



This project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817527



**MAIA**  
Mapping and Assessment for  
Integrated ecosystem Accounting

The MAIA country fact sheets summarize the state of affairs on natural capital accounting (NCA) in the countries connected to the MAIA project. They serve as an accessible overview and entry point for collaboration. The factsheets describe the needs from policy, society, science and business for the use of NCA, give an overview of the ongoing and published research -including knowledge gaps- in the country, include contact details and an overview of national partners and stakeholders involved in the accounts. Information in this document is based on MAIA Deliverables and exchanges, and the content is reviewed, co-authored and updated by MAIA-liaison persons in the participating country. This version was updated on August 5<sup>th</sup> 2022.

# Country fact sheet: **Bulgaria (BG)**

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**August 2022**

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# TABLE OF CONTENTS

-  **Summary**
-  **Country policy priorities for developing natural capital accounts**
-  **Pilot accounts under development**
-  **Summary table of accounts**
-  **Summary overview of highlight accounting projects**
-  **Knowledge gaps and difficulties for developing natural capital accounts**
-  **Support needs for developing natural capital accounts**
-  **Involved stakeholders**
-  **References**

## Summary

Key policy priority areas for Bulgaria are: Water regulation ES, Forest ES (extent, carbon sequestration), Biodiversity, Urban Areas Extent and ES, Cultural ES (tourism, cultural heritage) and Supply and Use tables for these ES. Only for forest ecosystems there already is national legislation on monitoring and valuation, there is demand to expand this to other ecosystems as well.

An extent and a condition account have been constructed and published for all ecosystems for the time series from 1990 to 2012, as well as an extent account for all ecosystems for the years 2000 up to 2018. An updated forest extent account is under development. A biophysical ES account is being constructed for Cultural ecosystem services and for Flood regulation, both on a local scale. Thematic accounts are being set up for Carbon in forest ecosystems on a regional scale, Urban ecosystems on a local scale and Biodiversity on a national scale.

In Bulgaria problems arise due to data availability and quality, as well as lack of clear guidance on working with the available data. The most important knowledge gaps include ecosystems asset accounts, ES accounts and a thematic biodiversity account. Another important issue is the lack of engagement of all stakeholders, insufficient communication and collaboration between state institutions and knowledge sharing and discussions with the general public and the business community. The last issue relates to the establishment of uniform translation of the relevant terminology in the respective language.

There is a need for better collaboration between all stakeholders to identify and close the data gaps. Institutional and policy support are necessary conditions for further development and implementation of the core and thematic accounts. More training and capacity building at the state and research institutions of all scales should enable them to be much more effective in proving to the business community and society in general, the real value of the natural environment.

## Country policy priorities for developing natural capital accounts

*Based on MAIA D5.1 (Annex 2 section 3)*

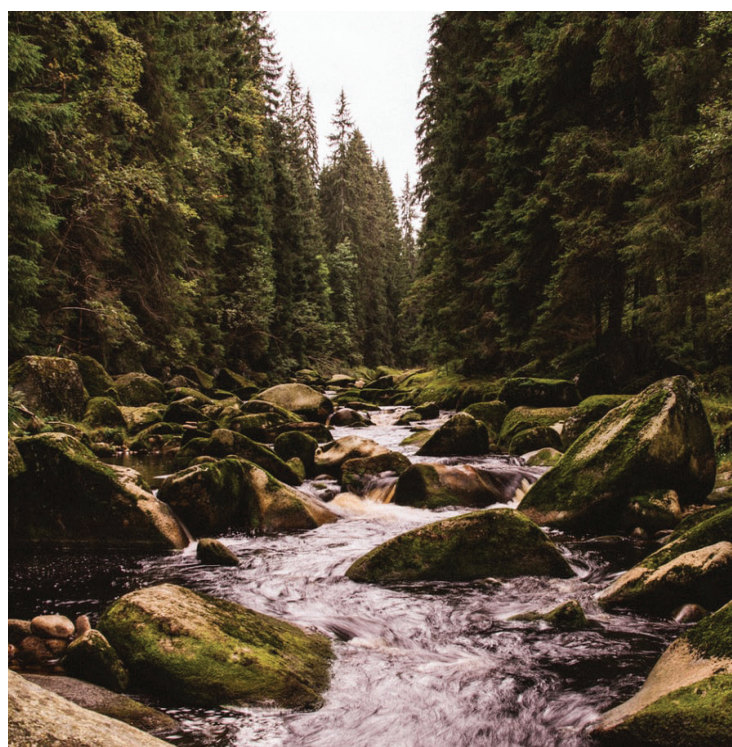
Key policy priority areas for Bulgaria are: Water regulation ES, Forest ES ( extent, carbon sequestration), Biodiversity, Urban Areas Extent and ES, Cultural ES (tourism, cultural heritage) and Supply and Use tables for these ES. Only for forest ecosystems there already is national legislation on monitoring and valuing, there is demand to expand this to other ecosystems as well.

