WWF

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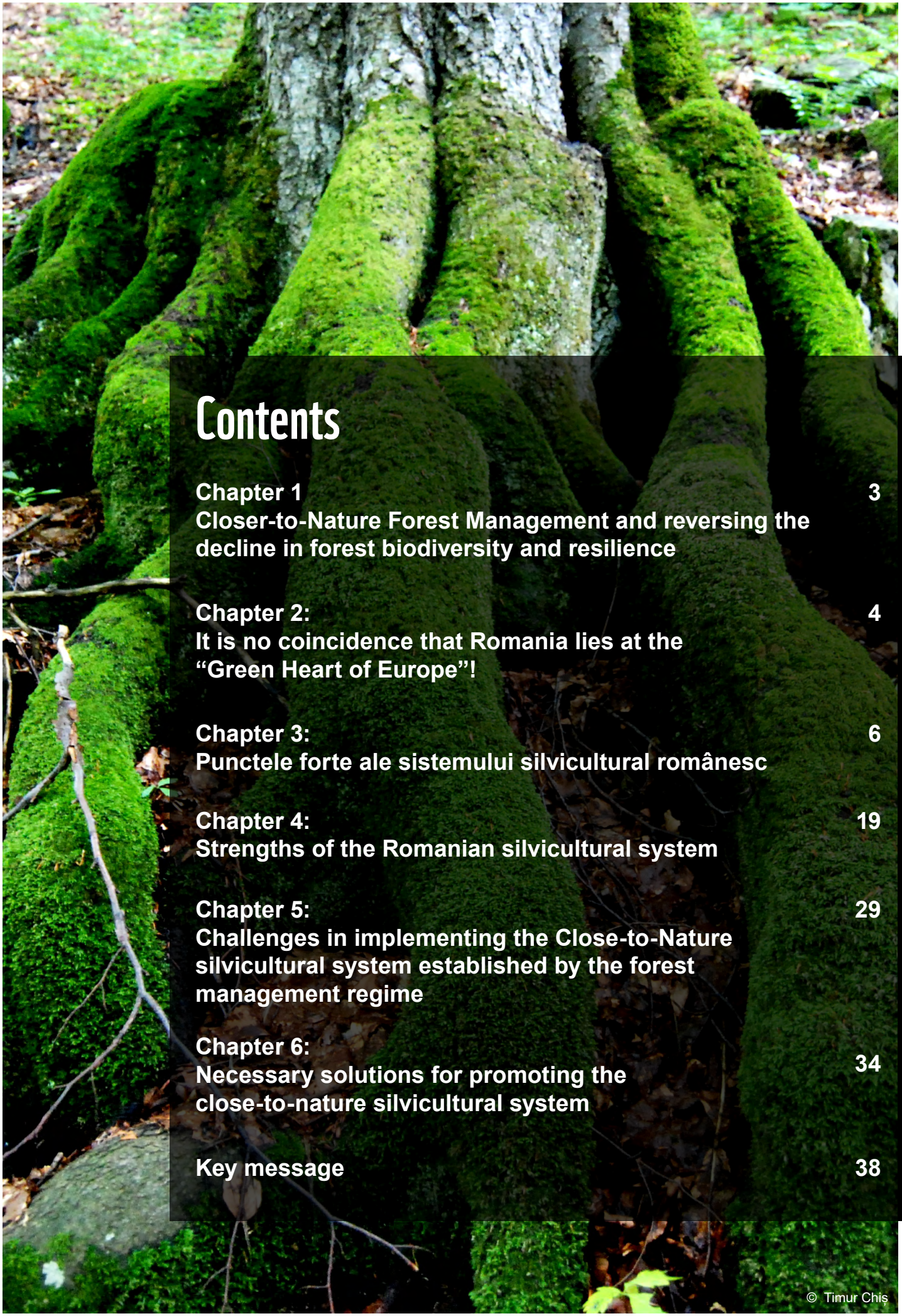
# Resilient Forests, Sustainable Bioeconomy

*A strategic vision for the future of Romania's forests*

When close-to-nature forestry is aligned with a sustainable forest-based bioeconomy, the two mutually reinforce each other, supporting the multiple functions of forests and strengthening socio-ecological resilience at the landscape level.



# Contents

# Foreword

Romania is home to some of the most well-preserved forest landscapes in Europe. The existence of this natural heritage in the region is no coincidence, but the result of a silvicultural system based on sound ecological principles, consistently applied for over a century. Despite enduring significant pressures, this system has withstood the test of time, although its implementation continues to face various challenges. If we appreciate the current state of Romania's forests, we must also understand and acknowledge the silvicultural framework that made these results possible and has stood the test of time. Unfortunately, too often the mistakes of some foresters, companies, or political decision-makers—committed in the context of a never-ending transition from communism to the European market—are wrongly attributed to the forestry system itself. As a result, more and more voices are calling for a radical overhaul of the system. Now, amid a new green transition, we must not abandon the very strengths of Romanian forestry. Instead, we must defend and improve these close-to-nature silvicultural practices—practices that some have never understood, and others are eager to discard in pursuit of short-term profit. This is why, for WWF-Romania, a key strategic direction is to strengthen law enforcement and preserve the core principles of the current forest management regime, while also supporting reforms aimed at improving administrative efficiency and effectively combating illegal logging — in line with the guidelines of the National Forest Strategy 2030.

In the current European Union context—shaped by the green transition, climate change adaptation, and biodiversity decline—Romania is well positioned to genuinely integrate biodiversity, climate resilience, and economic viability objectives for the benefit of local communities and the whole society. In reality, the silvicultural system applied in Romania is grounded in principles that have been ecologically validated through the test of time and offers a viable alternative to intensive, homogenizing models that have harmed biodiversity in other regions. This alternative must be defended and improved—not replaced or simplified.

Natural regeneration, diverse compositions of native species, long rotation periods (production cycles), the adoption of long periods of tranquility, and the planning for continuity of structurally diverse stands within a dynamic equilibrium all contribute to the development of resilient forests—forests capable of sustaining biodiversity, providing essential ecosystem services, and contribute to a competitive and sustainable bioeconomy.

It is important to understand that many of these close-to-nature silvicultural practices are applied in production forests, precisely to ensure the continuous supply of high-quality timber assortments from which a wide variety of high value-added and long-lasting wood products can be produced. This demonstrates that forestry cannot remain disconnected from the forest-based bioeconomy that develops downstream. A well-managed forest needs an economy that values its wood at its true worth, otherwise it loses its economic viability. In other words, the way we valorize wood determines the way we manage forests! There is a "symbiosis" between forest management and wood valorization—each depends on the other, in a pact of solidarity that spans generations. The timber harvested today at the end of a rotation period is, in essence, the outcome of a "project" that has been continuously supported by more than five generations of foresters. And those who plant and tend the forests today are fully aware that they will not live to see the "final result" of their project.

In conclusion, a sustainable forest-based bioeconomy cannot exist without a responsible silvicultural system that ensures the long-term conservation of forests—and the reverse is equally true: responsible forest management cannot be sustained without a forest-based economy that valorizes wood responsibly. This book explores precisely this balance: how we can build a sustainable bioeconomy through resilient forests—forests that are carefully managed, guided by long-term planning, and wisely valorized.

In this context, the present analysis is not only a plea for preserving a close-to-nature silvicultural model, but also a call to action for policymakers, national and European authorities, academia, NGOs, and industry to support this system through coherent public policies, dedicated funding, and measures that stimulate the forest-based bioeconomy. If we aim for resilient forests and a truly green economy, we must acknowledge that responsible forestry cannot be upheld through obligations alone—it requires concrete support, predictability, and coherence in forest policies. Only by strengthening this synergy can we build a sustainable forest-based bioeconomy that wisely valorizes Romania's natural heritage.

**Radu Vlad**
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# ABSTRACT

This paper provides a synthetic analysis of the Romanian forest management model within the context of the European Green Transition, the new nature restoration commitments, and the implementation of closer-to-nature forestry practices. Through natural regeneration, diverse natural compositions of native species, long rotation periods (100–180 years), ecological tranquility phases, and long-term structural diversity planning at landscape level, this system contributes to biodiversity conservation, strengthens climate resilience, and ensures the production of high-quality timber assortments which can be processed into a wide range of long-lived, top-end high value-added wooden products..

The core focus is on how close-to-nature forestry amplifies the multifunctional role of forests, both supporting and being supported by a sustainable forest-based bioeconomy.

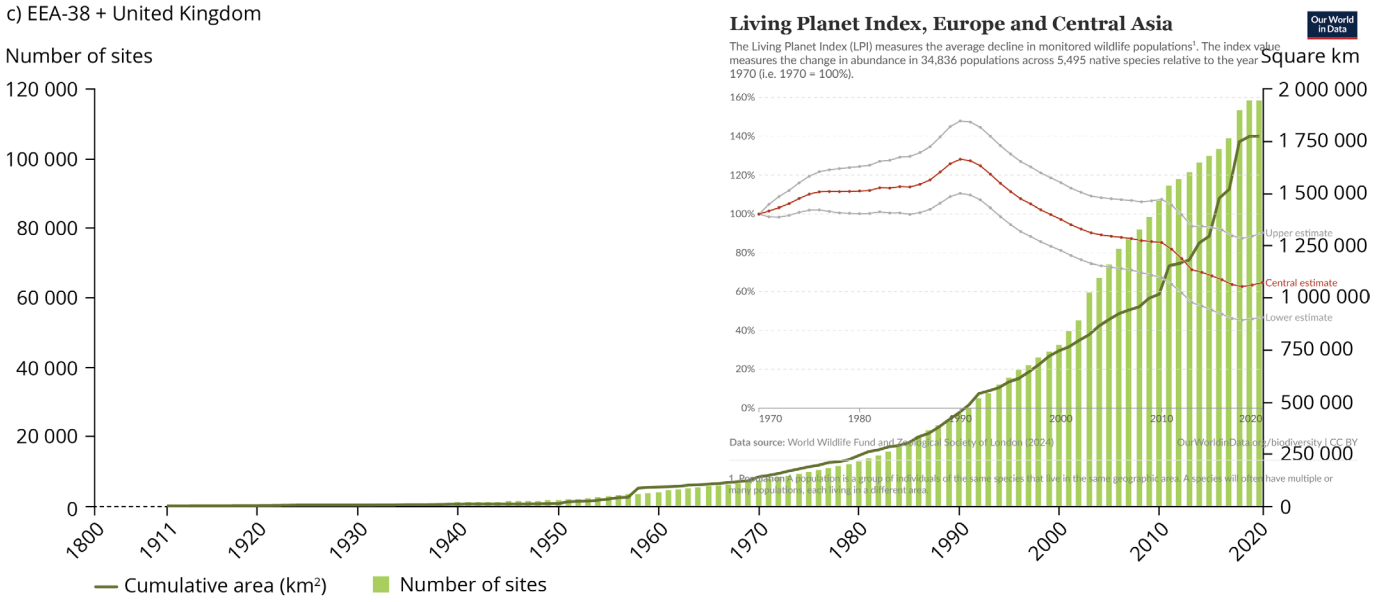
The main current challenges are also analysed: the additional costs associated with implementing strict forest management standards, the economic pressure to intensify harvesting, the underutilization of the superior wood valorization potential, the administrative fragmentation of forest land ownership, insufficient forest infrastructure, and the absence of dedicated financial support for forests. The paper proposes a series of strategic solutions, including: recognizing the forestry sector as a strategic sector at European level within the future Multiannual Financial Framework (2028–2034), allocating dedicated funds linked to performance indicators; reforming the timber valorization system, supporting the association of small forest owners, adapting strict protection designation criteria for forests and simplifying the administrative framework to ensure greater efficiency and transparency

The Romanian forestry model presented offers a functional balance between high-quality timber production, biodiversity conservation, and climate resilience, providing a relevant framework for implementing EU policies on climate neutrality, nature restoration, and sustainable community development. This valuable model must be maintained and further strengthened, requiring consistent administrative reforms aligned with the forest policy framework already established under the National Forest Strategy 2030.

# Chapter 1

# Closer-to-Nature Forest Management and reversing the decline in forest biodiversity and resilience

An analysis of the sources referenced in the EU Biodiversity Strategy for 2030 (EUBS 2030) reveals that, despite efforts to increase the coverage of protected natural areas, we are still facing an accelerated decline in biodiversity. This suggests that, beyond the protection of areas with high concentrations of biodiversity—where conservation, in line with the precautionary principle, is generally not compatible with active forest management—the core solution lies in integrating biodiversity conservation measures into forest management practices for production forests, which in fact constitute the vast majority of forest areas.




**Increase in the number and cumulative area of nationally designated terrestrial protected areas in Europe, 1800-2020**

*Fig. 1. A simple comparative analysis indicates that, despite conservation efforts, there is no direct correlation between the increase in the number and surface area of designated protected areas[1] and global biodiversity indices[2].*

To become truly effective, biodiversity conservation and the enhancement of adaptive capacity to climate change cannot rely solely on a network of protected areas. This is, in fact, one of the core messages of the EU Biodiversity Strategy when it promotes so-called closer-to-nature-forestry. The "key," therefore, lies in ensuring a multifunctional role for production forests by integrating biodiversity objectives and carbon sequestration into forest management.

[1] https://www.eea.europa.eu/en/analysis/maps-and-charts/increase-in-the-number-and-1

[2] https://ourworldindata.org/grapher/global-living-planet-index?country=~Europe+and+Central+Asia

# Chapter 2

# It is no coincidence that Romania lies at the "Green Heart of Europe"!

Romania as part of the Danube-Carpathian region is often described as part of "the green heart" of Europe[3]. A quick glance at automated (and objective) interpretations of satellite images confirms that, indeed, in this region the forest integrity at the macro, forest landscape level, is among the best preserved in Europe. This is generally supported by the proportion of forest areas reported as having favorable habitat conditions.


*Fig. 2.* ***What satellite analyses reveal about the state of Romania's forests. The Forest Landscape Integrity Index***[5] *(left) indicates that Romania's forests experience one of the lowest levels of anthropogenic modification in Europe; and the* ***Global Forest Watch***[6] *(right) product shows that the radical changes in forest canopy cover—whether caused by legal or illegal activities, or natural disturbances—occurs in Romania at a significantly lower scale compared to the European average.*

So we must ask ourselves: why do forests here remain in such good condition?

If we look at the conservation efforts made and consider how restrictive the forest management regime is in this region compared to other parts of Europe , we will immediately realise that this is not by chance.

The simplification and homogenization of forest structure—both in terms of tree species composition and age classes—along with the shortening of silvicultural rotation periods, have contributed to a decline in biodiversity across Europe. This trend has been particularly driven by the significant reduction of attributes characteristic of mature or old-growth forests (e.g., habitat trees, deadwood and species depending on it, etc.), as highlighted in the EU Biodiversity Strategy for 2030. **However, this has not occurred to the same extent in Romanian forestry!**

[3] https://wwfcee.org/

[4] Also confirmed by the proportion of forest habitat areas in Romania reported as being in a good state of conservation (good condition), which is 93.42%, compared to the EU average of 49.27% (source European Environment Agency (EEA): https://www.eea.europa.eu/en/analysis/maps-and-charts/condition-of-habitat-article-17-national-summary-dashboards-archived)

[5] https://www.forestintegrity.com/

[6] https://www.globalforestwatch.org/map/

[7] https://www.sciencedirect.com/science/article/pii/S0264837717305999


*Fig. 3. Forest stand structure within a production forest managed under the silvicultural regime*

If we value the current state of Romania's forests and the biodiversity they support, then we must also understand the silvicultural thinking behind these outcomes.

No, we must not confuse the mistakes of some foresters / landowners / companies / politicians with the silvicultural system itself. This is why, for WWF-Romania, one of the main strategic directions of action is to improve law enforcement and the current silvicultural system established under the forest management regime—within the broader context of the administrative reforms needed to make the system for combating illegal logging, and forest management in general, more efficient.

We consider Romanian forestry to be close-to-nature in general. Thus, even for production forests, the silvicultural norms in place establish a set of regulations that grant these forests a multifunctional role—simultaneously integrating environmental objectives (e.g., biodiversity, carbon sink & storing, water and soil protection, air purification etc.), social objectives, and the optimization of revenues from sustainable timber harvesting.

Therefore, it is worth highlighting some of the k**ey practices that define responsible forest management as it is applied in Romanian forestry!**

# Chapter 3

# Strengths of the Romanian silvicultural system


*Fig. 4. Forest landscape in the northern Romanian Carpathians.*

Despite all the administrative challenges Romanian forestry has faced over the past 30 years, we still have highly valuable forests[8]. This calls for a deeper understanding "why ?" and the contributing factors—many of which may not be as well known to the general public as those associated with negative impacts[9].

Multe din punctele forte ale silviculturii din România putem spune că au trecut proba timpului, fiind verificate de aproape un secol de implementare și perfecționare continuă. Beneficiilor pe care le vedem astăzi și de care ne bucurăm trebuie să le și înțelegem cauzalitatea, pentru ca nu cumva, luându-le de-a gata, în "vâltoarea reformelor", să ajungem să renunțăm tocmai la aceste puncte forte ale sistemului silvic din România.

[8] National forest area is increasing (land covered with trees: 6.900.962 ha (Cycle I NFI) → 6.929.047 ha (Cycle II NFI)); Average volume per hectare is increasing (321 m3/ha (Cycle I NFI) → 340 m³/ha (Cycle II NFI)); Artificial forest area is decreasing. (Source: National Forest Inventory https://roifn.ro/site/ )

[9] It is not the purpose of this document to provide a detailed account of the main challenges that have affected the forestry sector over the past 30 years. However, for the sake of objectivity, we list below the key issues: excessive politicization of forest administration; chaotic restitution process, still ongoing—and now further accelerated by the recent legalization of restitution for forests that have always been state-owned (new Forestry Code, Law 331/2025); widespread use of the "standing timber" sales system, which creates systemic conflicts of interest; illegal logging operations; lack of predictability in forest policy; overregulation and excessive bureaucracy; limited institutional capacity; absence of a functional forest cadastre; inadequate environmentally friendly forest infrastructure; severe underfunding of the forestry sector for more than three decades; uncompetitive practices and lack of support for higher-value wood processing; High Conservation Value areas are not fully mapped or adequately protected; lack of functional compensation mechanisms for forest owners facing environmental restrictions; social vulnerability of local communities and their dependence on firewood.

