***eco2adapt*'s Newsletter**
Volume 3, Series 1
Editor: Dr. Tahamina Khanam
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April, 2025

"*eco2adapt* is a Horizon Europe Research and Innovation action project funded by the European Union and coordinated by INRAE. It began in September 2022 and will run for five years with 31 partners from 11 countries. The project aims to provide solutions to combat the uncertain effects of climate change and promote resilient forest ecosystems for future generations."

In this first Newsletter of 2025, we would first like to welcome you all to the joint China-Europe Meeting to be held in Sanya, China, from 7-11 April. Four days of meeting and excursion are planned, along with training sessions for modellers and a Forum on Payments for Environmental Services – PES (please Policy section below for more information on PES). Project participants can contact their WP leader on ways to contribute to this Meeting. For those who cannot make it to China, we will have a second meeting Lithuania towards the end of the year.

We would also like to welcome you to our new pages on the website. We have initiated a group called "Friends of eco2adapt" and have invited the Editors in Chief of international forestry journals to answer three questions on the future of resilient forestry. We have also begun a Blog on the website, that enables eco2adapt participants to inform readers about conferences they have attended, papers they have written, science and policy, or simply just about their daily work or thoughts on resilient forestry.

After the fruitful year of 2025, and the IUFRO World Congress in Sweden, where eco2adapt organised several sub-plenary and technical sessions, project participants are still busy with dissemination. eco2adapt is closely linked to two new IUFRO Task Forces: "Forest-Water-Livelihood-Governance Nexus" and "Forest Living Labs for Sustainable Climate Adaptation," (2025 – 2029). We'll be providing more information soon about dissemination via these Task Forces. eco2adapt is also co-organising the 6th conference on "Soil Bio- and Eco Engineering – The Use of Vegetation to Stabilise Slopes" to be held in Mexico July 2025 and project participants are involved with the organisation of the 6th IUFRO International Conference on Forests and Water in a Changing Environment, to be held in Beijing, China from Oct. 20-23, 2025. Organisation of the final project conference and TEDx event has begun, to be held in conjunction with sister HE projects in the autumn of 2027 in France.

We hope you enjoy reading this Newsletter and we hope to see you soon at one of the many eco2adapt events this year!

Alexia and Yong
1 April 2025

Exploring Diverse Ecosystems

Silvicultural Solutions and Drone Technology for Climate Resilience future

Palle Madsen

InNovaSilva is a partner with emphasis on silviculture and restoration practice within the *eco2adapt* consortium, and we will provide portfolios of tree species and management options for the future forests in the living labs.

We can of course only do it in collaboration with the coordinators, research-colleges, and local stakeholders of the Living Labs. Silviculture is only meaningful when the future expected objectives and restrictions of forest management and restoration are lined up.

Silviculture is done for a reason!

When these reasons become clear we suggest portfolios of silvicultural solutions for the future forests directed by specified management objectives. This may involve new species or altered use of species. Some of today's most common tree species may be used less in future - if for example increased risks are foreseen that climate change or new diseases or pests may weaken or kill them. Other species - not yet present there or perhaps less common - may become more relevant in the future or they may be wanted to spread the risk and increase resilience. This of course depending on what the people in the Living Labs - forest owners, managers, and stakeholders - want their forests to provide them in the future.

To make it relevant and interesting in practice for people in the Living Labs, we fly selected parts of the forests (stands or areas) with our drone borne LiDAR (https://enterprise.dji.com/zenmuse-l2) to create digital 3D models of these forests.

The purpose is to develop models and visualizations of the future starting with forests that in fact exist on the ground today. We will use them as starting points for possible conversions models towards the different solutions for the future forests.

