ECOSYSTEM SERVICES IN COPPICE – IMPORTANCE AND PROSPECTS AS A STRATEGIC BASIS FOR EFFECTIVE FOREST MANAGEMENT AND HUMAN WELL-BEING

Ivaylo Tsvetkov[1], Svetla Bratanova-Doncheva[2], Yonko Dodev[1], Miglena Zhiyanski[1]

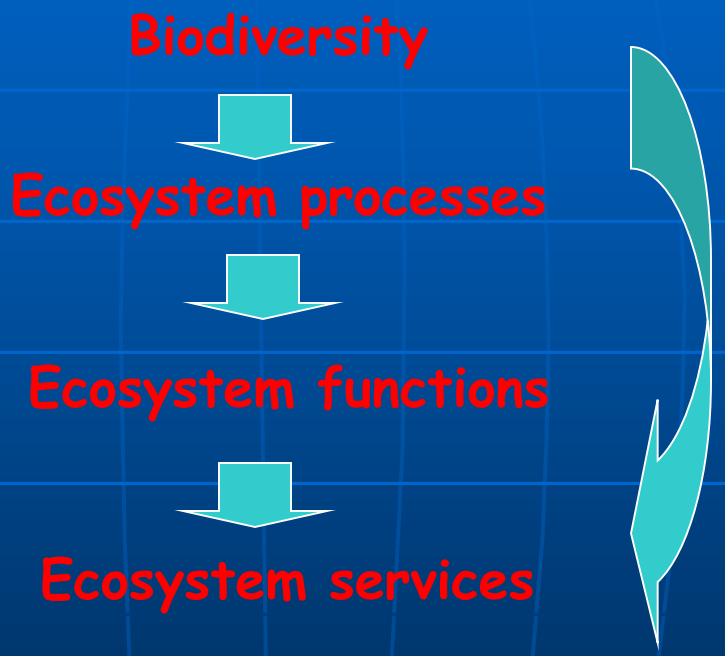
[1]Forest Research Institute, 132 Kliment Ohridski Blvd, Sofia 1756, Bulgaria
[2]Institute of Biodiversity and Ecosystem Research, 2 Gagarin Str, Sofia 1113, Bulgaria

COST FP1301, "Coppice Forests in Europe: Ecosystem services, protection and nature conservation", Antwerp, Belgium 14-17 June 2016

In the context of global changes, the biodiversity loss and degradation of ecosystems and their services are the bigest *problems* of the planete now

-> So, effective societal responses are needed to manage complex *socio-ecological (SE) interactions*.

The biodiversity has a crucial role in the ecosystem processes



The 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.

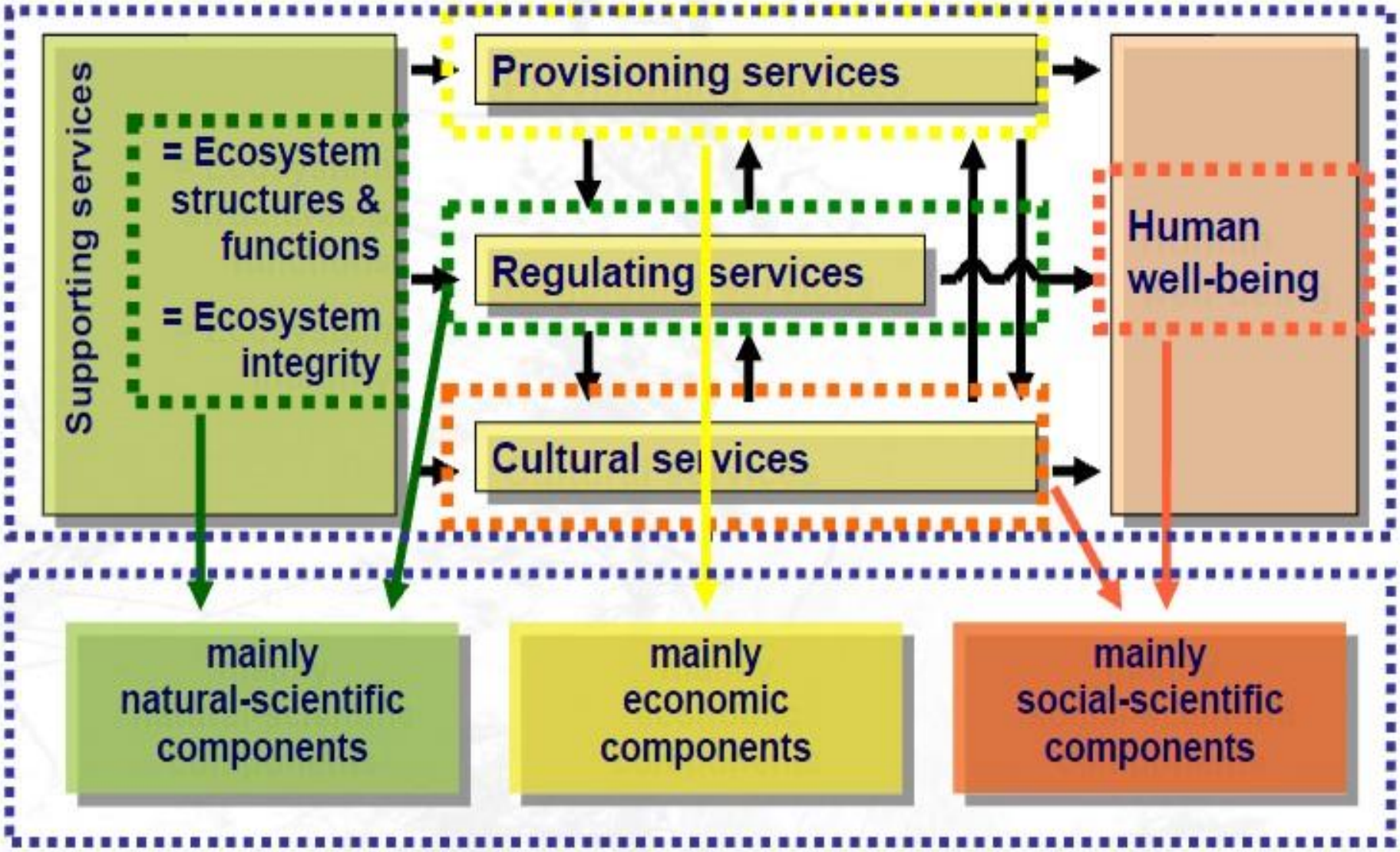
- ✓Four of the pilots are focused on Europe's main ecosystem types: **agro-ecosystems, forest ecosystems, freshwater ecosystems and marine ecosystems;**
- ✓A further pilot is focused on the use of conservation status data for assessing the state of ecosystems and of the associated delivery of services;
- ✓ The final pilot addressed the challenge of natural capital accounts;
- ✓In these pilots EU services worked hand in hand with Member States to make a review of national and European data and indicators to assess the condition of ecosystems, to quantify biodiversity and to map and assess their services.