Concerning the forest ES, there is already a biophysical valuation of the forest ecosystems that currently are not part of the NATURA 2000 network. This type of valuation will be completed for the NATURA 2000 forests as well. The Forestry Executive Agency has already come up with three methodologies of forest ecosystem valuation.

At the level of Bulgaria there are no policy decisions and regulations for natural capital accounting in the Biodiversity Act so far. Notwithstanding, some regulations are making use of natural capital accounting. For example, for the monetary valuation of forest ES, The Forestry Act, chapter 17, determines the public ecosystem benefits from the forest territories; the concrete forest territories and zones, in which public ecosystem benefits use is paid; the types of economic activities, which involve payment for public ecosystem benefits; the methods for determining the compensations and information about the collected and spent funds from compensation for public ecosystem benefits (art. 248-251). Another example is the Clean Air Act (Art. 22) and the Ordinance for Reducing the National Emissions of Certain Atmospheric Pollutants (Art. 7), for which a monitoring network has been built, following article 9-10 of the NEC Directive, which includes 27 sites and covers all 6 ecosystem types (Grasslands, Cropland, Forests and woodlands, Heathland

and Shrub, Wetlands, and Rivers and Lakes) on the territory of Bulgaria. The monitoring network satisfies the requirements given in the Technical specifications and is in accordance with MAES classification.

NCA elements, related mainly to monitoring and valuation, are present in different acts and regulations. There is a need to further develop them, associate them specifically to NCA, and "imprint" them in the general public and business "conscience" through education and knowhow dissemination, but, most importantly, through amendments to legislative and executive acts and regulations. The latter also need to be included, not only in the Biodiversity Act, but in a special NCA Act, jointly promulgated by the MOEW, the Economics Ministry, and the NSI.



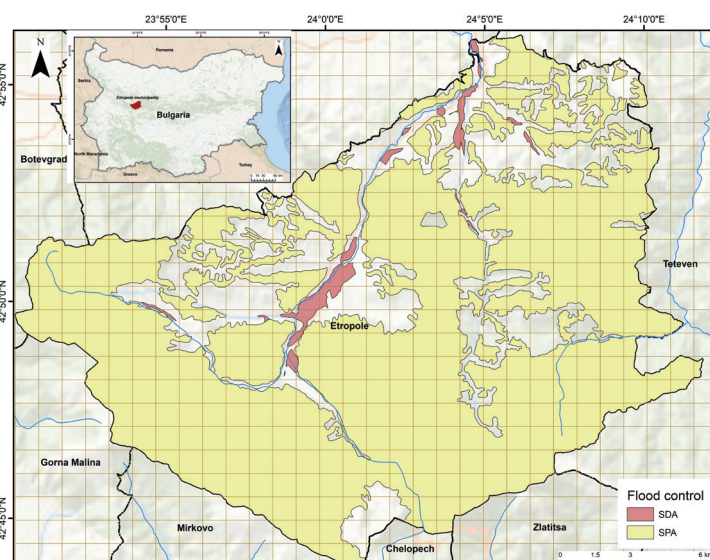
## Pilot accounts under development

### Summary table of accounts

Based on MAIA D3.1 (3.2); D3.2 (Annex 2 section 1);  
 D5.1 (Annex 2 section 5)

Account		Ecosystem Types / Ecosystem Services	Link to research
Accounts for ecosystem assets	Ecosystem extent account	All ecosystems (1990–2012)	Petrov et al., 2019
		All ecosystems (2000–2018)*	
	Ecosystem condition account	Forests*	Petrov et al., 2019
		All ecosystems (1990–2012)	
Accounts for ecosystem services	Ecosystem monetary asset account		
	Ecosystem services supply and use table - physical terms	Cultural ecosystem services	In press: Hristova et al., 2020
		Flood regulation*	
	Ecosystem services supply and use table - monetary terms		
Thematic accounts		Carbon account for Forest ecosystems*	
		Urban	
		Biodiversity*	

Scale	State of development
National	Finished
Regional	Ongoing
Local	None ongoing or published
*Highlighted in the fact sheet	



**Figure**

The Service Providing Areas (SPA) and the Service Demanding Areas (SDA) in Malki Iskar watershed within the frame of Etropole municipality (Hristova et al., in print).

