves in three different ecoregions – Desnianskyi, Roztochya and Shatskyi – for becoming role models that catalyze the introduction of a new type of participatory and adaptive ecosystem management in the wider landscape.

Beneficiaries and Target Groups

The project targets a wide range of stakeholders (e.g. inhabitants, land users, administration staff of the Biosphere Reserves, and downstream ecosystem service beneficiaries) as well as national and regional policy makers. Novel methods allowing for a strong stakeholder participation will be introduced and adapted to safeguard long-term benefits for all actors involved.

The biosphere reserves are empowered to interact with the population and relevant actors using appropriate tools and concepts and not only to moderate the transfer of knowledge, but also to act as a partner concerned with the interests of the population and the local economy. Of particular importance here is the possibility of financing and testing strategies developed in the region – an EbA innovation fund to awaken local commitment.

Project Activities

The project was initialized with a series of stakeholder workshops involving diverse actors - from school children to foresters up to the employees of the biosphere reserves. The participants exchanged knowledge and discussed views on the local ecosystems and their services.

In the first half of 2019, spatial analyses were carried out. An expert workshop was held in Svitiaz from 3 to 5 June 2019, at which the results of the previous workshop were further developed. The output is a first comprehensive diagnostics of the area, including challenges to ecosystem functionality as imposed by climate change as well as a first inventory of potential ecosystem-based strategies for adaptation to climate change.



"The participants' professional inputs and active discussions at eye-level have contributed to the success of the workshops and provided valuable insights into both the regions eco- and social systems. Thank you!"

Kevin Mack, Project team member and research fellow at the Centre for Econics and Ecosystem Management at the Eberswalde University for Sustainable Development, Germany



1



2



3



4



5

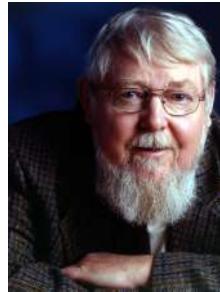
Page 14
1 & 4 Excursion with the experts group after the MARISCO workshop in June 2019 in the Shatskyi BR
(© A. Schick, 4 - Shatskyi BR administration)

2 Workshop at the forest college in the town Shatsk in November 2018
(© K. Mack)

3 Expert workshop in Svitiaz in June 2019
(© A. Schick)

Page 15
1, 3, 4 & 5 Expert workshop held in Svitiaz in June 2019
(© A. Schick)

2 Workshop with staff of the Shatskyi Biosphere Reserve in November 2018
(© J. Kloiber)



"Biosphere reserves are model regions for social and ecological land use – a focus should be on climate neutral agriculture and humus building. Also, regional products and nature tourism have big potential and can help people to make a living without destroying nature."

Prof. em. Dr. Michael Succow, Founder and Chair of the Michael Succow Foundation

This brochure
has been edited by



**Succow
Stiftung**



**Centre for Economics
and
Ecosystem Management**



**Eberswalde University
for Sustainable
Development**

Biosphere Reserves and Climate Adaptation

'Biosphere Reserves and Climate Adaptation' has been elaborated in the frame of the Ukrainian-German project "Ecosystem-based Adaptation (EbA) to climate change (CC) and regional sustainable development by empowerment of Ukrainian Biosphere Reserves". It consists of three volumes. Each volume is an open-access journal for Ukrainian biosphere reserve residents as well as any other interested person. Each volume will be available in Ukrainian and English language. For the digital version, please visit our website: www.eba-ukraine.net

Volume 1/3: "Natural Ecosystems"

Volume 2/3: "Impacts of and Adaptation to Climate Change"

Volume 3/3: "Acting in Climate Change"



WEST POLESIE

Administration of the Shatskyi Biosphere Reserve
vul. Zhovtneva 61
Svitiaz village, Shatsk rayon, Volyn oblast
81070 Ukraine

Authors: Angela Dichte, Pierre Ibisch, Mariia Khrystetska, Judith Kloiber,
Anatoliy Smaliychuk, Kevin Mack, Ina Rohmann

Svitiaz, 2019

Supported by:



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag

INTERNATIONAL CLIMATE INITIATIVE (IKI)