The essentials

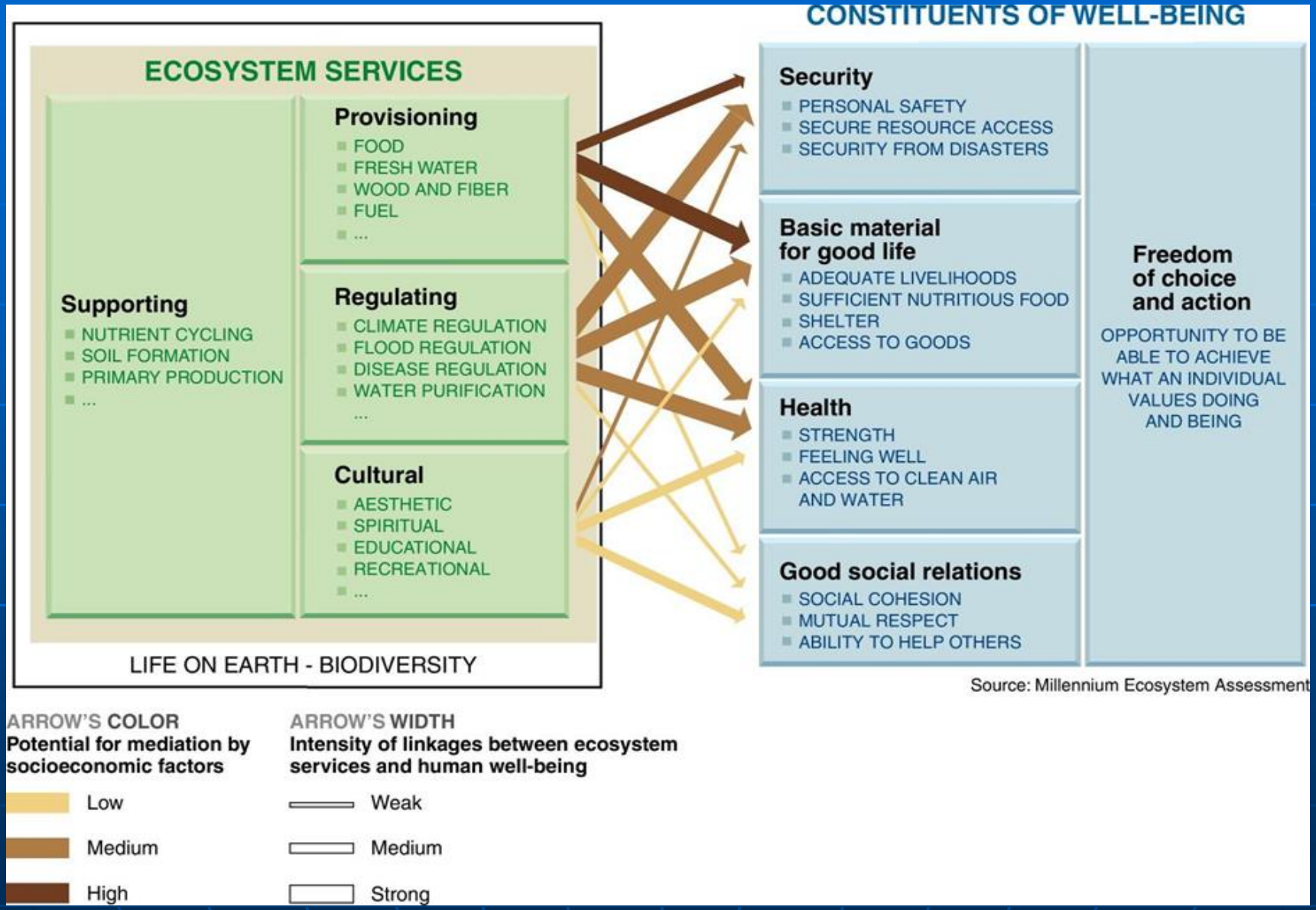
A basic target of the EU 2020 strategy is to show and guarantee that EU forests are managed according to the principles for sustainable management and to sufficiently contribute to the decreasing of the worldwide deforestation, thus assisting the balance of different function of forests and their ecosystem services provision…

One of the key direction in the EU strategy about the forests and the forest sector is mapping and assessment of the state of the ecosystems as well as the services provided. This is going to be a basis for the member states to develop a conceptual frame for valuation of ecosystem services encouraging their integration into the accountancy systems at both EU and national level…