## (3.1) A very good ecological connectivity among forest ecosystems

Ecological connectivity is essential for the long-term conservation of ecosystems, as it enables genetic exchange, maintains biological diversity, provides resources for species with diverse ecological requirements, and enhances the capacity of ecosystems **to adapt and remain resilient in the face of environmental change.**

The continuous changes of forest vegetation in the context of climate change, along with the movement and establishment of colonizing species across various habitats in transition, have only been possible because these ecosystems have remained interconnected and have functioned as an integrated system. Nature has the capacity to adapt and respond to climate change, demonstrating its flexibility in the face of diverse climatic "trends". However, for this adaptive process to continue effectively, **it is essential to maintain and restore functional ecological connectivity**. This is the most reliable way to ensure that our "home" can keep pace with the rhythm of climate change—without being caught off guard.

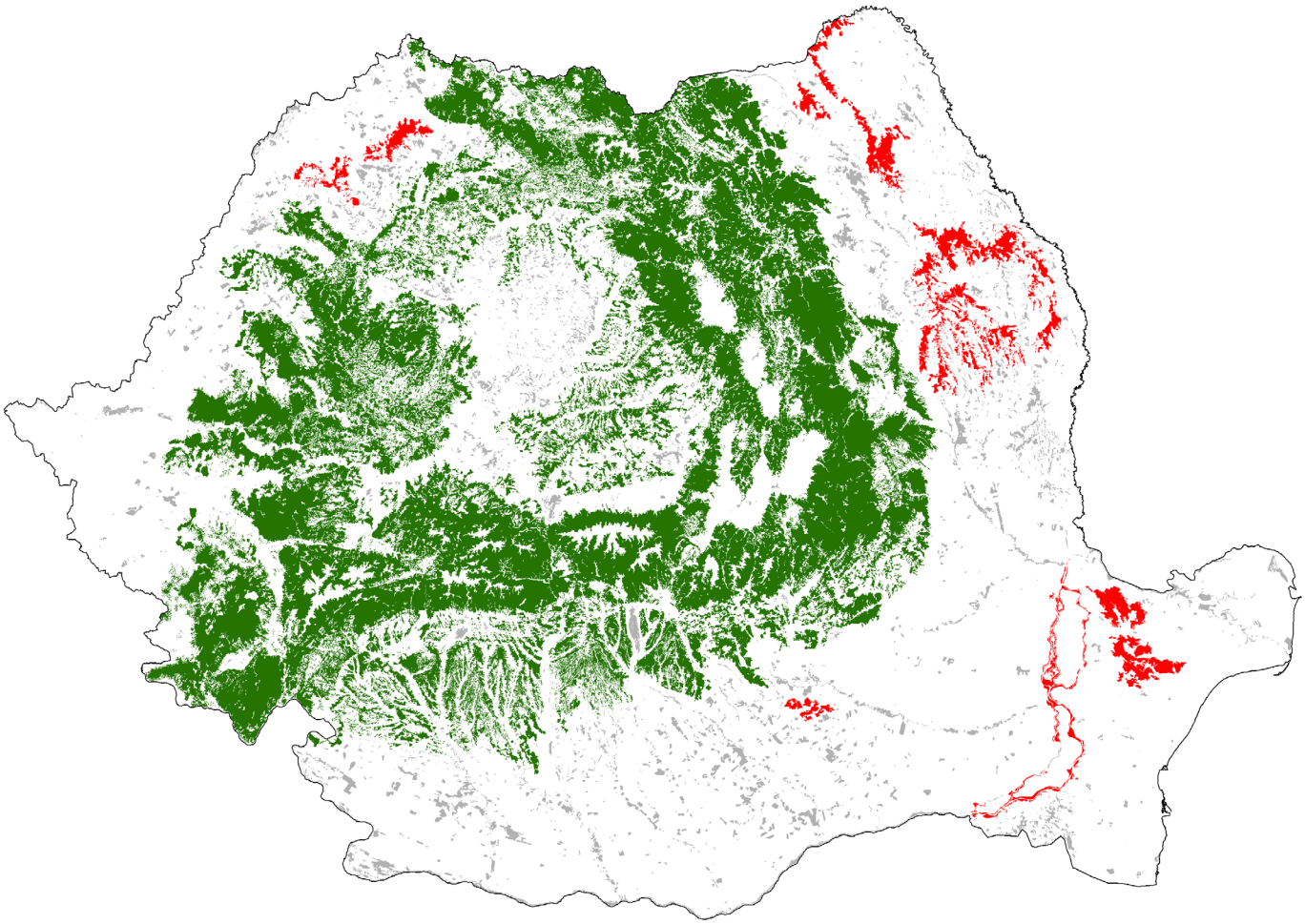


*Fig. 5. Forest Connectivity in Romania[10] shows that, using a 1 km buffer distance, approximately 86% of all forests—amounting to 6 million hectares — are connected in a single cluster surrounding the Carpathians*.*

The most recent data[11] from automated satellite image analysis show that Romania's forests enjoy one of the highest levels of ecological connectivity among forests in the Alpine and Continental biogeographic regions of Europe—registering a forest connectivity rate of 73.7% and a forest network coherence of 74.3%.

By comparison, the largest forested areas in Europe's temperate zone have a connectivity rate below 65%, while the average forest network coherence is under 49%.

[10] map from Stăncioiu, P.T. 2022. Biodiversity Conservation in Forest Management. In Giurcă A. and Dima, D.P. (Editors) The Plan B for Romania's Forests and Society (pp. 49-64). Transilvania University Press. Brasov, Romania

[11] https://forest-observatory.ec.europa.eu/forest/gfa (January 2025)

## (3.2) The integrity of the national forestland is guaranteed by law.

According to the Forestry Code, the change in land use category for forests has, for decades, been:

(i) strictly limited to construction and infrastructure projects, and for areas of more than 1 ha, a Government Decision is needed to approve the removal of forest land only for objectives of major public importance,

(ii) subject to a fee designed to discourage such conversions and

(iii) generally conditioned by compensating with other areas that must first be afforested.

On the other hand, the abandonment of certain agricultural practices over the past 30 years has led to the natural re-establishment of forest vegetation and the conversion of agricultural land (mainly former pastures and meadows) into forests. Today, wooden vegetation on agricultural land accounts for approximately 27% of Romania's total forest vegetation area (see Fig. 6), playing a significant role in enhancing ecological connectivity, biodiversity, carbon sequestration, and more. Future agro-silvicultural norms (agroforestry standards) should aim to prevent the degradation of these "forests", preserve high conservation value silvo-pastoral mosaic landscapes, and promote the voluntary implementation of the most appropriate nature restoration measures—for both grasslands and forests.

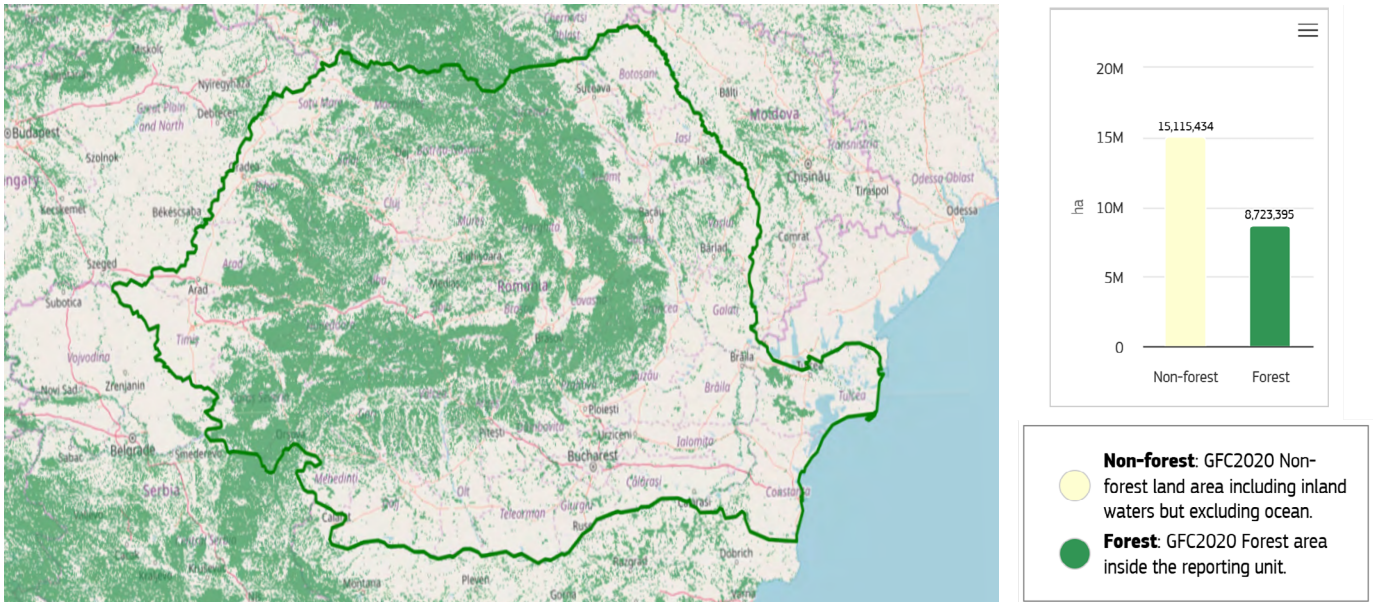



*Fig. 6. Observatorul Satelitar European asupra defrișărilor și degradării pădurilor[12] indică (ianuarie 2025) existența a cca 9According to the European Forest Observatory on Forest Degradation and Deforestation (January 2025), approximately 9 million hectares in Romania qualify as "forest" (i.e., based on satellite image analysis, they meet the FAO definition of forest), representing 37.6% of the country's surface area (NB: This percentage places Romania above the forest cover levels of Western European regions and comparable to countries such as Germany, Italy, Switzerland, or Poland).*

While forest deforestation is a pressing problem at global level, in Romania both the forest surface area and the average timber volume per hectare are constantly increasing.

With an average volume per hectare of more than 350 cubic metres (preliminary results NFI Cycle III), Romania's forests have the highest wood stocks per hectare in Europe after Liechtenstein and Switzerland; the EU-28 average being 182 cubic metres per hectare (State of Europe's Forest 2020 - FAO).

[12] https://forest-observatory.ec.europa.eu/forest/gfa

## (3.3) Promoting the natural forest type with diverse natural compositions of native species adapted to local conditions.

Romania has developed its own forest classification system, comprising 10 groups of forest type formations that include over 400 natural forest types, corresponding to various site conditions. Although environmental changes require periodic adjustments to this classification system and proper remapping of natural forest types at the national level, forest regeneration treatments, as well as tending and thinning operations, are practically aimed at maintaining or restoring **diverse natural compositions made up of native species adapted to local conditions**.

In Romania, the conversion of natural forests into plantations (see definition of forest plantations – EUDR) is not allowed—and does not occur in forestry practice. As a result, natural forest composition adapted to local site conditions covers approximately 77% of the total forest area, while only about 9% of forests have artificial structures with non-native species (according to the National Forest Inventory, Cycle II).

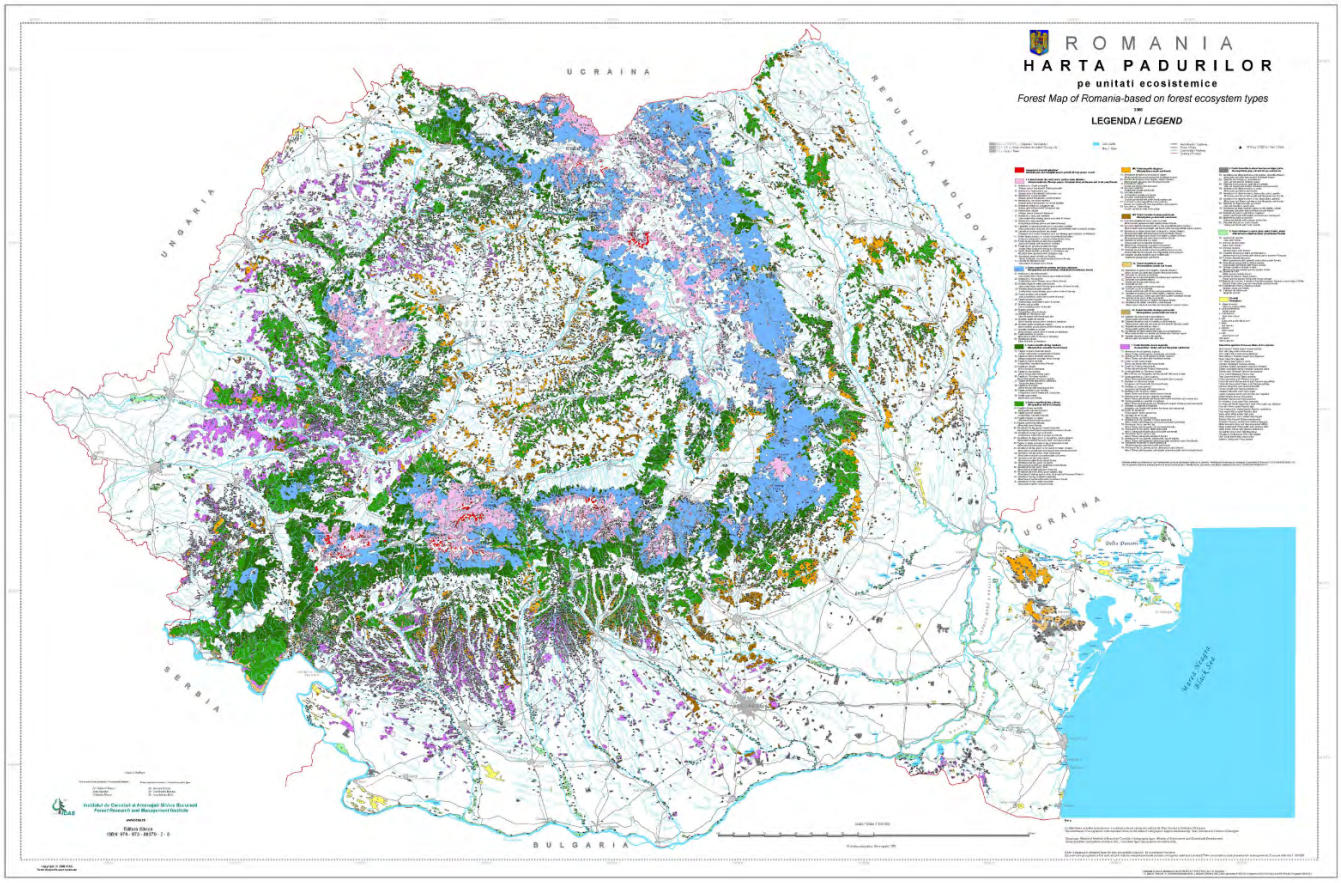



*Fig. 7. Forest habitat diversity in Romania (https://editurasilvica.ro/produs/harta-forestiera-a-romaniei/)*

By contrast, in many regions of Europe, diverse forest landscapes have gradually been replaced by plantations—often composed of fast-growing, high-yield tree species aimed at maximizing wood production. This approach has led to the simplification and homogenization of large portions of European forests, making them significantly more vulnerable to disturbances and reducing their resilience to environmental challenges such as insect outbreaks, windthrow, or wildfires—especially in conifer-dominated stands (EC Guidelines on Closer-to-Nature Forest Management, 2023).

Due to its geographical position, Romania is the only country in Europe that encompasses five distinct biogeographic regions (i.e., Alpine, Continental, Steppe, Pannonian, and Pontic). Given this diversity of natural conditions, and through the promotion of diverse natural compositions consisting of native species adapted to local site conditions, Romania's forests support a rich species composition—over 60 tree species, 20 shrub species, and thousands of higher vascular herbaceous plant species.


*Fig. 8. Habitat diversity means species diversity*

By maintaining natural habitats in a favorable conservation status, optimal conditions are ensured for all the species that make up forest ecosystems (forest-dwelling species). As a result, Romania's mixed forests support a biological diversity of over 20.000 species.

According to forestry technical norms, even in forests with a production role, it is forbidden to completely remove / persecute less economically valuable tree species.

## (3.4) Natural regeneration is promoted as a priority


*Fig. 9. Beech seedling regenerated on decaying dead wood.*

Natural compositions are primarily achieved through natural regeneration, which promotes the use of **locally adapted genetic provenance suited to site-specific conditions.** As a result, 72% of Romania's total forest area regenerates naturally from seed, passed on from one generation of trees to the next (National Forest Inventory, Cycle II). By comparison, across the EU-28, the share of forests regenerated naturally from seed is 62% (State of Europe's Forests 2020 – FAO).

Comparativ, la nivel European EU-28, ponderea pădurilor regenerate natural din sămânță este 62% (State of Europe's Forest 2020 – FAO).

## (3.5) Unique national system for the functional classification of forests, with an emphasis on protecting High Conservation Values

Romania has developed its own national system for the functional classification of forests, applied uniformly across the country regardless of ownership type (according to the 1954 Forestry Technical Norms and successively updated '69, '76, '87, 2000, 2022). Unique at the European level and continuously improved through the integration of new conservation concepts, this system also reflects the need to safeguard High Conservation Values, which are internationally recognized for their ecological importance[13].