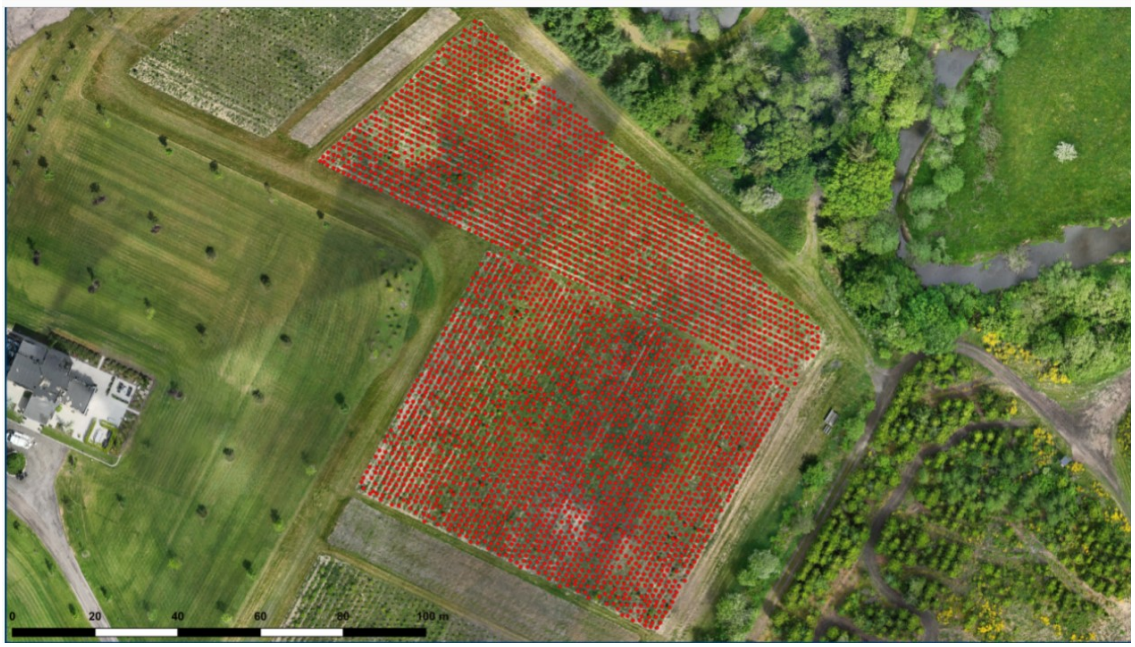

Fig. 1. The red dots show an accurate position of the single small trees. Height down to 10-20 cm tall seedlings can be provided.

We emphasize the provision of several solutions and not just one or two solutions for each Living Lab because of the significant uncertainty of what will be the challenges and risks for the future forests' health and stability. The increased risk calls for a spread of risk through implementation of multiple management practices and species, if possible, to avoid large scale failures.

In the following we show some examples from our training with our LiDAR drone in Denmark to demonstrate some of what we can provide, limited by forest types, we have practiced on so far.

These examples range from positioning of newly planted or 3-year-old (Fig. 1) and 15-year-old (Figs. 2 and 3) trees in afforestation projects on farmland as well as a 21-year-old nurse crop of poplar with a directly sown beech understory (Fig. 4) of same age.

Fig. 2. Individual trees show by their individual crowns contribute to the stand canopy and with the height of the individual trees shown for each tree in this young 15-year-old afforestation project.

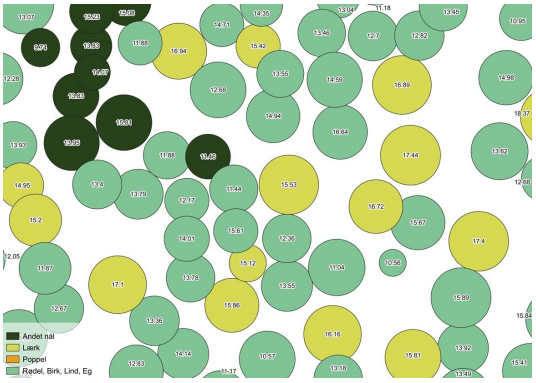

Fig. 3. Another design used to visualize individual trees - here shown by species or species group (color), crown diameter (diameter of circle), position, and their height in numbers.

Fig. 4. A transect of a specified width (here 5 m) shown with a 21-year-old poplar nurse crop (30 m tall) with also 21-year-old sown beech providing an understory. On such transects you can measure height and potentially also diameter of individual trees accurately.

Additionally, we can accurately monitor tree position, stock density, tree height, and estimate standing volume and carbon stock. With repeated monitoring (flights) over the years, we can estimate growth and carbon sequestration. We do also develop measurements and describing stand structure, heterogeneity, and regeneration. In addition to describe forest structures in a silvicultural context we thereby pursue indices to monitor habitat quality.

Source: https://www.eco2adapt.eu/blog/innovasilva

Policy section

Gradual vs. transformative adaptation to climate change

Frank Berninger

At the centre of *eco2adapt* is an adaptation to climate change. I started to understand the importance of adaptation when I visited my mother's area in Germany after the "COVID-19 interruptions" from Finland. The forests in the Siebengebirge close to Bonn used to be a mix of native beech and planted spruce stands. After the drought in 2019, most of the spruce died. Within *eco2adapt*, we explore what adaptation means and how management can limit similar damages to forest ecosystem services caused by climate change. Depending on which course climate change is taking, we will be confronted with a number of inconvenient choices. Spruce has been the main source of forest income for thousands of German forest owners. In Finland, damages to spruce stands have been increasing, although the present situation is not (yet?) dramatic. However, spruce is about one-third of the wood harvested in our living lab in North Karelia, and old spruce forests are essential for biodiversity and carbon sequestration. Within *eco2adapt* we think about adaptation of forestry to climate change. Adaptation to climate change in the forest sector has been mostly gradual, assuming that climate change will be relatively benign. In *eco2adapt*, we will review and revise these options and need to think about transformative options to adapt to climate change. We need to understand what to do if humankind fails to limit climate change.