The concept of Ecosystem Goods and Services

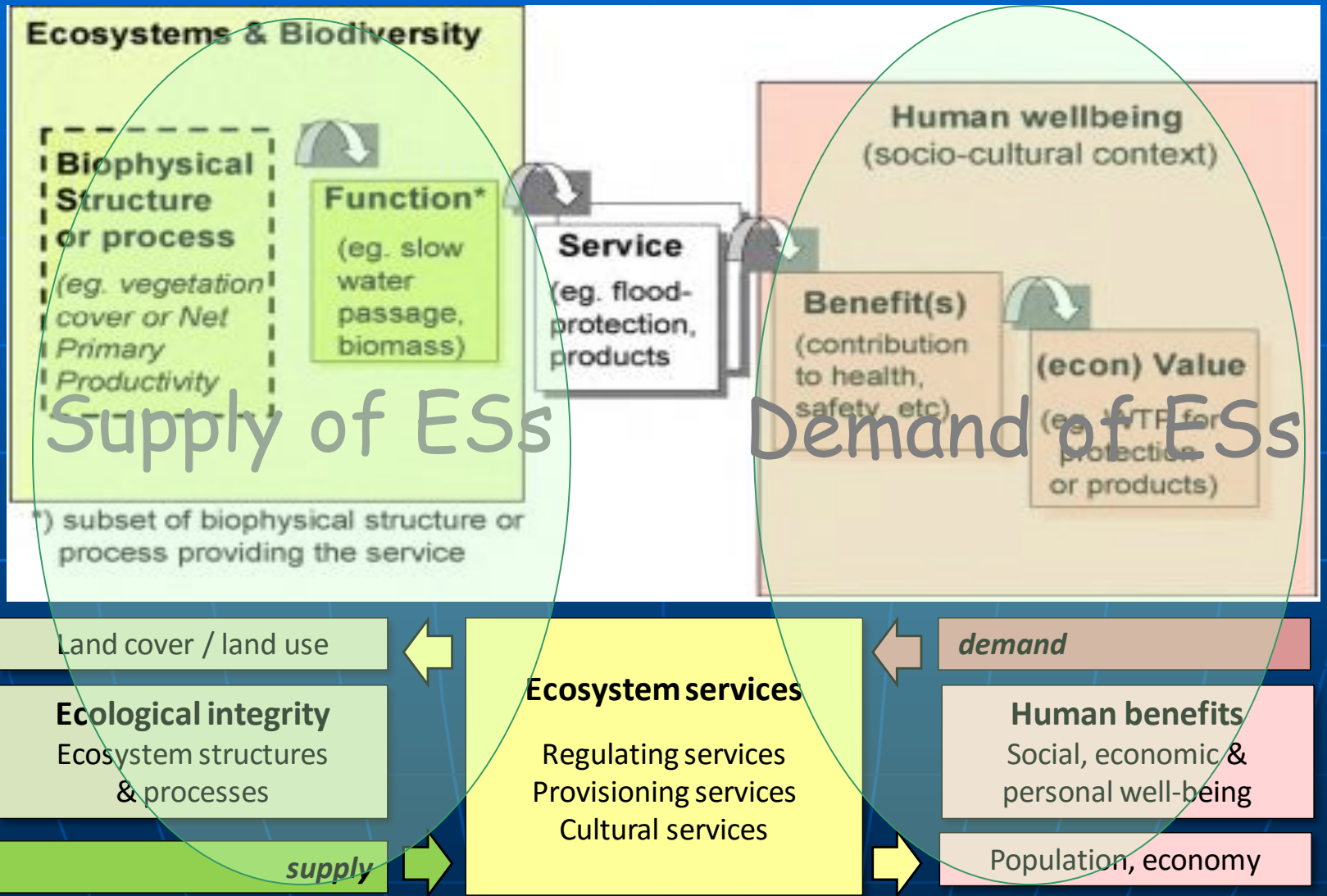


Linkages between ecosystem services and human well-being



Source: Millennium ecosystem assessment, 2000-2005

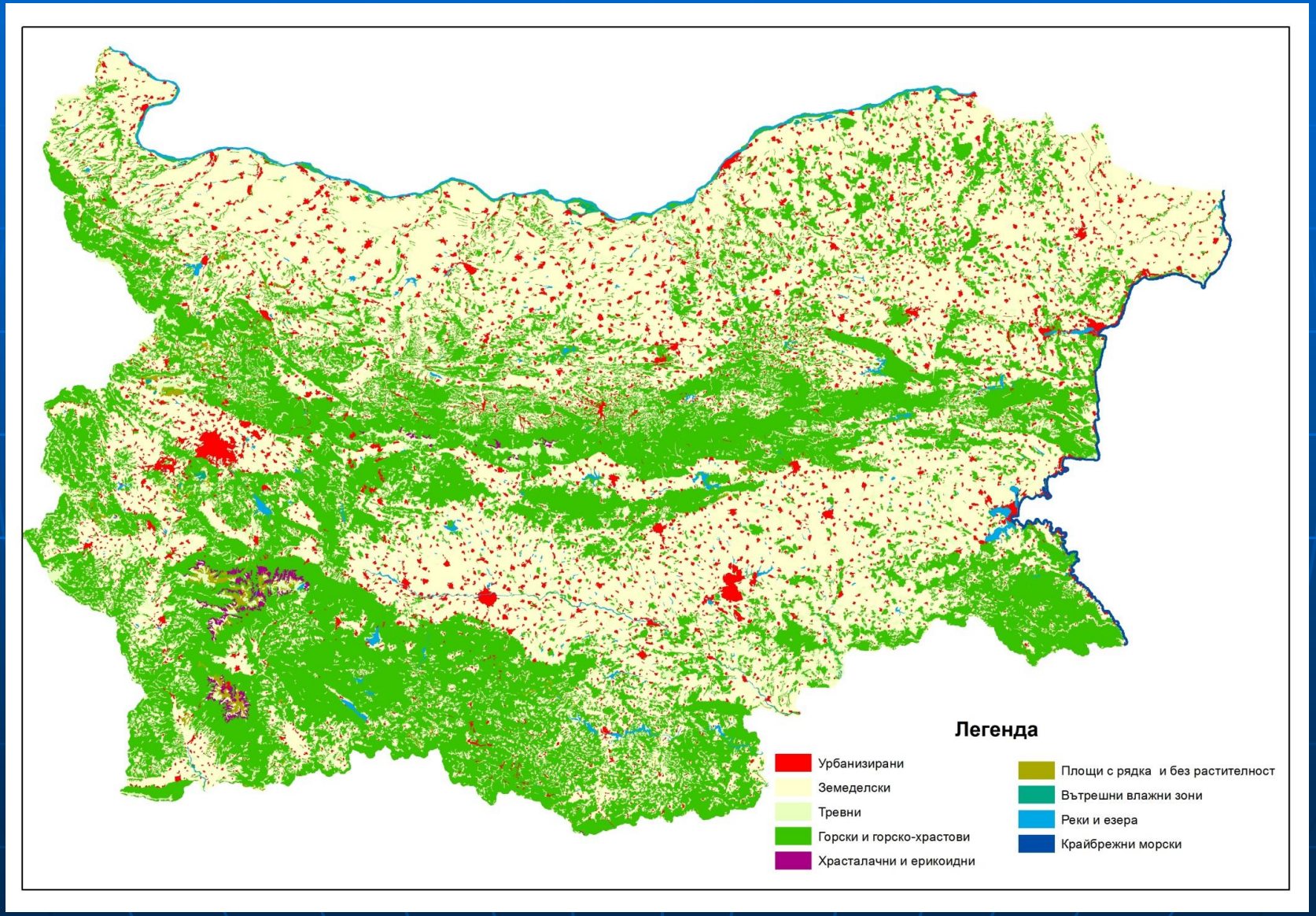
Millenium Ecosystem Assessment
Conceptual framework