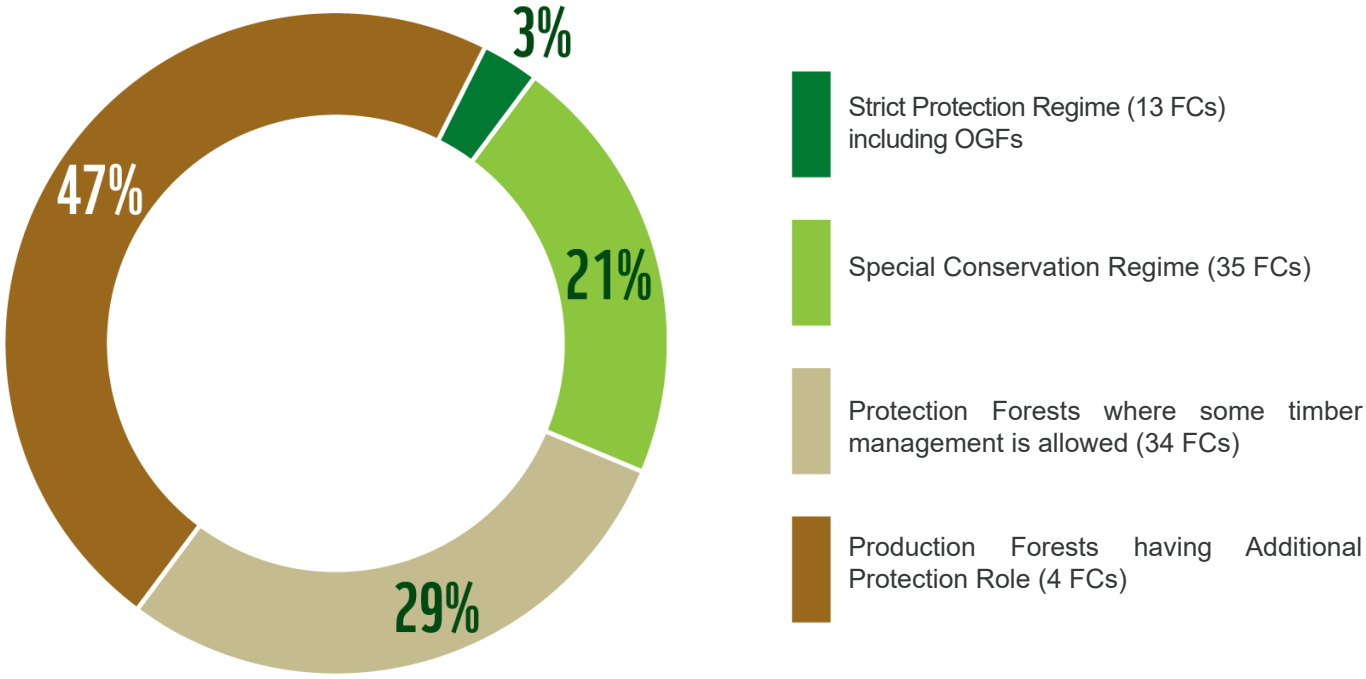



*Fig. 10. Share of forests in different functional categories*

The first functional group (entitled Forests with special protection functions) includes forests that fulfill key protective roles related to water, soil, and climate regulation, as well as forests with nationally important cultural objectives, recreational forests, forests for conservation of the gene pool, and forests located within protected natural areas[14].

As such, 3% of forests are already under a strict protection regime[15]; an additional 21% are under a special conservation regime, where only conservation measures are allowed—strictly aimed at maximizing the assigned protective role, with no regulation of the production process (i.e., silvicultural interventions do not pursue economic production objectives). Furthermore, 29% of forests have a protection function for which the production and harvesting process is regulated, but in a way that supports the development of stand structures optimized to fulfill their protective role.

The second functional group (Forests with Production and Protection Functions) includes forests that serve both production and protection purposes, accounting for 47% of Romania's forest area.

The functions of forests are assigned through forest management plans, based on designation thresholds established in the Silvicultural Technical Norms. These plans are prepared by accredited, independent entities, and any changes to functional classifications must be thoroughly justified and formally approved by Ministerial Order. As proof of long-term consistency, the classification of forests by functional type has undergone only minor changes over the decades.

[13] https://www.hcvnetwork.org/

[14] 1.1 Forests for water protection (predominantly hydrological functions); 1.2. Forests for land and soil protection functions (predominantly pedological functions); 1.3. Forests with protection functions against natural or anthropogenic climatic factors; 1.4. Forests with predominantly social protection functions; 1.5.Forests of scientific interest, for the preservation of forest gene-pool and of other high-value natural ecosystems; 1.6. Forests with special functions for biodiversity conservation and protection.

[15] State of Romania's Forests Report 2020: https://mmediu.ro/en/domenii/paduri/amenajarea-padurilor/starea-padurilor/

## (3.6) Diversity of forest regeneration methods that mimic natural processes

A wide range of regeneration treatments are regulated in Romanian forestry, **following nature-based models** and thereby creating structural diversity within forest stands. Romanian silviculture aims to emulate natural processes—such as insect outbreaks, windthrow, forest fires, disease or physiological decline, and landslides—while taking into account the specific ecological characteristics of forest habitats. As a result, in over 90% of forest areas, regeneration is achieved through gradual transition using repeated interventions. Clear-cutting is applied in only **4.5%** of cases and is strictly limited to surface areas of 1, 3, or 5 hectares, depending on the forest type, specifically in those cases where this silvicultural treatment is appropriate (Wood Resource Balance in Romania).


*Fig. 11. Similarity between different silvicultural regeneration treatments and the influence of natural factors on forest structure.*

## (3.7) Long rotation periods for forests

In production forests, long rotation periods are applied, with the harvesting age[16] for the main tree species—beech, oak, spruce, and silver fir—ranging between 100 and 180 years. In addition to this age, there is a regeneration period of 20–40 years during which the gradual removal of old trees takes place. Where selection cutting (uneven-aged forest management) is applied, the regulations require the harvesting of large-diameter trees, which for spruce, fir, and beech can reach or even exceed 1 meter in diameter. Depending on the natural site conditions, these species typically reach 80–100 cm in diameter only after 200–300 years.

The determination of the harvesting age is closely linked to the target wood assortments intended to be produced from forests with a production function. In Romanian forestry, regardless of the ownership type, long rotation periods are imposed through silvicultural regulations to ensure the production of large-dimension wood assortments, suitable for higher value processing and the manufacture of high value-added wood products.

Thus, the adoption of long rotation cycles truly gives meaning to the multifunctional role of forests, considering also the social and environmental benefits generated by this silvicultural system. By comparison, in many forest regions across Europe, stands are managed up to only 60–80 years of age, as forest managers have the flexibility to prioritize maximum wood volume yield rather than the quality of wood assortments or the environmental services provided by forests.

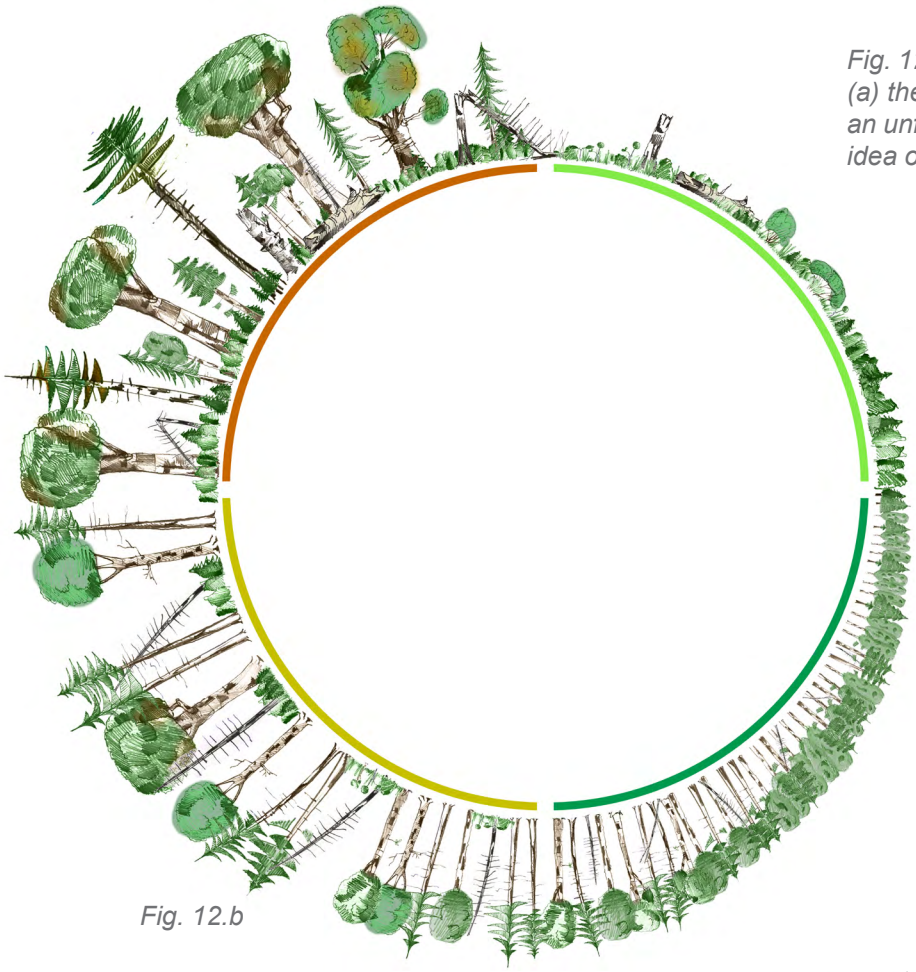


*Fig. 12. Illustration of long production cycles: (a) the development of the forest over time - an unfolding representation; (b) captures the idea of cyclicity.*

*Fig. 12.b*

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*Fig. 12.a*

[16] For production forests, the technical harvesting (rotation) age is the age at which the average annual production of wood of a given targeted wood assortment, becomes maximum

## (3.8) The principle of sustained yield and the development of diversified mosaic structures that maintain dynamic equilibrium across the landscape

Naturally, the structure of a forest evolves over time. Like any living system, forests follow a cyclical development: regeneration establishes, trees grow together, develop, age, enter a phase of decline—and then the cycle begins again. We cannot stop a forest's evolution at a specific stage, just as we ourselves cannot remain forever young. What we can do, however, is to ensure—through long-term, planned management—that all these stages of development are continuously present across a given forest landscape (technically referred to as a Production Unit, typically ranging between 500 and 2000 hectares).

To apply **the principle of continuity of timber harvests** (sustained yield), forest management plans aim to shape a shifting steady-state mosaic structure across the landscape (see fig.13). This means that silviculture seeks to create—and then sustain—a diversified age-class structure at the landscape level, where forests of all age classes are always present in a balanced proportion across the area, even if not in the same location.

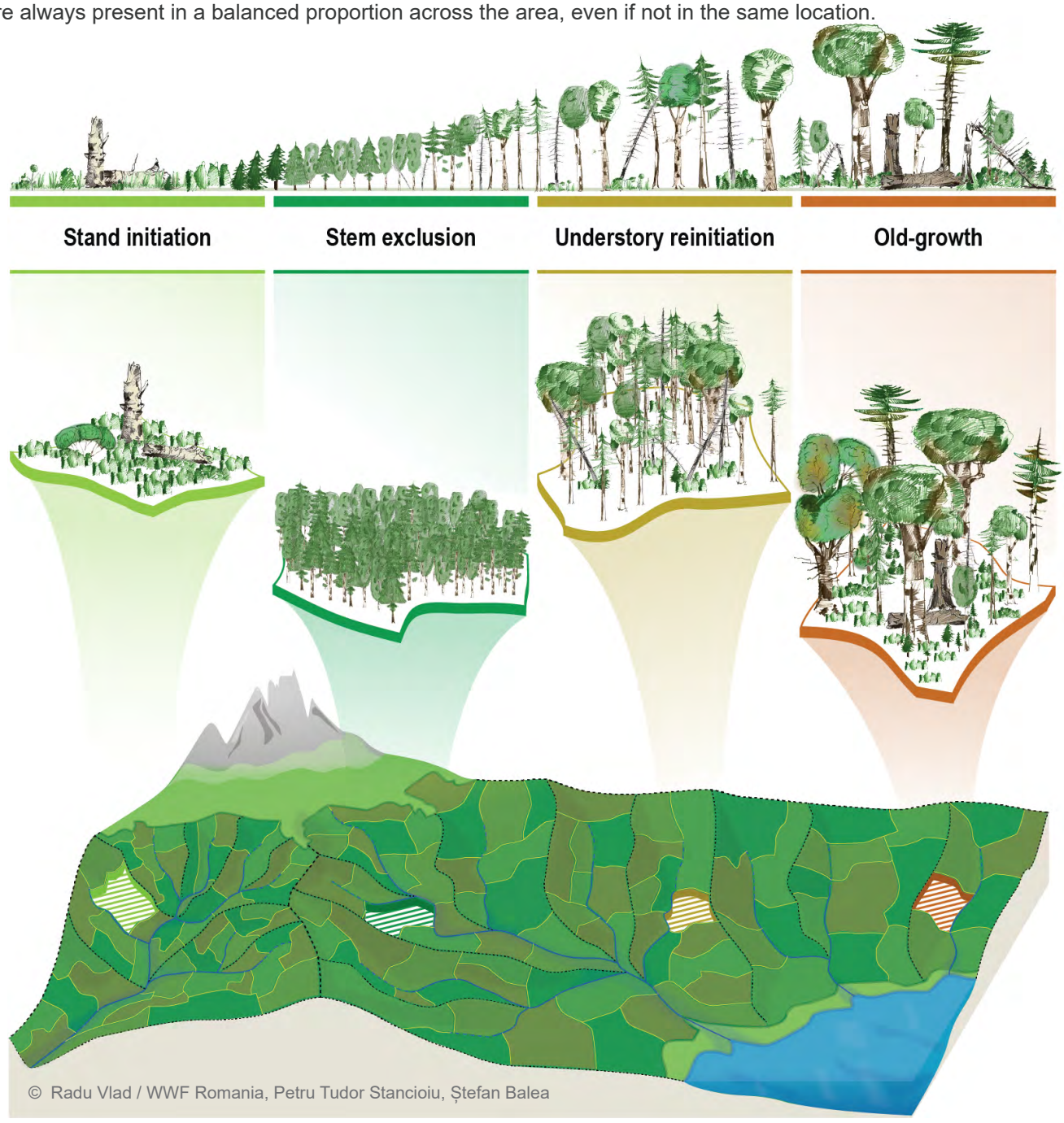



*Fig. 13. Shaping shifting steady-state mosaic across very large, well-connected forest landscapes, in which all developmental stages are present at any given time in a given forest landscape, even if along time they will be in different places.*

[17] Kimmins, J. P. 2004. Forest ecology. A foundation for sustainable forest management and environmental ethics in forestry. New Jersey: Prentice Hall

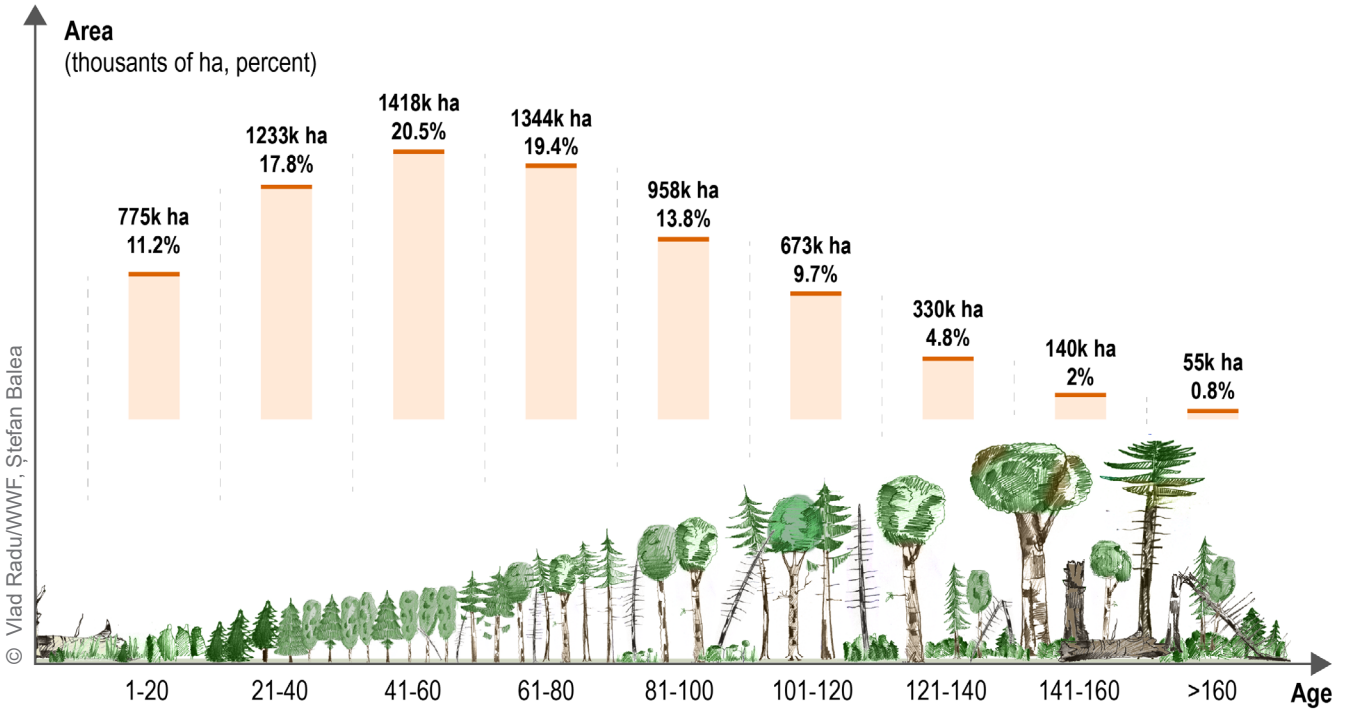



*Fig. 14. Age class distribution at national level (according to the National Forest Inventory)*

Although Romania is renowned for its vast share of "old-growth forests," the National Forest Inventory reveals an underrepresentation of forest stands over 120 years old. This situation is explained by the intensive logging during the Sovrom period (1946–1956), the natural afforestation of abandoned pastures over the last 35 years, as well as the structural changes affecting over 1.5 million hectares that were restituted to private owners, who, in many cases, were allowed to choose the forest areas to be returned to them. As a result, the forests restituted to individuals were, in large part, selectively chosen for their advanced age and high standing timber volume per hectare—and many of these were "regenerated" through harvesting operations carried out over the past 35 years.

At the local level, this imbalance in age-class structure is even more pronounced due to the (artificial) administrative fragmentation of the national forestland. The forest area was divided among more than 800,000 owners, resulting in the Major Forest Units (MFUs — large territorial entities organized by watershed, designed for integrated forest planning) being split and reorganized into tens of thousands of forest landscapes (i.e., production units established at the property level).

The method used to calculate the ten-year allowable cut is designed to support the long-term restoration of a balanced age-class distribution of forest stands within each production unit (forest landscape)—a process referred to as the "normalization of the production stock" This approach involves forecasting forest development over the next 20, 30, or even 40 years.

Maintaining this system ensures the long-term rebalancing of the proportion of mature and old-growth forests at the landscape level, along with the specific attributes associated with these forests. A simple exercise in imagination helps illustrate this: consider how the age-class structure will look in 20 or 40 years, when today's 60–100-year-old stands reach maturity. The share of mature (old-growth) forests will gradually increase at the national level—precisely as a result of the way we calculate and plan timber harvests. In practice, a planned reconstruction of the structural diversity of forests at the level of each forest landscape.

> Romania possesses strong expertise in structural forest modeling and has developed a mathematical model for calculating the allowable cut using the age-class method—unique at the European level. The model is mandatory for all properties exceeding 100 hectares.

