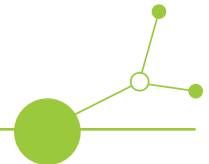




RE-ENFORCE

Deliverable 2.3.2

Report on Joint Evaluation on Pilot Actions



Version 1

05 2026





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1. Summary

The internal Pilot Action Workshop was conducted as part of Deliverable 2.3.2 (Joint evaluation of Pilot Actions). The workshop, held on March 6, 2026, brought together Project Partners and Associated Partners of the RE-ENFORCE project to review the current status, challenges, and preliminary findings of the six Pilot Actions addressing major drivers of forest degradation in Central Europe. These are: ash dieback (*Hymenoscyphus fraxineus*), drought, forest fires, bark beetle outbreaks, storm disturbances, and inappropriate management of riparian forests.

Across diverse ecological and socio-economic contexts, the Pilot Actions test a range of nature-based solutions, combining natural regeneration processes with active restoration measures such as reforestation, assisted species migration, and diversification of stand structure. The workshop provided a platform for knowledge exchange, critical reflection, and peer feedback, highlighting both common patterns and site-specific differences in restoration approaches.

Key discussions during the internal workshop emphasised the importance of adaptive, site-specific management strategies, the role of biological legacies and biodiversity in enhancing forest resilience, and the need to integrate long-term monitoring and stakeholder engagement into restoration planning. The workshop outcomes will contribute to the further development of the *Transnational Forest Restoration Strategy* and will support the exchange of applied knowledge for climate-adaptive forest management across Central Europe.

The online stakeholder workshop successfully facilitated exchange between Project Partners and external stakeholders on both the Pilot Actions and the draft *Transnational Forest Restoration Strategy*. Key topics included (a) the need for context-specific tree species recommendations, (b) the importance of clearly defined restoration objectives, and (c) the relevance of additional factors such as browsing pressure and invasive species management. The feedback collected provides valuable input for further refining both the Pilot Actions and the *Transnational Forest Restoration Strategy*.

2. Internal Pilot Action Workshop

On March 6, 2026, an online Pilot Action workshop was held via Zoom, organized by the Austrian Research Centre for Forests as part of the RE-ENFORCE project. The workshop aimed to support an internal peer review of all implemented Pilot Actions and provided an opportunity for Project Partners (PPs) and Associated Partners (APs) to exchange, discuss, and jointly assess the current state of implementation.

The specific objectives of the workshop were to:

- review and discuss the current implementation status of each Pilot Action,
- identify challenges and open issues,
- discuss next steps and lessons learned, and
- collect systematic internal feedback from Project Partners and Associated Partners.

In addition, a dedicated session focused on the draft *Transnational Forest Restoration Strategy*. The workshop was attended by 36 representatives of Project Partners and Associated Partners involved in the respective Pilot Actions. If APs were unable to attend, structured interviews were conducted prior to the event to ensure their input was captured. The key insights from these interviews were integrated into the respective Pilot Action discussions. A summary of the interviews is provided in **Annex 1**.

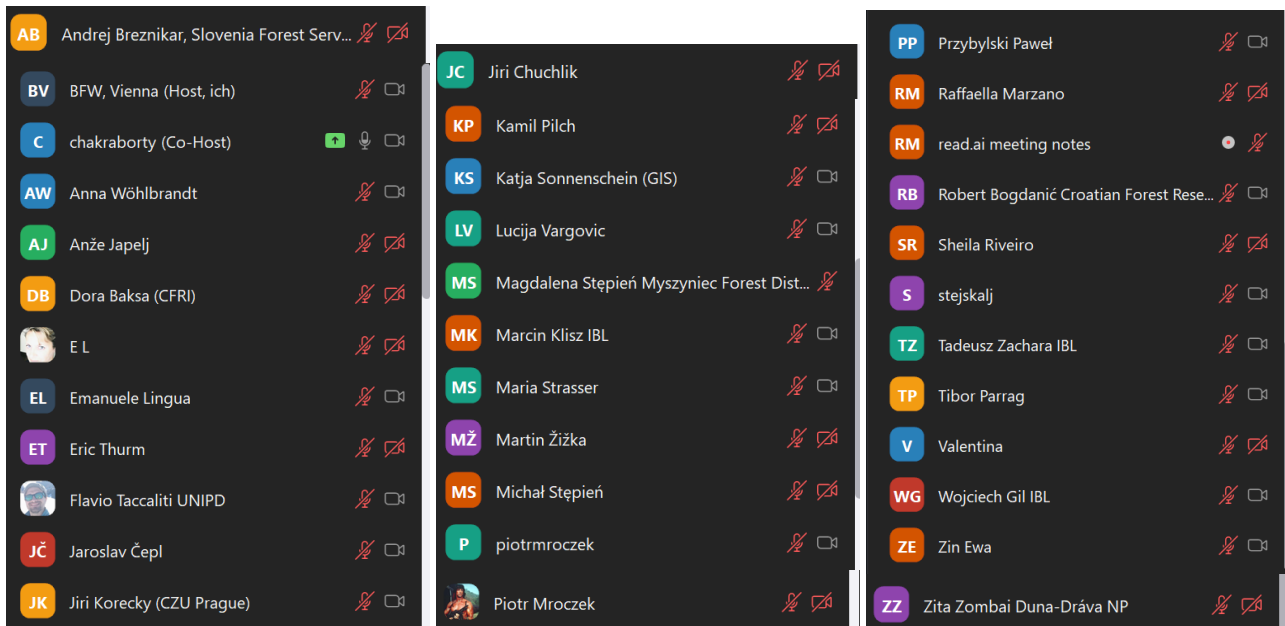


Figure 1: Participants list (screenshot).