National process of mapping and assessment of ecosystems and their services (The Bulgarian example)

- ✓Within ecosystem assessments, whether correction and integration of previous knowledge or acquiring and integrating new knowledge and data is required, an adequate methodology with specific principles and reasoning is necessary.
- ✓Increasing societal needs for benefits and services from forests requests more efficient use and development of novel tools aimed at reaching a balance between the functions and services provided as result from sustainable management of the forest ecosystems
- ✓While performing ecosystem assessment, the challenge remains in developing an analytical framework for attributing ecosystem services to measurable ecosystem characteristics and mapable units, and to track changes over time.

Mapping various type of ecosystems in Bulgaria



Running projects:

- ✓WEMA: Wetland Ecosystem services Mapping and Assessment in Bulgaria (Sep 2015 - Nov 2016).
- ✓FEMA: Freshwater Ecosystem services Mapping and Assessment in Bulgaria (Sep 2015 - Nov 2016).
- ✓GRASSLAND: Assessment and mapping of GRASSLAND ecosystems condition and their services in Bulgaria (Sep 2015 - Nov 2016).
- ✓SPA-Ecoservices: Mapping and assessment of sparsely vegetated land ecosystem services in Bulgaria (Sep 2015 – Nov 2016).
- ✓ESENIAS-TOOLS: East and South European Network for Invasive Alien Species – a tool to support the management of alien species in Bulgaria (June 2015 - Nov 2016).
- ✓ IBBIS: Improving the Bulgarian Biodiversity Information System (July 2015 - Nov 2016).
- ✓TUNESinURB - Toward better UNderstanding the Ecosystem Services in URBan environments trough assessment and mapping. *TUNESinURB* (Nov 2015 – Apr 2017).
- ✓FOR OUR FUTURE: FORests and woodlands - ecOsystem services mapping and assessment in the bUlgaRian Forest territories oUTside natURa2000 nEtwork .

The National strategy for development of the forest sector in Republic of Bulgaria, 2013-2020 g. - a linkage point between the EU strategy for the forests and the forestry sector about mapping & assessment of the Ecosystem Services (ES) and the National legislation!

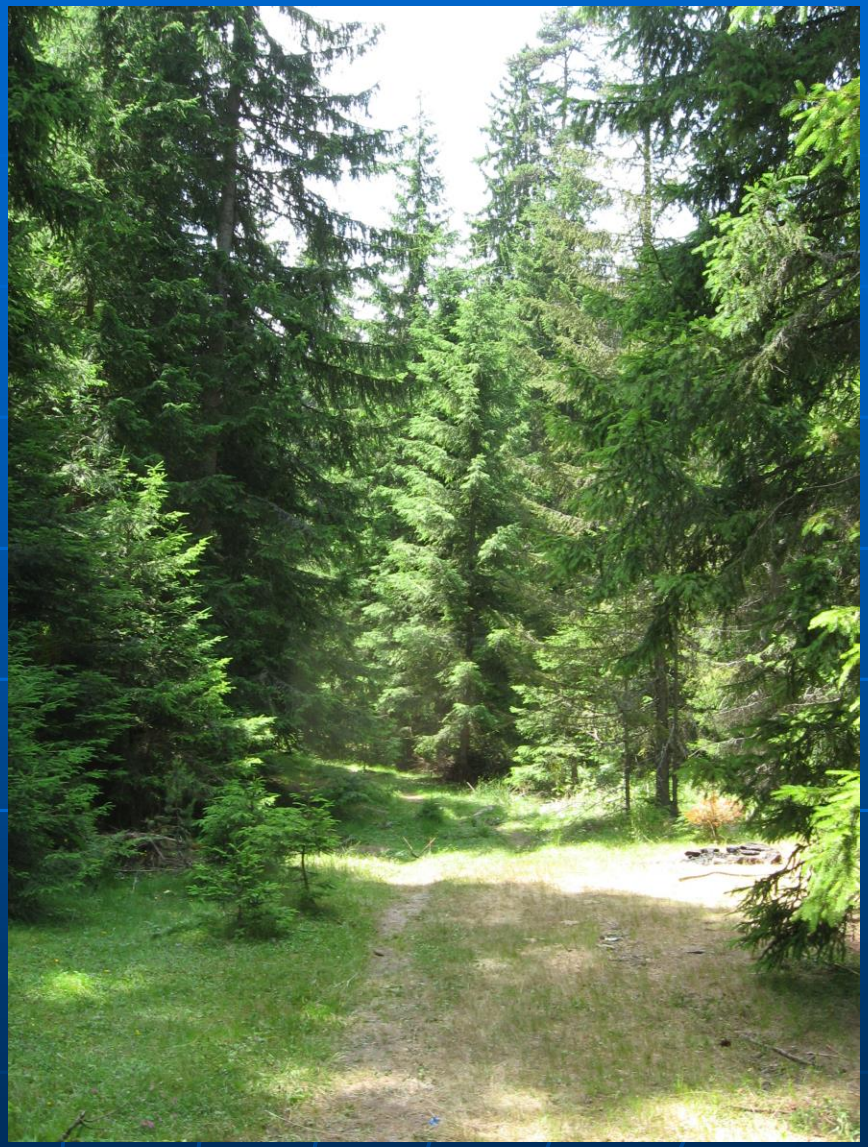
EU strategy for the forests and the forestry sector

