



Policy Brief

Key Messages

The rise of new digital technologies and playful tools brings potential for deeper and better contextualised participation in forest planning, particularly in urban and semi-urban publicly owned and community forests.

Digital forest technologies risk deepening inequalities in forest governance unless equity is prioritised from the outset.

Our analysis of more than 25 playful forest technologies reveals that current tools primarily cater to urban, educated, digitally literate groups, while serving older adults, low-income communities, rural residents, and people with limited digital skills less meaningfully.

To ensure inclusive participation across the Nordic-European region, we recommend:

- Design technologies that bridge gaps in digital literacy, economic access, and geographic connectivity, rather than assuming everyone has the same technical skills.
- Support initiatives that physically connect modellers with field researchers, academics with practitioners, and developers with end users.
- Ensure publicly funded forest data collection and governance processes provide both digital and non-digital participation routes, with complexity levels that adapt to user capabilities.
- Establish frameworks that allow all stakeholders, especially women and minorities, to openly voice concerns about equity and sustainability.

Introduction

Playful and immersive technologies, such as location-based games, extended reality (XR) applications (including augmented reality (AR) and virtual reality (VR)), and innovative participatory mapping methods, are beginning to reshape forest governance across the Nordic region and much of Europe.

But who benefits from these innovations and who risks being left behind?

The PlayFair Forest Network brought together 49 researchers from 10 European countries and 7 stakeholders to explore this issue. Using technology mapping, stakeholder surveys, and expert workshops, we reviewed over 25 playful forest technologies. Our results show a consistent pattern: these tools tend to serve urban, educated, digitally literate groups, whilst providing limited benefit to older adults, low-income communities, rural residents, and individuals with limited digital skills.

As one survey respondent observed: "The technology serves those who already have a voice, making them louder, whilst those without digital access become even more invisible." This policy brief provides evidence-based recommendations to ensure that forestry's digital transformation promotes democratic and equitable participation for all.



Nordic Forest Research



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Current Challenges

Through our collaborative analysis, we identified five categories of playful forest technologies in use or in development:

- Location-based games and gamified data collection tools
- Immersive technologies (VR/AR visualisations, digital forest twins, robotic companions)
- Participatory mapping and crowdsourcing systems
- Serious games focused on sustainability education and multiple perspectives
- Decision support and scenario planning platforms

Across all categories, clear patterns of inclusion and exclusion emerge. Urban populations, those with higher levels of technological literacy, younger age groups, those with higher incomes and education levels, and individuals already engaged in forest issues consistently benefit most. Meanwhile, systematic barriers limit the value these tools provide to those with limited digital familiarity, low-income communities, rural and remote populations, people with disabilities, linguistic minorities, and communities holding traditional ecological knowledge.

The main obstacles include equipment costs, digital literacy gaps, language limitations, institutional resistance to participatory technologies, and limited accessibility features. Without addressing these barriers, digital forest technologies risk creating a two-tier system in which participation depends on economic resources, technical capabilities, and geographic location rather than being based on forest knowledge, lived experience, or a legitimate stake in forest decisions.



photo by Philip Chambers

For Policymakers

Digital forest technologies establish path dependencies that limit future options for many years. Policymakers need to promote innovation while avoiding lock-in, ensuring that technologies benefit diverse communities rather than making communities adapt to technology. It is important to consider unintended consequences: past decisions may restrict future policy choices.

Recommendations:

- Develop participatory processes that hear diverse stakeholders before committing to digital infrastructure
- Require flexibility and optionality in publicly funded technologies to adapt at both landscape and individual scales
- Balance top-down standards with local judgement by those closest to forests
- Establish enabling regulation that supports innovation whilst protecting equity and the environment



photo by Philip Chambers



For Forest Owners, Communities and Professionals

This diverse group encompasses forest owners ranging from older adults who possess deep forestry knowledge but may struggle with newer technologies, to younger people who are comfortable with digital tools but might lack forestry experience. It also includes community members who enjoy recreating in forests, local residents impacted by forest decisions, and professionals and educators working to connect these groups. With constant updates in research and regulations, there is an overload of information. Technologies need to accommodate this diversity rather than assuming a single "typical" user.



photo by Philip Chambers

For Forest Owners:

