# MAPPING AND ASSESSMENT OF ECOSYSTEM SERVICES OF COPPICE FORESTS IN BULGARIA - METHODOLOGICAL APPROACH


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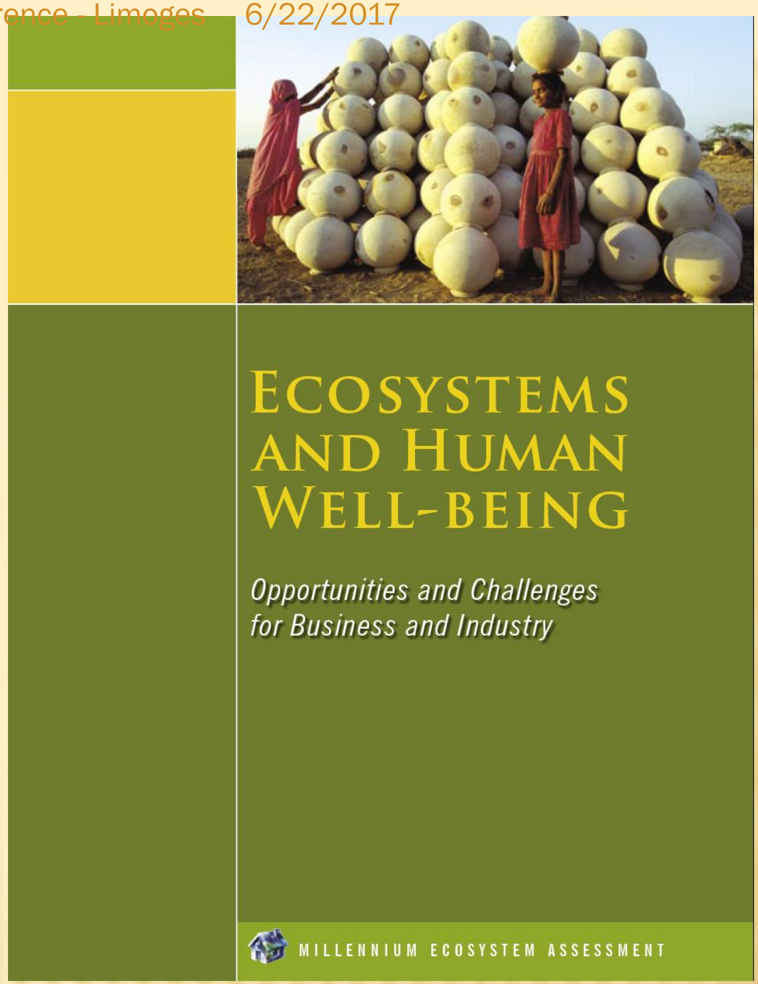
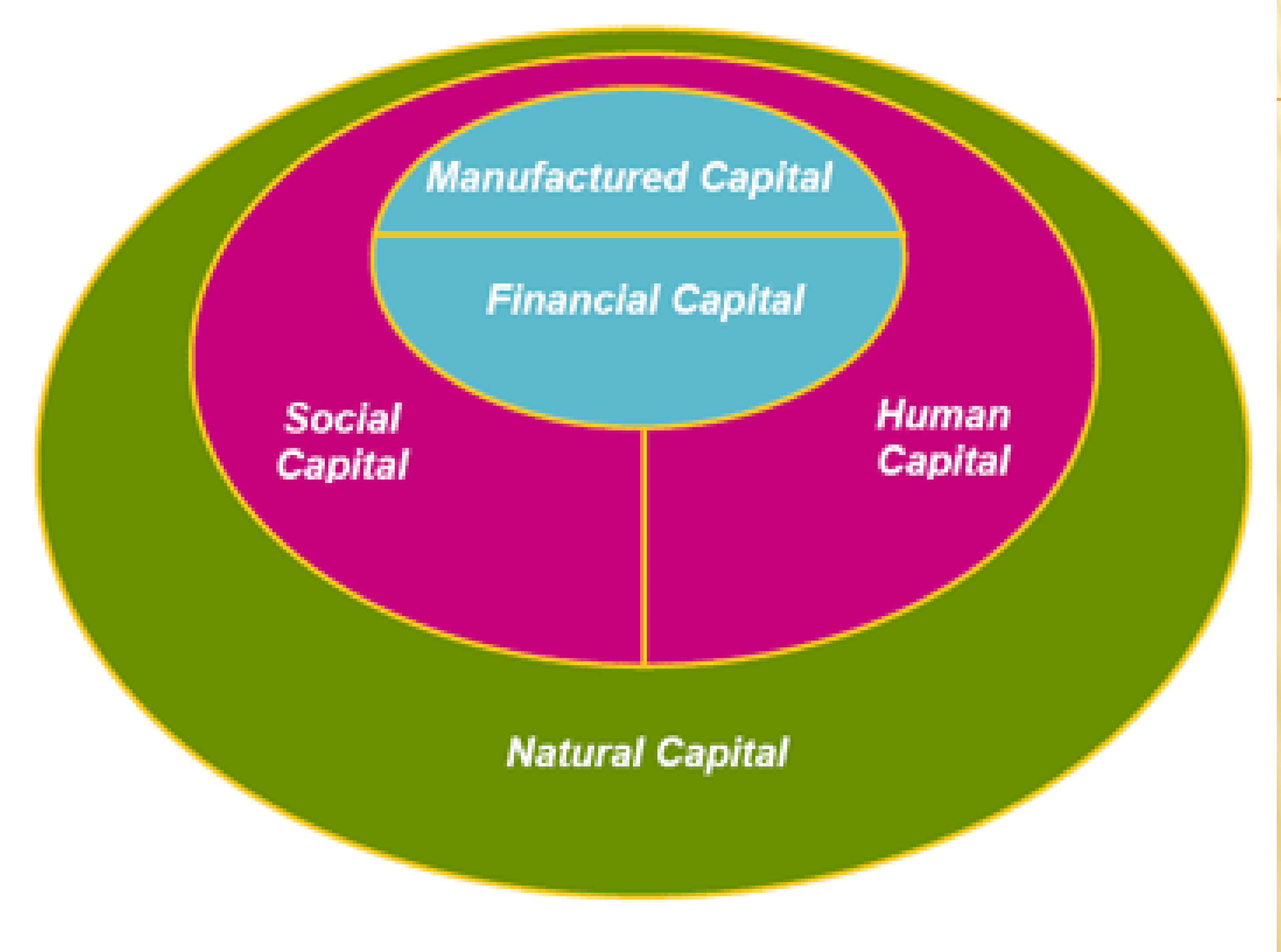
# CONTENTS