Some basic points:

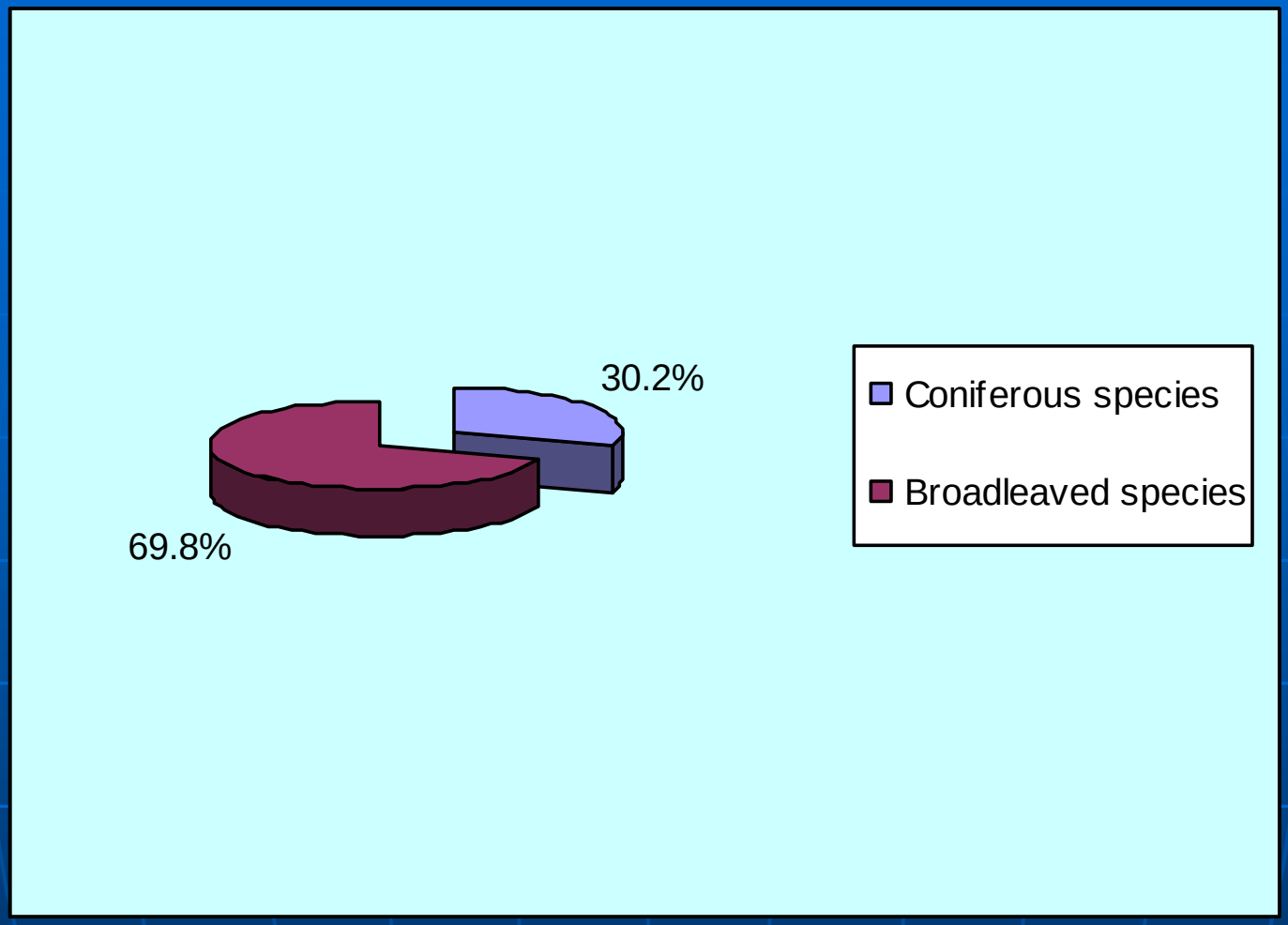
- ✓ The forests and afforested areas cover ca. 40% from the EU territory;
- ✓ ¼ are included in Nature 2000;
- ✓ Logging is supposed to increase with 30% until 2020;
- ✓ The forest biomass is the most important source of green energy in EU;
- ✓ It makes up approximately half of the total energy consumption from RES in EU.

Some facts about the Bulgarian forests

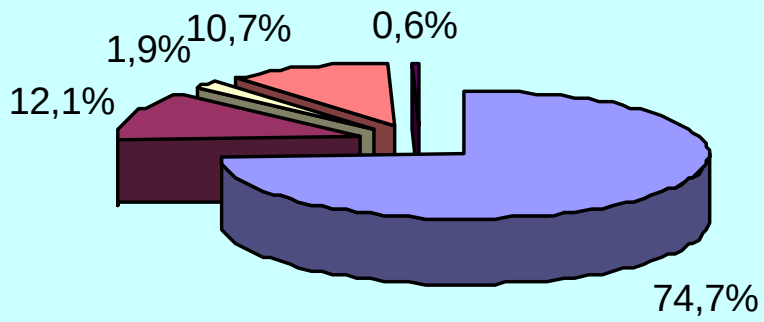
- ✓ Total afforested area – 4.114 M ha (37.4%).
- ✓ Average annual increment ≈ 14.4 M m^3
- ✓ Total timber volume > 644 M m^3
- ✓ Average age – 53 years
- ✓ Average stem volume – 172 m^3/ ha
- ✓ Forest territories included in *Natura* > 57%



Area of coppice forests - 1,998,033 ha



Distribution of the afforested area (%)



Distribution of forests by ownership (%)

National strategy for development of the forest sector in Republic of Bulgaria, 2013-2020 г.