For example, if a production unit (forest landscape) contains no stands that have reached the harvesting age, regeneration fellings will not be permitted in younger forests. In such cases, harvesting is postponed—sometimes for several decades—in order to restore the representation of mature stands. Conversely, when multiple forest areas reach harvesting age simultaneously and the volume eligible for harvest exceeds the allowable cut, not all of these areas will be included in the ten-year harvesting plan. This is because the annual allowable cut is limited based on the calculated harvest potential, which also considers forest growth rates. Under these conditions, not all mature or old-growth stands—those that have reached or exceeded the rotation age—will be harvested within the same period. Some will be deferred to the following decade or even later planning cycles.

As a result, certain stands will continue to age, reaching significantly advanced ages—well beyond the technical harvesting (rotation) age, 100-180 years for the main species—although, in theory, regeneration fellings would be permitted.

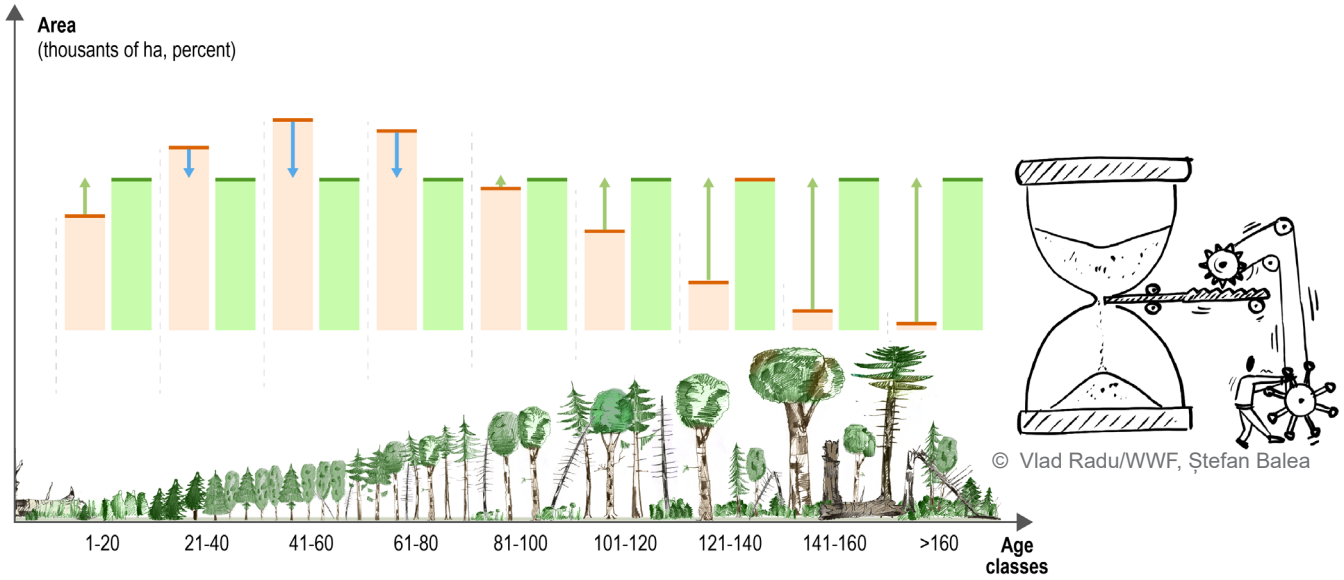



*Fig. 15. Designing sustainable timber harvests following the principle of sustained yield and normal age class distribution has the effect of reversing over time the under-representation of old-growth forest attributes in the national forest stock. (beige color - current age class structure; blue color - balanced structure - "normalisation" of the production stock)*

## (3.9) The long period of tranquility that acts as a "rewilding" phase

In the final stage of the forest production cycle (i.e. of the rotation), harvesting is prohibited. Only sanitation cuttings may be allowed—where applicable—and these are limited to 1 m³/year/ha (through forest management planning). Recent updates to the silvicultural norms now prohibit even these sanitation cuttings in forests located within Natura 2000 sites (which cover approximately 40% of Romania's national forestland).

This tranquility period begins when the stand reaches 75% of the rotation age and continues until the start of the regeneration treatment. This represents a resting phase of approximately 25–50 years—or even longer in forest landscapes with a surplus of stands that have surpassed the rotation age and are awaiting their turn for silvicultural treatments, depending on regeneration urgency.

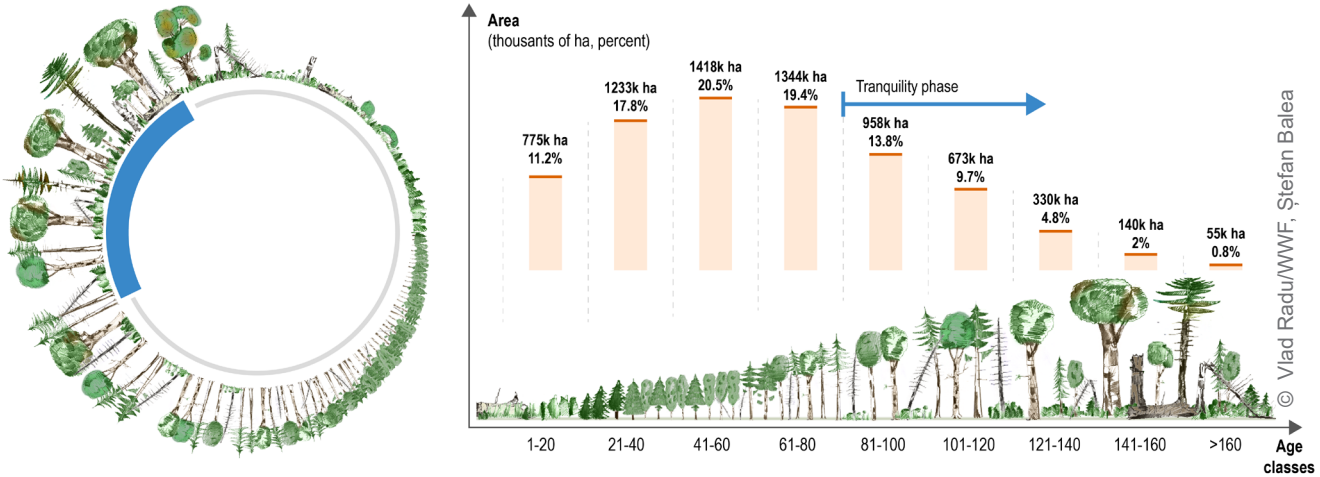



*Fig. 16. The tranquility period (rewilding zone) in the life of a cultivated forest*

The tranquility period typically lasts over 30 years, and national age-class distribution data indicate that areas under such tranquility phases cover approximately 1.5 million hectares—over 20% of Romania's national forestland. This measure functions similarly to establishing a temporary protection regime, often applied over large, contiguous areas. As a result, many forest-dwelling animals may go their entire lives without ever encountering humans.

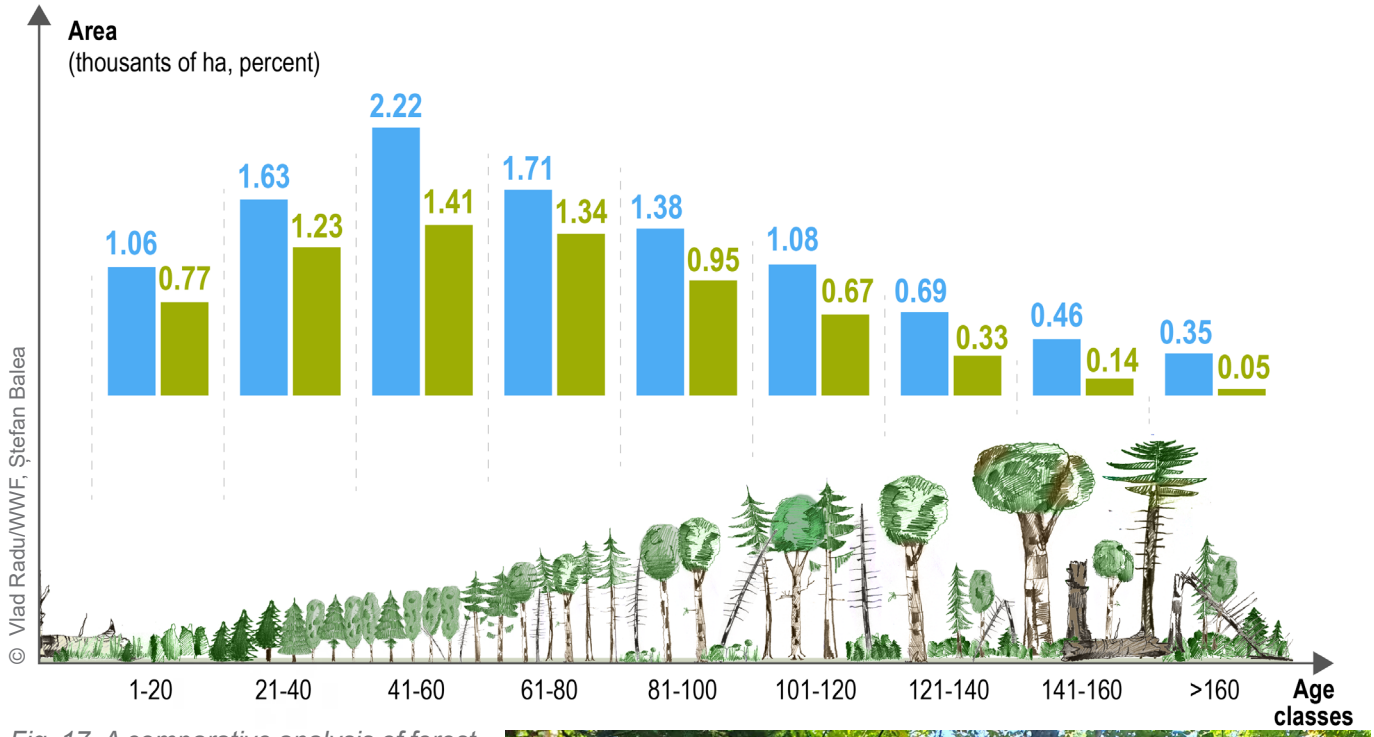



*Fig. 17. A comparative analysis of forest age-class structures based on national forest inventories (Germany – blue vs. Romania – green) shows that Germany has a significantly higher proportion of old forests than Romania. But, in all likelihood, because silvicultural operations are applied continuously—without the imposition of designated tranquility phase—there is no public confusion between well-managed mature forests and old-growth forests.*

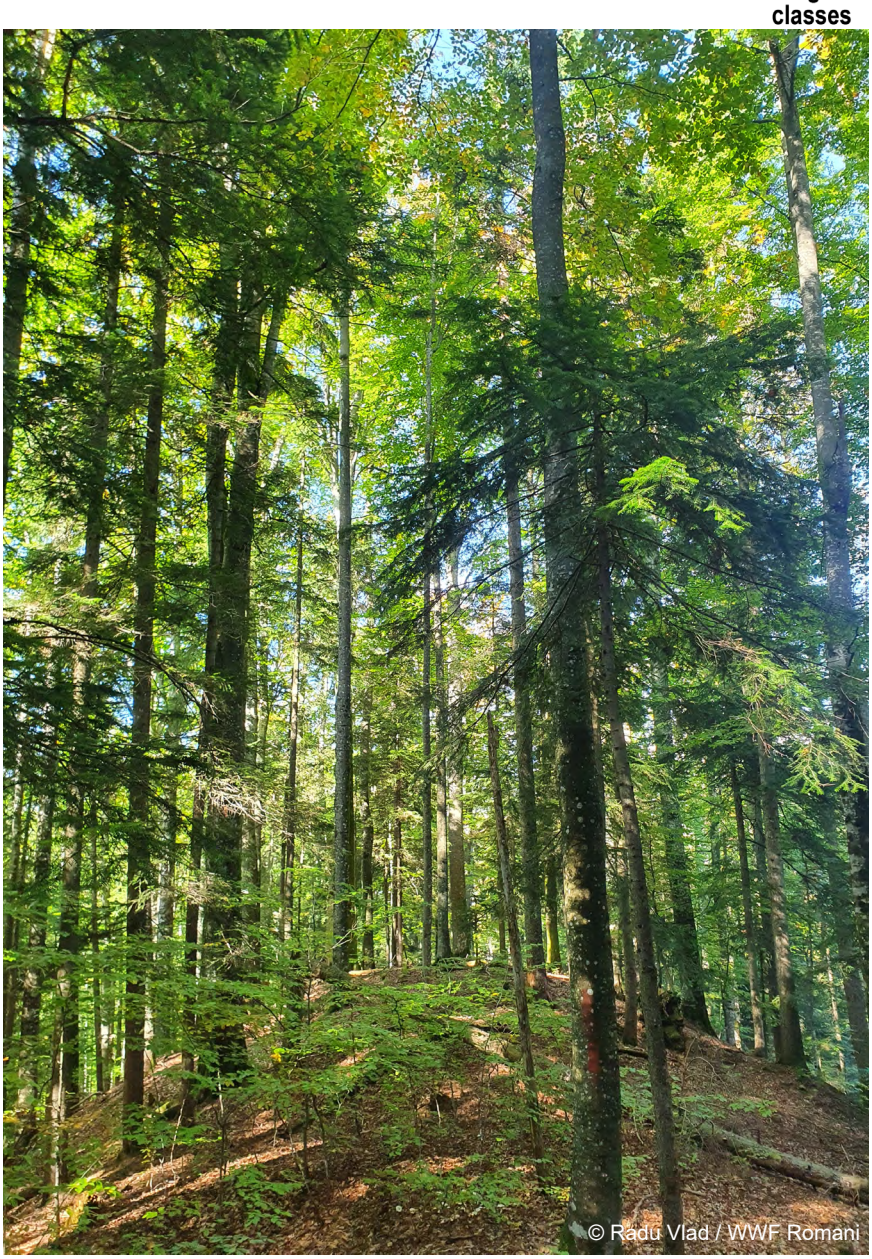



*Fig. 18. During the minimum 30-year "rewilding phase" production forests develop a structure that more closely resembles the natural one, through the restoration of attributes specific to mature or old-growth forests—such as the presence of large deadwood in various stages of decomposition, habitat trees, and species associated with these microhabitats. At the same time, the vertical stratification process of the stand begins, marked by the appearance of released growing space for regeneration.*

*Example of a target structure with a high degree of naturalness, **closely resembling** old-growth forests. This type of structure should be achieved in all commercial forests by the end of the rotation cycle.*

From an ecological perspective, this is a period during which production forests regain their tranquility and mature/old-growth forest attributes, and **develop a structure with a high degree of naturalness**.

By applying the good practices mentioned—natural regeneration, natural species compositions, and long rotation periods—combined with a period during which harvesting is restricted for several decades, properly managed production forests can be guided toward structural conditions similar to those of old-growth forests.

This is a common objective, mandated by norms, even in production forests!

It means that every stand is planned to reach such a structural state at a specific point in time. As a result, across a time horizon spanning decades and even centuries, all stages of forest development will always be present—interwoven in a fine-grained mosaic—within each local forest landscape, even when referring strictly to forests with a production function.


*Fig. 19. The characteristic structure of Old-Growth Forests (i.e. complex forest structures including multiple developmental stages forming a horizontal mosaic and vertically stratified structure; the presence and high density of "veteran trees" that have reached senescence; standing and downed deadwood in all stages of decay, with most of the deadwood volume originating from large trees that have reached senescence and died; structures that are not significantly influenced by anthropogenic management activities, etc.) — in order to distinguish them from managed forests with a high degree of naturalness.*

# Chapter 4

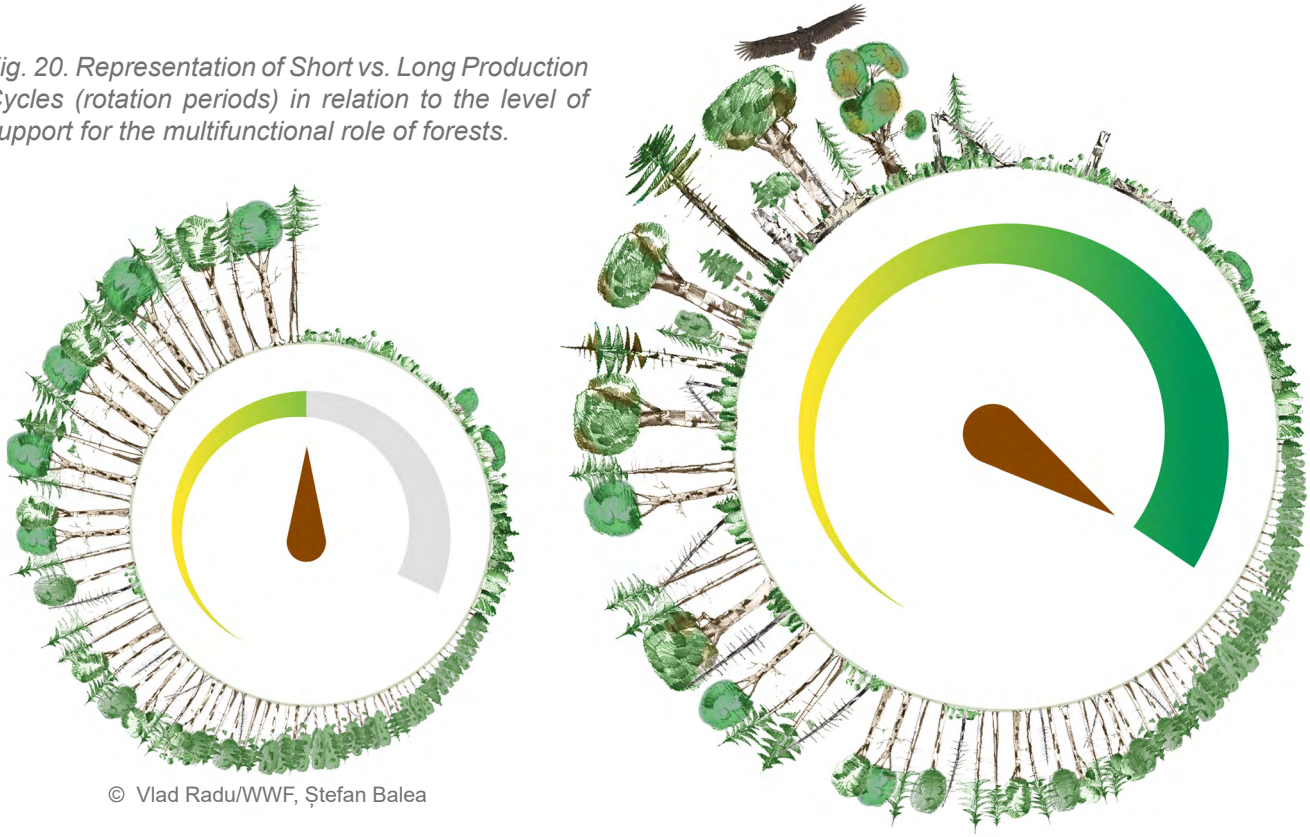
# Close-to-Nature forestry and the multifunctional role of forests

## The core characteristics of Romanian forestry—established by law—are what provide the multifunctional role for production forests.