- Ecosystem services concept – supply/demand
- Methodology for MAES of forest ecosystems
- About coppice forests in Bulgaria
- How to assess the ESSs in coppices – steps
- Indicators for ESSs
- Analysis from available data
- Conclusions

*The institutional capacities to manage the earth's ecosystems are evolving more slowly than man's overuse of the same systems.*




Manufactured Capital
Financial Capital
Social Capital
Human Capital
Natural Capital

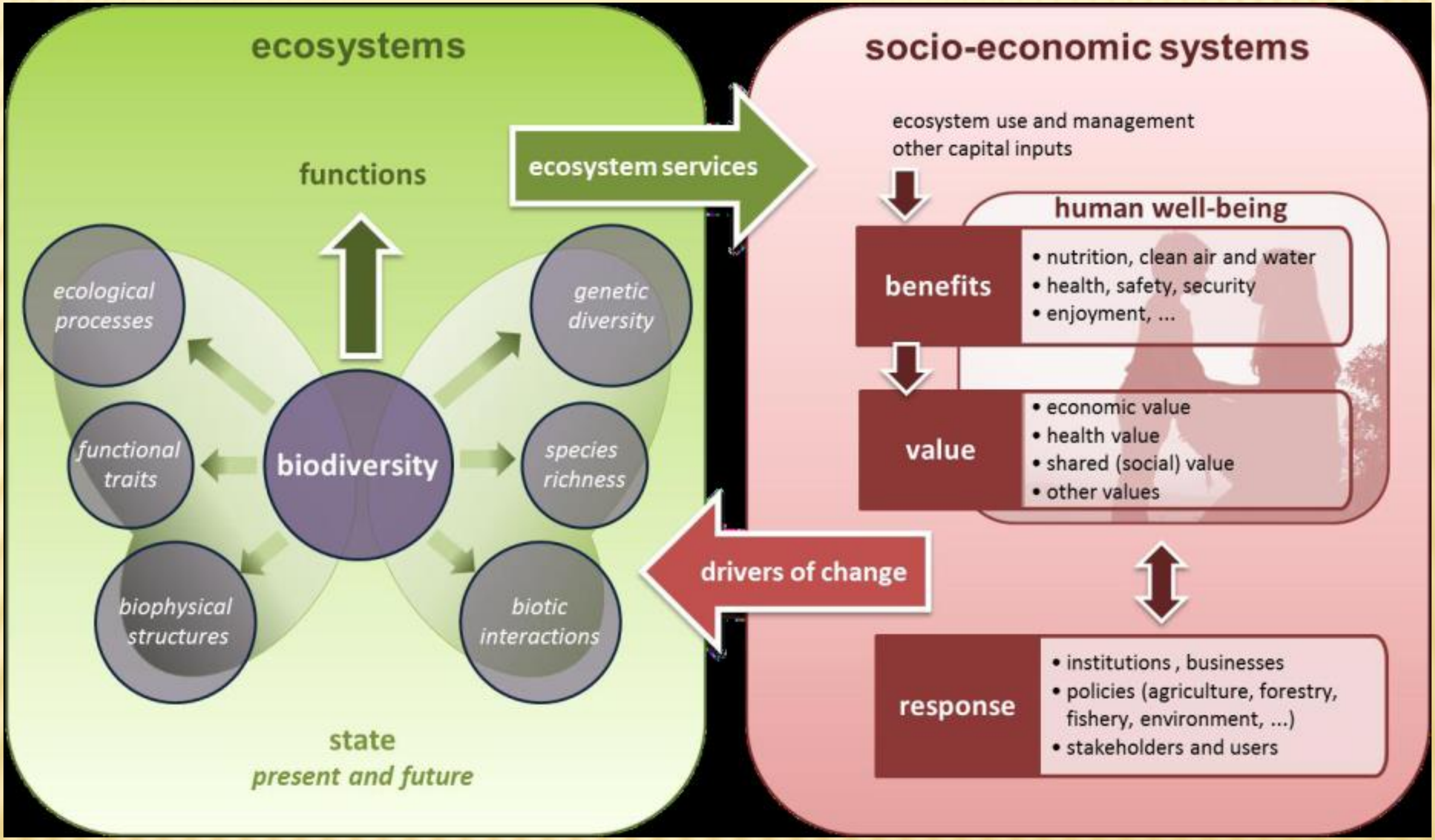
# ECOSYSTEM SERVICES CONCEPT

# CONTEXT

- **Action 5 of the EU Biodiversity Strategy** to 2020 foresees that Member States will map and assess the state of ecosystems and their services in their national territory by 2014.
- The Working Group **MAES-EC**, which steers the implementation of Action 5 decided to test it based on the outcomes of six thematic pilots. One of them is forest pilot.

MAES Context Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (EC 2011) 6 Targets, 20 Actions: to halt loss of Biodiversity & degradation of ecosystem services in EU by 2020

Target 2: ***Maintain and restore ecosystems and their services*** ☐ By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15 % of degraded ecosystems. Action 5 • calls Member States (MS) with the assistance of the European Commission to map and assess the state of ecosystems and their services in their national territory by 2014 and to assess the economic value of such services and promote the integration of these values into accounting and reporting systems at EU and national level by 2020.


ecosystems
functions
ecosystem services
ecological processes
genetic diversity
functional traits
biodiversity
species richness
biophysical structures
biotic interactions
state
present and future
socio-economic systems
ecosystem use and management
other capital inputs
human well-being
benefits
• nutrition, clean air and water
• health, safety, security
• enjoyment, ...
value
• economic value
• health value
• shared (social) value
• other values
drivers of change
response
• institutions , businesses
• policies (agriculture, forestry, fishery, environment, ...)
• stakeholders and users