- ✓ The ecosystem services are legislatively settled in Bulgaria with the Low of the Forests in 2011;
- ✓ It is stated for the first time that social ecosystem benefits provided from the forests should be paid for;
- ✓ There is a ground for development and introduction of a concept for ecosystem services and their sustainable and socially-tolerable management as well as functional schemes for paid use of ecosystem services;

National strategy for development of the forest sector in Republic of Bulgaria, 2013-2020 г.

- ✓Within the priorities for using the potential of the forest sector for development of the 'green economy' one of the measures makes provision for establishment of conditions for sustainable and paid use of ecosystem services provided by forest territories.

- ✓The measure is aimed at creating conditions for assessment of ecosystem services as well as supporting the introduction of innovative financial mechanisms and stimuli to encourage the preservation and sustainable use of water resources and biodiversity through payment of ecosystem services.

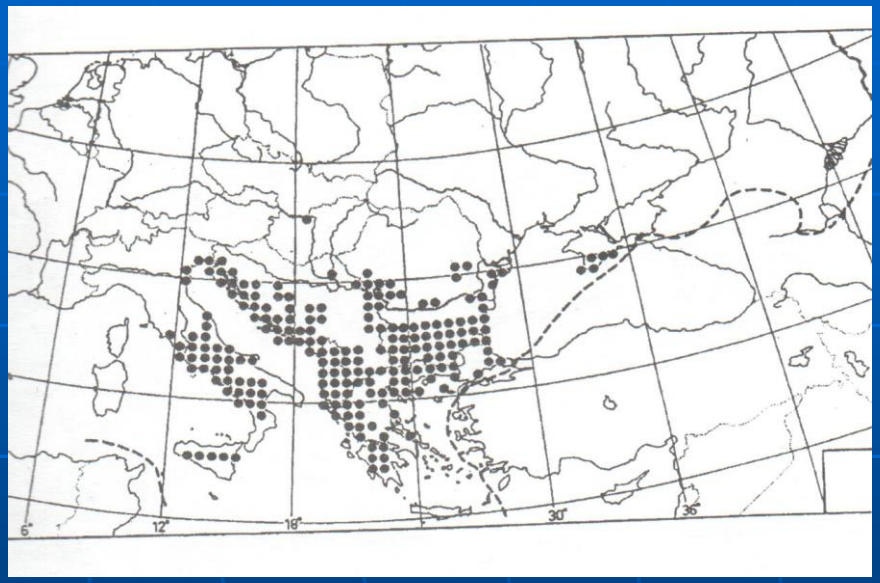
- ✓The measure will be realized by development and application of methodology for assessment of ecosystem services and schemes for paid use of social ecosystem services and compensatory payments for forest territories, including those from *Nature 2000*.

National strategy for development of the forest sector in Republic of Bulgaria, 2013-2020 г.

- ✓Currently, there is no approved methodology for valuating the ecosystem services and recompensation of forest owners for ecosystem benefits and services from forest territories;

- ✓There is a need for preparation of methodology and ordinance for application of the respective texts from the Low of the Forests for recompensation of the ecosystem benefits from forest territories, which would advantage the economic activity.

The Oriental hornbeam (*C. orientais* Mill.) – a potential good example for coppice ecosystem services?



Area distribution of *Carpinus orientalis* in Europe

Total covered area – ca. 200 000 ha; Dominating species – 140 000 ha (ca. 5% from the total afforested area).

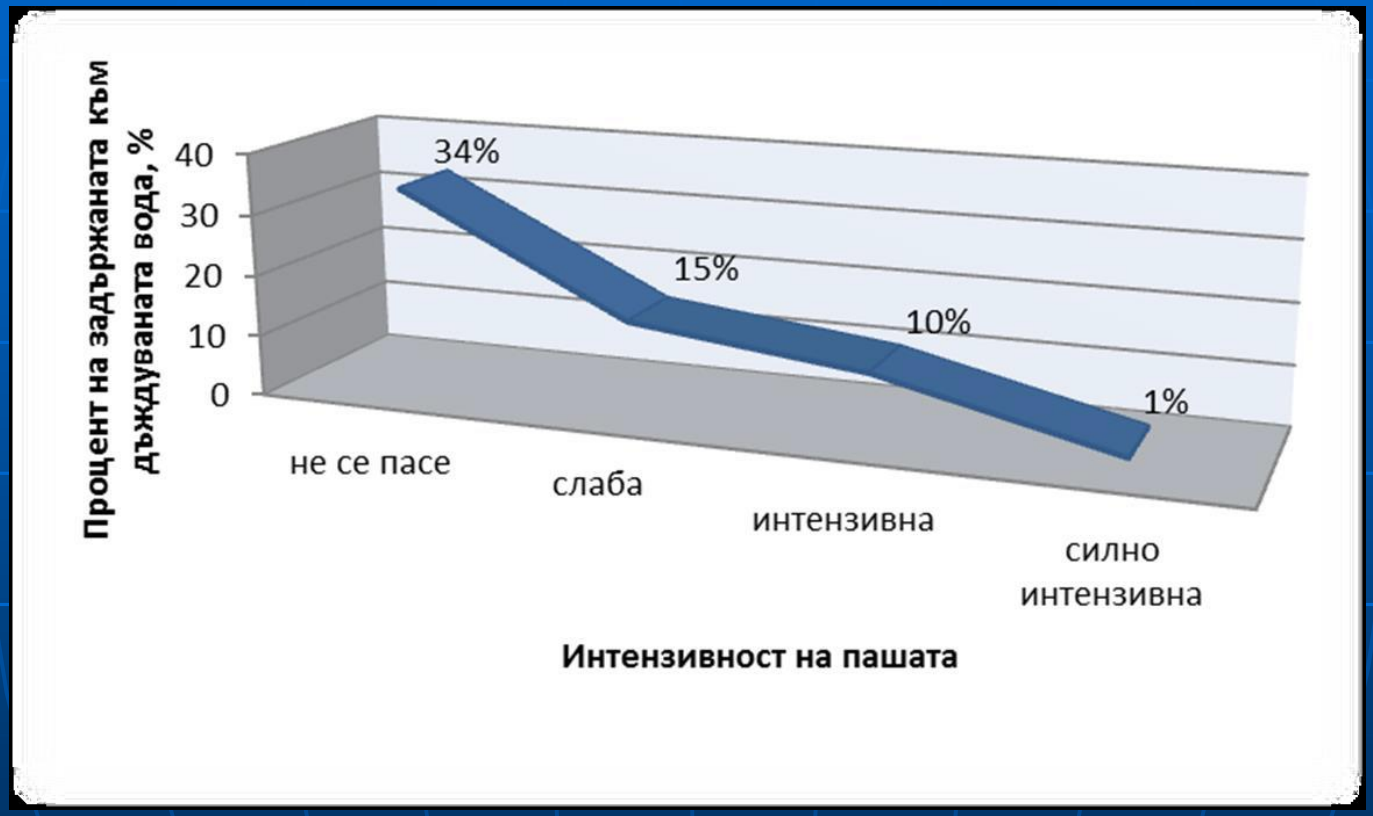
Altitudinal distribution of the *C. orientalis* Mill., FE "Etropole'