## Summary overview of highlight accounting projects

### Ecosystem Extent Account

#### Scale

National, Biogeographical regions, NATURA2000 network.

#### Involved and funding partners

Executive Environment agency (ExEA) by the Ministry of environment and water, National statistical institute (NSI).

#### (Policy) Goal of the study

The main goal is to show the changes in ecosystem types in Bulgaria for three periods: 2000–2006, 2006–2012 and 2012–2018. Ecosystem extent account is the basic account and a starting point of all accounts which will be developed in Bulgaria according to the SEEA-EEA framework and the SEEA matrix of net changes for each ecosystem.

#### Ecosystems under study

All ecosystem types, according to MAES typology, which are mapped in Bulgaria.

#### Methods and data used for the study (if relevant indicators used)

For land and freshwater ecosystems we will use four datasets from Corine Land Cover (CLC) databases for the following years: 2000, 2006, 2012 and 2018. The ecosystem classification in Bulgaria is in accordance with the MAES typology and we have created a link between ecosystems types (level 2) and CLC (class 3) datasets. Comparing datasets in their ecosystem size among the three periods, we will calculate the net changes (Increasing minus decreasing areas) for each ecosystem type. For the Marine ecosystem we use data from a mapping project under the programme “Biodiversity and ecosystems” (2015), financed by EEA grants 2009–20014. For this ecosystem type we use the EUNIS classification – level 3 and calculate the area for each ecosystem subtype in square kilometers for the Bulgarian Exclusive Economic Zone in the Black Sea. All ecosystem types are calculated in square kilometers.

#### Link to the research/reference

Not available at the moment.

#### Approximate date of final results

End of 2021.



## Forest Extent Account

 **Scale**  
 National.

 **Involved and funding partners**

National Statistical Institute of Bulgaria (NSI), Executive Environment Agency (ExEA) and Forest Research Institute – Bulgarian Academy of Sciences (FRI-BAS).

 **(Policy) Goal of the study**


The main goal of the study is to provide information on the stocks and changes of the area of forest and woodland ecosystems, as it is of particular policy interest for both SEEA-EA and SEEA-CF.

The first task is to develop a methodology and describe the potential data sources suitable for calculation of the extent of forest, woodland and other. The other main task is to present methods for estimating ecosystem provisioning services from forests and woodland in particular wood supply (timber harvest) and game hunting meat in physical and monetary terms. For the purpose of the MAIA project, two material services in physical and monetary terms from forest ecosystems have been estimated: supply of timber and harvested game meat from big game. Harvested wood is in cubic meters and national currency, using the average market prices of timber by category and species and the physical amount of timber harvested from forest polygons from Forest management projects linked from felling permits. In the supply-use tables produced, only natural (uncultivated) forests are

accounted and plantations are excluded. For game meat, actual market prices by weight of big game, according to the Guide to Material Flows in the Economy, were used. The results will be presented on a map and tables.

 **Ecosystems under study**

Woodland and Forest ecosystems - predominantly forest area, including woodland and forest ecosystem assets – which cover the CLC classes: broad-leaved, coniferous, mixed forests and transitional woodland shrubs (corresponding to the level 3 MAES typology). The most important forest classes from FMP, based on their origin, are seed or highstem forest, coppice forest, forest plantations based on canopy cover, mountain pine, fellingings.

 **Methods and data used for the study (if relevant indicators used)**

Pilot accounts of forest ecosystems have been compiled in physical terms according to available time series data in a standard table's format, for accounting the changes in area. The maps are produced using GIS tools and the WGS 84 UTM35N coordinate system.

The ecosystem accounting area (EAA) covers the whole territory of the country (national level) and the basic spatial units (BSU) are grid cells 1x1 km<sup>2</sup>. The approach to tracking changes in the areas (extent) of all ecosystem types, including forest ecosystems, is based on the intersection (splitting) of polygons (forest land cover classes corresponding to level 3 forest ecosystems, forest properties according to their use from the cadastral

map, forest types from forest management projects) into a 1x1 km<sup>2</sup> national GRID. In this way, we have data on the area in each grid cell of different ecosystem types, which allows the calculation of changes between 2 periods of time (increase, decrease, net and gross change, stable ecosystem stock).