# ECOSYSTEM SERVICES

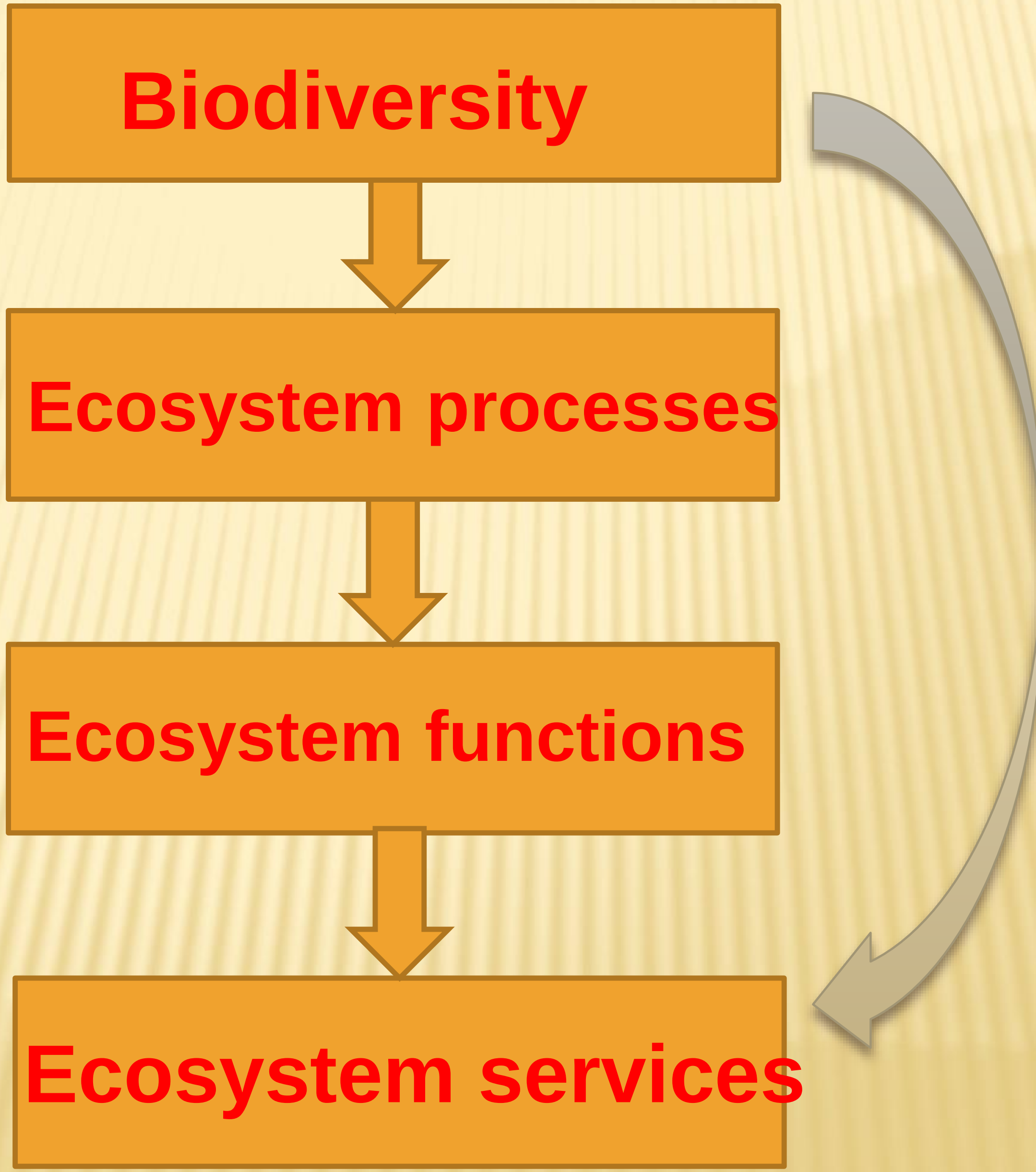
- **ES are the benefits that people obtain from biodiversity, ecosystems and their functions.**
- **Biodiversity** has multiple roles supporting the delivery of ecosystem services and assessment the status of ecosystems. Connecting biodiversity to ecosystem state but also to particular ecosystem functions and ecosystem services entails thus defining multivariate combinations of these different dimensions of biodiversity and using them for mapping and assessment. (MAES 1&2 Reports)

# ECOSYSTEM SERVICES

"***The capacity of ecosystems to provide services derives directly from the operation of natural biogeochemical cycles that in some cases have been significantly modified***".

Millennium Ecosystem Assessment, 2000,2005

# Ecosystem functions and biodiversity



- The concepts to analyse complex SE interactions: ***ecosystem integrity, resilience and ecosystem services***
- The objective: to develop framework to assess ***resilience of ecosystem services, based on DPSIR framework, indicators and scenarios***

# ECOSYSTEM INTEGRITY - DEFINITION

The ability of ecosystem for self organization and self maintenance of ecosystem structures and functions

# ECOSYSTEM SERVICES (ESS)

- Three types of services:

1) **provisioning** (products obtained from ecosystems e.g. food, wood, water),

2) **regulating** and **supporting** (moderate or control of environmental conditions e.g. flood control; water purification by aquifers, carbon sequestration by forests, species balance, pollination; maintain ecosystem functions - for example primary production, soil formation, water cycling),

3) **cultural** (non-material benefits obtained from ecosystems e.g. recreation, education, aesthetics),

Choosing what ecosystem services to enhance in the concrete area is **political** -trade-offs between changing societal objectives at local, national or regional scale

# CONCEPTUAL FRAMEWORK

# CICES, 2013

Sections– 3
Divisions– 8
Groups – 20
Classes - 48

CICES for ecosystem service mapping and assessment

CICES for ecosystem accounting

| Sectio | Division | Group | Class |
|---|---|---|---|
| Provisioning | Nutrition | Biomass | Cultivated crops |
| | | | Reared animals and their outputs |
| | | | Wild plants, algae and their outputs |
| | | | Wild animals and their outputs |
| | | | Plants and algae from in-situ aquaculture |
| | | | Animals from in-situ aquaculture |
| | | Water | Surface water for drinking |
| | | | Ground water for drinking |
| | Materials | Biomass | Fibres and other materials from plants, algae and animals for direct use or processing |
| | | | Materials from plants, algae and animals for agricultural use |
| | | | Genetic materials from all biota |
| | | Water | Surface water for non-drinking purposes |
| | | | Ground water for non-drinking purposes |
| | Energy | Biomass- | Plant-based resources |
| | | | Animal-based resources |
| | | Mechanical | Animal-based energy |
| Regulation & Maintenance | Mediation of waste, toxics and other nuisances | Mediation by biota | Bio-remediation by micro-organisms, algae, plants, and animals |
| | | | Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals |
| | | Mediation by ecosystems | Filtration/sequestration/storage/accumulation by ecosystems |
| | | | Dilution by atmosphere, freshwater and marine ecosystems |
| | | | Mediation of smell/noise/visual impacts |
| | Mediation of flows | Mass flows | Mass stabilisation and control of erosion rates |
| | | | Buffering and attenuation of mass flows |
| | | Liquid flows | Hydrological cycle and water flow maintenance |
| | | | Flood protection |
| | | Gaseous / air flows | Storm protection |
| | | | Ventilation and transpiration |
| | Maintenance of physical, chemical, biological conditions | Lifecycle maintenance | Pollination and seed dispersal |
| | | | Maintaining nursery populations and habitats |
| | | Pest and disease | Pest control |
| | | | Disease control |
| | | Soil formation | Weathering processes |
| | | | Decomposition and fixing processes |
| | | Water conditions | Chemical condition of freshwaters |
| | | | Chemical condition of salt waters |
| | | Atmospheric composition | Global climate regulation by reduction of greenhouse gas concentrations |
| | | | Micro and regional climate regulation |
| Cultural | Physical and intellectual interactions with biota, ecosystems, | Physical and experiential | Experiential use of plants, animals and land-/seascapes in different environmental settings |
| | | | Physical use of land-/seascapes in different environmental settings |
| | | Intellectual and representative interactions | Scientific |
| | | | Educational |
| | | | Heritage, cultural |
| | | | Entertainment |
| | | | Aesthetic |
| | Spiritual, symbolic and other interaction | Spiritual and/or | Symbolic |
| | | | Sacred and/or religious |
| | | Other cultural | Existence |
| | | | Bequest |

