Designing a Data-Driven Decision Support System for Sustainable and Climate-Resilient Forest Management: Lessons Learned from the OptForEU Project

Lasse Berntzen
School of Business
University of South-Eastern Norway
Hønefoss, Norway
e-mail: lasse.berntzen@usn.no

Marius Rohde Johannessen
School of Business
University of South-Eastern Norway
Borre, Norway
e-mail: marius.johannessen@usn.no

Alessio Collalti
Forest Modelling Laboratory
National Research Council of Italy
Perugia, Italy
e-mail: alessio.collalti@cnr.it

Mauro Morichetti
Forest Modelling Laboratory
National Research Council of Italy
Perugia, Italy
e-mail: mauro.morichetti@cnr.it

Hermine Mitter
Department of Environmental Systems Sciences
University of Graz
Graz, Austria
e-mail: hermine.mitter@uni-graz.at

Stefanie Linser
Institute of Forest, Environmental and Natural Resource Policy
BOKU University
Vienna, Austria
e-mail: stefanie.linser@boku.ac.at

Alice Ludvig
Department of Economic and Social Sciences
BOKU University
Vienna, Austria
e-mail: alice-ludvig@boku.ac.at

Francesca Gianetti
Department of Agriculture, Food, Environment and Forestry
University of Florence
Florence, Italy
e-mail: francesca.giannetti@unifi.it

Ilaria Zorzi
Bluebiloba Startup Innovativa s.r.l
Florence, Italy
e-mail: ilaria.zorzi@bluebiloba.com

Sorin Cheval
National Meteorological Administration
Bucharest, Romania
e-mail: sorin.cheval@meteoromania.ro

***Abstract*—Climate change mitigation and adaptation increasingly rely on effective forest management, as forests represent one of Europe's largest carbon sinks while simultaneously providing biodiversity, economic, and social benefits. However, forest management decisions are complex due to uncertain climate futures, diverse ecosystem services, and regionally varying management practices. The OptForEU project addresses this challenge by developing a data-driven Decision Support System (DSS) to assist forest managers and policymakers in evaluating management strategies across different climate and policy scenarios. While most project outputs target forestry and environmental science audiences, this paper presents the project from an Information Systems (IS) perspective. The paper describes the background, design principles, data architecture, and implementation of the DSS, emphasizing the challenges of integrating heterogeneous data sources, fostering cross-disciplinary collaboration, and involving stakeholders in co-creation. Lessons learned from large-scale European collaboration are discussed, with particular attention to user adoption, ontology mismatches, and the socio-technical challenges of deploying data-driven decision tools across diverse national contexts. The paper concludes with reflections on how IS methods and co-creation practices can improve the adoption of environmental decision-support tools in complex multi-stakeholder settings.**

Keywords-forest management; decision support; co-creation; open data; OptForEU.

I. INTRODUCTION

The OptForEU project has produced numerous scientific outputs, primarily for forestry researchers, climate scientists, and environmental policymakers. However, the project also represents a substantial effort in building an operational, data-driven Decision Support System (DSS), raising important Information Systems and socio-technical challenges that are highly relevant beyond forestry research, particularly for forest owners and forest managers. This paper, therefore, presents the project from an Information Systems perspective, focusing on system design, data integration, stakeholder collaboration, and implementation lessons relevant to IT professionals and IS researchers.

Forests play a central role in climate mitigation because they store and sequester large amounts of carbon while simultaneously providing biodiversity, recreation, and economic value through timber production and other ecosystem services. At the same time, climate change, induced biotic and abiotic disturbances (e.g., droughts, pest outbreaks, forest fires, windstorms), and evolving economic and policy demands create complex trade-offs between conservation objectives and resource utilization. Forest management decisions must balance unmanaged or old-growth forests, which often maximize biodiversity and long-term carbon storage, with sustainable and integrated forest management that supplies renewable materials and supports economic activity while still contributing to ecosystem services.

Forest management decisions differ from many other policy and management decisions in that their consequences unfold over decades and are often irreversible. Choices regarding harvesting intensity, species composition, or conservation set forest trajectories that constrain future options and lock in ecological and economic outcomes for generations [1].

In practice, forest management decisions are often based on a combination of expert judgment, locally developed planning tools, and fragmented datasets. While such approaches may work within stable contexts, they offer limited support for systematically evaluating long-term trade-offs under uncertain climate futures or comparing alternative strategies across regions [2].

While DSSs have been studied for decades in environmental and natural resource management, the literature has often prioritized model development and technical performance. Less attention has been given to the socio-technical conditions of implementation, including stakeholder participation and co-creation, trust, institutional fit, and cross-context adaptation in heterogeneous policy and cultural settings [3].

Decision-makers therefore face long-term choices under uncertain climate and economic scenarios, often with incomplete information and regionally specific constraints.

The OptForEU project seeks to address this complexity by providing decision-support tools that enable stakeholders to evaluate alternative management strategies under varying environmental and policy assumptions. This paper explores why a DSS approach is needed in forest management, how data-driven methods support such decision-making, how stakeholder co-creation shapes system design, and which lessons can be learned from cross-disciplinary system development.