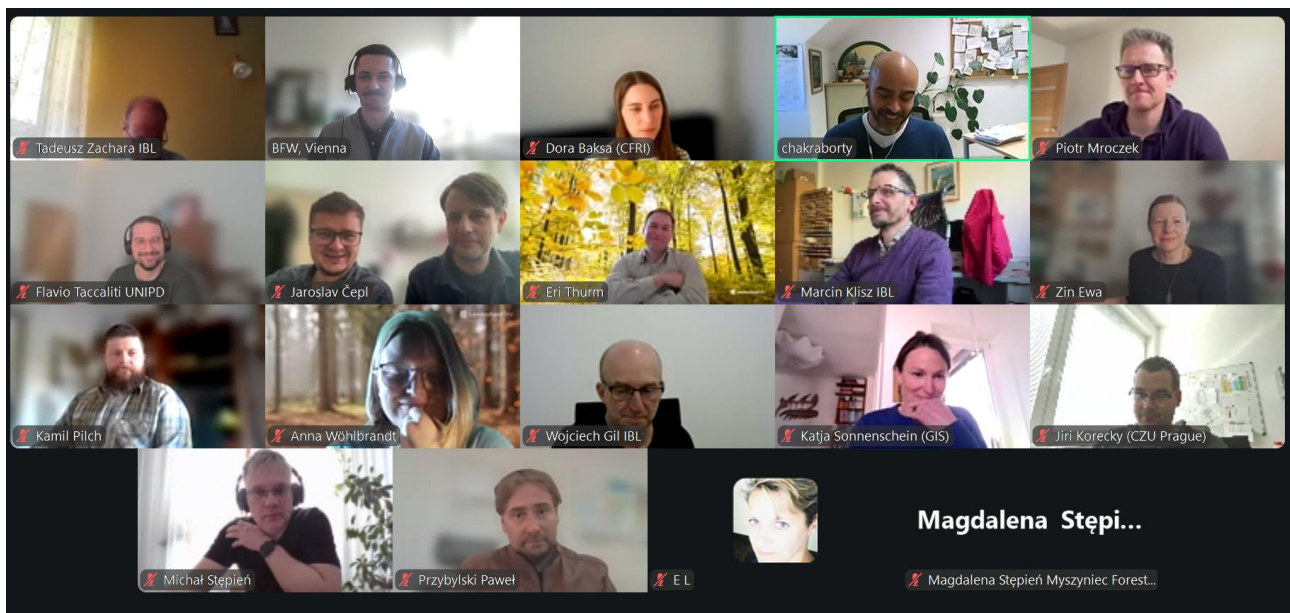


Figure 2: Screenshot of online workshop session.

The workshop was organized into six thematic sessions, each addressing a specific driver of forest degradation. Within each session, the respective Pilot Action areas were presented by the responsible project partners, followed by joint discussions to evaluate the implemented nature-based solutions and to collect feedback from all workshop participants.



Agenda	
09:00	Welcome and opening remarks Dr. Debojyoti Chakraborty <i>Austrian Research Centre for Forests</i>
09:15	Draft Transnational Forest Restoration Strategy Dora Baksa, univ. mag. ing. silv. <i>Croatian Forest Research Institute</i>
09:30	Pilot Action 1 – Ash dieback Anna Wöhlbrandt, M.Sc. <i>Landesforst Mecklenburg-Vorpommern, Germany</i>
10:15	Pilot Action 2 – Drought Robert Bogdanić, mag. ing. silv. <i>Croatian Forest Research Institute</i> RNDr. Jaroslav Čepl, Ph.D. <i>Czech University of Life Sciences Prague</i>
11:00	Coffee Break
11:15	Pilot Action 3 – Fire Dr. Ewa Zin <i>Forest Research Institute, Poland</i>
12:00	Pilot Action 4 – Improper management of riparian forests Tibor Parrag, M.Sc. <i>Duna-Dráva National Park Directorate, Hungary</i>
12:45	Lunch Break
13:30	Pilot Action 5 – Bark Beetle Dr. Debojyoti Chakraborty <i>Austrian Research Centre for Forests</i>
14:15	Pilot Action 6 – Storm Dr. Flavio Taccaliti <i>University of Padova, Italy</i>
15:00	Recap and concluding remarks Dr. Debojyoti Chakraborty <i>Austrian Research Centre for Forests</i>

Figure 3: Agenda of the internal Pilot Action workshop.



3. Joint Stakeholder Workshop on Pilot Actions

On 28 April 2026, an online stakeholder workshop on Pilot Actions was held via Zoom, organized by the *Croatian Forest Research Institute* and the *Austrian Research Centre for Forests* within the RE-ENFORCE project. The workshop supported the external review of all implemented Pilot Actions and provided a platform for exchange between Project Partners (PPs) and external stakeholders. In addition, the draft *Transnational Forest Restoration Strategy* was presented to gather feedback on its structure, content, and relevance.

The specific objectives of the workshop were to:

- share information on six jointly developed Pilot Actions
- review and discuss the current implementation status of each Pilot Action,
- present the current state of the draft *Transnational Forest Restoration Strategy*, and
- collect systematic external feedback from stakeholders.