In a classical paper, Robin Craic[1] wrote, "Stationarity is dead- long live transformation: Five properties for climate change adaptation law", that we need to accept that adaptation to climate change will be painful. This means we need to accept that some ecosystem services and ecosystems will be lost. In *eco2adapt*, we model ecosystems' vulnerability and identify critical tipping points. We look at strategies to maintain ecosystem services under different climate scenarios. Still, we also explore transformative changes, like large-scale tree species changes and changes in rotation length, that may be necessary under unfavourable climate change scenarios.

If we fall back on high-end scenarios of climate change we might need to shift to more transformative adaptation scenarios since management for greater resilience may not be enough. These may encompass actions that present stakeholders are not comfortable with. For example, assisted migration has been very contested due to potential adverse effects on biodiversity. It is also prohibited by law in many places. Other effects may be that some ecosystem services, especially forest carbon sequestration, may not be maintained due to higher tree mortality.

Collaboration within Europe and China allows us to have a broader horizon across many socio-economic conditions. Our work is not restricted to the interactions of climate and forests, but together with our stakeholders, we deal with a wide range of topics, including management and governance.

[1]*Robin Kundis Craig, Stationarity is Dead - Long Live Transformation: Five Principles for Climate Change Adaptation Law, 34 Harv. Envtl. L. Rev. 9 (2010).*

Advancing Forest PES in Europe: Bridging Policy, Finance, and Practice

Cecilia Fraccaroli and Sven Wunder, EFI

Europe has long implemented tailored agri-environmental Payment for Environmental Services (PES) models, with correspondingly relatively few forest PES and PES-like initiatives, mostly for watershed management and carbon sequestration[1,2]. We currently have already quite consolidated insights into designing and implementing PES to achieve the best impacts - as highlighted in our recent *eco2adapt* policy brief[1]. However, these currently scattered initiatives (i) rely on uncertain funding dynamics, (ii) lack an umbrella framework to facilitate their relevance, permanence and possible upscaling and (iii) remain predominantly linked to timber production.

Strengthening the policy and institutional framework

To scale up European forest PES beyond the current niche level, we are beginning to see stated intentions and incremental efforts across policy, research and finance. In support of the EU Forest Strategy and

Bioeconomy Strategy, the European Commission is promoting innovative public and private payment schemes for forest ecosystem services (ES). For instance, through its guidelines for developing public and private PES[3], the EC provides advice and technical guidance to member states.

The importance of strengthening the institutional backbone blending theoretical and practical insights was also highlighted during the seminar we recently organised within the realm of *eco2adapt*'s Task 2.4 (jointly with INTERCEDE project)[4]. The participants - private entities, researchers, policymaker and landowners – emphasized the need for sustained public funding for PES, rigorous monitoring of outcomes, and knowledge-sharing systems to ensure effective impact evaluation and replicability. Member States were said to be primarily responsible for mapping specific FES and evaluating the potential of PES to contribute to their enhanced provision.

Innovative finance and private sector engagement

On the financial front, EFI recently contributed to an online event where the European Investment Bank and Finance Earth launched a joint PES guidance publication. Innovative PES-like financing strategies across Europe were showcased as key drivers for channelling capital into forest business plans and management. Examples of alleged forest PES cases included mushrooms production in Finland – which incentivizes provisioning ES (unusual for PES systems), incipient biodiversity credits in Sweden, and a blended private-public certification initiative in Italy. These approaches were generally reinforcing the link between forest owners and investors and aimed at increasing the compatibility between timber harvesting and other ES provided (cf. linked publication [5], pp.59-61).

Several of the cases presented at the two events used a combination of public and private financing, i.e. hybrid models (public grants, private co-financing, corporate ES buyers). Private finance has some potential to attract capital to pilot these efforts, however it is hard to see why and how the private sector should bank a large-scale provision of public goods, such as for biodiversity conservation. It is thus also important that the public sector maintains the commitment of providing an institutional architecture and to mobilize resources. In our view, the idea of the private sector acting as a convenient out-of-the-blue financial saviour for European biodiversity is ludicrous: private financing will have an auxiliary role at best.