Through this, the paper makes three main contributions: First, the paper provides a detailed account of the design and architecture of a large-scale, data-driven DSS for forest management developed in a European research context. Second, it identifies key socio-technical challenges related to data integration, stakeholder trust, and cross-national collaboration. Third, it contributes to Information Systems research by reflecting on how co-creation and design science approaches can enhance the adoption of environmental decision-support tools. The paper is guided by the following questions:

1. *How can a data-driven DSS support forest management decisions under climate and policy uncertainty?*
2. *What socio-technical challenges emerge when such systems are co-created with diverse stakeholders?*
3. *What lessons can be drawn for the design and adoption of environmental DSS in complex governance contexts?*

Section II describes the design process. Section III presents the data-driven decision framework. Section IV focuses on co-creation and stakeholder-centered design. Section V presents results and lessons learned. Section VI discusses the findings. Section VII concludes the paper and proposes future work.

II. Designing a DSS for Forest Management

DSSs have long been used in domains characterized by uncertainty, multiple competing objectives, and incomplete information. Forest management represents precisely such a domain, where decisions often affect ecosystems and economic conditions for decades or even centuries.

Forest management decisions must simultaneously consider carbon sequestration capacity, biodiversity preservation, timber production, management intensity, climate change adaptation, soil conservation and health, economic viability, and regional policy constraints. Traditionally, such decisions rely heavily on expert judgment and locally developed practices, making systematic comparisons across alternative forest management practices difficult. The OptForEU DSS aims to address this challenge by providing tools that simulate different forest management practices under three different climate change scenarios, quantify the impacts of ecosystem services, and support transparent decision-making processes, all based on a set of Essential Forest Management Indicators (EFMIs).

From an Information Systems perspective, the system must achieve analytical accuracy while remaining usable and trustworthy for practitioners. Results must be interpretable, transparent, and aligned with existing decision-making practices. Major design challenges include accommodating diverse user groups across different European regions and countries, handling heterogeneous data sources, maintaining transparency in modeling outputs, and ensuring adaptability across different forest types and governance contexts.

III. Data-Driven Decision Framework

The OptForEU DSS relies on integrating a wide variety of data sources into a unified analytical framework. Central inputs include satellite imagery (e.g., European Copernicus data), national forest inventory data, climate projections, soil and biodiversity datasets, model output, open data repositories, and records of forest management practices.

While empirical and observational data describe current and historical forest conditions, they cannot directly provide projections of future forest development under alternative climate and management scenarios. Model-generated datasets are therefore used to support long-term scenario analysis under climate uncertainty.

The DSS is informed by a suite of model-generated datasets describing forest dynamics under alternative climate and management scenarios. In particular, outputs from forest ecosystem models, including 3D-CMCC-FEM [4] and PICUS [5], provide projections of EFMIs and information on forest growth, carbon fluxes, and structural changes. These are complemented by regional climate model outputs (e.g., RegCM-CCLM [6] and REMO-iMOVE [7]), and by land-surface model simulations (e.g., JULES [8]), which describe land–atmosphere exchanges and surface processes. Together, these modeled datasets form the core knowledge base used to "fill" the DSS and support the evaluation of management options across varying climatic and policy contexts.

 ISBN: 978-1-68558-382-8

Each modeling component contributes complementary information to the DSS. Forest ecosystem models provide management-sensitive indicators, including productivity, carbon sequestration potential, mortality risk, and structural development under alternative silvicultural strategies. Regional climate models supply spatially explicit projections of temperature, precipitation, and climate extremes, enabling the assessment of exposure to future climatic conditions and other EFMIs. Land-surface model outputs further enrich the dataset by describing hydrological and energy exchanges, which are relevant for evaluating ecosystem functioning and climate-related feedback.

To reduce overlap and inconsistencies, outputs are harmonized into a common indicator framework, aligned spatial formats, and compatible temporal resolutions before integration into the DSS. This allows comparisons across models, regions, and scenarios despite differences in spatial resolution, temporal coverage, and variable definitions. The use of multiple models also improves robustness by enabling ensemble-based analysis across different assumptions and scenarios.

By integrating multiple models and scenarios, the DSS relies on an ensemble-based knowledge base that captures a range of plausible futures. This approach allows users to explore trade-offs among management strategies and assess their robustness under varying climatic and environmental conditions. In this way, the DSS leverages process-based modeling and climate projections to provide a transparent and data-driven foundation for decision-making in complex forest management contexts.

Integrating these sources poses substantial technical challenges. Data must be normalized across regions that use different measurement standards and collection methodologies, while differences in temporal resolution complicate time-series analysis. In addition, missing or incomplete data must be handled carefully to avoid misleading conclusions, and large-scale spatial datasets create significant computational demands.