90% of the stands are situated between 350 and 800 m

Specific characteristics featuring the "ecosystem services" related to *Carpinus orientalis* coppice forests

- ✓Thermophilic and fire-resistant;
- ✓Extremely drought tolerant;
- ✓Unpretentious;
- ✓Extraordinary coppicing abilities;
- ✓Highly pest and disease resistant;
- ✓High adaptability

Waterguarding and anti-erosion functions of *C. orientalis* Mill.



Oriental hornbeam minimizes the slope effect on the superficial water flow and converts it to underground one. The pasture activity strongly affects both the waterguarding abilities and intensity of the water flow.

- ✓In terms of the forest politics and the dominating forestry concepts the species has been considered for a long time to be "of a little importance" and "weedy species" mainly due to its low productivity, thus neglecting its ecological functions;
- ✓Due to the above mentioned reasons the species has not been intensively studied;

On the contrary, nowadays the "ecological merits" of the Oriental hornbeam (waterguarding, soil-protective, antierosion, recreative, etc) come to the fore and are highly valued!

The hidden values of *C. orientalis* on nonproductive habitats…

From the ecological point of view (in particular concerning "regulation & cultural" ecosystem services), the most valuable are the stands formed on poor and very poor (nonproductive) habitats – steep and cliff terrains, sunny exposures, poor to very poor soils & shallow to very shallow and stony soils,

The "unbeatable" merits:

- ✓The participation of other economically more valuable species is extremely rare;
- ✓They don't demonstrate higher productivity;
- ✓None of them is more hardy.

Since the firewood is a traditional product from the coppice management of the Oriental hornbeam some of its wood quality attributes might raise its contribution to the provisional ecosystem services.

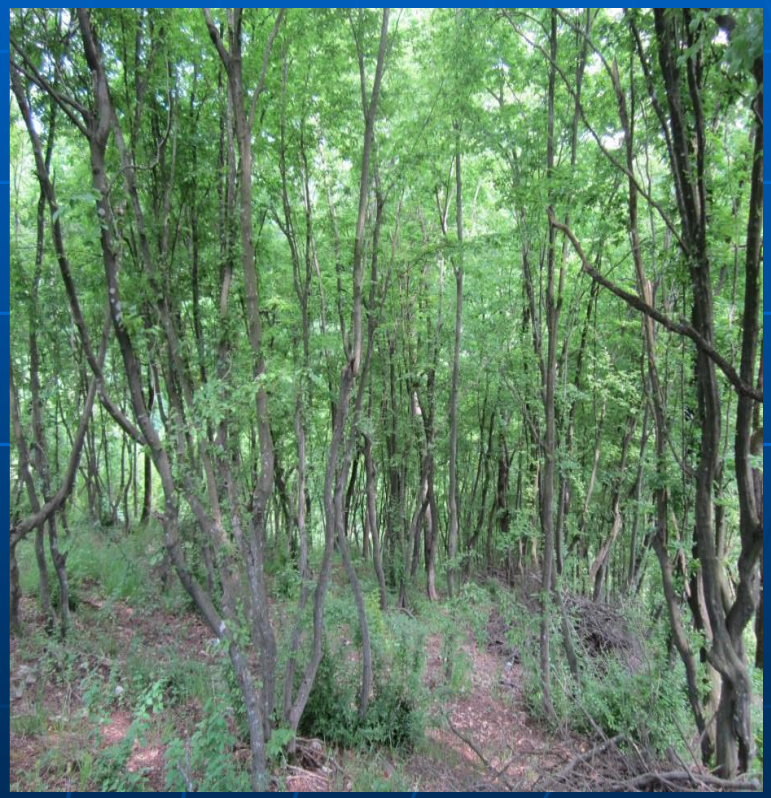
✓The wood of *C. orientalis* doesn't contain sulfur. That makes it suitable for production of biofuel; In addition, it minimizes the risk of rust and corrosion of metal parts of the fuel systems;

✓Due to the lack of sulfur and the low content of nitrogen, small amounts of harmful substances are coming off during process of burning;