# BG 03 BIODIVERSITY AND ECOSYSTEM SERVICES - EEA

PDP2 Methodological assistance for ecosystem assessment and biophysical valuation

MetEcoSMap

# BASED ON:

- EEA Technical report No 1/2014 - Terrestrial habitat mapping in Europe: an overview - Joint MNHN-EEA report
- MAES – documents – 2 Reports 2013,2014
- Concept of ecosystem integrity - ENVEurope Project – 2010-2013
- Burhard's  matrix – 2009, 2010, 2013,2014

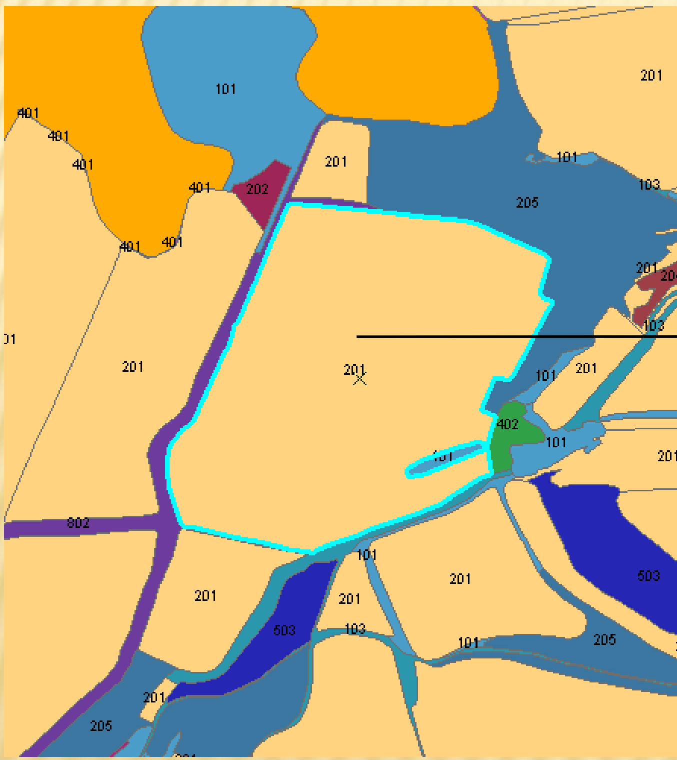
- The national methodological framework on mapping and assessment of ecosystem services aims to streamline the national ecosystem mapping and biophysical assessment process in Bulgaria.
- The methodology is not aimed to complete the full cycle of ecosystem service valuation and reporting.
- It delivers a practical step-by-step guidance to the process of:
  - Assessing the ecosystem typology at national scale
  - Assessing the ecosystems condition of 9 ETs,
  - Assessing the ecosystems' potential to deliver ecosystem services (biophysical valuation) of 9 ETs
  - Mapping the ecosystems condition
  - Mapping the assessment of ecosystem services

In Bulgaria, the ecosystems mapping and assessment process is so far organized on ad hoc basis but the need for closer cooperation is being seen by the involved **stakeholders**, notably central administrations and NGOs.

The legal basis is provided by Regulation 691/2011 and (for the forest ecosystems only) by a dedicated chapter in the Forestry law and its sublegislation.

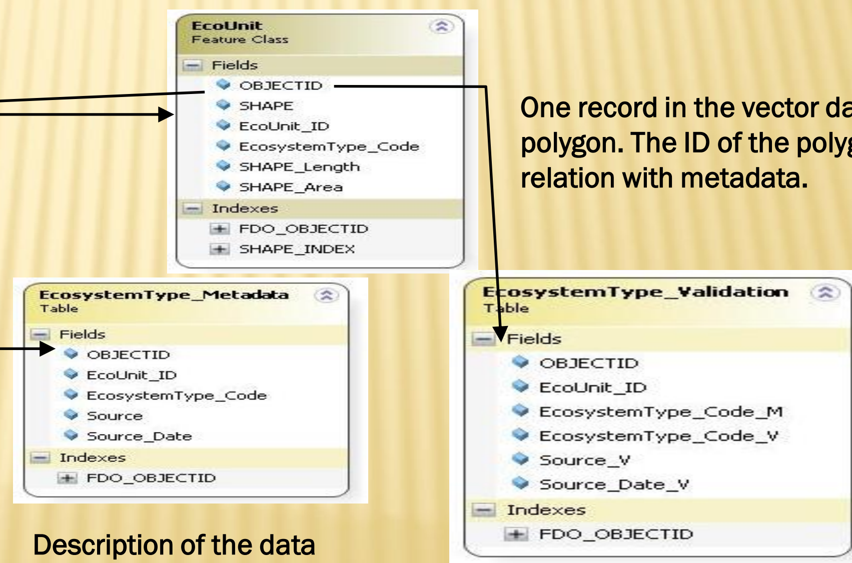
# MAPPING METHODOLOGIES: PREPARATION

Each polygon represents one ecosystem type at level 3



**Step 1**: Collecting data for ecosystem condition parameters (methodologies contain typical border parameters and available data on each)

**Step 2:** Assessment based on available data: calculate for each polygon, fill database (uniform between ecosystem types)




One record in the vector dataset for each polygon. The ID of the polygon used for relation with metadata.

Description of the data sources used for type determination.

Resulting table from validation.