The workshop was attended by 53 participants, including representatives of RE-ENFOCRE Project Partners and external stakeholders from relevant forestry, restoration, research and policy-related institutions.

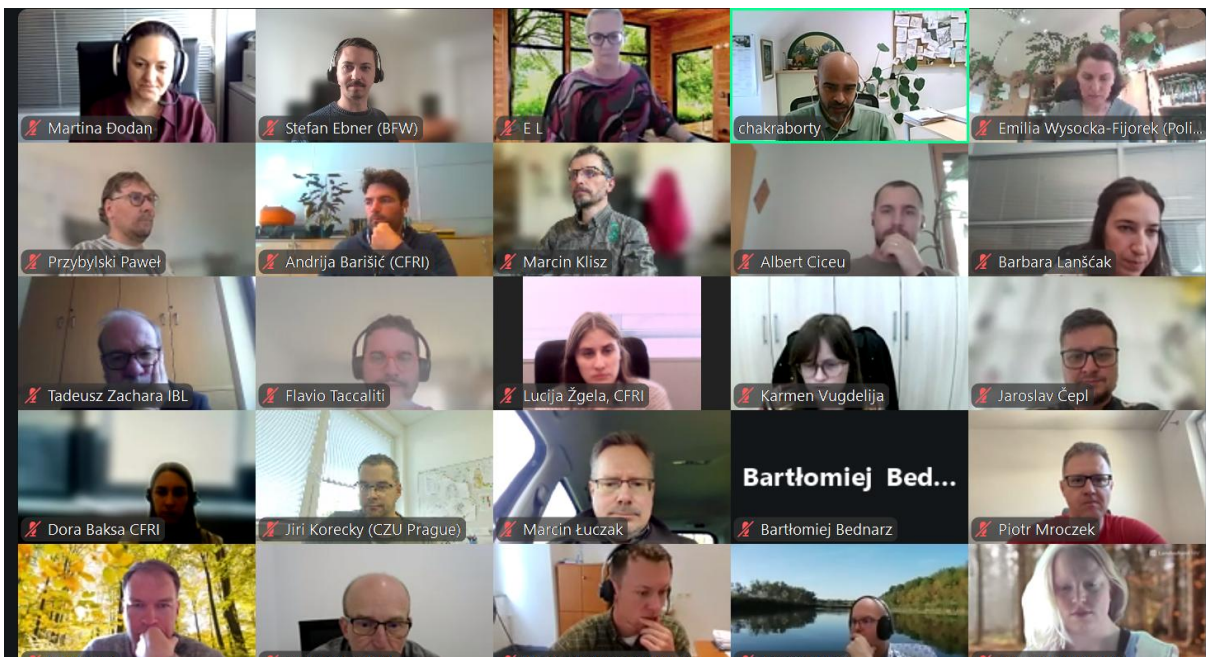


Figure 4: Screenshot of most of the participants of the online workshop session.









SE Stefan Ebner (BFW) (Host, ich)	 Flavio Taccaliti	PP Przybylski Paweł
C chakraborty (Co-Host)	GZ Galić Zoran	 Robert Bogdanić
 E L (Co-Host)	G goran.gregurovic	SF Silvia Ferlazzo-MASAF-DIFOR2
MD Martina Đodan (Co-Host)	IW Iza Władczyńska	SP SLiWL Paweł Drozd
AB Agata Borucka	 Jan Kowalczyk	TZ Tadeusz Zachara IBL
AH Agnieszka H	JK Jiri Korecky (CZU Prague)	TP Tibor Parrag
A Albert Ciceu	KS Kamil Szpakowski	T Tommaso Baggio
AW Aleksandra Wiktor	KV Karmen Vugdelija	V Valentina
AB Andrija Barišić (CFRI)	KD Katarzyna Dąbrowska	WG Wiktor Gawron SLiWL
AG Anna G	LV Lucija Vargovic	WG Wojciech Gil IBL
AP Anna Praszczak MKIŚ	LŽ Lucija Žgela, CFRI	
AW Anna Wöhlbrandt	MC Malgorzata Czyz.	
AJ Anže Japelj (SFI)	MK Marcin Klisz	
BL Barbara Lanšćak	MŁ Marcin Łuczak	
BB Bartłomiej Bednarz	MS Markus Sallmannshofer	
BP Betty Parizkova	MŽ Martin Žižka	
DM Davide Marangon	M MartinaBrkovic	
DB Dora Baksa CFRI	MG Mirko Grotti	
E e.nevola	 Nenad Potočić	
EW Emilia Wysocka-Fijorek	P patricija.franjevic	
ET Eri Thurm	 Piotr Mroczek	
EO Ewa Osuchowska		

Figure 5: Participants list (screenshot).

The workshop was structured in two parts. It began with a presentation by Martina Đodan, who introduced the current structure and content of the draft *Transnational Forest Restoration Strategy* as well as the six Pilot Actions. This was followed by an interactive discussion moderated by Debojyoti Chakraborty, focusing on collecting structured external feedback from stakeholders.



Agenda

09:00 **Welcome and opening remarks**

Dr. Debojyoti Chakraborty

Austrian Research Centre for Forests

09:05 **Pilot Actions and Transnational Forest Restoration Strategy**

Dr.sc. Martina Đodan

Croatian Forest Research Institute

09:50 **Coffee Break**

10:00 **Interactive discussion session**

11:50 **Recap and concluding remarks**

Dr. Debojyoti Chakraborty

Austrian Research Centre for Forests

12:00 **End of the Workshop**

Figure 6: Agenda of the joint Stakeholder Workshop.