The promotion of n**atural tree species composition** adapted to local conditions, gradual **natural regeneration** under canopy shelter, the adoption of **long rotation periods** to obtain high-quality large-dimension timber assortments, and the application of **the continuity principle** (principle of sustained yield)—focused on creating and maintaining **shifting steady-state mosaic** at landscape level, that aim for a **balanced and dynamic** age classes **distribution** within the **forest landscape** (i.e. forest management unit) —combined with the establishment of extended **tranquility period**, all guarantees the application of a **close-to-nature silvicultural system**.

In this way, the management of production forests **integrates environmental protection objectives** (e.g., maintaining high biodiversity, protecting soils and water, ensuring a positive carbon balance), enhancing the resistance and resilience of forest ecosystems, while also **optimizing revenues** from sustainable timber harvesting.

*Fig. 20. Representation of Short vs. Long Production Cycles (rotation periods) in relation to the level of support for the multifunctional role of forests.*





## 4.1. Maintaining a high biodiversity

(a) High-forest systems with **long rotation periods** (approximately 100–180 years), together with (b) the establishment of **tranquility periods**, naturally allow for **the restoration of attributes characteristic of mature / old-growth forests** — both **horizontally and vertically**. These include habitat trees and standing or fallen deadwood that create specific microhabitats, the emergence released growing space for regeneration, and vertical stratification, all of which contribute to **increasing the overall structural diversity of the forest**.


*Fig. 21. Production forests (a), after the tranquility phase, reach a structure similar to that of natural, mature forests (b), and accommodate the habitat needs of a wide range of species.*

The method used to calculate ten-year harvests, which aims to maintain or restore (c) a mosaic structure for forests and (d) a **balanced age-class distribution** at the landscape level (a balanced proportion of age classes within the management unit), serves as a **guarantee for preserving high biodiversity** (provides very diverse habitat conditions).

By promoting (e) **diverse natural compositions of native species adapted to local site conditions**, each stage of forest development is associated with specific assortments of colonizing species.

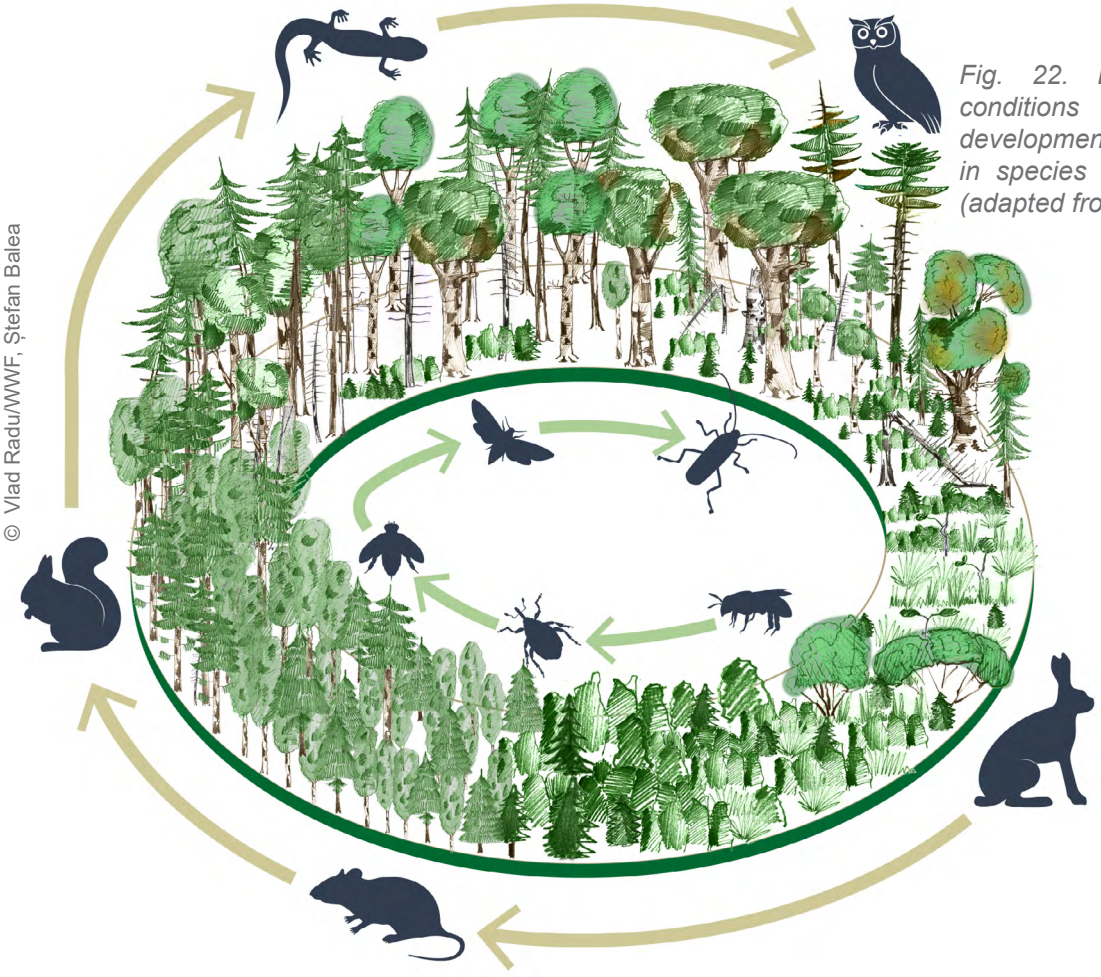


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*Fig. 22. Evolution of habitat conditions over the forest development cycle and the change in species due to this evolution (adapted from Hunter, 1990).*

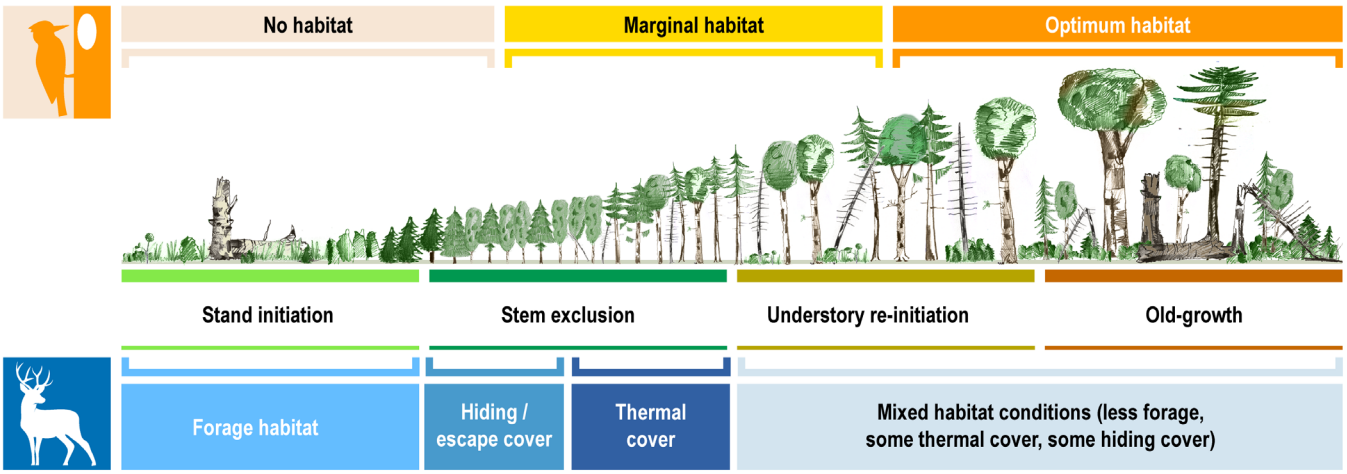



*Fig. 23. The use of different developmental stages by 'specialised' (woodpecker) and 'generalist' (deer) species (adapted from Smith et al. 1997[18]).*

**Only in a complete shifting steady-state forest mosaic landscape—one that includes all stages of forest development in different locations, yet simultaneously—can the complete spectrum of biodiversity characteristic to that region be present.**

Therefore, no one stage is more important than another, as no one development phase/structural pattern of forests fulfills the ecological requirements for all species.

Maintaining a dynamic forest landscape that varies over time (i.e., forest structure and conditions change over time in any given location), yet remains constant in spatial offering (i.e., all development stages coexist across the landscape at any given time), ensures **permanence in time and space** of all trophic chain elements and specific habitat conditions. This continuity is essential for biodiversity conservation (Tudor Stancioiu, 2022)[19].

(**f**) **The tranquility period** acts as an extended protection regime—lasting at least 30 years and covering a minimum of 20% of the forest landscape—dynamic in its spatial location but continuously present within the same landscape. This provides favorable shelter and refuge conditions for wildlife.

## 4.2. Enhancing the resistance and resilience of forest ecosystems

The maintenance of (i) diverse mosaic structures at the landscape level, (ii) strong ecological connectivity, and the establishment, through (iii) natural regeneration, of (iv) vertically stratified, uneven-aged structures, combined with (v) the high level of characteristic biodiversity they support, together ensure the greatest resistance and resilience of forests against harmful climatic factors. Such diversified structures enable forests to better adapt to climate change. The forest ecosystem thus gains increased capacity for self-regulation and structural heterogeneity, making it more capable of withstanding environmental challenges such as strong winds, droughts, wildfires, or insect outbreaks.


*Fig. 24 .Dead wood, living forests*

[18] Smith, D.M., Larson, B.C., and Kelty, M.J., 1997. The practice of silviculture: Applied forest ecology. John Wiley and Sons. 560 pp.

[19] Stăncioiu, P.T., 2022. Biodiversity Conservation in Forest Management. În Giurcă A. and Dima, D.P. (Editors) The Plan B for Romania's Forests and Society (pp. 49-64). Transilvania University Press. Brasov, Romania.

## 4.3. Wood production focused on quality not quantity

Like most living organisms, trees exhibit accelerated growth during the early stages of life, after which this growth rate gradually declines with age. Once they reach old age, trees accumulate very little additional biomass. At the same time, their commercial quality (as determined by the mechanical and physical properties of the wood) deteriorates, as parts of the trunk begin to be affected by decay (cracking, rot, insect damage, and other defects).

For production forests, it is therefore important to determine the optimal age at which timber harvesting and forest regeneration should occur to initiate a new rotation period (production cycle). This ensures a balance between biomass production efficiency and the quality of the harvested wood—which is the primary objective of timber production.

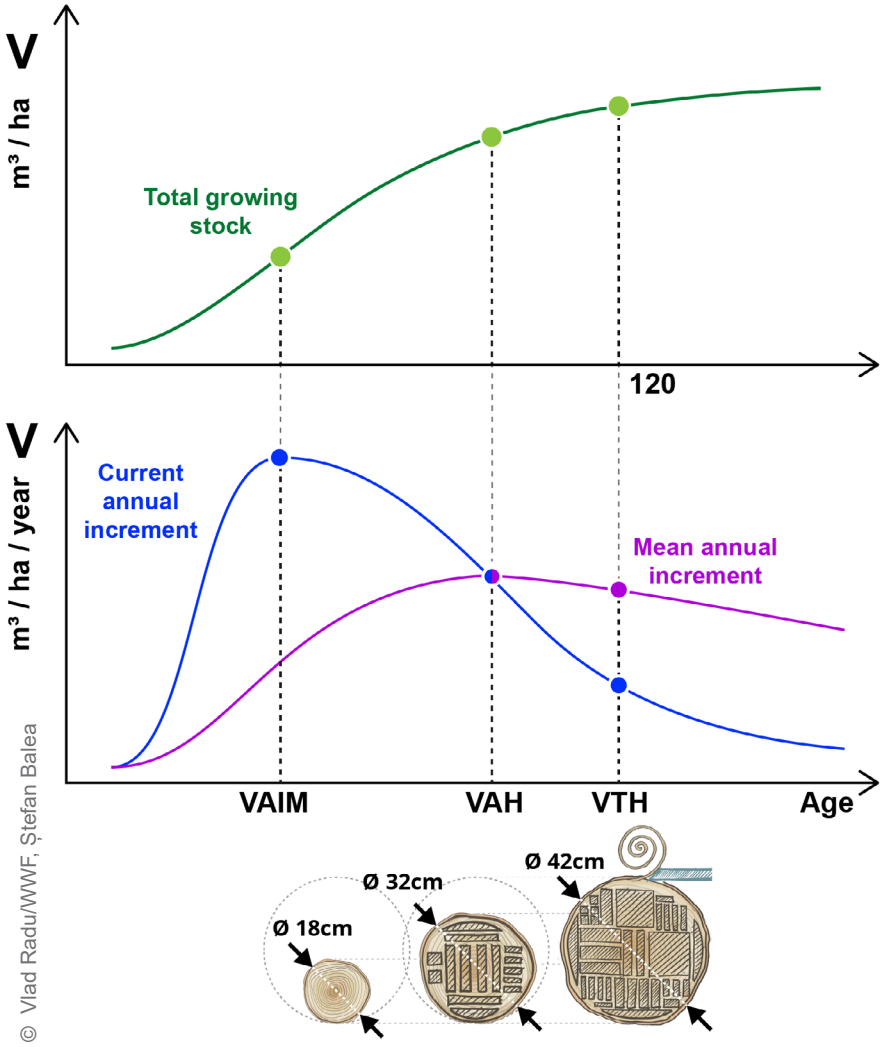



*Fig. 25. Volume growth dynamics - timber production by age.*

***VAIM (40)** - The age at which the current annual increase is maximum - not adopted in practice.*

***VAH (90)** - The absolute harvesting (rotation) age is the age at which the average annual production of undifferentiated timber reaches its maximum - it is not adopted in Romanian forestry practice.*

***VTH (120)** - The technical harvesting (rotation) age is the age at which the average annual production of wood of a given targeted wood assortment, becomes maximum. In Romania, the VTE is established by rules to optimise the production efficiency of "superior target-assortments".*

Romanian forestry **regulations establish an late harvesting age** (old forest stage) specifically to support the production of **high-quality timber assortments**—suitable for advanced processing in downstream wood industries into high value-added products with a long lifespan. This is why, in Romania, the management objectives for production forests **prioritize efficiency in obtaining superior-quality wood**, rather than maximizing raw biomass output. The system consciously **accepts a significant reduction in quantitative wood production efficiency** in order to achieve this **qualitative objective**.

If the objective of forest management in Romania were to maximize biomass (raw wood) production, the rotation cycle would need to be aligned with the age at which biomass accumulation reaches its peak—i.e., when the mean annual increment is at its maximum, typically around 70–90 years. If the sole interest would be timber production as a quantity, this is the point at which the forest rotation period should end, since the average annual growth rate begins to decline thereafter. However, it is important to note that Romanian forestry goes beyond this objective. It does not aim merely to maximize quantitative biomass production but instead prioritizes the production of **high-quality timber and the multifunctionality of forests**.

After the mean annual increment begins to decline, it remains at relatively high levels for a considerable period. By extending the harvesting age (the rotation), it becomes possible to obtain superior assortments of large-size timber. Thus, the forest is guided to continue developing for several additional decades—typically between 30 and even 80 years—in order to reach peak yield in the production of target assortments such as high-grade sawn timber, technical or aesthetic veneer, or resonance wood. The Romanian silvicultural system therefore requires in practice, through its regulatory framework, not only the quantity but especially the quality of timber, in order to ensure the production of high-value assortments that, once processed downstream, can yield maximum added value in the form of intensively manufactured wood products with long life cycle.

**Note**: It is important to emphasize that this entire period of extended harvesting age **overlaps with the tranquility phase** (see Chapter 4), during which interventions in the canopy are minimal. As a result, the tree trunk benefits from more consistent annual growth (**more regular annual increases**), which **enhances the quality of the resulting log**.

## The technical harvesting age is determined according to the production objectives pursued through forest management

The **technical harvesting (rotation) age** refers to the age at which timber is planned to be harvested through regeneration treatments in production forests. This age is determined as the point at which trees reach **maximum productivity** in producing **the specific wood assortment targeted as the production goal**. The technical harvesting age varies depending on species, local productivity (as determined by site quality), and—very importantly—on the intended end use of the wood (i.e. the target assortment for production).

For example, if the primary objective of planned production were pulpwood assortments, the forest would be managed on short rotations, favoring fast-growing species and possibly promoting vegetative regeneration through coppice. In contrast, if the target assortment is resonance wood—for musical instruments, for instance—the harvesting age may extend up to 180 years, focusing on the site-adapted native species grown from seed (natural regeneration).

This is why we must understand that **the way we valorize wood dictates the way we manage our forests**[20].

## Exemplu:

If the goal is to obtain large-dimension oak wood for barrel-making, this material cannot be sourced from oak logs at 40–50 years of age, as the tree trunk is still too thin and the wood quality is unsuitable for producing staves. At 80–90 years of age—when total biomass productivity is at its peak—the desired assortment might technically be obtained, but the efficiency of producing large-dimension wood assortment for stave-grade lumber would still be suboptimal, and sawing losses would be high. The optimal age for an oak forest to produce the desired assortment (i.e., "large-dimension, high-grade sawn timber") is at least 120–140 years, when log diameters exceed approximately 46–50 cm, allowing for good yield and quality in stave production.

It is true that such assortments could also be obtained by extending the forest's development beyond 200 years. However, at very advanced ages, tree trunks begin to degrade naturally (due to wounds, cracks, fungal decay, insect damage, etc.), leading to significant losses in wood quality—even though overall stand volume is higher and the trees are larger. Therefore, the production process for high-quality target assortments must be optimized by finding a constant balance between the forest manager's effort/costs and the long-term benefits gained through downstream wood processing. This is why, for an oak forest growing under favorable site conditions, the target assortments are "large and very large logs; veneer and high-grade lumber," and the harvesting age is set at 130 years (for pedunculate oak) or even 140 years (for sessile oak).

If the target assortment is "aesthetic veneer," the technical harvesting age would be 160–180 years. On the other hand, if the sole goal is to obtain firewood or low-grade construction logs for rural use, it may make sense to begin harvesting as early as 80–90 years.