- Experiment with digital tools designed for intergenerational use, sharing your forestry knowledge whilst learning new technical skills from younger family members
- Actively seek training that matches your current capabilities, whether digital literacy support or forestry decision-making guidance
- Test and provide feedback on tools that help you navigate the daily influx of research and regulatory information
- Take ownership of forest decisions by using available support tools whilst maintaining your autonomy and expertise
- Voice your needs when digital tools create barriers, helping developers understand where non-digital alternatives are essential

For Forest Professionals and Educators:

- Develop adaptable teaching resources that work for non-technical forest owners whilst maintaining sophisticated capabilities for advanced learners
- Support professionals struggling to teach diverse audiences with tools designed only for university students
- Facilitate structured dialogue between practitioners and owners to understand actual needs rather than assumptions
- Connect academic and practical knowledge through partnerships between universities, forest schools, technology companies, and extension services

For Researchers and Funders

Researchers encounter silos separating modellers from field workers, a disconnect between conservation efforts and industry priorities, and limited resources for learning emerging technologies. Short project cycles hinder investment in acquiring new methods. Overcoming these barriers necessitates funding structures that promote collaboration rather than supporting isolated projects.

Recommendations:

- Create collaborative funding programmes requiring genuine co-design between researchers, developers, end users, and policymakers
- Fund skills development in emerging methods (VR, games, participatory technologies), recognising that learning requires time beyond short project cycles
- Establish initiatives that physically bring together divided communities, bringing modellers into forests and field researchers to computing labs
- Support gamified partnering events before major funding calls, where potential collaborators meet through playful activities
- Learn from gaming and HCI communities by encouraging attendance at gaming events and adopting proven engagement methods



For Business and Technology Developers

Developers encounter diverse challenges: startups depleting resources on compliance without impact, corporate innovators (especially women) stuck in internal bubbles where dissent is ignored, and techno-optimists ignoring ecological boundaries and exclusion issues. Design processes should focus on actual users and real constraints instead of hypothetical ideas.

Recommendations:

- Streamline compliance pathways and provide accessible equity-design guidance from project start
- Break company bubbles through networking, connecting developers with researchers and actual users beyond organisational walls
- Create safe spaces for dissent where developers (especially women and minorities) can raise equity or sustainability concerns without career penalties
- Spend time in forests with practitioners before designing, understanding real workflows and constraints, rather than assumptions
- Share open platforms, lowering barriers to creating playful forest technologies
- Balance optimism with realism: consider ecological capacity limits (how many robot dogs per hectare?), recognise that even digital services consume physical resources, and identify who might be excluded
- Recognise diversity within user groups, designing flexible solutions rather than one-size-fits-all approaches

Expected Impact

Implementing these recommendations will contribute to:

- Democratic forest governance where diverse voices shape decisions, particularly groups currently excluded from digital processes
- Reduced digital inequality through hybrid participation models that work for both tech-savvy and non-digital users
- Better-informed forest decisions that incorporate local knowledge, diverse values, and multiple perspectives
- Increased trust in forest institutions through transparent, accessible, and culturally appropriate engagement
- Innovation serving society by directing technology development toward equity rather than technical sophistication alone

Next Steps & Future Vision

Immediate Actions (2026):

- Engage with policymakers and funding bodies to embed equity standards in forest technology programmes.
- Develop case studies that demonstrate equitable technology deployment across diverse contexts.
- Maintain a programme of webinars for knowledge exchange and mutual support.

Our vision is a Nordic-European forest sector where digital and playful technologies fulfil their democratic potential, enabling all people to meaningfully participate in forest governance, regardless of age, economic circumstances, location, or relationship with technology.

Achieving this requires a fundamental shift: from innovation as an end in itself towards innovation that serves collective wellbeing. It demands valuing multiple forms of knowledge and capability equally, ensuring that different kinds of expertise inform one another, and designing technologies that build bridges rather than barriers.

The PlayFair Forest Network is committed to supporting this transformation through continued research, practical guidance, and cross-cultural learning across the region and beyond.

About the PlayFair Forest Network

The PlayFair Forest Network (2025-2026) has brought together researchers, practitioners, and technology developers from across Europe to ensure that playful forest technologies promote equitable participation in forest governance.

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Website: <https://sites.uef.fi/playfairforest/>

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