The private sector could, for instance, have a key role in piloting the financing of new PES fields, as we currently see in the emerging markets for biodiversity credits. However, looking at the insightful experiences with carbon credits and biodiversity offsets, it is important for these new biodiversity markets to invest in transparent methodologies and strong institutional governance[6].

Setting aside land

The Finance Earth publication looks primarily at synergies of PES with sustainable forest management (SFM) and the provisioning ES from wood, basically through timber revenues. This assumes an underlying *land-sharing philosophy,* where forest management integrates diverse societal and ecological demands into an economic model where timber-oriented management is in the driver's seat. Indeed, currently markets have already invested in carbon-focused PES, which does not necessarily require radical changes in forest management. However, at a bird's-eye view it is thought-provoking that over decades of increasing forest cover and promotion of SFM in Europe, the continent's forest biodiversity has nevertheless markedly declined. With an urgently needed focus on improving efforts of biodiversity conservation in Europe, should PES not also increasingly incentivise *land-sparing* approaches? This could involve paying landowners for longer-term forest set-aside strategies that renounce of timber and other extractive "provisioning ES" revenues and compensate for landowners' corresponding opportunity cost. One such long-term strategy is rewilding, where basically forest areas are left to nature's own process of ecological restoration. This can also involve the reintroduction of large grazers into landscapes where they can help in seed dispersal and to maintain lower fuel-load to reduce wildfire risk. More experimentation and applied research are needed to understand the best way to pay for such new rewilding areas, as well as to quantify the opportunity costs. While ideas for new forest PES forms are being developed, it is important also to think outside of the box of the currently predominating forestry paradigms, not putting all eggs into the same old-familiar basket.

[1] *Wunder, 2024. How can we make Payments for Environmental Services work?*

[2] *SINCERE, 2018. Innovation Mechanisms in Europe*

[3] *European Commission, 2023. Guidance on the Development of Public and Private Payment Schemes for Forest Ecosystem Services*

[4] *Wunder and Fraccaroli, 2025. Advancing the Implementation and Effectiveness of Payments for Environmental Services (PES) in European Forests*

[5] *Finance Earth, 2024. Integrating payment for ecosystem services schemes (PES) into forest management and business plans*

[6] *Wunder et al., 2025. Biodiversity credits: learning lessons from other approaches to incentivize conservation*

Overview of the Living Lab

Living Lab in China: Baotianman Experiment Forest

Photo 1. The main station building of Baotianman Forest Ecosystem Research Station

Baotianman is located in Nanyang of Henan Province, the southern foothills of the Funiu Mountains in China. It is in the transitional belt from the warm temperate zone to the northern subtropical zone, typically with deciduous broad-leaved natural forests dominated by the species of oak (Photo 1).

Expected Results. The primitive forest at Baotianman is one of few natural species reservoirs in China. Using flux tower (Photo 2), the team will conduct monitoring and research on experimental plots under simulated climate change to build up one set of basic monitoring data-set of forest ecosystem, and thus to reveal the response and adaptation mechanisms of natural forests in Baotianman to drought and warming (Photo 3).

Photo 2. Flux tower (Right).

Photo 3. The experimental platform for manipulative through fall reduction

Source: Newsletter of China-EU Project eco2adapt, second Issue

Scientific news

Peris-Llopis et al. 2024. Impact of species composition on fire-induced stand damage in Spanish forests. *Scientific reports* 14, 8594. https://doi.org/10.1038/s41598-024-59210-4

Mixed forests, which comprise a variety of tree species, play an important role in maintaining biodiversity and providing essential ecosystem services. It's commonly believed that these diverse forests are more resilient to disturbances, such as wildfires, compared to forests dominated by a single species. However, recent research challenges this assumption, revealing that the relationship between forest composition and fire resilience is more complex than previously thought.

Our study examined tree mortality due to fire in both mixed-species and pure-species forests in Spain. The research included data from National Forest Inventory (NFI) plots, encompassing over 30,000 trees, over a period spanning from 1986 to 2007. This extensive dataset allowed to assess how different forest compositions influenced stand damage after fire. Contrary to the prevailing belief that mixed forests better withstand fire, our study uncovered that mixed-species forests can sometimes experience higher tree mortality rates after fire compared to pure-species forests. These rates varied depending on species composition and varying levels of species admixture (Fig. 1.).