[20] https://www.researchgate.net/publication/361566589_The_Plan_B_for_Romania's_Forests_and_Society

It may seem counterintuitive to non-specialists to understand why it is appropriate to deliberately harvest "old" or "more-than-a-century-old" trees in a planned manner. However, in the case of production forests, the alternative would be to harvest them while they are still young—meaning they would never reach the age of becoming "more-than-a-century-old." If we commit to harvesting trees only once they become mature or old, we ensure that forests will reach advanced developmental stages. Then, through regeneration cuttings, the forest's developmental cycle (rotation period) can begin again.

It is important to note that, in order to support the conservation of habitat trees and veteran trees even within production forests, the new Forest Code promotes the establishment of a network of aging islands—small "oases" that act as biodiversity hotspots and contribute to increasing the structural diversification of forests. In these designated areas, trees are allowed to follow their natural life course without intervention.

## 4.4 Superior valorization of wood is key to the economic efficiency of Romania's silvicultural system

Only through superior valorization of wood[21]—as sawn assortments with each type directed toward its appropriate industrial use—can maximum added value be achieved through advanced downstream processing. Proper sorting of timber before market entry is essential to ensure that the superior target assortments obtained are channeled into the appropriate industrial applications, thereby maximizing the economic efficiency.

This is the only way to give sense to the efforts that forestry has been steadily making for more than a century.

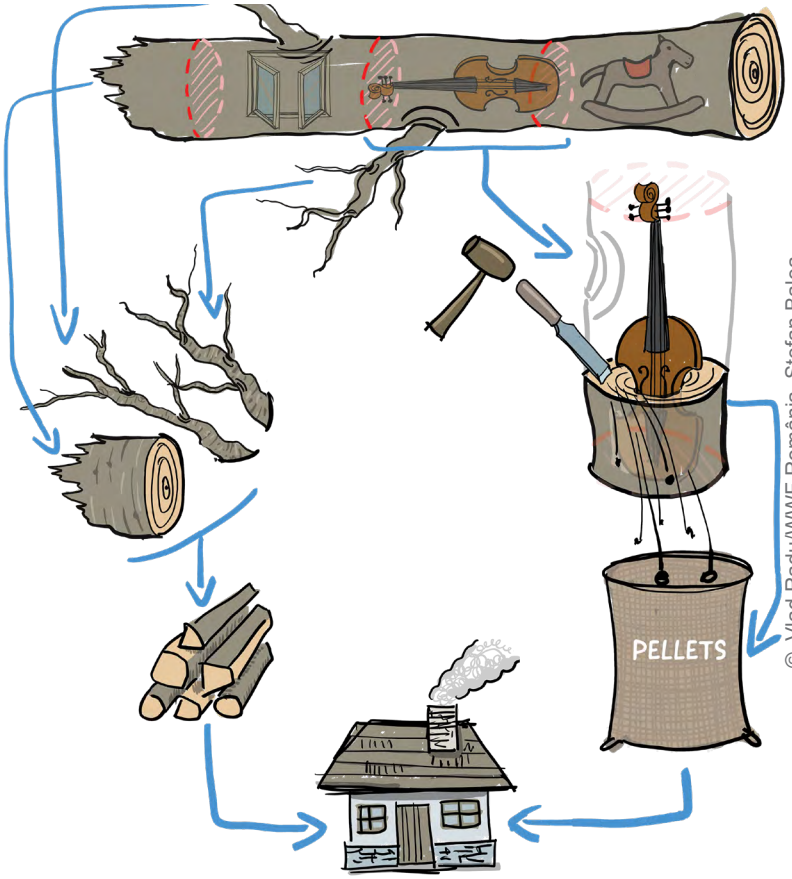



*Fig. 26. Illustration of high value added use for wood*

If we aim to "get more from less" (referring here to the volume of harvested wood), it is essential to promote superior valorization and processing of timber—based on high value-added (as emphasized in the EU Forest Strategy for 2030). This should be a core strategic direction, clearly reflected and actively supported in practice through national forest policies. As we can see, this approach is necessary not only for reasons of economic efficiency and competitiveness but also to sustain a close-to-nature silvicultural system—one that delivers multiple environmental benefits as well.

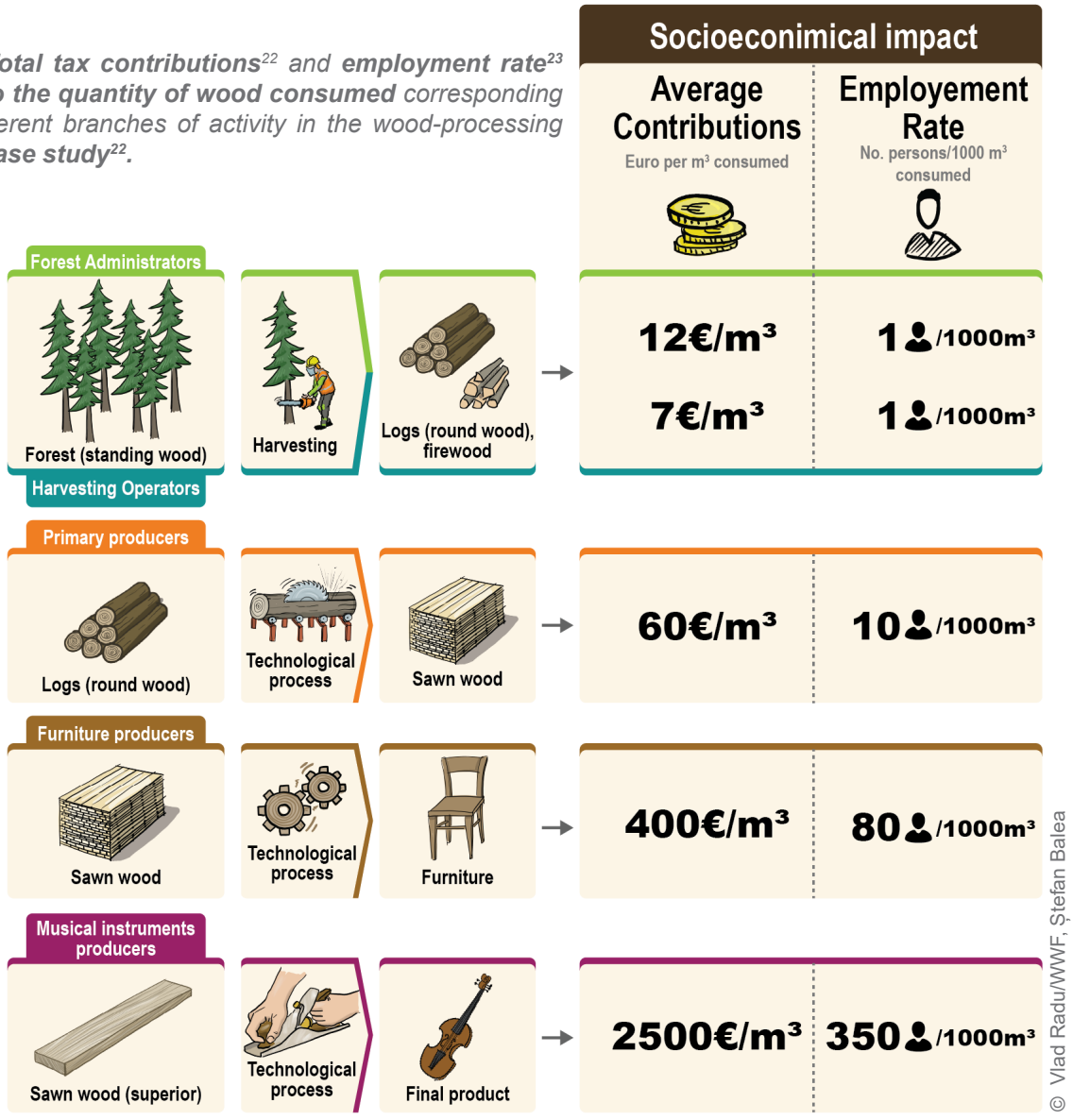
[21] According to Government Decision No. 715/2017 approving the Regulation on the valorization of timber from publicly owned forests, "superior valorization of timber" is defined as: "the valorization of timber carried out by forest administrators in the form of assortments of processed (sawn) roundwood, whereby each assortment is assigned the appropriate industrial destination that allows for the highest possible added value to be achieved."

## 4.5 Socio-economic benefits for society

The "alchemy" of transforming wood into "green gold" lies in **the added value generated** through advanced processing—and this value is **directly proportional** to the total amount of **taxes paid** to the state (including employee social contributions, corporate income tax, local taxes, environmental levies, etc.) **relative to the volume of wood consumed** by an operator or group of operators.

To highlight the socio-economic contribution of a silvicultural system focused on efficiently producing superior target assortments and the benefits of local superior wood processing into high value-added products, WWF-Romania initiated a case study aimed at quantifying the total taxes paid to the state across various "business models" representing different segments of the wood processing industry. To collect the data, a questionnaire was distributed to several categories of economic operators, and the information was extracted from each company's annual financial statement and the national wood traceability system (SUMAL).

*Fig. 27. **Total tax contributions**[22] and **employment rate**[23] **relative to the quantity of wood consumed** corresponding to the different branches of activity in the wood-processing sector - **Case study**[22].*




[22] Total tax contributions: tax on profit and other taxes, tax on income from salaries, tax on dividends, special funds taxes and similar payments, other state budget liabilities, income tax on purchases from individuals, labour insurance contributions, CAS, CASS, other social insurance expenses, building tax, land tax, means of transport tax, company tax, sanitation tax, operating permit tax, expenses related to sponsorships and donations, expenses related to disasters and similar events, expenses related to environmental protection.

[23] Employment rate: the total number of direct jobs related to the amount of wood consumed (average data based on several case studies); expressed as the number of jobs per each 1000 cubic metres of roundwood equivalent, consumed/processed.

[24] Disclaimer! The data are not statistically relevant to be representative at national level, the figures refer only to the sample captured. The results of this study are presented by way of example.

The data clearly demonstrates that the intensive processing of high-quality timber assortments provides the greatest socio-economic contribution—both in terms of total taxes paid to the state and the employment rate relative to the volume of wood consumed—provided the material is used appropriately. For instance, a single cubic meter of high-quality wood transformed into musical instruments can generate a greater socio-economic return than 40 cubic meters processed into lumber or 200 cubic meters exported as raw logs.

Moreover, within the wood value chain—from forest to final product—these contributions accumulate. Each vertical value chain depends on the level of wood processing. This is where the real tragedy lies: the superior wood assortments, obtained through substantial silvicultural effort, often no longer reach their appropriate industrial destinations. The export of unprocessed wood or the unsustainable use of superior assortments results in the loss of jobs for the local community, and added value that could otherwise be generated through superior processing.

The sustainable management of a natural resource can only be achieved when local communities benefit from it. Long-term solutions can only be conceived and implemented when those communities both understand the necessity and experience the positive outcomes of processing that resource.

It is therefore a matter of public interest what happens to the wood resources harvested from publicly owned forests. Society has already shown that it understands the importance of high-value wood utilization. What remains is for policymakers—the ones in charge of decision-making—to recognize this as well, particularly when drafting the new regulation for the valorisation of timber from public owned forests.

## 4.6 Adapting to a changing industry

### The production of superior target assortments involves obtaining multiples of wood assortments.

When harvesting trees intended for the production of high-quality large-size assortments, the entire range of wood assortments is implicitly obtained. From a tree selected for producing aesthetic veneer, for example, we will not obtain only veneer-grade wood. The harvest will also include high-quality sawn timber, industrial wood for panel production, pulpwood, and firewood (wood fuel). By contrast, in forests managed solely for pulpwood production—where the technical harvesting age is around 60-80 years—it is simply not possible to obtain veneer logs, timber beams for traditional construction, carved or bentwood furniture, barrels, or wood suitable for violins and other musical instruments.

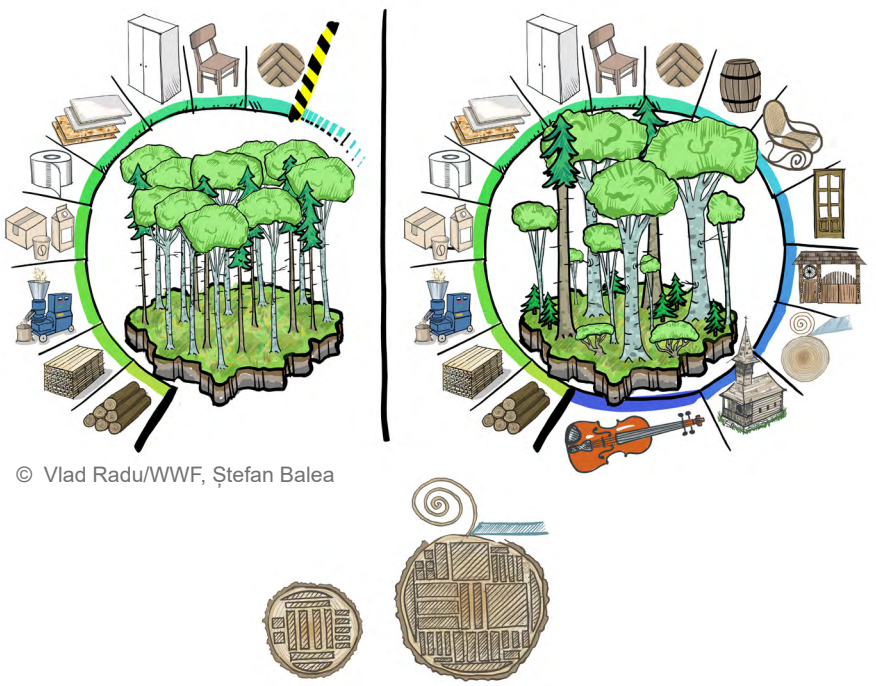


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*Fig. 28. When close-to-nature silvicultural practices go hand in hand with the sustainable use of wood: Resilient forests = resilient forest-based bioeconomy. Small-diameter logs harvested through short production cycles typically yield wood products with a shorter lifespan—such as firewood (woodfuel), paper, wood panels, or certain types of furniture. However, only large-dimension, high-quality logs can provide the raw material for curved wood furniture, wine barrels, joinery components, and traditional timber construction. N.B. We all remember that the reconstruction of Notre-Dame Cathedral in Paris was delayed after the fire—until suitable oak logs could be found to craft the massive beams for the roof.*

- Close-to-nature silvicultural practices support biodiversity and enable the development of a diversified forest-based bioeconomy—one that can more easily adapt to changing market demands. The more diverse the supply of wood as a renewable natural resource, the greater the potential for diversifying activities within the wood processing sector.
- The sector focused on processing large-size timber assortments is currently represented primarily by small and medium-sized enterprises (SMEs), which adopt high value-added processing solutions. These businesses generate a greater local socio-economic contribution compared to the highly industrialized processing of small-size logs. Strengthening SMEs is essential for developing a resilient forestry sector—one that is better equipped to adapt to dynamic changes in the market.
- Large-size target assortments offer a significant competitive advantage on the market for superior wood products—with high economic value and long life service.
- These assortments make it possible to obtain the materials needed for traditional constructions, such as wooden churches, traditional wooden gates, and wagons

## The production of high-quality large-size timber assortments allows for adaptability to various macroeconomic trends.

The world is in constant flux. Change is accelerating, and shifting macroeconomic trends are increasingly deepening the lack of predictability—even within the bioeconomy sector.

Forestry, however—unlike annual agricultural crops—requires long-term production planning that spans decades or even centuries (see long production/rotation cycles). In Romania, a forest is managed by at least five generations of foresters before reaching harvestable age, all working under the same overarching forest management planning aimed at producing high-quality large-dimension timber assortments (superior wood assortments). In this context, it becomes clear that the most effective way to adapt to shifting economic trends is to ensure continuity in forest management through long production cycles (rotation periods) that yield large-dimension timber assortments, following the principle "from large, one can easily make small."

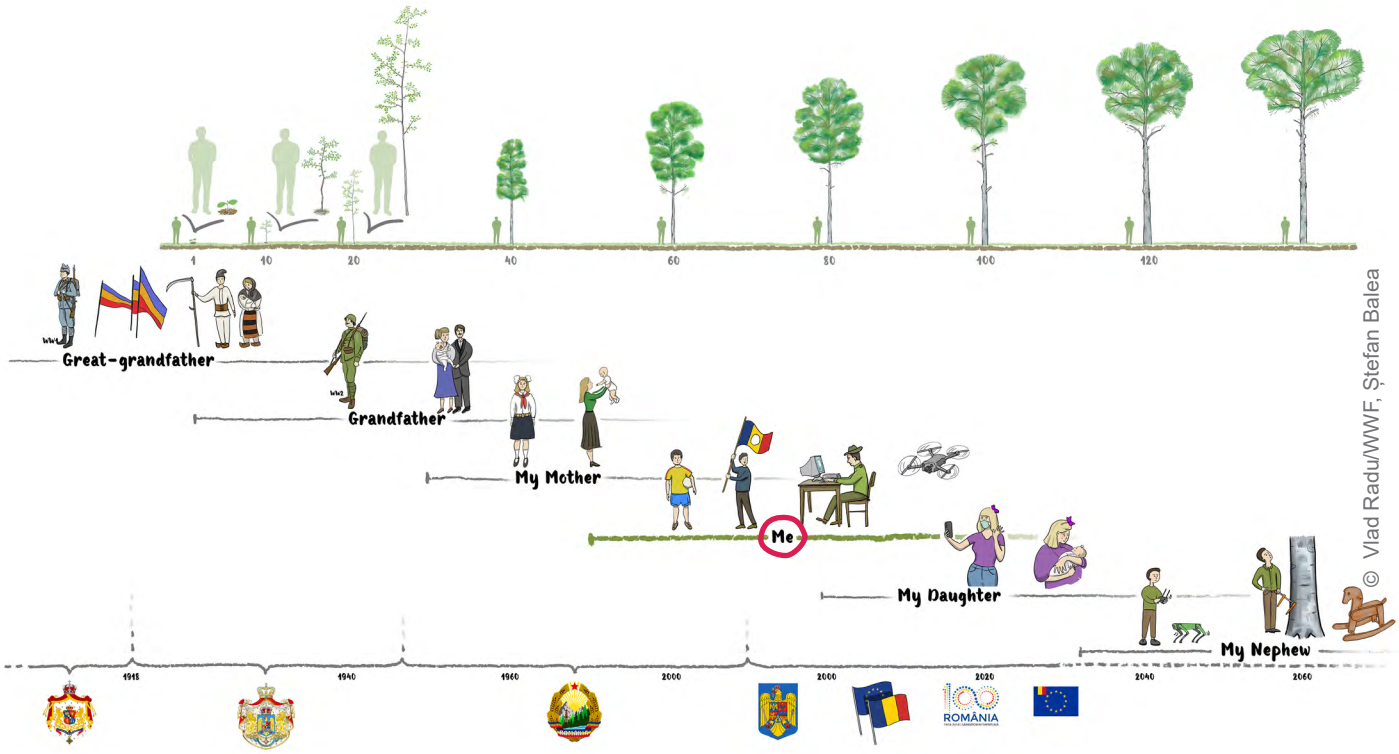


*Fig. 29. Managing forests through long production cycles is a powerful symbol of intergenerational solidarity. The one who plants a forest will not harvest it, and the one who harvests did not plant it. At least five generations of foresters follow the same overarching forest management planning, all working toward the same production objective.*

A hasty decision to shorten the rotation period for short-term economic gain is, in practice, an irreversible one. Once the cycle is shortened, society must wait several decades without harvesting wood in order to restore a balanced age-class distribution. In reality, this is nearly impossible given current socio-economic conditions and the critical importance of wood for society.