# MAPPING METHODOLOGIES: ASSESSMENT

**Step 3:** Fill in 0-5 scores for each parameter or for each ecosystem condition indicator, for example:

| Parameter | Unit | Methodology | Assessment scale | | | | |
|---|---|---|---|---|---|---|---|
| | | | Score 1 (bad) | Score 2 (poor) | Score 3 (moderate) | Score 4 (good) | Score 5 (very good) |
| **Plant Diversity** | **%** | **Statistic** | **0-20** | **20-40** | **40-60** | **60-80** | **80-100** |

**Step 4:** For condition, calculate Index of Performance **IP** for the polygon's ecosystem condition and enter into database: **$IP=\Sigma ni/\Sigma ni(max)$,**

where: $\Sigma ni$ – sum of parameter assessment scores; $\Sigma ni(max)$ – sum of the maximum of parameter assessment scores (i.e. n *5); IP – a real number with values between 0 and 1

# Mapping methodologies: Assessment

**Step 5**: Fill in 0-5 scores for each parameter or for each ecosystem service indicator, for example:

- ecosystem service parameter:

| Parameter | Unit | Methodology | Assessment scale | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Score 0 | Score 1 (bad) | Score 2 (poor) | Score 3 (moderate) | Score 4 (good) | Score 5 (very good) |
| **Crop Yield** | **t/ha** | **Statistic** | **No relevant** | **0-1.0** | **>1-1.5** | **>1.5-2.0** | **>2-3.0** | **>3** |

- For services, calculate MEAN value for Real (expert assessed) Ecosystem service Capacity (**RESsC)** for the polygon's ecosystem services and enter into database: MEAN (**RESsC) = Σni/Σni(max),**

where **Σni** – sum of parameter assessment scores (**RESsC** ); **Σni**(max) – sum of the maximum of parameter assessment scores (i.e. n *5); MEAN(RESsC) – a real number with values between 0 and 1

# MAPPING METHODOLOGIES: CREATING MAPS

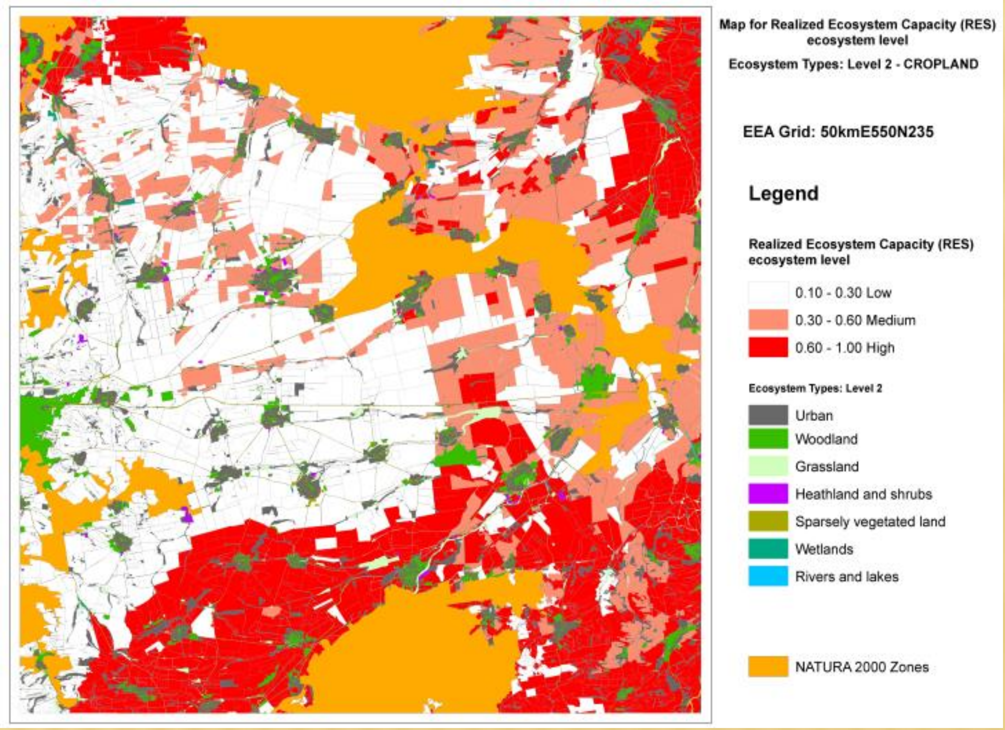
Step 6: Preparation of Digital Maps for ES types at level 3

- GIS compatible vector format - geospatial standards of OGC and INSPIRE;
- One complete coverage in a single layer;
- Cartographic projection: ETRS89-LAEA;
- Scale between 1:10 000 and 1:25 000;
- All other details – provided in the methodology