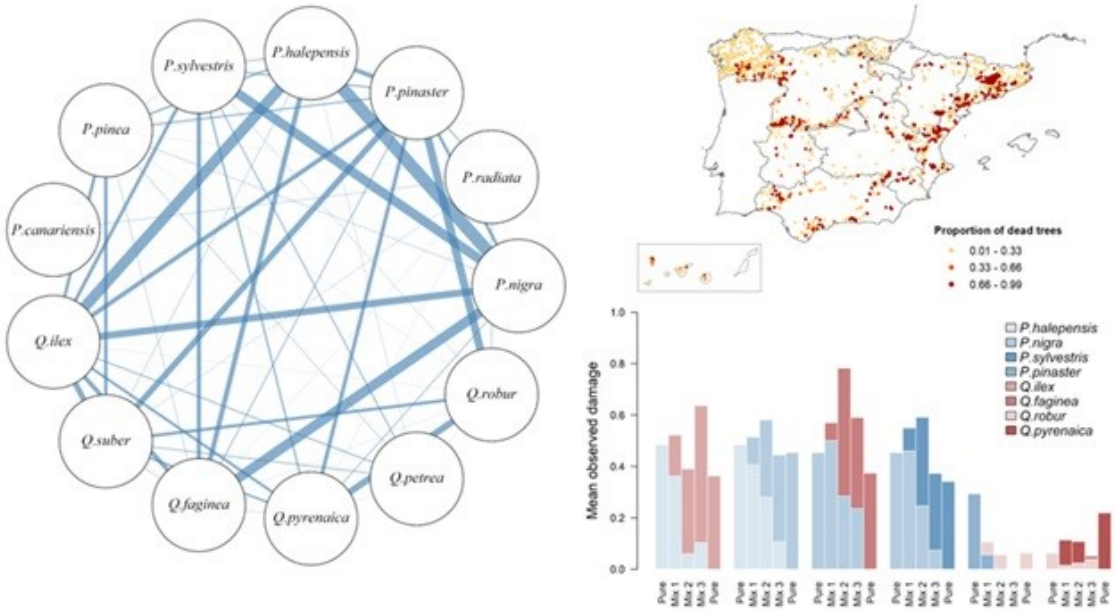

Fig. 1. a) Species co-occurrences in the NFI burnt plots. Band width represents number of co-occurrences. b) Proportion of damage due to fire (dead trees) in the burnt NFI plots. c) Mean observed damage according to species and proportion of mixture in the burnt NFI plots.

This increased vulnerability is particularly evident in mixed forests containing tree species with differing responses to fire, such as fire-resistant versus fire-resilient species. The differing fire-related strategies of tree species, defined based on variations in bark thickness, serotiny, and regeneration methods among others, can create conditions where the presence of one species increases the vulnerability of the other to fire. For instance, forests comprising both Aleppo pine (*Pinus halepensis*) and Black pine (*Pinus nigra*) exhibited greater susceptibility to fire damage than forests dominated by either species alone. In mixed forests where species with contrasting fire strategies coexist, these differences can lead to unintended consequences. For example, increased fuel load in intermediate layers of the forest structure when self-pruning species are mixed with species lacking this capacity. This dynamic can result in higher overall tree mortality in mixed stands due to higher connectivity between layers, resulting in facilitated spread of fire up-tree.

These findings suggest that the composition of tree species in a forest plays a crucial role in determining its resilience to fire. While mixed forests offer numerous ecological benefits, certain combinations of species may increase vulnerability to fire. This study highlights the need for newer approaches to forest planning and fire risk, considering the complex interactions between tree species and their individual and collective response to fire. By carefully selecting species combinations and mixture levels that complement each other's fire strategies and heighten stand survival, we can work towards promoting forests that are both diverse and better equipped to withstand the challenges posed by wildfires.

Outreach

Pl@ntNet in Action: Tracking Dzūkija National Park's Flora

Gailenė Brazaitytė, Gediminas Brazaitis and Michael Manton

One of the key aims of the *eco2adapt* project is to promote citizen science. Monitoring plant species throughout the project's living labs is no small task and would generally require years of botanical expertise. Now, with the Pl@ntNet application, plant identification has become easy and accessible to nature lovers and scientists alike. With just a single photo, the app can identify plant species in seconds, making it easier than ever for citizens to contribute to scientific research.

As a part of *eco2adapt's* citizen science initiative, Vytautas Magnus University established the Pl@ntNet observation group "Dzūkija National Park Living Lab", inviting all interested users to help identify and locate the park's flora. Dzūkija National Park, with its mosaic landscape of pine forests, wetlands, dunes, and meadows, is home to over 700 recorded vascular plant species – ranging from common and rare native to invasive species. Thanks to Pl@ntNet, identifying and sharing this rich flora has become more accessible than ever.

In the past year, the group has recorded 181 plant observations, identifying 77 different species. Most of these are common and characteristic species of Dzūkija's forests, such as Marsh Tea (*Rhododendron tomentosum*) and Common Toadflax (*Linaria vulgaris*) (Photo 1).