## 4.7 "Cleaner" products that support climate neutrality

### Maximizing carbon sink and storage in forests

When adopting long production cycles that exceed the age at which biomass accumulation reaches maximum efficiency (see Fig. 22), forests continue to sequester and store carbon for several more decades—typically 30 to 90 additional years—while developing the attributes of mature and old-growth forests. Romanian forestry thus supports a positive carbon balance by proposing an optimal equilibrium between carbon sink and storage within the forest, through sustainable timber production, and further complemented by long-term carbon storage in solid wood products.

### Maximizing carbon sequestration in long-lived wood-based products

Superior wood target assortments are primarily intended for advanced processing into solid wood, which is integrated into long-lived products. In this way, the life of the wood continues beyond the forest—through products such as timber constructions, joinery components, carpentry, and furniture—storing carbon for another 50 to 500 years, or even longer. These long-lived wood products support the cascading use of wood and lay the foundation for a sustainable circular forest-based bioeconomy, as they can be reused, repaired, or recycled into new wood products. Their final use should ideally be for energy generation, contributing to climate neutrality.

### Reducing the carbon footprint of wood processing – cleaner product

High-quality solid wood assortments reduce energy consumption—and thus carbon emissions—associated with the production of finished products. Today, modern wood processing techniques can produce wood products from smaller pieces, through joining, pressing, or gluing. However, every additional cut, machining step, or bonding material increases energy use and involves chemicals. It is well known that solid wood is a "cleaner" material: it commands higher market value, its use is healthier for the user, and gives a more comforting feeling.

A forest-based bioeconomy focused on superior wood processing can both support and be supported by close-to-nature silviculture. The forest bioeconomy model being promoted is both a cause and a consequence of a close-to-nature forest management.

# Chapter 5

# Challenges in implementing the Close-to-Nature silvicultural system established by the forest management regime

**Some of the healthiest, most biodiverse, and most resilient forests in Europe are found in Romania and across Southeast Europe. The existence of this natural heritage in the region is neither a coincidence nor a result of limited logging capacity. It is owed to the high national standards for forest management that Romania and other countries in the region have upheld over the years—even though implementation continues to face a series of challenges.**

Unfortunately, at a time when the European Union is explicitly orienting itself toward closer-to-nature forestry[25], the continuity and enhancement of these already traditional practices are increasingly being called into question in Romania[24]. It is therefore essential to understand the nature of these challenges so that we can design the most appropriate solutions to encourage the adoption and continuation of responsible silvicultural practices.

The following section outlines several of the most pressing challenges.

## (5.1) Implementing the national forest management regime entails significant additional efforts and costs that forest owners/administrators must bear on their own—within the context of a common market.

Because these **requirements are stricter than those in other regions**, they **generate additional costs** which, when operating **within a shared European market**, can **negatively impact** the short and medium-term **competitiveness** of forest owners/administrators and **the local wood processing sector**.

The revenues of forest owners and managers come primarily from the sale of harvested timber. However, Romania's silvicultural system leads to a sustainable design of wood harvests with an intensity well below the European average. This reality has triggered constant pressure to amend the forest management regime in order to alter the fundamental elements that define Romania's close-to-nature forestry model—specifically, to legally increase the volume of timber that can be harvested.

[25] https://op.europa.eu/en/publication-detail/-/publication/2d1a6e8f-8cda-11ee-8aa6-01aa75ed71a1

[26] https://wwf.ro/paduri/black-day-for-forests/

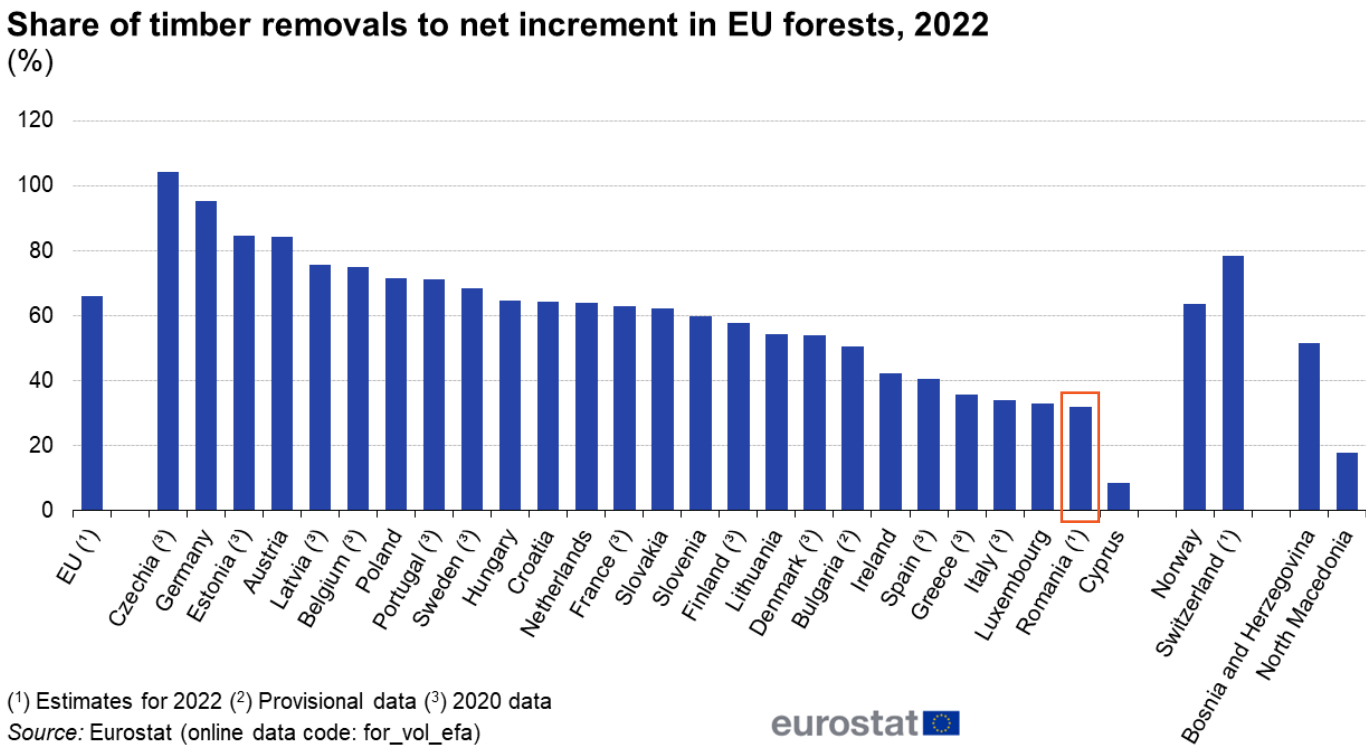


*Fig. 30.* ***Example****: As a result of applying close-to-nature silvicultural practices—such as long rotation periods, age-class–based harvest planning, tranquility periods, silvicultural treatments, and multi-functionality principles—the planned wood harvest rate in Romania remains below 37% of the forest's current annual growth. This is significantly lower than the EU average, which approaches 70%.*

In the absence of genuine (public or private) support for implementing these more demanding standards, more and more forest owners and managers are beginning to question why they should continue to shoulder the burden of delivering forests' multifunctional benefits—at the expense of their own economic viability. These legitimate concerns are compounded by the interests of the primary wood processing industry, which can often be summarized in two words: "more and cheaper" when referring to the primary wood resource. These objectives, however, are only achievable through "adjustments" to national legislation and the lowering of legal standards, aimed at allowing more intensive harvesting. The most accessible ways to do this would be to shorten rotation periods (production cycles), eliminate tranquility periods, and abandon the principle of sustained yield (continuity). All of these changes would represent a departure from the foundations of close-to-nature silviculture and the abandonment of the multifunctional role of production forests. Such changes could legally triple the allowable harvest. More timber harvested means higher revenue for forest managers and owners, even if the unit price decreases due to increased supply. However, while higher harvested volumes may bring **short-term gains** for forest owners or administrators, the real beneficiary would be the primary wood processing industry, which would benefit from the lower unit prices caused by market saturation. Romania has already experienced this dynamic during the second wave of forest restitution (2001–2007), when the market was flooded with wood—much of it harvested illegally—and timber acquisition prices in Romania fell to levels incredibly low compared to the EU market at the time.

## (5.2) High-quality large-dimension timber assortments often fail to be used by the wood processing industry for the very purposes for which the forest was managed.

In Romania, this situation is primarily due to the near-universal reliance on the stumpage (standing timber) sales system, which undermines the potential for superior valorization of wood[27].

[27] **Superior valorization of wood** is defined (HG 615 /2017 - Regulation on the valorisation of timber) as the sale of timber in the form of assortments of sawn timber, whereby each assortment is given the appropriate industrial destination that maximises the added economic value and the cascading use of the timber.

This is further compounded by the dominance of market models focused on primary wood processing or the use of wood for energy purposes (e.g., wood fuel, biomass). The starting point for proper cascading use of wood is the implementation of a sales system based on clearly defined assortments when wood is introduced to the market. However, the current stumpage sales system used by public forest administrations presents a major obstacle to higher-value added wood utilization. Without proper sorting of timber, the added value that could be achieved through superior processing is not guaranteed, and cascading use is undermined from the very beginning of the wood supply chain. As a result, **much of the superior timber assortments**—carefully planned for in forest management plans—**fails to end up in high-value-added products** due to insufficient sorting and inadequate differentiated utilization.

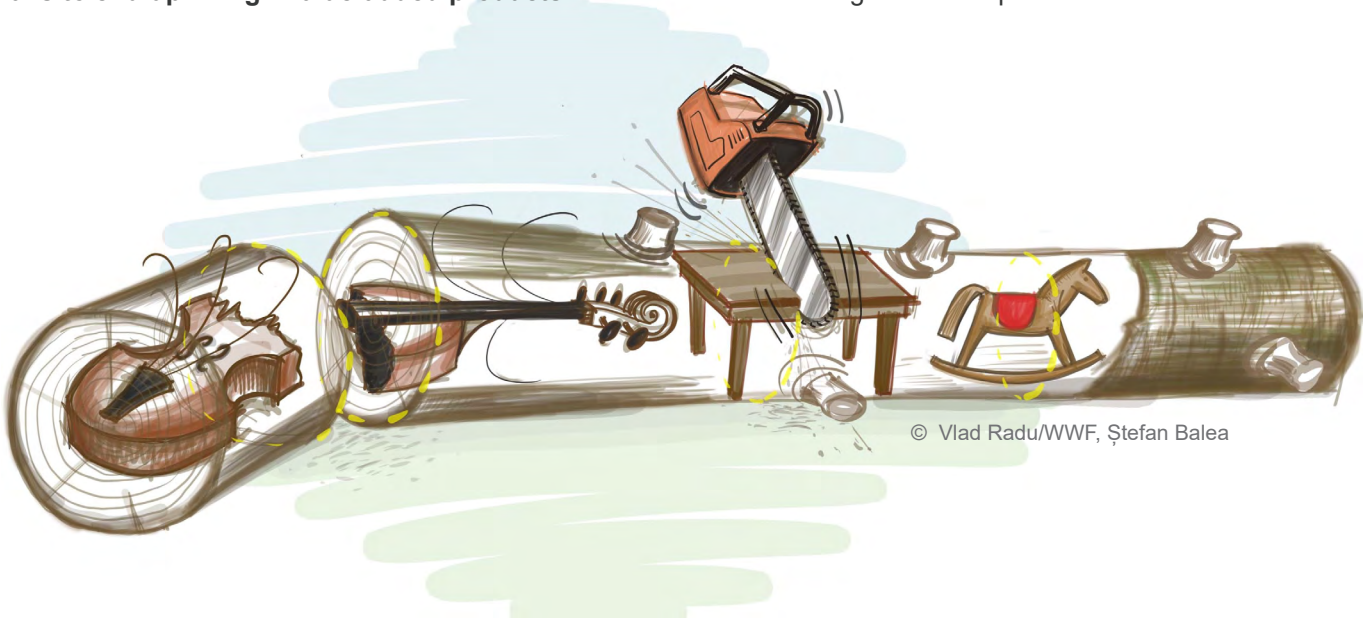


*Fig. 31. Without proper timber sorting, superior assortments cannot be directed to the appropriate industrial uses that would allow for the maximization of their added economic value and the entire forest management effort is economically undermined.*

It is important to note that for more than 100–180 years, forest production in Romania has been oriented toward obtaining high-quality large-dimension timber assortments—at the expense of maximizing the quantitative output of raw wood mass (see Chapter **4.3**). This means that if the superior assortments produced (e.g., aesthetic veneer, resonance wood, or high-quality lumber for furniture) are given the same industrial destination as lower-grade assortments (e.g., wood fuel or wood chips and particles for fibreboard production), the entire economic efficiency underpinning this silvicultural system is lost—especially in the case of production forests. In other words, "we're casting pearls before swine."

When national policies fail—on one hand—to compensate private forest managers for maintaining this ambitious system and—on the other hand—to incentivize the appropriate industrial use of the superior assortments it produces, it is no surprise[28] that more and more managers are questioning the rationale behind maintaining such a system through binding regulations.

## The main challenges and obstacles for superior valorization of wood include:

- The overwhelming reliance on stumpage sales, a widespread system that creates systemic conflicts of interest;
- Poor forest infrastructure and logistics, such as the lack of log landing platforms and designated log yards, underdeveloped road and cable transport networks, and insufficient access to modern, environmentally friendly logging equipment;
- Limited administrative capacity of small operators to manage differentiated wood valorization (due to small annual harvest volumes, scattered harvesting sites, and limited technical resources);
- Rising energy costs and competition from the firewood (wood fuel) market;

[28] https://wwf.ro/noutati/blog/new-forestry-code-risks-leading-to-logging-liberalization/

- A wood market dominated by the primary processing industry, which is likely oversized relative to resource availability and whose business model relies on the highly technologized consumption of large volumes of undifferentiated wood—often exerting market pressure for bulk timber acquisition;
- Non-competitive market practices, including violations of competition rules;
- A shortage of skilled personnel specialized in proper wood sorting.

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*Fig. 32. Less than 10% of the timber harvested at national level ends up in top-end high value-added wood products (illustrated, for example, in blue). The majority of the harvested volume is primarily used as firewood, energy biomass, wood chips for panel manufacturing, or basic lumber.*

## (5.3) Lack of predictability and incoherent forest policies at the national level, compounded by the absence of dedicated financial support from EU public funds

Managing forests under long production cycles (rotation periods) requires long-term predictability and stability—often spanning multiple successive political regimes (see Section 4.6, Fig. 26). This stability is essential for maintaining the foundations of forest planning and for preserving the administrative integrity of areas considered part of the same forest landscape (i.e., Production Units). However, over the past 35 years, forest legislation, administrative fragmentation, and shifting ownership structures have been in constant flux. These changes have posed major challenges to the consistent application of sustainable forestry practices (see, for example, the altered age-class structure at the landscape level due to forest restitution—discussed in Section 3.8).

Unfortunately, the chaotic restitution process—one of the main drivers of illegal logging in Romania—is poised to enter a new phase, involving the "privatization" of forests that have always been publicly owned[29]. As a result, the association and cooperation of small private forest owners is not being incentivized, and the fragmentation of the national forestland continues unabated—at a time when the endless cycle of administrative reform in forestry remains unresolved.

Emerging from decades of state monopoly, Romania's public policy framework has failed to adapt to the new socio-economic realities and the competitive environment of the EU common market in which it now operates.

Over the past 35 years, forests have been met with nothing but expectations—many of them legitimate, yet unsupported. Responsibility and care for forests cannot be achieved solely through legal mandates; they must also be backed by meaningful support. Unfortunately, such support has failed to materialize—neither from public funds nor from the private sector, which has often profited from the ecosystem services provided by forests. As a result, the entire burden of conservation and the implementation of high-quality standards to fulfill the multifunctional role of forests still falls solely on forest owners and managers.

This situation demands reflection. Agriculture, although not particularly high-performing in many areas, has benefited from substantial and dedicated financial support. One must ask: where would agriculture be today without public subsidies? And yet, despite receiving subsidies, agriculture is increasingly shifting toward intensive production models. Meanwhile, Romania's forestry sector, in the absence of any systematic support, has managed to remain close to nature. Is this not a compelling argument for dedicated support to such close to nature forestry?

[29] https://wwf.ro/paduri/wwfs-proposals-for-new-forestry-code/

When high standards are imposed on forest management (i.e., high expectations), without providing real support for conservation efforts, it is unrealistic to expect consistent excellence in legal compliance. Many of the problems facing Romania's forests stem from a lack of support in implementing a much stricter silvicultural regime than is required in other regions—or in other sectors, such as agriculture.

## (5.4) Controversies surrounding the protection of mature and old forests with a high degree of naturalness—resulting from the application of close-to-nature silvicultural practices (even if passively, during the decades-long "tranquility period")—often arise from a common confusion: these forests are mistaken for ancient (primeval), Old-Growth forests

Old-Growth Forests must not be confused with mature/old forest stands that have been deliberately managed[30] to reach such stages. Unfortunately, conceptual and definitional ambiguities surrounding what constitutes an "old-growth forest" persist, often misleading public debates and perceptions. When people think of an old-growth forest, many may picture only dense woodlands with a diversity of tree species and age classes, majestic trees, deadwood covered with moss and fungi, rare wildlife, and the absence of anthropogenic interventions for decades. **It is important, however, to recognize that this is just an archetype**. Indeed, these are characteristic elements of old-growth forests. **But in reality, all these features can also be found in well-managed production forests**, where a close-to-nature silvicultural system has been applied, aimed at producing high-quality large-dimension timber, enhancing conservation values, and increasing forest resilience to climate change[31] .