4. Evaluation of Draft Transnational Forest Restoration Strategy

The jointly developed *Transnational Forest Restoration Strategy* aims to provide a comprehensive roadmap for the restoration of six major types of degraded forest ecosystems across Central Europe. The strategy integrates knowledge gained from the Pilot Actions and translates it into practical, scalable approaches for forest restoration under changing environmental conditions. The current draft represents an intermediate stage in its development (Deliverable 1.4.1) and was subject to internal review during the workshop. Following this internal consultation, the strategy will be further refined and subsequently undergo external review within a joint stakeholder workshop before the finalisation of the evaluation process (Deliverable 1.4.2).

The strategy is structured around the main drivers of forest degradation addressed within the project and outlines key processes, aims, challenges, and restoration approaches for each driver.

In the case of ash dieback, the strategy distinguishes between short-term mitigation measures and long-term adaptation pathways. In the short term, efforts focus on preserving the remaining genetic diversity of ash populations as a basis for future breeding programmes aimed at developing resistant populations. However, the underlying resistance mechanisms are still not fully understood and therefore require further research. In the long term, restoration strategies include promoting natural regeneration processes and integrating ash into mixed forest systems where appropriate.



For drought-affected forests, the strategy highlights the cascading impacts of water scarcity on tree physiology and forest structure, including reduced photosynthesis, carbon starvation, and hydraulic failure, which may ultimately affect entire forest ecosystems. Given that climate change is expected to significantly increase the frequency, severity, and duration of drought events, adaptive management strategies are essential. A key approach is the establishment of mixed forest stands with drought-tolerant species, supported by adaptive silvicultural practices - such as more intensive thinning - that enhance overall forest resilience.

In the context of forest fires, the strategy identifies several factors contribution to the increasing risk of forest fires in the future: climate change; land use changes, particularly the expansion of the wildland-urban interface and land abandonment leading to fuel accumulation; and shifts in forest management objectives towards multifunctional forest use, which are often followed by increasing recreational pressure. Post-fire restoration approaches include a combination of active restoration (e.g. planting or seeding, thinning, competing vegetation control, etc.), and passive restoration through natural succession. Particular emphasis is placed on the role of biological legacies, especially deadwood, which contributes to microclimatic regulation and supports natural regeneration processes. However, varying outcomes across sites highlight the need for further research and site-specific management recommendations.

For riparian forests affected by inappropriate management practices, the strategy highlights the need to move beyond traditional compartment-based forestry approaches. Instead, restoration should be guided by a landscape-scale perspective and the principle of ecological integrity. Key measures include the conversion of non-native poplar plantations into native riparian forests, combined with active and passive regeneration processes. These approaches aim to enhance biodiversity, restore ecosystem functions, and establish forest stands that are better adapted to changing climatic conditions.

Bark beetle outbreaks are identified as a major driver of structural and functional changes in Central European forest ecosystems. Outbreaks can lead to shifts in tree species composition, reduced carbon sequestration, potentially increased fire risk due to accumulated dead biomass, and significant economic losses. The strategy therefore promotes a combination of reactive and proactive management approaches, including salvage logging, sanitation felling, spatial risk mapping, and decision-support tools. At the same time, diversification of forest structure and composition, are highlighted as key elements to reduce future vulnerability. Case studies demonstrate that active forest management can support recovery processes and mitigate the long-term impacts of bark beetle disturbances.

For wind-disturbed forests, the strategy recognises post-windthrow restoration as a complex challenge involving ecological, management, and societal dimensions. Ecology-based restoration approaches are considered essential, particularly the retention of biological legacies. Deadwood elements can provide natural shelter for naturally regenerating or planted seedlings, while lying logs may serve additional protective functions, such as reducing risks from rockfall or avalanches in mountainous areas. The strategy emphasises that nature-based solutions must be aligned with existing management objectives and that post-disturbance interventions should be tailored to site-specific conditions.

4.1. Internal Review as part of the Internal Pilot Action Workshop

The workshop discussion emphasised that the strategy should be considered a living document, requiring continuous updates to reflect the latest scientific knowledge. Participants highlighted the need to incorporate recent research findings, particularly regarding increasing disturbance rates and changing tree regeneration dynamics across Europe. In addition, integrating modelling approaches was identified as an important next step to support the development of a robust yet flexible roadmap. While the strategy aims to provide overarching guidance, it must also allow for adaptation to specific regional and site conditions.



4.2. External Review as part of the Joint Stakeholders Workshop

Stakeholders expressed strong interest in guidance on tree species selection for forest restoration. It became clear that species choice is highly context specific. For example, Scots pine (*Pinus sylvestris* L.) is currently facing significant challenges in Poland, particularly on more fertile sites, while in parts of the Czech Republic, Scots pine may be considered as one of the potential alternatives to Norway spruce *Picea abies* (L.) H. Karst.). In addition to ecological conditions, national legal frameworks and country-specific contexts were identified as important factors influencing species selection. Participants suggested structuring tree species recommendations according to biogeographic regions and drivers of forest degradation. It was therefore proposed to include a dedicated table in the *Transnational Forest Restoration Strategy*, presenting tree species recommendations by country, degradation driver, and biogeographic region.

Stakeholders also emphasised that restoration objectives strongly influence species choice, highlighting the need to clearly link management goals with species selection.