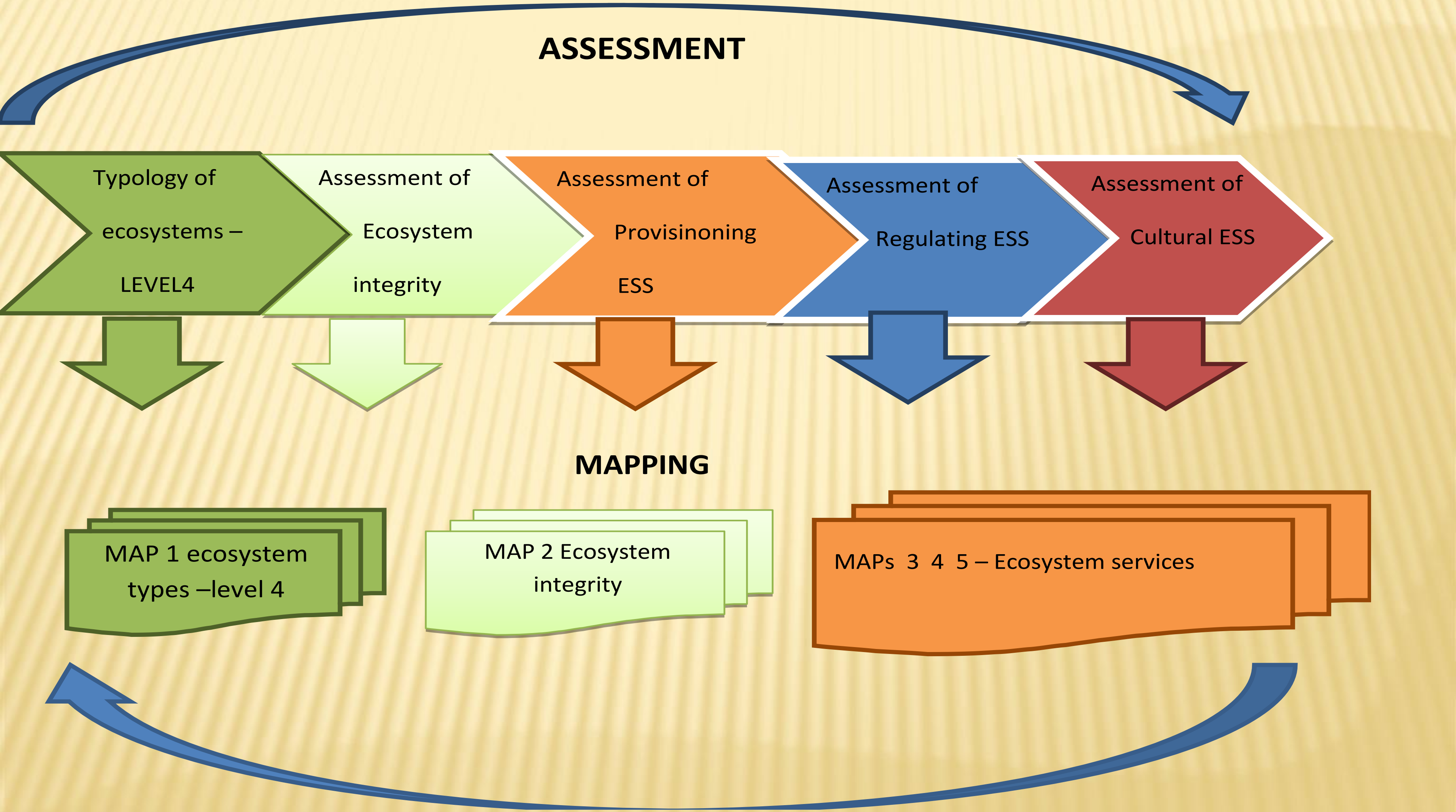
Step 7: Generation of metadata

Step 8: Putting the puzzle together:

- Digital Maps – example
- Color coding: comply with common EU standards; details in the methodology



## 3 The process of mapping and assessment of ES and ESS – BOX4 – MAES



# INDICATORS FOR ASSESSMENT OF ECOSYSTEM STATE AND ESSS

- Ecosystem integrity – *Burchard&Muller* (2009, 2013) – ENVEurope Project
- SEBI
- WFD, MSFD
- MAES

| Ecological integrity indicators | | | | Ecosystem types - level 2 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Urban | | | Cropland | | | [illegible] | | | | | | | | | | | | | | Marine | | |
| | | | | Ecosystem types - level 3 (попълва се от всяка работна група) | | | | | | | | | | | | | | | | | | | | | | |
| Ecosystem structure | Biotic diversity | | flora diversity | v | | | v | | | v | | | | | | v | v | | | | | | | | | |
| | | | fauna diversity | | | | v | | | v | | | | | | v | v | | | | | | | | | |
| | | | habitat diversity | | | | | | | v | | | | | | v | v | | | | | | | | | |
| | | | additional variable (invasive species) | | | | | | | | | | | | | | | | | | | | | | | |
| | | | additional variables (naturalness) | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v |
| | Abiotic heterogeneity | | soil heterogeneity | v | | | v | | | | | | | | | | | | | | | | | | | |
| | | | water heterogeneity | | | | | | | | | | | | | | | | | | | | | | | |
| | | | air heterogeneity | v | | | | | | | | | | | | | | | | | | | | | | |
| | | | habitat heterogeneity | | | | | | | | | | | | | | | | | | | | | | | |
| | | | additional variables (pollution) | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | | | | | |
| Ecosystem processes | Energy balance | input | exergy capture | v | | | | | | v | | | | | | v | v | | | | | | | | | |
| | | storage | exergy storage | | | | | | | | | | | | | | | | | | | | | | | |
| | | output | entropy production | | | | | | | | | | | | | | | | | | | | | | | |
| | | other state variables | meteorology | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v | v |
| | | efficiency measures | metabolic efficiency | | | | | | | | | | | | | | | | | | | | | | | |
| | Matter balance | input | matter input | | | | | | | | | | | | | | | | | | | | | | | |
| | | storage | matter storage | v | | | v | | | | | | | | | | | | | | | | | | | |
| | | output | matter loss | v | | | | | | | | | | | | | | | | | | | | | | |
| | | other state variables | regeneration | | | | | | | | | | | | | | | | | | | | | | | |
| | | other state variables | element concentrations | | | | | | | v | | | | | | v | v | | | | | | | | | |
| | | efficiency measures | nutrient cycling | | | | v | | | | | | | | | | | | | | | | | | | |
| | Water balance | input | water input | | | | v | | | | | | | | | | | | | | | | | | | |
| | | storage | water storage | | | | v | | | | | | | | | | | | | | | | | | | |
| | | output | water output | | | | | | | | | | | | | | | | | | | | | | | |
| | | other state variables | element concentrations | | | | v | | | | | | | | | | | | | | | | | | | |
| | | efficiency measures | biotic water flow | v | | | | | | | | | | | | | | | | | | | | | | |

The assessment of ecosystem services is based on real parameters (measurable and available) and presents the Real (assessed) ESs Capacity for selected ecosystem type. Based on the index of performance, obtained in assessing the ecosystem state, the Ecosystem Services Potential capacity could be estimated.

ESs Potential Capacity is the desirable and possible supply of ecosystem service for specific type of ecosystem if this ecosystem is managed by an appropriate way. The value of ESsPC is informative for the planners when preparing plans and scenarios for urban development.

For the mapping the real ecosystem service capacity (RESsC) value will be applied.

The scores of each indicator measured are then summed up ($\sum ni$). An index of ecosystem performance (IP) is then calculated, as ratio of the sum of the indicators scores maximum possible indicator sum: -

$$IP = \sum ni / - \sum ni(max)$$

and belongs to the range (0 and 1)

Where:

$\sum ni$ – maximum possible indicator assessment, obtained by multiplication of number of indicators and the maximum possible score

$\sum ni(max)$ – sum of the maximum of indicator assessment

The IP assessment scores for the different conditions of the ecosystem are as follows:

IP 0-0,2 – very bad, 0,21-0,4 – bad, 0,41-0,6 – moderate, 0,61-0,8 – good, 0,81-1,0 – very good,

# ASSESSMENT OF ESS

An expert assessment in scores from 1 to 5 is assigned, according to the scale in Table 7 (after completion). The assessment scores of each indicator measured are then summed up ($\sum n_i$).