To accomplish the goal of the study, NSI used the following geospatial data sources at the national level to develop pilot accounts of the extent of forest ecosystems:

CLC layers available for 5 years (1990, 2000, 2006, 2012 and 2018);

Forest Management Projects layer (10-year period of action 2013-2023) and attributive data from the register of felling permits and killed game from Executive Forest Agency (ExFA);

Layer with data for the land properties (forest land properties) for 3 years – 2019, 2020 and 2021 from Geodesy, Cartography and Cadastre Agency;

Earth Physical Blocks of land Map 2021 from Ministry of Agriculture, Forestry and Foods.

 **Link to the research/reference**

Pilot ecosystem core accounts report Deliverable 3.3 on MAIA official website with table results and maps.

 **Approximate date**

2022.

## Flood Regulation Accounting in Mountain Watersheds

 **Scale**  
 Local.

The study covers three mountain watersheds - of the Ogosta, Malki Iskar and Yantra rivers, which are representative for the low to mid-mountain areas in Bulgaria.

 **Involved and funding partners**  
 NIGGG-BAS.

 **(Policy) Goal of the study**

The main policy drivers for flood regulation accounting refer to water management, which is set out in the Bulgarian Water Act (WA). It is implemented mainly through two key planning instruments, the River Basin Management Plans (RBMPs) and Flood Risk Management Plans (FRMPs). The main activities in the FRMPs focus on the floodplain areas, while the regulation of the ecosystems

at watershed level has been more or less neglected. The identification of the Service Providing Areas (SPA) and the accounts of their regulation function would be a valuable contribution to the next update of the FRMPs.

 **Ecosystems under study**

Woodland and forest, Heathland and shrub, Grassland, Cropland, Urban.

 **ES/thematic account under study**

Flood regulation.

 **Methods and data used for the study (if relevant indicators used)**

The flood regulation accounting is based on the assumption that specific ecosystems can reduce the extent and intensity of floods, thus diminishing the risk of damage to build environments. The ecosystems which provide the flood control functions (ES supply) are located at a distance from the demand areas. The spatial relationship between them is conceptualized by Service Providing Areas (SPA) and Service Benefiting Areas (SBA). Accounting is applied to three case study

areas, which have already been an object of flood regulation mapping and assessment (Nedkov and Burkhard, 2012; Boyanova et al., 2016). The assessment of ES supply is based on the results of biophysical modeling by the GIS-based AGWA tool, which utilizes the KINEROS (Kinematic Runoff and Erosion model) hydrologic model and the ArcSWAT model. The results are obtained in the form of flood regulation supply capacity maps and presented in six categories ranging from 0 (no relevant capacity) to 5 (very high relevant capacity). In order to define the SPAs, the upper three categories from the assessment scale are selected. The SBAs are defined in a similar way by selecting from the map of ES demand the areas with medium to very high demand.

 **Link to the research/reference**

Hristova, D., Nedkov, S., and Katsarski, N. Modeling flood regulation ecosystem services in support of ecosystem accounting in Bulgaria (in print);

 **Approximate date of final results**

April 2022.

## Carbon Accounts in Forest Ecosystems


 **Scale**  
 Local.


The study covers the territory of Belovo Municipality, located in the Pazardzhik Oblast of Southern Bulgaria. The study area is 346.4 km<sup>2</sup> and encompasses the forest area managed by the State Forest Enterprise – Belovo (SFE-Belovo) and the forest area within the boundaries of Rila National Park - a protected area.

 **Involved and funding partners**  
 FRI-BAS.

 **(Policy) Goal of the study**

The main goal of the study is to provide data on carbon stock changes in the forest ecosystems, which is of particular policy interest in view of the mitigation potential of these ecosystems in reducing the greenhouse gas emissions. In addition, the pilot study aims to address, first, the consistency of data availability, in terms of spatially-explicit data on forest resources and land cover change and, second, to assess the relevance of combining different data sources and information in the process of mapping and accounting the carbon stock changes in the living biomass of the forest territories.