Another key issue raised was browsing pressure, identified as an important factor limiting natural regeneration, forest restoration success, and the establishment of climate-resilient mixed forests. In addition, limited natural regeneration can reduce local genetic diversity and adaptive capacity of tree species. As game management is a complex and socially sensitive topic, it will be addressed in a dedicated review chapter of the *Transnational Forest Restoration Strategy*.

Furthermore, the management of non-native and invasive tree species in the context of climate change was highlighted as an important topic. This aspect will also be included in the review chapter of the strategy.

5. Evaluation of Pilot Actions

Each Pilot Action tests innovative forest restoration strategies with the ultimate goal to derive tailored nature-based solutions, including adapted tree species and provenance selection, targeted silvicultural management, soil preparation techniques, and elements of assisted migration. The Pilot Actions are embedded in a structured intervention logic linking strategy development, practical testing, and iterative refinement. Strategic forest restoration approaches were translated into Pilot Actions and implemented under real management conditions across Central Europe. Their effectiveness and outcomes were systematically monitored and jointly evaluated through internal and external peer review. The resulting insights are used to refine restoration approaches and to develop transferable solutions that will be directly incorporated into the *Transnational Forest Restoration Strategy*, transnational guidelines, and the online decision-support system.

5.1. Internal Review as part of the Internal Pilot Action Workshop

The workshop was organized into six thematic sessions, each addressing a specific driver of forest degradation. This structure ensured that systematic feedback was provided on each Pilot Action.

5.1.1. Session 1 - Ash dieback (PA1)

Background

Ash dieback, caused by the invasive fungal pathogen *Hymenoscyphus fraxineus*, represents a major threat to ash-dominated forests across Central Europe. In the affected regions, widespread mortality of *Fraxinus excelsior* L. has led to severe structural degradation and loss of ecosystem functions in formerly valuable hardwood floodplain forests. The disturbance is species-specific, making homogeneous ash stands particularly vulnerable and highlighting the need for diversification strategies.



Implementation

The Pilot Actions focus on restoring affected stands through a combination of natural regeneration and active reforestation. Experimental approaches include the planting of mixed tree species to reduce ash dominance, combined with protective measures such as fencing to reduce browsing pressure. In addition, different regeneration strategies are being tested to evaluate how species mixtures and site conditions influence restoration success under pathogen pressure.

Preliminary findings

Initial observations indicate that pure ash stands are highly susceptible to collapse, whereas mixed stands show greater resilience and regeneration potential. However, successful establishment of alternative species is often constrained by browsing pressure, making protection measures against herbivores essential. Under certain conditions, carefully targeted active management interventions may also be considered in strictly protected areas such as national parks to support positive ecological developments.

Discussion

The workshop discussion highlighted additional ecological observations related to tree species responses under stress conditions. In Poland, for example, it was observed that younger trees may have a higher capacity to regenerate their root systems after fungal infections, thereby accessing deeper soil water resources under drought conditions. Furthermore, certain species, such as oak, were reported to compensate for defoliation through the formation of secondary shoots. In contrast, ash shows limited ability to produce such compensatory growth, resulting in progressive crown deterioration, particularly when affected by both a decline of groundwater availability and ash dieback.

The role of ash in current and future restoration strategies was also discussed. While the initial project proposal intended the use of ash dieback-resistant planting material (e.g. in Germany), such material was not sufficiently available for practical application. Consequently, no active planting of ash has been implemented within the Pilot Actions to date, and current restoration approaches of ash rely primarily on natural regeneration. However, the future use of resistant ash genotypes remains a relevant option and may be considered in subsequent projects once suitable planting material becomes available.

These insights underline the importance of species selection and adaptive management strategies under combined biotic and abiotic stress conditions.

5.1.2. Session 2 - Drought (PA2)

Background

Increasing frequency and intensity of drought events due to climate change pose a growing threat to forest ecosystems in Central Europe. Young trees are particularly vulnerable, as water stress can significantly affect survival, growth, and physiological performance. The pilot areas in Croatia and the Czech Republic focus on understanding how drought stress influences early tree survival and development and how planting material can be better adapted to adverse conditions.

Implementation

Experimental trials were established to assess the effects of drought stress on seedlings of key tree species (*Pinus sylvestris* L. and *Fagus sylvatica* L.). The experimental design combined controlled pre-planting drought treatments with intraspecific variation. Physiological parameters such as photosynthetic activity, stomatal conductance, and growth performance are monitored to evaluate plant responses to water limitation under field conditions.

Preliminary findings

Preliminary results indicate that drought stress prior to planting may exert a long-lasting effect on seedling performance, influencing their growth and physiological traits. However, nutrient availability appears to



play an even more important role than drought legacy effects, suggesting that optimal seedling nutrient status and site conditions, particularly soil fertility, are key factors for successful seedling establishment under drought conditions. Long-term monitoring will be necessary to better understand the persistence of drought legacy effects and their relevance to climate-adapted forest regeneration.

Discussion

The discussion highlighted several important considerations regarding the experimental design and future development of the Pilot Actions. In both Croatia and the Czech Republic, the trials currently focused on national provenances, while drought-resilient provenances from southern regions have not yet been included. Participants emphasized that assisted migration, including the use of genetically adapted forest reproductive material, could represent a key strategy for climate-smart forest restoration. For example, drought-resilient provenances from Turkey are being tested in separate trials in the Czech Republic but were not part of the current Pilot Action.