An average value with abbreviator for each of the provided service is then calculated, as ratio of the sum of the indicators scores and the maximum possible indicator sum:

MEAN (P,R or C) (example: MEAN (P I) – Average for provisioning service 1) =

$$\sum n_i / \sum n_i(max)$$

Where:

$\sum n_i$ – sum of parameter assessment

$\sum n_i(max)$ – sum of the maximum of indicator assessment

MEAN (P,R or C) – is a real number with values between 0 and 1

The MEAN assessment scores for the different conditions of the ecosystem are as follows:

MEAN = 0-0,2 – very bad, 0,21-0,4 – bad, 0,41-0,6 – moderate, 0,61-0,8 – good, 0,81-1,0 – very good,

# OUTPUTS OF METECOSMAP PROJECT

- 9 Methodologies for each ET – Forest Es – G.Kostov et al.
- Coceptual framework –Sv. Bratanova-Doncheva et al.
- Monitoring guidelines - Sv. Bratanova-Doncheva et al.
- In-situ verification guide – N.Chipev et al.

Coming soon on www.metecosmap-sofia.org

# FORESTS IN BULGARIA

# FORESTS IN BG

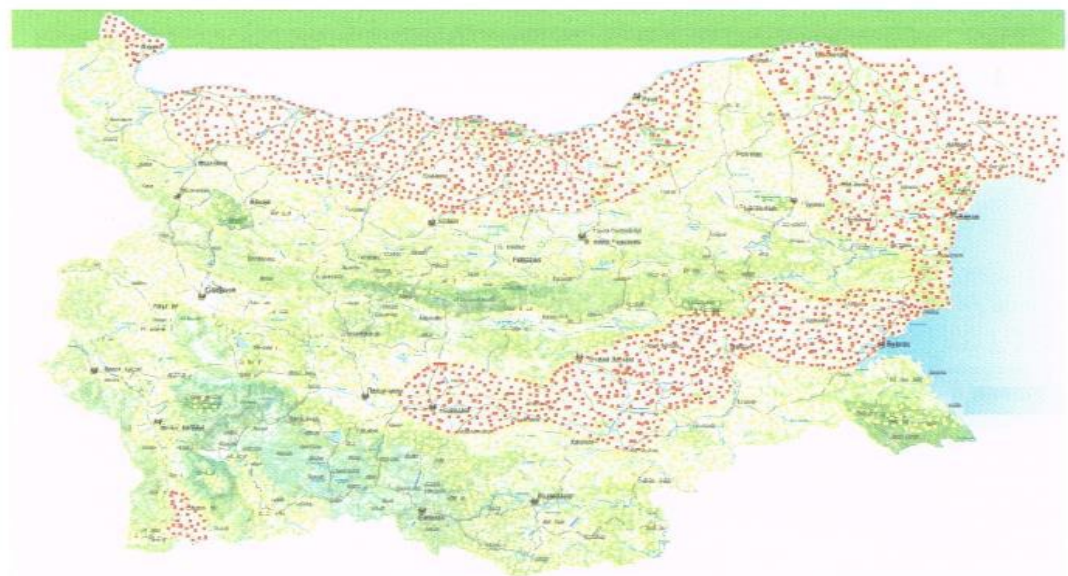
- Total afforested area – 4.114 Mha (37.4%).
- Average annual increment ≈ 14.4M m3
- Total timber volume > 644 M m3
- Average age – 53 years
- Average stem volume – 172 m3/ha
- Forest territories included in Natura > 57%

# COPPICE FORESTS IN BULGARIA

- **Area of coppice forests - 1,998,033 ha -47%**
- Main species – *Quercus* species, *Fagus*, *Carpinus*, *Castanea sativa*

Climate change vulnerability of coppice forests according to realistic and pessimistic scenarios, (*Raev* et al., 2011)

Фиг. 28 Реалистичен сценарий за 2080 г.



Фиг. 29 Песимистичен сценарий за 2080 г.

| | | | |
|---|---|---|---|
| 2<br>**G1.** | Coppice forests | Broadleaved deciduous woodland, forest and plantations dominated by summer-green non-coniferous trees with vegetated regeneration. Excludes mixed forests (G4) where the proportion of conifers exceeds 25%. | **G1.1 + G1.2 + G1.3:**<br>**G1.1.** Riparian and gallery woodland, with dominant Alnus, Betula, Populus or Salix. Riparian woods of the boreal, boreo-nemoral, nemoral and submediterranean and steppe zones, with one or few dominant species, typically *Alnus*, *Betula*, *Populus* or *Salix*. Includes woods dominated by narrow-leaved willows *Salix alba*, *Salix elaeagnos*, *Salix purpurea*, *Salix viminalis* in all zones including the mediterranean. Excludes riverine scrub of broad-leaved willows, e.g. *Salix aurita*, *Salix cinerea*, *Salix pentandra*<br>**G1.2.**Mixed riparian floodplain and gallery woodland - Mixed riparian forests, sometimes structurally complex and species-rich, of floodplains and of galleries beside slow- and fast-flowing rivers of the nemoral, boreo-nemoral, steppe and submediterranean zones. Gallery woods with Acer, Fraxinus, Prunus or Ulmus, together with species listed for **G1.1.** Floodplain woodland characterized by mixtures of *Alnus*, *Fraxinus*, *Populus*, *Quercus*, *Ulmus*, *Salix*.<br>**G1.3** Alluvial forests and gallery woods of the mediterranean region. Dominance may be of a single species, of few species or mixed with many species including *Fraxinus*, *Liquidambar*, *Platanus*, *Populus*, *Salix*, *Ulmus*. Excludes mediterranean *Salix* woods (G1.1) and shrubby riparian vegetation (F9.3).<br><br>**G1.6** - Beech woodland - Forests dominated by beech *Fagus sylvatica* in western and central Europe, and *Fagus orientalis* and other *Fagus* species in southeastern and the Pontic region. Many montane formations are mixed beech-fir or beech-fir-spruce forests, which are listed under **G4.6**<br><br>**G1.7** : Thermophilous deciduous woodland - Forests or woods of submediterranean climate regions and supramediterranean altitudinal levels, and of western Eurasian steppe and substeppe zones, dominated by deciduous or semideciduous thermophilous *Quercus* species or by other southern trees such as *Carpinus orientalis*, *Castanea sativa* or *Ostrya carpinifolia*. Thermophilous deciduous trees may, under local microclimatic or edaphic states, replace the evergreen oak forests in mesomediterranean or thermomediterranean areas, and occur locally to the north in central and western Europe.<br><br>**G1.A** : Meso- and eutrophic Quercus, Carpinus, Fraxinus, Acer, Tilia, Ulmus and related woodland - Woods, typically with mixed canopy composition, on rich and moderately rich soils. Includes woods dominated by *Acer*, *Carpinus*, *Fraxinus*, *Quercus* (especially *Quercus petraea* and *Quercus robur*), *Tilia* and *Ulmus*. Excludes acid *Quercus* woodland (**G1.8**) and woodland with a large representation of southern species such as *Fraxinus ornus* or *Quercus pubescens* (G1.7).<br><br>**G1.C** : Highly artificial broadleaved deciduous forestry plantations - Cultivated deciduous broad-leaved tree formations planted for the production of wood, composed of exotic species, of native species out of their natural range, or of native species planted in clearly unnatural stands, often as monocultures.<br><br>**G1.0: Mixed Broadleaved deciduous woodland.**<br>All other mixed broadleaved, with different species composition |