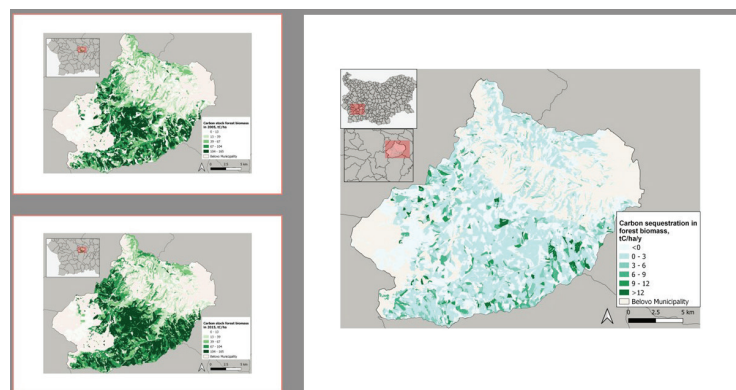
 **Ecosystems under study**  
 Woodland and forest ecosystems

 **ES/thematic account under study**  
 Thematic account: Climate change SEEA – EA – Accounting for carbon

 **Methods and data used for the study (if relevant indicators used)**

Two different methodological approaches for carbon stock and flow estimates in accordance with IPCC 2006 were tested (Gain-Loss and Stock Difference Methods) for the time period 2005-2015. Both methods are recognized by the SEEA-EA. Comparative analysis of both approaches was performed in terms of feasibility, accuracy, and technical implementation. Stock Difference Method appeared to be more appropriate, and the final results are discussed in this regard.


The study accounts only for carbon changes in the living biomass of the forest's ecosystems, due to the lack of relevant data to be used in assessing the changes of the carbon stock in the other pools. The mean carbon stock of forests in the case-study region in 2005 is estimated at 60.8 tC/ha, while in 2015 it increases to 68.0 tC/ha. The mean value of carbon sequestration is 1.25 tC/ha per year. In respect to carbon account, the opening stock of biomass is 1759.737 ktC, net carbon balance is 218.028 ktC and closing stock 1977.765 ktC.



## Urban Account


 **Scale**  
 Local to Regional.

The study was applied on urban areas with diverse features and conditions: A/ Sofia: capital city functions (1.3 mln.), incl. excellent landscaping traditions, and B/ Burgas: mid-size city in direct contact with protected wetlands; seashore; industry/tourism/maritime trade and shipping functions.

 **Involved and funding partners**  
 Sofia University "St.Kliment Ohridski" – Geospatial Research and Technologies National University Center.

 **(Policy) Goal of the study**

Focus on Local climate regulation: for the 1st time BG started monitoring the Cooling Effect of urban areas. The results have been used to further develop methodology oriented towards new/adaptive urban planning solutions to mitigate the Surface Urban Heat Island (SUHI) effect in the existing city structure, including an appropriate toolkit for collecting field data and building understandable information for urban planning actors.

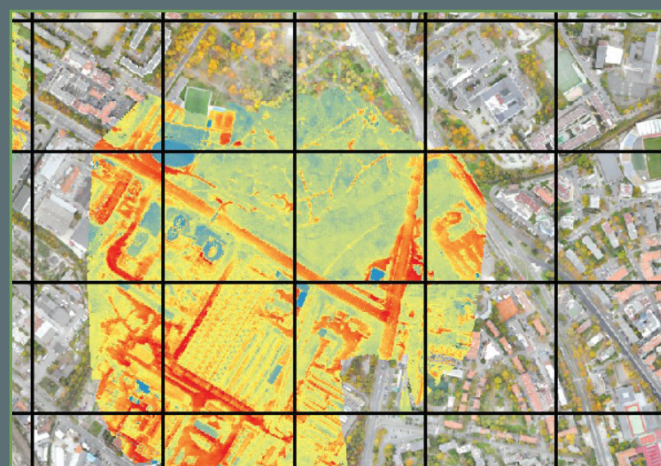
 **Ecosystems under study**  
 Urban Ecosystems: Spatial unit, based on Disaggregation of the urban area in Local Climate Zones (LCZ) (Stewart & Oke, 2009), recognized as accounting units by SEEA EEA (2021).