Methodological aspects were also addressed, particularly concerning gas exchange measurements. It was noted that field conditions can strongly influence measurement results, highlighting the importance of repeated measurements to ensure robust and reliable data.

A central topic of the discussion was the importance of long-term monitoring. To better assess tree performance under drought conditions, participants suggested integrating additional environmental parameters, such as soil moisture measurements. Furthermore, evaluating long-term growth performance and drought resilience will require extended monitoring periods, as well as possible supplementary studies and preselection of suitable planting material. The first meaningful insights into long-term drought responses are expected to emerge during future drought events.

These insights highlight the importance of combining eco-physiological analyses, genetic selection, and long-term field observations to develop effective drought adaptation strategies in forestry.

5.1.3. Session 3 - Fire (PA3)

Background

Forest fires, traditionally associated with Southern Europe, are becoming increasingly relevant in Central Europe due to climate change. In Poland and Northern Italy, recent fire events have created large disturbed areas requiring restoration. These disturbances raise important questions regarding the effectiveness of passive and active restoration approaches, and the need to adapt species composition to projected future climatic conditions.

Implementation

The Pilot Action combined monitoring of natural regeneration with experimental restoration trials in Poland and Italy. In Poland, both active and passive restoration approaches were assessed. In the Italian pilot area, active restoration trials were established using assisted species migration, namely the planting of downy oak (*Quercus pubescens* Willd.) on selected microsites influenced by biological legacies such as deadwood or pioneer vegetation. Additionally, natural regeneration was also observed at control plots.

Preliminary findings

Observations from PA3 indicate that natural regeneration is occurring successfully in many areas, with effective forest recovery, several tree species establishing, and time since disturbance being key factors. However, naturally regenerating species are primarily adapted to current conditions and may not be optimal under future climates. The newly established assisted migration trials are expected to provide important insights into how active interventions can support climate-adaptive forest restoration and reduce future fire risks. Yet, these two issues may require different treatments, which must be considered.



Discussion

The discussion highlighted the innovative character of the pilot areas in Poland and Italy, as comparable restoration approaches are currently rare in their respective national contexts. In Poland, the pilot area represents one of the few cases where post-fire restoration is being systematically observed under both active and passive management. In Italy, the application of assisted species migration in post-fire restoration is still uncommon, making the pilot area an important opportunity to test future solutions.

A key topic of the discussion was the role of deadwood in post-fire landscapes and its implications for future fire risk. It was emphasized that the removal of deadwood does not necessarily lead to safer conditions. On the contrary, clear-cutting and removal of woody debris may promote the development of grass-dominated vegetation, which can be highly flammable. In contrast, passive restoration approaches often favor the establishment of broadleaved species, which are generally less flammable than conifers. In addition, the presence of deadwood contributes to more heterogeneous microclimatic conditions that can support regeneration processes. However, due to the complexity of interactions between vegetation, fuel loads, and site conditions, and the limited availability of empirical data, it remains difficult to derive universally applicable, evidence-based management recommendations.

The discussion further emphasized that restoration strategies must be closely aligned with management objectives. While passive restoration may support biodiversity and reduce costs, it may not always meet objectives related to timber production or specific stand structures. Regional legislation also plays an important role, as forest managers are often required to ensure forest regeneration within defined timeframes (e.g., in Poland or Hungary), which may necessitate active interventions such as planting.

In addition, the ecological role of fire was addressed. Fire can create favorable conditions for light-demanding species and supports specialized taxa that depend on fire disturbance events for regeneration. Furthermore, the interactions between fire risk management and the wildland-urban interface were discussed: Fire risk may increase with high fuel loads, and the proximity of forests to densely populated areas represent a significant challenge for forest management.

Finally, the comparison between the pilot areas in Poland and Italy highlighted the importance of legal and institutional frameworks in shaping restoration approaches. In Poland, legislation requires reforestation within five years after disturbance (Polish Forestry Act, 1991), while in Italy, public funding for post-fire restoration is generally restricted for a period of five years, unless a restoration project is formally approved by the managing authority (Law 353/2000). These contrasting frameworks strongly influence whether passive or active restoration approaches are applied in practice.

Overall, the discussion underlined that effective post-fire restoration requires a balanced consideration of ecological processes, management objectives, and regulatory conditions. Integrating natural regeneration and maintaining biological legacies where possible, as well as adapting strategies to local ecological and socio-economic contexts, were identified as key elements of successful restoration.

These findings are particularly relevant for developing integrated and region-specific fire management strategies under changing climatic conditions in Central Europe.

5.1.4. Session 4 - Inappropriate management of riparian forests (PA4)

Background

Many riparian forests in Central Europe have been altered by past management practices, including the establishment of monocultures and the introduction of non-native species. In the Duna-Dráva region in Hungary, large areas of riparian forests are dominated by *Populus alba* L. and hybrid poplar, resulting in genetically, structurally, and functionally homogeneous stands with reduced biodiversity and altered ecological functions.



Implementation

The Pilot Action aims to restore species-rich softwood gallery forests through targeted silvicultural interventions. Measures include replacing hybrid poplars and invasive species with native species such as oak, elm, and ash, and thinning dense stands. Given the strict legal framework and the conservation status of the area, it is essential to adopt measures prior to the transformation of the tree species composition, including a soil survey and the development of a management plan.