Because close-to-nature forest management is relatively common in Romania, managed forests tend to reach structural characteristics similar to those of old-growth forests.

Given the specific characteristics of the forest management system in Romania (i.e. long rotation ages, periods of tranquility, promotion of natural forest types, etc.), it should not be implied that managed forests classified in the higher age classes (over 120–180 years) automatically have a high conservation value that requires strict protection status. Such an assumption would risk the abandonment of these good practices, which would in fact contradict the very objective of biodiversity conservation through the promotion of close-to-nature silvicultural practices.

By establishing age as the main criterion for prohibiting the harvesting of forests with trees older than 120 or 140 years, timber harvesting will be redirected toward younger forests to meet market demand. This will generate significant negative side effects. If harvesting is not permitted beyond this age threshold, production forests will be managed on shorter rotation cycles (harvesting of younger stands), thus increasing the quantity of wood available for exploitation. Within a few decades, Romania's production forest stock will consist only of young forests, with all the associated climate and biodiversity disadvantages. This would be, in practice, an irreversible process. Society cannot afford to wait decades with no timber harvesting just to bring forests back to a natural structure with ages of 120–180 years. Moreover, forest owners will not be willing to manage forests toward such structures only to have them eventually placed under protection as well.

In order not to undermine the application of these close-to-nature practices across the vast majority of production forests, it is necessary to apply clear criteria and indicators for the designation of strictly protected areas (N.B. more than just the age of the trees), which also take into account the national specific features of the forest management regime.

[30] https://wwf.ro/paduri/old-growth-forests-in-romania/

[31] https://wwf.ro/paduri/new-interests-in-protecting-old-growth-forests/

# Chapter 6
# Necessary solutions for promoting the close-to-nature silvicultural system

## 6.1 Adequate financial support:

- Given its significant impact on people and the environment, forestry should be recognized as a **strategic sector** both at the national and European level, within the future Multiannual Financial Framework of the EU for the 2028–2034 period. To ensure alignment with the European Union's strategies and legislative obligations, the support needs of the forestry sector must be integrated from the earliest stages of budget planning. **Dedicated financial support is needed for sustainable forest management**, enhancing climate resilience, compensatory mechanisms for forest owners/managers facing management restrictions, advancing research and innovation, strengthening institutional capacity, and promoting a sustainable circular bioeconomy — all with the aim of increasing the competitiveness and resilience of a sector that stands as an economic, cultural, and ecological "flagship" in many European regions.
- Without dedicated financial allocations tied to the achievement of clear performance indicators—regardless of the level of ambition set by national legislative frameworks—the attainment of the EU's key objectives, such as climate transition, biodiversity conservation, sustainable economic growth, competitiveness, or innovation, will be difficult, if not impossible. Although forests represent a strategic sector essential for sustainability and development, they remain chronically underfunded. This underfunding hampers efforts to meet international commitments and to ensure sustainable livelihoods for the communities that rely on the renewable natural resources provided by forests.
- **Establishing compensatory financial mechanisms for ecosystem services** is essential—ensuring that the value of services provided by forest ecosystems, maintained through the protective functions of forests, is also covered by the direct or indirect beneficiaries, particularly when they derive economic gains from these services ( the implementation of the "beneficiary pays" principle). We draw attention to the fact that this principle (the establishment of schemes for compensatory payments for environmental services) is explicitly promoted at the European level through the **EU Forest Strategy for 2030**.
- Public procurement policies should be designed to stimulate the use of wood products with high added value and long lifespan (e.g., through the Social Climate Fund, which can finance building renovation and energy efficiency measures). At the same time, sustainability criteria must be applied for the biomass intended for energy production, ensuring that forest resources are utilized in a responsible and climate-smart manner.

## 6.2 Forestry policies that intertwine the continuity of close-to-nature silvicultural practices and administrative efficiency

- **What we want from Romania's forests is already clearly outlined in the National Forest Strategy 2030**[32]. Romania now has a clear strategic direction for the reform of its forestry policies, and this "red thread" must be followed closely. It is essential that close-to-nature silvicultural practices—applied consistently for over a century and which have enabled the country to preserve its priceless natural heritage—be preserved within the Forestry Norms that are currently under revision. At the same time, forestry policies must ensure coherence, predictability, and administrative efficiency by reducing excessive bureaucracy and eliminating unnecessary administrative burdens.

[32] https://wwf.ro/paduri/the-national-strategy-for-forests-2030-finally-sets-the-red-line/

- Furthermore, to equitably integrate biodiversity conservation into forest management, it is essential to transpose the new conservation approaches and mechanisms—introduced by the revised Forest Code—into technical norms and best practice guidelines. These include: the retention of "habitat trees" (veteran trees), the creation of a network of "aging islands", the enhancement of "ecological connectivity", the safeguarding of "biodiversity elements", and the protection of forest vegetation along watercourses. All these measures must be designed in a way that contributes to the restoration of forest ecosystems, enhancing their biodiversity and resilience, in line with the objectives set out in Regulation (EU) 2024/1991 on Nature Restoration.
- We consider it justified that, for small forest holdings, owners should have the opportunity to contribute to decisions concerning forest management planning and implementation (e.g., selection of target assortments for production). However, this should only be permitted under sustainable conditions—by applying a new set of technical norms (e.g., selection system / continuous forest cover forestry), which must include clearly defined and easily monitored performance indicators (e.g., maximum harvestable volume, minimum stand basal area, target species composition, etc.). These measures aim to (i) prevent the cumulative impact of regeneration fellings at the forest landscape level, and (ii) ensure continuity in sustainable wood harvesting and predictability for the market.
- The reform of the control system should aim to shift from the current model—focused on the marking and guarding of standing trees in the forest—towards a system based on the control of timber volumes at the first placing on the market. Payments for contracted and harvested timber should be made exclusively for the quantities of wood officially declared when entering the market, not for the standing volume estimated through pre-harvest assessments. This approach represents the essence of a genuine reform in forest administration—one that can deliver the long-awaited simplicity, transparency, and efficiency, with direct implications for the regulation on the valorisation of timber, the regulation on forest guarding, and the overall architecture of the national system for combating illegal logging.

## 6.3 Clear regulations on the valorization of timber from publicly owned forests, in line with the provisions of the National Forest Strategy 2030 (NFS2030)

- Facilitating access to forest resources for businesses operating in forestry-related sectors, based on their contribution to the socio-economic development of local communities (NFS2030 – DSA3). Establishing clear mechanisms to enhance the forestry sector's contribution to the sustainable socio-economic development of local communities, through vertical value chains, relative to the amount of wood consumed.
  - » Establishing the possibility for public auctions of timber from publicly owned forests to apply additional awarding criteria—not limited solely to the direct price offered for the raw wood resource, but also considering the local socio-economic contribution generated through the vertical value chains of timber harvesting, processing, and marketing, relative to the quantity of wood consumed.
  - » For the commercialization of processed roundwood by forest administrators managing publicly owned forests, a National Catalogue of Industrial Roundwood Assortments should be established, promoting an appropriate (minimum) sorting standard to support the higher-value utilization of wood.

Only by promoting the principles of cascading use—through value-added processing chains that produce long-lasting products embedding the highest economic value—can we effectively reduce pressure on forests and support close-to-nature forestry systems planned to yield high-quality, large-dimension wood assortments (Note: which result from long rotation cycles). The silvicultural effort is only truly rewarded when these superior assortments are valorized at their full worth. This is the only way to ensure the economic viability of a system focused on the quality of wood assortments, rather than on maximizing the volume of harvested biomass.

## 6.4 Basic investments in forest infrastructure are essential to enable the superior valorization of wood and the application of intensive silvicultural systems.

- Supporting investments in environmentally friendly forest logistics and infrastructure is essential, given that this sector is severely underdeveloped in Romania. The density of the forest road and compliant access network is significantly below the required level—likely the lowest in Europe. As a result, logs are legally extracted by skidding or semi-skidding over very long distances (approximately 3 million m³ over distances greater than 1.5 km, 2 million m³ between 1–1.5 km, and about 5 million m³ between 500 m and 1 km). Moreover, due to the lack of organized log landing platforms, harvested timber is often stored and handled along roads and valleys. This practice has a major negative impact on soil resources, water quality, natural regeneration, and the remaining stand, as well as on the actual quality of the harvested wood. Over time, these effects lead to decreased forest resistance and resilience, and increased carbon emissions—including those from high fossil fuel consumption during extraction.
- Environmentally friendly forest infrastructure also involves logistical systems such as cable yarding lines (aerial cableways), the construction of log landing platforms, and designated wood depots that allow for the proper storage, handling, and sorting of timber under optimal environmental and economic conditions.
- Moreover, without an adequate access network, it becomes practically impossible to apply intensive silvicultural regeneration treatments such as single selection or group selection systems, which are designed to create uneven-aged forest structures—especially where such treatments are justified to enhance the forest's protective functions.

It is essential to establish the necessary conditions that allow for the proper sorting of harvested timber—**the first step toward cascading use and superior valorisation of wood**. These investments must ensure economic efficiency while remaining fully aligned with the "do no significant harm" principle in relation to the environment.

## 6.5 Clear criteria and indicators for the designation of strictly protected areas, reflecting the national specificities of the forest management regime.

- The designation of strictly protected areas for the implementation of the EU Biodiversity Strategy (10% target) must give priority to all forests that meet the criteria for virgin and quasi-virgin forests, as defined by national legislation aligned with the Carpathian Convention's agreed guidelines[33]. All such forests fall within the scope of the Guidelines on defining, mapping, monitoring and strictly protecting Primary and Old-Growth Forests in the EU, adopted by the European Commission[34].
- The identification methodology approved by the authorities for designating strictly protected areas[35] broadens the scope of forests eligible for strict protection, based on their high degree of naturalness. At the same time, it clearly distinguishes between forests with natural structures that have been deliberately maintained or managed as a result of planned close-to-nature forestry—precisely to avoid undermining their continuity. In this regard, the methodology also proposes the designation of other forests with a high degree of naturalness that do not qualify as Old-Growth Forests (i.e. they do not meet all the criteria and indicators established by national legislation for identifying virgin and quasi-virgin forests), but which: (i) fulfil a minimum set of naturalness indicators, and (ii) provide multiple protection functions (for which wood production is not regulated and whose management is compatible with a strict protection regime). These forests are proposed to be designated under a strict protection regime — "non-intervention" — precisely to allow the restoration of structural characteristics typical of Old-Growth Forests, without undermining the continuity of close-to-nature practices for forests where the production process has been regulated[36].
- Ensuring a transparent and participatory process that enables the proactive involvement of forest owners and administrators in the development of proposals for the designation of strictly protected areas, in line with the principles outlined in the Identification Methodology and the National Forest Strategy 2030, approved by Government Decision no. 1227/2022 (Objective 3.2).

[33] http://www.carpathianconvention.org/topics/sustainable-forest-management-2/

[34] https://environment.ec.europa.eu/publications/guidelines-defining-mapping-monitoring-and-strictly-protecting-eu-primary-and-old-growth-forests_en

[35] https://www.madr.ro/docs/PNRR/2025/Metodologie-criterii-ACTUALIZAT.pdf

[36] https://wwf.ro/paduri/methodology-for-strict-protection/

## 6.6 Strengthening unitary forest landscape-level management

- Promoting unified forest planning at the level of Major Forest Units (MFUs), using the National Forest Register.
- Encouraging the association of small forest owners to enable effective forest guarding and responsible forest management. Establishing a new institution/association ("National Commons"), inspired by indivisible and inalienable associative ownership models, intended for small, administratively fragmented forest owners (whose forests cannot be sustainably managed individually), with dividend allocations for owners (after clarification of legal ownership), guaranteed by the state from the moment of taking the areas for administration purposes. The establishment of such an association by special law is required as historical reparation for the abusive confiscation process and the subsequent chaotic restitution of forests[37].
- Amending the new Forest Code to restrict the transfer of land from the national forestland from state public ownership to state private ownership, except for land that did not belong to the public domain of the state prior to March 6, 1945 and is subject to restitution of ownership rights under the law. Otherwise, it creates the conditions for a revival of the chaotic restitution process that leads to the artificial administrative fragmentation of the national forestland. Artificial fragmentation of the national forestland, associated with disjointed/non-uniform management, through the continuation of chaotic restitutions, is a profoundly irresponsible act that causes significant economic, social, and ecological harm.

[37] https://romania-rurala.ro/2022/05/05/reparatie-istorica-fata-de-procesul-abuziv-de-confiscare-si-ulterior-retrocedare-haotica-a-padurilor-infiintarea-composesoratul-national-pentru-repararea-abuzurilor-comunismului-si-a-retroce/

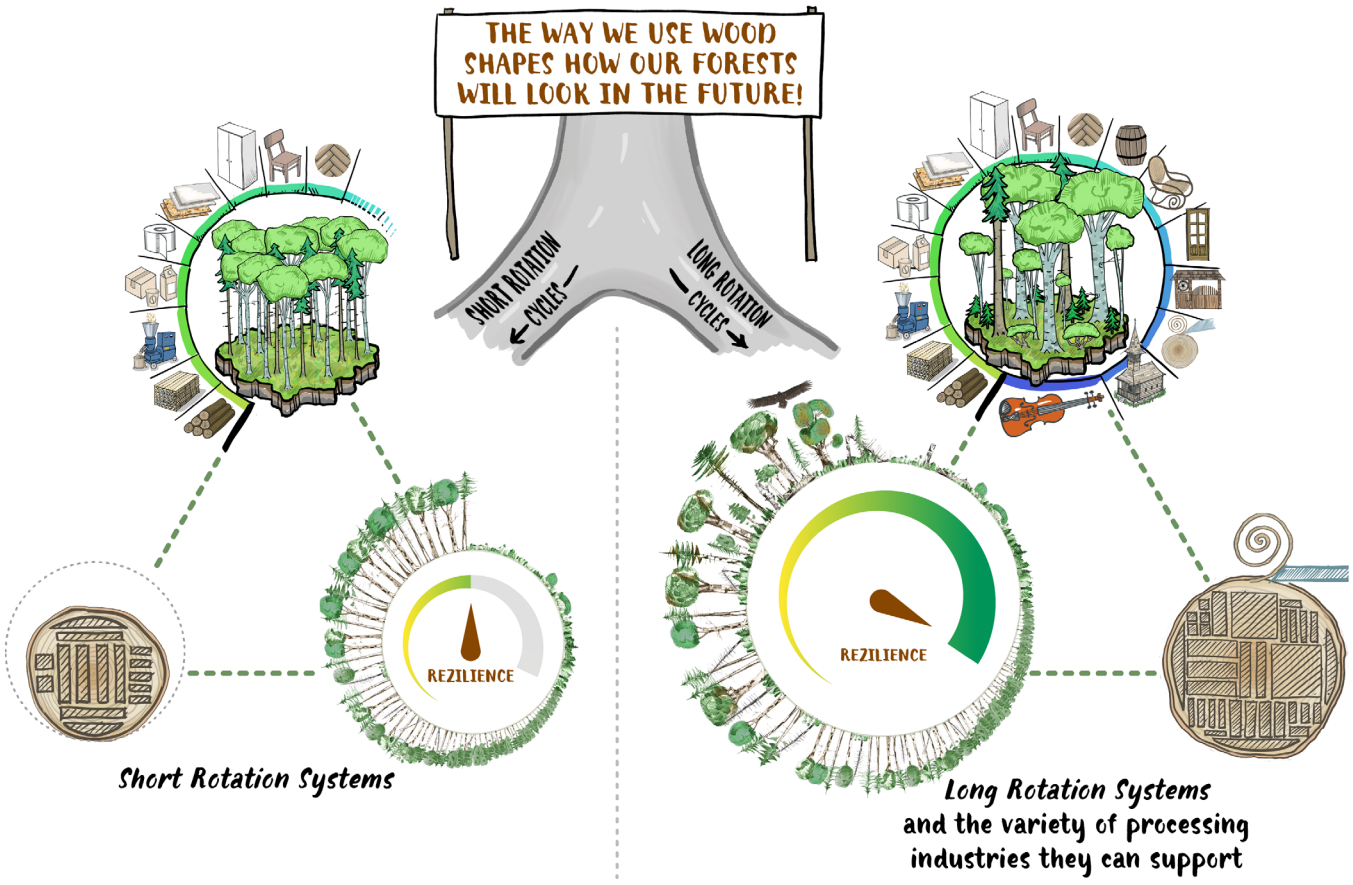
# Key message

*Romania possesses a valuable model of close-to-nature forestry, built on natural regeneration, a diversity of native species adapted to local conditions, long rotation cycles, and long-term forest management planning extended across landscapes and generations.*

*This responsible management framework supports biodiversity conservation, strengthens forest resilience to climate change, and enables the production of high-quality wood. By processing this wood into long-lasting products with high economic value, the foundation is laid for a resilient forest-based bioeconomy—capable of generating sustainable development and tangible benefits for local communities.*

*At a time when Europe is seeking forest management models aligned with the green transition, Romania has both the duty and the opportunity to position itself as a "model" — a benchmark for long-term, closer-to-nature practices — a living example of harmonious coexistence between nature and society, validated by time and proven results.*

*Romania can play a strategic role in achieving the EU's objectives for climate neutrality, nature restoration, and sustainable rural development. However, applying this model entails additional costs and efforts that must be acknowledged and supported through public policies and dedicated financial mechanisms in the upcoming EU Multiannual Financial Framework. We cannot speak of a sustainable forest-based bioeconomy without a responsible silvicultural system — just as we cannot sustain such a system without an economy that values wood wisely.*



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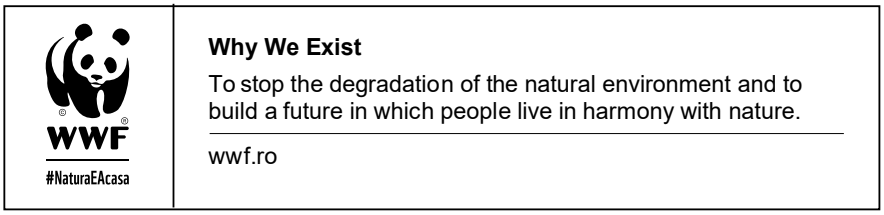


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