Photo 1. Identified Marsh Tea (*Rhododendron tomentosum*; left) and Common Toadflax (*Linaria vulgaris*; right) in Lithuania Living Lab (Source: Gailenė Brazaitytė, Pl@ntNet)

The group encourages citizens to observe not only common but also invasive species. With a changing climate, ecosystems all around the world have become increasingly vulnerable to non-native species invasions – Dzūkija National Park is no exception.

Throughout all Lithuania, 18 invasive plant species have been declared. Of the 181 total observations shared in Dzūkija National Park group, 38 have identified invasive plants of four different species: Boxelder (*Acer negundo*), Tall Fleabane (*Erigeron annuus*), Large-leaved Lupine (*Lupinus polyphyllus*) and Common Broom (*Cytisus scoparius*).

Boxelder (*Acer negundo*), a widespread invasive species, is commonly identified near rivers, creeks, and lush meadows, where it poses a significant threat to riparian habitats (Photo 2).

Tall Fleabane (*Erigeron annuus*) is a seemingly delicate plant that disrupts Dzūkija's forests by outcompeting low-growing native plants. Its high invasiveness is driven by abundant seed production and wind dispersal. Tall Fleabane begins flowering in early summer and continues until the late autumn, allowing it plenty of time to spread seeds. A single flower can produce up to 80 seeds, and even if cut down, it regrows rapidly within 3-4 weeks. Given these traits, it's no surprise that this species has spread throughout the living lab.

Photo 2. Identified invasive Boxelder (*Acer negundo*; left) and Tall Fleabane (*Erigeron annuus*; right) in Lithuania Living Lab (Source: Mindaugas, Pl@ntNet (left) & Indrė Ruškytė, Pl@ntNet (right)).

Large-leaved Lupine (*Lupinus polyphyllus*) in Dzūkija National Park has a long history. First introduced nearly a century ago, it was originally planted to improve soil fertility through its nitrogen-fixing abilities and to prevent erosion. However, the sandy soils of Dzūkija are an ideal habitat for many native species, and today, Lupine is considered a threat to local ecosystems. Within the living lab, it has been recorded as one of the most common invasive species, thus numerous observations have been shared in the Pl@ntNet group (Photo 3).

Common Broom (*Cytisus scoparius*) was introduced to Dzūkija forests as a food source for wild animals. Adapted to thrive in poor soil conditions, it has since spread across the living lab, forming dense thickets that shade out nearby native plant communities. In the Pl@ntNet group, this species has been observed multiple times, highlighting its rapid and widespread expansion throughout the park.

Photo 3. Identified invasive Large-leaved Lupine (*Lupinus polyphyllus*; left) and Common Broom (*Cytisus scoparius*; right) (Source: Indrė Ruškytė, Pl@ntNet).

The Pl@ntNet app can also be used to identify rare and endangered plants with two species identified. **Finland pink** (*Dianthus arenarius*) (Photo 4) with delicate white flowers were recorded in four locations. This rare species thrives in the sandy, semi-open habitats of Dzūkija, and is classified as Least Concern (LC) in the Red Data Book of Lithuania.

European arnica (*Arnica montana*) (Photo 4) with bright yellow flowers that bring colour to the dry living lab pinewoods throughout the summer were observed in three locations. This plant is classified as Vulnerable (VU) in the Red Data Book of Lithuania.

Photo 4. Identified red-listed Finland pink (*Dianthus arenarius*; left) and European arnica (*Arnica montana*; right) in Lithuania Living Lab (Source: Indrė Ruškytė, Pl@ntNet)

Weather it's spotting common, rare or invasive species, Pl@ntNet bridges the gap between citizen

curiosity and scientific research. Every observation contributes to monitoring Dzūkija National Park's flora and identification of the region's botanical richness. As the new vegetation season approaches, we look forward to even more contributions from our Pl@ntNet community.

For further information contact: gediminas.brazaitis@vdu.lt

ForestRe Ltd. in *eco2adapt*

Phil Cottle

ForestRe Ltd is an independent consulting company that works closely with, but independently of, Globe Underwriting – an insurance Agency based in the City of London. The Globe forestry unit which I lead, is globally a uniquely experienced forestry risk mapping, measuring, modelling and pricing team.

No one wants to buy insurance. Only if the perceived climate risk is real and significant, does insurance become a logical step in managing the asset. We have found via experience that even some significant forest management organisations appear to be unfamiliar with the basic community causes of fire and hence adopting appropriate fire mitigation and management strategies. For these reasons our marketing strategy has been to inform and explain, and not to 'sell' insurance.