Preliminary findings

Initial observations show that many stands are overly dense and lack structural diversity due to inappropriate past management. Preliminary results suggest that conventional thinning intensities are not sufficient to promote natural tree regeneration, and more intensive interventions may be required. In addition, changing site conditions, particularly reduced groundwater availability, point to the need for changes in tree species composition, requiring adaptation of restoration strategies towards more climate-resilient forest types. These findings highlight that active measures are often necessary, even in highly protected conservation areas, to support habitat recovery.

Discussion

The discussion addressed the role of natural ecosystem engineers, particularly beavers, in riparian forest dynamics. Although beaver populations are currently limited in the floodplain areas of the Duna-Dráva National Park, their activities can improve habitat conditions and enhance structural diversity. At the same time, potential conflicts with forest management were acknowledged, as beavers may damage economically valuable trees. However, participants emphasized that in large, protected landscapes, coexistence between ecological processes and management objectives is generally feasible.

Further discussion focused on similarities between restoration challenges in riparian forests and in areas affected by other drivers. Comparisons were drawn with post-storm restoration in Poland, particularly regarding the question of how to accelerate the development of the desired species compositions. While in Hungary fast-growing poplar species dominate regeneration dynamics, in Poland pioneer species such as birch (*Betula pendula* Roth) and aspen (*Populus tremula* L.) play a similar role. In both cases, natural succession would eventually lead to more stable, late-successional forest types, but practical management constraints often require faster transitions. Participants emphasized that learning from natural processes, including the temporary role of pioneer species, is essential for developing effective and realistic restoration strategies.

5.1.5. Session 5 - Bark beetle (PA5)

Background

Bark beetle outbreaks, coupled with drought and rising temperatures, have caused widespread mortality in conifer-dominated forests across Central Europe. In Austria, large areas of Norway spruce (*Picea abies* (L.) H. Karst.) stands have been severely affected, creating the need for large-scale restoration and raising questions about future forest composition and management objectives.

Implementation

The Pilot Action focuses on reforestation of disturbed areas through the establishment of mixed deciduous forests. Planting designs consider both ecological and economic objectives, including the selection of drought-resilient species and the use of planting densities suitable for mechanized maintenance. Tending measures are applied to reduce competition, and browsing protection is implemented where necessary.

Preliminary findings

Early observations indicate that seedling mortality due to drought, spring frost, and browsing can be substantial, requiring relatively high planting densities. Mechanical tending is generally effective, although



in some cases additional chemical treatments are necessary to control competing vegetation. The Pilot Action highlights the importance of integrating ecological restoration with economic considerations, aiming to establish forest stands that are both climate-resilient and capable of producing high-quality timber.

Discussion

Browsing pressure was identified as one of the main challenges affecting restoration success in the pilot area. Positive examples of cooperation between forest owners and regional authorities responsible for game management were highlighted. Measures such as extending hunting seasons and increasing hunting quotas have been implemented to support forest regeneration with climate-resilient tree species. Despite these efforts, browsing damage remains a significant constraint.

Participants emphasized that without effective and adaptive wildlife management, successful forest regeneration would be difficult to achieve, even when protective measures such as fencing are applied. Experiences from Poland demonstrate that implementing changes to hunting legislation requires close cooperation with research institutions and regulatory authorities to enable legal changes. These findings underline the importance of integrating forest and wildlife management as a prerequisite for successful restoration.

5.1.6. Session 6 - Storm (PA6)

Background

Storm events represent a major disturbance to forests in Central Europe, with increasing frequency and intensity linked to climate change. Events in 2017 and 2018 caused large-scale windthrow in Northern Italy and Poland, resulting in extensive damage to forest structure and function.

Implementation

The Pilot Action investigates forest recovery processes following wind disturbances through experimental designs focusing on silvicultural measures, forest reproductive material and seedling types, natural regeneration, and biological legacies. In Italy, transects were established to assess the influence of distance from seed sources, and planting trials examine the role of deadwood in creating favorable microclimatic conditions. In Poland, additional experiments focused on regeneration strategies, including seedling type, planting method, and tending intensity.

Preliminary findings

Preliminary results from Italy show that regeneration density declines with increasing distance from seed trees, highlighting the importance of remnant trees. Deadwood has been shown to improve microclimatic conditions and reduce seedling mortality, while also influencing browsing patterns. In Poland, early findings indicate that container-grown seedlings perform better than bare-root plants, while planting season appears to be less influential. Overall, the results emphasize the importance of spatial structure, biological legacies, and adaptive management in post-storm forest restoration in large open areas.

Discussion

The discussion highlighted strong contrasts between the pilot areas in Italy and Poland, reflecting differences in ecological conditions, terrain, and management contexts. In the lowland areas of Northern Poland, relatively homogeneous site conditions and easily accessible location allowed for extensive salvage logging and more uniform restoration approaches. In contrast, the mountainous regions of Northern Italy are characterized by more heterogeneous conditions, limited accessibility, and a higher retention of biological legacies, resulting in more complex microclimatic conditions and regeneration dynamics.

Socio-economic factors were also identified as important drivers influencing restoration strategies. While forest management in some areas is primarily economically oriented, in others it is strongly shaped by



protective functions, such as safeguarding infrastructure against natural hazards. These diverse objectives make it difficult to define common restoration approaches.

In addition, interactions between disturbance agents were discussed. In the Italian pilot areas, bark beetle infestations following windthrow represent a significant challenge, particularly in areas that are difficult to access for salvage logging. Climate change further accelerated bark beetle development, leading to increasingly interconnected disturbance dynamics. These findings highlight the need for integrated management approaches that consider multiple disturbance drivers simultaneously.