 **ES/thematic account under study**  
 Thematic account – Local Climate Regulation under SEEA – EEA.

 **Methods and data used for the study (if relevant indicators used)**

Approach: data collection and analysis of land surface temperature variations by Local Climate Zone Data; Unit of Measure - T°C; Acquisition instruments: Landsat 8 and Unmanned Aerial System for Thermal Photogrammetry with a self-calibrating sensor - a sample stratified study of the magnitude of the SUHI effect (Albris platform, Sensefly); Results to support a pilot accounting table:

	BURGAS CITY_LCZ	Buildings	Impervious	Vegetation	Average surface temperature, C
LCZ_3	Compact low-rise	19,96	23,77	21,42	21,5
LCZ_5	Open mid-rise	21,95	25,23	21,98	22,3
LCZ_6	Open low-rise	19,8	24,24	20,87	21,4
LCZ_8	Large low-rise	19	26	23,35	23,4
B	Scattered trees	23,78	29,49	23,36	23,6
D	Low plants	23,22	26,04	20,04	20,4
E	Bare rock or paved	22,26	25,46	21,68	22,9



## Knowledge gaps and difficulties for developing natural capital accounts

*Based on MAIA D3.2 (Annex 2 section 3); D5.1 (Annex 2 section 5e and 6d)*

In Bulgaria problems arise because of data availability and quality issues and a lack of clear guidance on working with the available data. The most important knowledge gaps include ecosystems asset accounts, ES accounts and a thematic biodiversity account. Another important issue is the lack of engagement of all stakeholders, insufficient communication and collaboration between state institutions and knowledge sharing with the general public and the business community. The last issue relates to the establishment of uniform translation of the relevant terminology in the respective language.

The key challenge is the lack of readily available and sufficiently detailed georeferenced data at national level (often national classifications are used and corresponding tables must be elaborated). Key data sets at national level at the INSPIRE Portal (e.g. land planning, flood reduction, climate adaptation, agriculture, cohesion policy) are missing. These are essential for ecosystem accounts development. This gap can be explained by the lack of national legislation concerning mapping and assessment of ecosystems and ecosystem services and national capital accounting. Moreover, there are unclear guidelines on the integration of administrative data sources, according to the principles proposed for physical and monetary evaluation of EA and ES.

Some specific knowledge gaps are: development of the ecosystem asset accounts; application of GIS methods for biophysical and monetary evaluation of ES; a case study on thematic biodiversity accounts and methods of linking biodiversity data with monetary accounts. Priority should be given to forest ES, as it is the only ecosystem in Bulgaria with a law of its own, and the

development of other extent accounts. Specifically for Carbon accounts in forest ecosystems there is a lack of systematically measured and gathered data on dead wood and carbon stock and carbon stock changes in dead wood. In fact, in terms of consistency, it could be possible to estimate carbon stock changes in deadwood based on a model, but the validation of these estimates requires additional studies. Regarding the other pools – soil and litter, data from ICP Forests Programme could be used. However, the national ICP Forests Programme data have a lot of limitations in terms of consistency and the direct use of this information to feed the carbon accounts in forest soil and litter could be applied on a broader regional or national scale.

The lack of quality and quantity of data results in problems with the statistical relevance of some of the ecosystem valuations, its quality, accuracy, quantification ability, etc.

There is a notable lack of sufficient engagement on the side of the state institutions on NCA. This could partly be explained by the institutional "borders": a lack of communication and collaboration, which does not allow for one state institution to be fully aware of available information in other state institutions. There is a need to make available information more visible, workable, and applicable, as the general public and the business community lack quality information about and understanding of the ES concept and the benefits of NCA for sustainable economic and social development.

Another relevant issue is the establishment of uniform translation of the relevant terminology in the respective language. Funds have to be set aside for accurate translation of the surveys and the accompanying publications, including terminological dictionary, as well as the research outputs. This is important to avoid placing stakeholders and experts at a disadvantage and is considered as one of the most important goals of this project, since it will enable much wider information and knowledge sharing.

Bulgarian stakeholders conclude that quality expertise about NCA is still missing in the country and, therefore, it is too early to predict the time horizon for the practical implementation of the ES concept.

## Biodiversity Account

### Scale

National, Biogeographical regions.

### Involved and funding partners

Executive Environment agency (ExEA), National statistical institute (NSI).

### (Policy) Goal of the study

The main policy goal is to determine the species' richness and abundance of their sites in the country. The species, which are the subject of this study, are of national and European interest. The sites with the highest species' richness will be a starting point for future investigations of the ecosystem status and the quality of ecosystem services they provide. The status of the species for each ecosystem type is one of the key indicators to assess the ecosystem condition and the status of ecosystem services they provide.