| | | | | Indicator | Parameters and units | Data sources | coppice forests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Section | Division | Group | Class | | | | G1,2,3 | G1.6 | G1.7 | G1.A | G1.C | G1.0 |
| | | | Cultivated crops | Harvest | m3/ha | Statistics; | | | | | | |
| | | | Reared animals and their outputs | Yield | livestock units/ha | Statistics; | Y | Y | Y | Y | | |
| | | | Wild mushrooms and their outputs | presence of mushrooms for food | number of species / kg/ha buying stations | Statistics; | Y | Y | Y | Y | | Y |
| | | Biomass | Wild animals and their outputs | Heads of animals reared for hunting Fishing stock | number/ha | Statistics; | Y | Y | Y | Y | | Y |
| Provisioning | | | Surface water for drinking | forest cover, age | percentage of forest, age class | Management plan | Y | Y | Y | Y | | Y |
| | Nutrition | Water | Ground water for drinking | forest cover, age | percentage of forest, age class | Management plan | Y | Y | Y | Y | | Y |
| | | | Fibres and other materials from plants, algae and animals for direct use or processing | timber, medicinal plants | m3, number of species | Statistics; | Y | Y | Y | Y | | Y |
| | | Biomass | Genetic materials from all biota | plant composition | trees composition, understory composition | | Y | Y | Y | Y | | Y |
| | | | Surface water for non-drinking purposes | forest cover, age | percentage of forest | Water permits for the water body | Y | Y | Y | Y | | Y |
| | Materials | Water | Ground water for non-drinking purposes | forest cover, age | percentage of forest | Water permits for the water body | Y | Y | Y | Y | | Y |
| | Energy | Biomass-based energy sources | Plant-based resources for energy | trees and shrubs | stock, m3/ha | Management plan | Y | Y | Y | Y | | Y |
| | | Mediation by biota | Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals | age distribution, increment | age class, m3/ha | Management plan | Y | Y | Y | Y | | Y |
| | | | Filtration/sequestration/storage/accumulation by ecosystems | function of forests | % of protection forests and forests with other special functions | Management plan | Y | Y | Y | Y | | Y |
| | Mediation of waste, toxics and other nuisances | Mediation by ecosystems | Mediation of smell/noise/visual impacts | forest cover, age | Percentage of forest cover, age class distribution | Management plan | Y | Y | Y | Y | | Y |
| | | Mass flows | Mass stabilisation and control of erosion rates | Soil erosion rate | soil erosion rate | Management plan | Y | Y | Y | Y | | Y |
| | | | Buffering and attenuation of mass flows | vegetation cover | area [ha] | Management plan | Y | Y | Y | Y | | Y |
| Regulation & Maintenance | | | Hydrological cycle and water flow maintenance | | | | Y | Y | Y | Y | | Y |
| | | Liquid flows | Flood protection, incl. avalanche protection | | | | Y | Y | Y | Y | | Y |
| | | | Storm protection | | | | Y | Y | Y | Y | | Y |
| | Mediation of flows | Gaseous / air flows | Ventilation and transpiration | forest cover, age, stocking index | Percentage of forest cover, age class distribution | Management plan | Y | Y | Y | Y | | Y |
| | | Lifecycle maintenance, habitat and gene pool protection | Pollination and seed dispersal | Biodiversity | number of plants, number of pollinators | Joint Research Center - IES | Y | Y | Y | Y | | Y |
| | | | Maintaining nursery populations and habitats | habitat diversity | number of habitats | national data/ | Y | Y | Y | Y | | Y |
| | | | Pest control | | | | Y | Y | Y | Y | | Y |
| | | Pest and desease control | Disease control | General condition | 4 level scale | ICP forest data | Y | Y | Y | Y | | Y |
| | | | Weathering processes | site type | site type classification | Management plan | Y | Y | Y | Y | | Y |
| | | Soil formation and composition | Decomposition and fixing processes | site type | site type classification | Management plan | Y | Y | Y | Y | | Y |
| | | | Chemical condition of freshwaters | | | | Y | Y | Y | Y | | Y |
| | | Water conditions | Chemical condition of salt waters | | | | | | | | | |
| | | Atmospheric composition and climate regulation | Global climate regulation by reduction of greenhouse gas concentrations | C storage in forest, C sequestration by forest , Forest growth, growing stock | | National data, EFISCEN calculations | Y | Y | Y | Y | | Y |
| | | Maintenace and protection of facilities | Protection of infrastructure , objects and facilities | Protection forests | %, type | National data | Y | Y | Y | Y | | Y |
| | Maintenance of physical, chemical, biological conditions | | Micro and regional climate regulation | | | | Y | Y | Y | Y | | Y |
| | | | Experiential use of plants, animals and land-/seascapes in different environmental settings | farm tourism,visitors (birdwatch, plantwatch | Number per year | national data | Y | Y | Y | Y | | Y |
| | Physical and intellectual interactions with biota, ecosystems, and land-/seascapes [environmental | Physical and experiential interactions | Physical use of land-/seascapes in different environmental settings | Visitors, rural tourism, walking and biking trails | Number per year | national data | Y | Y | Y | Y | | Y |
| | | Intellectual and representative | Heritage, cultural | cultural monuments | number of monuments/products | national data | Y | Y | Y | Y | | Y |
| ural | | | Entertainment | | number of visitors, number of | | | | | | | |

| | Type | Coppice forest |
|---|---|---|
| | Subtype | G1.7 |
| ESs class code | P2 | 1 |
| | P3 | 3 |
| | P4 | 3 |
| | P5 | 5 |
| | P6 | 5 |
| | P7 | 4 |
| | P8 | 3 |
| | P9 | 2 |
| | R1 | 3 |
| | R2 | 3 |
| | R3 | 4 |
| | R4 | 3 |
| | C1 | 4 |
| | C2 | 4 |

# CONCLUSIONS

- The Coppice forests are important not only with their provisioning services – supply of wood, but also with their regulating- erosion control, CC, floods, C sequestration etc and cultural services – recreation, landscape heterogeneity.
- So, the forest management have to be adaptive with the aim also to maintain the regulating ESSs and enhance the CC resilience

# THANK YOU

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