5.2. External Review as part of the Joint Stakeholders Workshop

During the discussion, stakeholders highlighted that the objectives of forest restoration within the Pilot Actions are not always clearly defined. This makes it difficult to assess the effectiveness and success of implemented measures. Participants emphasised that restoration goals are closely linked to the desired ecosystem services of future forest systems. At the same time, it was noted that climate change may significantly alter the provision of ecosystem services over time. A clear understanding of pre-disturbance forest conditions is important as a reference point for restoration planning, although future restoration targets need to consider changing climatic conditions and may not necessarily aim to restore the previous forest state.

To address these points, the Pilot Actions will be further refined. Additional information will be collected on:

- the main ecosystem services provided by the forest prior to disturbance, and
- the intended restoration objectives under current and future climate conditions.

This will support a more transparent and consistent evaluation of restoration measures across Pilot Actions.

6. Conclusion

The internal Pilot Action Workshop demonstrated the high relevance and practical value of the Pilot Actions implemented within the RE-ENFORCE project. Despite the diverse ecological conditions, disturbance regimes, and management contexts, the discussions revealed several shared challenges and consistent lessons across all Pilot Actions.

A central outcome of the workshop is the recognition that successful forest restoration often requires a balanced integration of natural processes and active management interventions. While natural regeneration and biological legacies play a crucial role in supporting ecosystem recovery, targeted measures such as planting, thinning, and protection against browsing are often necessary to achieve specific restoration objectives and ensure timely forest development. At the same time, the importance of adapting restoration strategies to site-specific conditions, future climatic changes, and socio-economic constraints was repeatedly emphasized.

The workshop further highlighted the importance of cross-sectoral coordination, particularly the integration of forest and wildlife management, as well as the need to consider legal and institutional frameworks that shape restoration opportunities across different regions. In addition, the discussions underlined the critical role of long-term monitoring in improving the understanding of restoration processes and supporting evidence-based decision-making.

Importantly, the Pilot Actions were recognized not only as experimental sites but also as demonstration and learning platforms that facilitate knowledge exchange between researchers, practitioners, and policymakers. The experiences gained provide valuable insights into the implementation of nature-based solutions under real-world conditions and contribute to the development of scalable and transferable restoration approaches.



The stakeholder workshop confirmed the importance of involving external stakeholders in the development and evaluation of forest restoration approaches. Feedback from stakeholders highlighted several aspects that require further consideration, particularly the need for clearly defined restoration objectives, the integration of additional relevant factors such as browsing pressure, and the management of non-native and invasive tree species. The insights gained will be incorporated into the ongoing development of the *Transnational Forest Restoration Strategy* and the refinement of Pilot Actions, contributing to more robust and applicable forest restoration solutions across Central Europe.

The outcomes of the workshops will directly feed into the further development of the *Transnational Forest Restoration Strategy* (Deliverable 1.4.2). By integrating scientific knowledge, practical experience, and stakeholder perspectives, the RE-ENFORCE project contributes to advancing climate-adaptive forest restoration in Central Europe and supports the transition towards more resilient and multifunctional forest ecosystems. Further exchange with external stakeholders will be essential to validate and refine the presented approaches and to support their broader application beyond the project context.



Annex 1: Summary of Interview with PP University of Padova and AP Veneto Agricoltura.

On 18 February 2026 (15:00-16:00), representatives of PP8 (Università degli Studi di Padova, TESAF Department), Flavio Tacaliti and Davide Marangon, conducted an online interview with Roberto Fiorentin from Veneto Agricoltura, Associated Partner of PP8 within the Interreg Central Europe RE-ENFORCE project.

The interview was carried out in preparation for the internal Pilot Action Workshop (Deliverable 2.3.2), as the Associated Partner was unable to attend the workshop due to other commitments. The aim of the interview was to collect input, feedback, and questions regarding the current status and future development of the Pilot Actions.

During the meeting, PP8 presented the two Pilot Actions in which they are involved: PA3 (forest fires) and PA6 (storm disturbances). Both Pilot Actions include study areas in Italy and Poland. The presentation also incorporated recent exchanges with the Polish partner (PP7, IBL), including ongoing work and planned research activities. Particular emphasis was placed on the implementation of nature-based solutions, the innovative aspects of the Pilot Actions, and preliminary findings.

The Associated Partner actively contributed to the discussion and raised several questions, which were subsequently brought into the workshop discussions:

- In the Polish pilot areas, is *Pinus sylvestris* a natural (potential) climax species, or is its presence mainly the result of plantation forestry?
- What would be the potential natural forest composition in these areas? Are oak species present?
- Is the observed trend of converting conifer plantations into broadleaved forests (known from other regions such as Baden-Württemberg, Germany) also relevant in the Polish pilot areas following disturbances?
- What are the effects of planting season (spring vs. autumn) in PA6? Are preliminary results available?
- What is the effect of reducing or removing broadleaved vegetation cover in PA6?
- Are *Pinus sylvestris* and *Pinus nigra* native species in the Italian pilot areas, or were they introduced through plantation?
- Was *Quercus pubescens* naturally present in the Italian PA3 study area prior to the restoration interventions?
- In addition, the Associated Partner referred to relevant external initiatives, including the FORGENIUS project and the Seed4Forest tool, as potentially valuable resources for the project consortium.

The questions and inputs collected during this interview were integrated into the discussions of the internal Pilot Action Workshop.