Hence, since the early noughties' our focus has been in illustrating climate risk impacts on managed forestry in terms of frequency, severity and indeed the nature of risk itself such as unpredictable 'extreme' events. Since 2019 we introduced the use of earth observation data into the measurement and mapping of risk so bringing independent data to risk assessment. This is key to a rigorous procedure for pricing risk that also enables us to model loss data be it fire or wind, and so to provide the client with a risk profile anywhere on earth and to avail them of the opportunity to take measures to mitigate the forecast losses.

Through my involvement with *eco2adapt*, I have considered far more issues of forest adaptation and risk mitigation and discussed with various insurers whether they would ever consider incentivising such management activities. Through my involvement with the ***European Institute of Cultivated Forests***, I am learning about adaptation and mitigation management. Consequently, from this year such concepts are included in our presentations as management tools that can help reduce the loss potential significantly, particularly from fire, but also pest and disease and to some extent wind.

Our presentations to investors for example this 7th January ('***Investments into Forestry & Biodiversity Summit'*** **(**https://ce-em.com/**)** continue to illustrate using actual examples, losses from climate events in commercial forests managed by the best in sector; how modelled loss data can be used in forecasting the volatility in returns to investors in the light of known risk; how insurance products can be tailored to the risk appetite of the forest owners and now, how can examples of risk adaptation, mitigation and management reduce potential losses, leading to new modelled risk for such forests. The following planning cycle was presented to the Summit that included not just the traditional management practices but mitigation tools now available to us to be one step ahead of the fire:

Fig. 1. The adaptation work being carried out by ForestRe Ltd. in association with Globe: EU Horizon Project *eco2adapt*

Managed and public forests pose different risks. As we have seen in the recent California fires, it is the same old problems of excess fuel loads that have existed for years, and the same old fire management technology. This was observed in a very recent linked-In post by Edna Keane of **Treemetrics** Ltd. ' *...That here we are again facing the same issue of excess fuel build-up leading to catastrophic fires ...and still relying on many of the same fire-fighting methods discussed back then [1982]'.*

By and large, managed forests and agro-forestry do try to control fuel loads as well as having defensive infrastructures in place. But the latest threats especially in the USA is due among other factors, ill-informed 'conservation' principles. As insurers we need to provide the sector with data that quantifies the risk that various management practices engender, and offer clients an insurance price to fit their particular risk and to reward /incentivise their practices that really mitigate against major fires. But we shall continue to speak about the newer mitigation technologies and the importance of considering adaptation measures that over the long term will make forests more resilient to a warming climate.

Past events

eco2edapt Researchers Actively Engage at EcoSummit 2024

During EcoSummit 2024 in Zhengzhou, China (December 12–19, 2024) researchers from the *eco2adapt* team have been actively sharing knowledge, fostering collaboration, and strengthening international partnerships.

Key Highlights:

Presentations by Team Members. Frank Berninger (UEF), Xudan Zhu (UEF), He Qu (ZAFU), Zhun Mao (INRAE), and Tao Yu (CAF-Chinese Academy of Forestry) delivered oral presentations (Photo 1).

eco2adapt Project Progress Meeting. A dedicated meeting was held to review and update the progress of the *eco2adapt* project, ensuring alignment with goals and sharing insights among team members.

Strengthening Collaborations with Chinese Researchers. Frank Berninger and Xudan Zhu engaged in discussions with Chinese researchers to explore new cooperation opportunities in our field.

Living Lab Visit at ZAFU, China. Frank Berninger, Liang Chen and Xudan Zhu visited the living lab at ZAFU, China. The visit included meetings and a presentation to share project advancements and exchange ideas for future developments (Photo 2 and 3).

The team's active participation highlights our commitment to driving impactful research and fostering global cooperation. Stay tuned for more updates!

Photo 1. Prof. Frank Berninger (UEF) in ecoSummit 2024; *Source: Xudan Zhu, UEF*

Photo 2. Dr. Zhun Mao (INRAE) and Liang Chen (UEF) in ecoSummit 2024; *Source: Xudan Zhu, UEF*

Photo 3. Prof. Frank Berninger (UEF) with Chinese researchers; *Source: Xudan Zhu, UEF*

Upcoming events

eco2adapt joint meeting in Sanya, Hainan Province of China, April 7-11, 2025.

eco2adapt joint meeting will be hold in Sanya, Hainan Province of China from April 7th to 11th, 2025. The primary purposes of this meeting are to exchange the progress and outputs, and to promote next phase collaborations. Through in-depth discussions and exchanges, it is intended to enhance cooperation between EU and China in forest ecosystem resilience and management.