### Ecosystems under study

All ecosystems, according MAES typology, which are mapped in Bulgaria.

### ES/thematic account under study

Thematic account – Biodiversity account.

### Methods and data used for the study (if relevant indicators used)

Data from the Nature Directives reporting (Habitat Directive and Bird Directive) for the periods 2007 – 2012 and 2013 – 2018 will be used. The main parameters: Species distribution, conservation status for species and habitats, population trends, and their population size and density. Data from the Red Books (1984, 1985 and 2015), structured according to IUCN rules will also be used, together with data from the National Monitoring System for Biodiversity, managed by the ExEA. Scientific articles and external datasets from NGOs will be consulted too.

The main method is the calculation of the species richness and abundance. Using linkages to the ecosystem types in which they live, we will use their conservation status and population data as indicators to estimate the ecosystem condition and the services they provide. Next, we will use biodiversity indexes, such as Shannon and Wiener index, Red List Index, Chao1 and Conservation Value index for all sites and ecosystems.

The mapping scale is 10x10 km ETRS grid on national level, Biogeographical regions (Continental, Alpine, and Black Sea regions), the Black Sea marine area and the Natura 2000 network.

### Link to the research/reference

Not available at the moment.

### Approximate date of final results

In the end of 2022.



## Support needs for developing natural capital accounts

Based on D3.2 (Annex 2 section 4);  
 D5.1 (Annex 2 section 7)

There is a need for better collaboration between all stakeholders to identify and close the data gaps. Policy support is a necessary condition for further development of the core and thematic accounts. More training and capacity building at the state and research institutions of all scales should enable them to be much more effective in proving the business community and society in general, the real value of the natural environment.

To build up expertise and further study the data availability, it is imperative to have collaboration with and among key Bulgarian stakeholders: ministries, academia, mapping agencies and non-governmental organizations that are

active in monitoring land cover/land use, ecosystem extent and condition. Collaboration would build a much more stable and significantly larger "ecosystem" to support the experts in the field which face a number of difficulties. Central in this strategy is to align the terminology NCA community, businesses and the public, which in turn will help to clarify objectives and tasks.

Strong policy support is needed for further development of the accounts. For this purpose, SEEA-EEA needs to be established as an EU standard as soon as possible, according to Bulgarian stakeholders. In Bulgaria itself, there are some specific steps that can and should be prioritized. First, the draft of the new Accounting Act, which has been under discussion in BG Parliament since 2016, should emphasize the integration of non-financial values into the general financial accounting. Second, the Ministry of the Environment and Waters should propose an Ordinance on Ecosystems Condition and Ecosystem Services and the Benefits from them. Stricter regula-

tion of ES monitoring and legislation for other ecosystems in addition to forests, would also benefit the uptake and practical implementation of NCA.

Next to increase collaboration and policy support, there is a need to increase the level of awareness of businesses and society as a whole of ES and their processes. A higher level of general understanding of the value of the NCA concept is necessary for its acceptance and incorporation in the general accounting process. Demonstration of the financial losses that stem from environmental destruction and undervaluation of ecosystems and ecosystem services would raise public realization of the potential of nature as an investment. Such policies would dispel the existing opinion that some MS, including Bulgaria, may not be politically and economically ready and willing to accept all possible consequences that follow from ecosystem accounting, in particular those related to a possible sharp nominal increase of the GNP, which may underline some of the country's competitive advantages.

## Involved partners and stakeholders

Based on MAIA D5.1 (Annex 2 section 2);  
 European NCA stakeholder day

Government	Research	Private sector and NGO
Sofia Municipality Engineering Company	Sofia University "St. Kliment Ohridski"	WWF – Bulgaria
Ministry of Environment and Water (MOEW)	Forest Research Institute - Bulgarian Academy of Sciences	Geographica
Executive Environment Agency (ExEA) at the Ministry of Environment and Water	Institute of Biodiversity and Ecosystem Research - Bulgarian Academy of Science	EcoResolve EcoSolutions
National Statistical Institute (NSI)	National Institute of Geophysics, Geodesy and Geography - Bulgarian Academy of Sciences	
Forestry Executive Agency at the Ministry of Agriculture, Foods, and Forests.	Veliko Tarnovo University	
Ministry of Regional Development and Public Works		

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