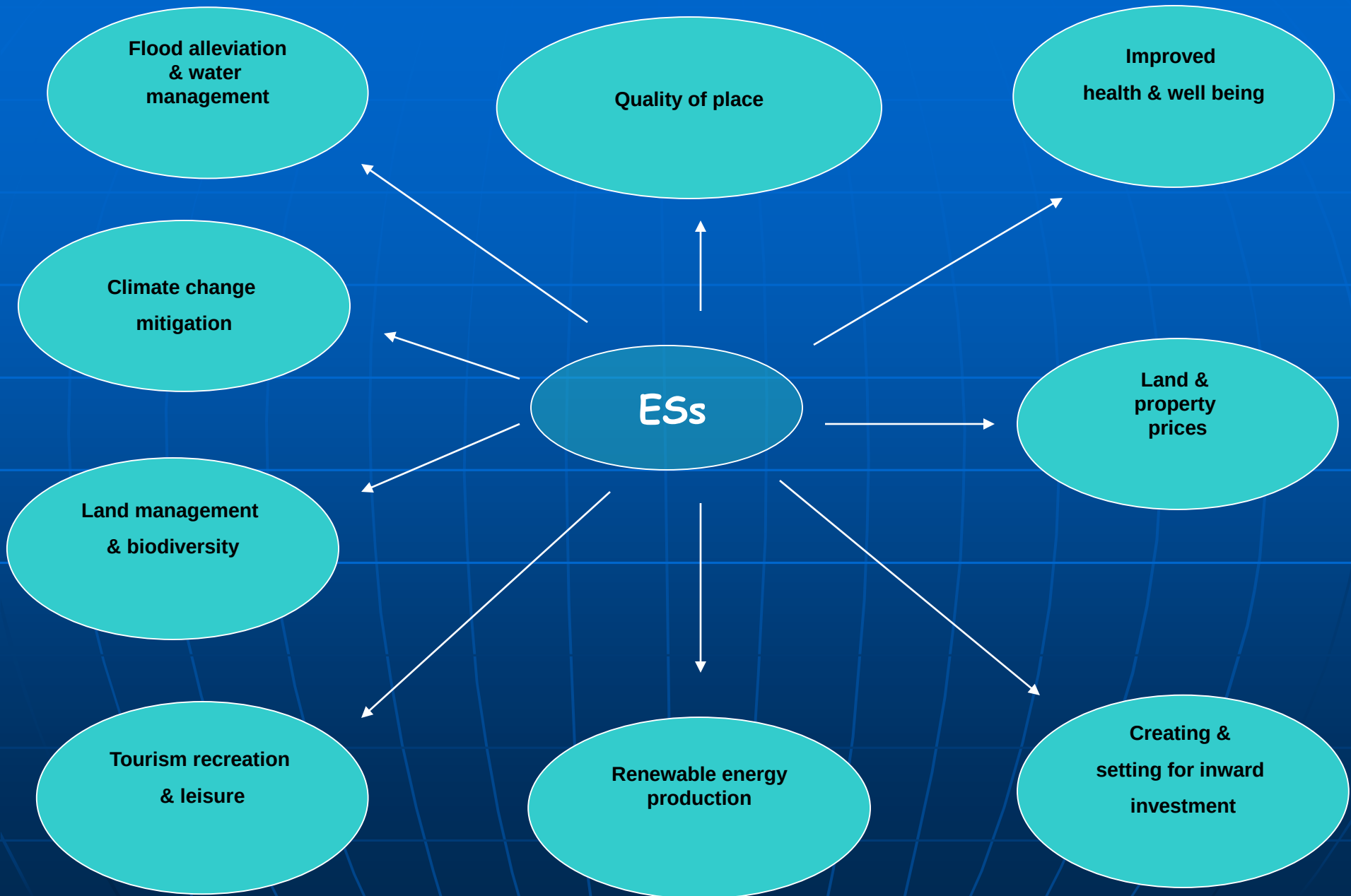
✓Because of the high content of calcium, the ash content is also high.

✓The caloric value is rather high - 4620 Kcal/kg, which results in a rather high relative fuel value!

✓On account of its high caloricity, density and volume weight, the *C. orientalis* features one of the highest fuel values as compared to the other woody species!

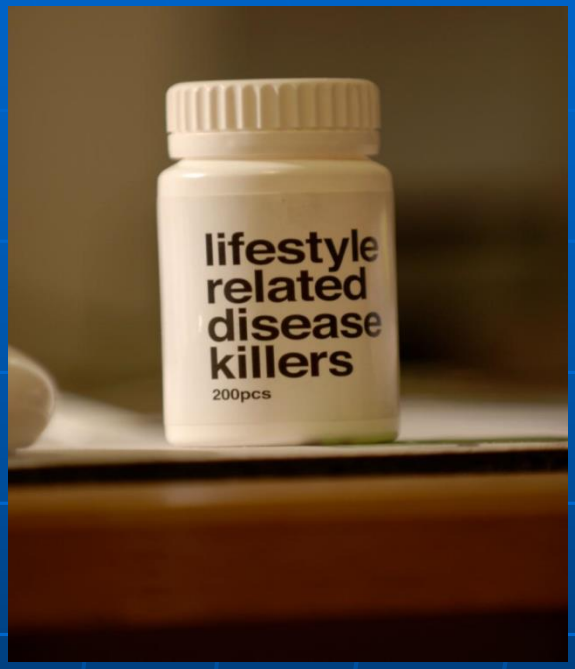


Ecosystem services and economic benefits of COPPICE STANDS



Coppice stands – some key findings

- ✓Coppice stands have great adaptive potential and capacity to mitigate climatic change and to provide provisioning and regulating ESs;
- ✓Coppice stands play a role as a reservoir of carbon and have a high potential for carbon sequestration in their components;
- ✓The proper maintenance and management of the coppice stands could contribute for betterment of carbon storage.



The management of the coppice stands **should be optimized in order to provide better provisioning and regulating ESs. They offer a good options for** recreation and relaxation as well. The quality of the ESs provided and their impact on the human well-being is mostly related to the improvement of their structure and functionality.

Thanks for your attention!