We hereby cordially invite eco2adapt partners to participate in this meeting. Your esteemed presence, along with the sharing of your professional insights and valuable suggestions, will play a pivotal role of the eco2adapt project. The attachment includes more information and draft agenda.

There will be EU-China team joint sessions on specific topics, which can be link with Working Packages (WP) of *eco2adapt*-EU and Research Tasks (RT) of *eco2adapt*-China. We encourage leaders and delegates of each WP and RT to suggest the session topic by 28th February. Each session will be 90 minutes include presentations and QAs. Depending on the number of presentations, we plan to organize poster presentations space for Living Labs and young scientists.

If you have any questions or suggestions, please contact with: Alexia Stokes (alexia.stokes@cirad.fr), Prof. Yong Pang (pangy@caf.ac.cn) for meeting arrangement and Dr. Yi Wang (wangyi@icbr.ac.cn), Dr. Yu Tao (yutaogis@ifrit.ac.cn) for local information.

Announcement

Training course announcement

Exploring Forest Landscape Resilience with the DORIAN Model

Date and Place: 14:00 – 18:00, 11 April in Sanya, China

Organisor: Team of Applied Ecology and Ecosystem Services (EASE), UMR AMAP, France
Zhun Mao, researcher of INRAE – UMR AMAP, France (zhun.mao@inrae.fr); Jiaxi Yao (yao.jiaxi@outlook.com), junior researcher of INRAE – UMR AMAP, France; Cédric Gaucherel (gaucherel@cirad.fr), research director of INRAE – UMR AMAP, France.

Forests are complex socio-ecological systems that provide a wide range of ecosystem services while facing increasing pressures from global change. Understanding the resilience of forest landscapes and the dynamics of ecosystem services under different management scenarios is crucial, but remains a major challenge for researchers, policy makers and land managers.

To address this challenge, we invite you to participate in our training course on the DORIAN model, a cutting-edge modelling method designed to simulate the dynamics of socio-ecological systems and the associated ecosystem services. This course will introduce participants to the fundamentals of DORIAN, its application in ecosystem service assessments, and its potential to support decision-making in forest landscape management.

Course highlights:

- Introduction to socio-ecological system modelling and ecosystem networks
- Understanding the limitations of traditional modelling approaches and the benefits of network-based methods
- Hands-on experience with the DORIAN model: defining nodes (discrete objects) and edges (interaction rules)
- Application of DORIAN to real management scenarios to explore cascading effects of decision-making on ecosystem services

Why join us?

- Gain valuable insights into an innovative approach for modelling complex ecological interactions
- Learn from experts in forest landscape modelling and socio-ecological dynamics
- Enhance your skills in scenario analysis for sustainable landscape management
- Engage with a network of like-minded professionals and researchers
- Use DORIAN to design your own case study !

Who should join us?
This course is designed for researchers, students, environmental managers, and policymakers interested in modelling ecosystem services and resilience in forest landscapes. No prior experience with DORIAN or network-based models is required, but a basic understanding of ecological processes and system dynamics will be beneficial.

The course in Sanya, China is free and prioritized for *eco2adapt* members, but please contact the organizers if you are interested in attending and we will keep you updated on future opportunities.
Join us for this exciting opportunity to deepen your understanding of forest resilience and ecosystem service dynamics using the DORIAN model! For more details and registration information, please contact the organizers.

References

Gaucherel, C., Pommereau, F. (2019). Using discrete systems to exhaustively characterize the dynamics of an integrated ecosystem. Methods in Ecology and Evolution, 10(9), 1615-1627.

Mao, Z., Centanni, J., Pommereau, F., Stokes, A., Gaucherel, C. (2021). Maintaining biodiversity promotes the multifunctionality of social-ecological systems: holistic modelling of a mountain system. Ecosystem Services, 47, 101220.

Summer School "Ecology and Climate Change" August 11-22, 2025

The course on "Ecology and Climate" change will focus on the interactions of climate change, soils and water in headwatersheds. Climate change will change soil processes quite drastically. As a result, aquatic ecosystems' resilience is also affected because these are closely linked to soils. As an interdisciplinary project the summer school will deal with ecological, socio-cultural and economic aspects of climate change. There will be an important hands-on component where we will learn field and lab methods. The summer school will be organised jointly with the Eco2adapt and Microeco projects as a collaboration of the Universities of Eastern Finland, the University of Belgrade and the Zhejiang A&F Universities.
The course fees are 550 € - 250 € and free for UEF degree students.
Registration before the 1.6.2025. Dates are 11.8-22.8 and the location is Joensuu, Finland.
https://apply.summerschool.uef.fi/courses/course/129-summer-school-ecology-and-climate-change


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