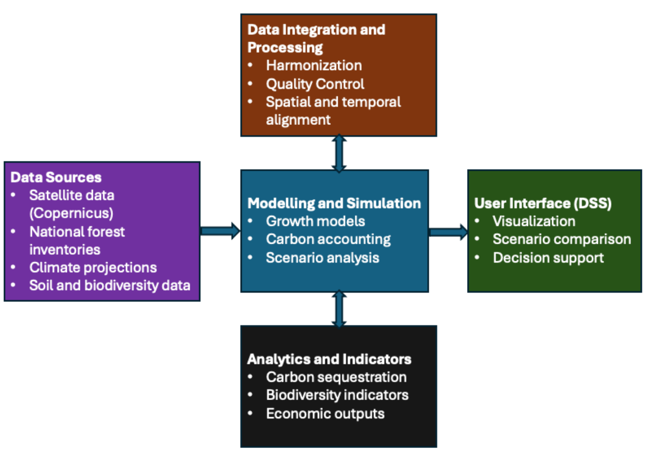

Figure 1. Conceptual architecture of the OptForEU DSS.

For an IT-oriented audience, this part of the project highlights data engineering and integration challenges rather than domain-specific forestry science. The project demonstrates how open data and Earth observation technologies enable scalable environmental decision support, while also revealing persistent challenges related to data quality, harmonization, and computational performance.

As illustrated in Figure 1, the OptForEU DSS follows a layered architecture separating data acquisition, integration, modeling, and user interaction. This separation supports scalability across regions and allows individual components, such as climate scenarios or management models, to be updated independently. The architecture illustrates the flow of heterogeneous environmental and management data sources through data integration and modeling layers to user-facing decision-support functionalities.

The layered structure emphasizes data harmonization, scenario-based simulation, and indicator-based analytics supporting transparent and comparable forest management decisions across regions.

IV. Co-Creation and Stakeholder-Centered Design

The development of the OptForEU DSS revealed that technical accuracy alone is insufficient for creating decision-support tools that will be trusted, adopted, and integrated into real-world forest management practice. Because forest governance involves multiple stakeholders with different objectives, regulatory responsibilities, professional traditions, and epistemic cultures, the project adopted a co-creation approach to ensure that the DSS would be relevant, usable, and legitimate across diverse national contexts. The adoption of co-creation as a design strategy reflects long-standing traditions in participatory design that emphasize the involvement of users and practitioners in shaping technological artifacts [9][10]. Co-creation in this setting goes beyond consultation: it is an iterative socio-technical design process in which stakeholders and system developers jointly shape system requirements, modeling assumptions, and user-facing functionalities (ibid.).

Forest managers, policymakers, scientists, NGOs, and environmental agencies often operate with divergent priorities, including biodiversity protection, timber production, climate mitigation, economic viability, and cultural or recreational values. These priorities not only differ across groups but also across countries, making it unlikely that a one-size-fits-all DSS would align with existing decision-making practices. In addition, many forest management decisions rely heavily on experiential knowledge and local practices, which are not easily captured in technical models or harmonized datasets. Co-creation was therefore essential for bridging these epistemic and institutional differences, supporting mutual understanding, and securing stakeholder buy-in for the joint indicator development, the modeling framework, and the system outputs. Participatory design research shows that involving stakeholders early is essential for developing artifacts that are legitimate and meaningful to practitioners [11].

A. Co-creation methods and process

The OptForEU co-creation process used a combination of multi-stakeholder workshops, semi-structured interviews, prototype testing sessions, and iterative feedback loops. These methods mirror participatory design approaches that promote collaborative problem articulation and design refinement [10]. Workshops held in partner countries and in national languages brought together forest managers, policymakers, scientists, and environmental organizations. Early prototypes—ranging from conceptual models to interactive interface mockups—were presented to stakeholders, enabling evaluation of system transparency, interpretability, and relevance.

Feedback was synthesized through thematic analysis and systematically integrated into subsequent design iterations, consistent with Design Science Research principles emphasizing iterative evaluation and refinement [12][13]. This cyclical process not only improved system usability but also helped uncover implicit knowledge and assumptions held by stakeholders.

B. Cross-national and cross-disciplinary challenges

The co-creation process highlighted several socio-technical challenges inherent in developing a DSS applicable from the local to the pan-European level. First, stakeholders used different terminologies and conceptual framings for forest conditions, risks, and management practices. Terms such as "old-growth forest," "resilience," or "ecosystem services" carried different meanings across countries and professional groups, necessitating shared definitions to avoid ambiguity in model outputs and indicators.

Second, regulatory diversity across Europe affected how users interpreted the relevance of certain scenarios or indicators. What is considered a realistic management alternative in one country may be legally restricted or culturally unacceptable in another. Differences in terminology and institutional practices can hinder useful collaboration and adoption unless shared representations and understandings are developed [14].

Third, differences in digital maturity and model literacy created asymmetries in stakeholders' ability to evaluate and critique early prototypes. Some users preferred fine-grained, stand-level outputs supported by national inventory data, while others emphasized regional scenario comparisons or policy-level summaries. Navigating these differences required a flexible design approach that could accommodate varying levels of detail and analytical complexity without compromising transparency or usability. Post-implementation, the project will distribute a survey to pilot testers to evaluate the perceived usefulness of the DSS, based on technology acceptance literature [15][16].

C. Socio-technical design tensions

A central finding from the co-creation process was the presence of socio-technical design tensions that shaped the system architecture. One such tension concerned the trade-off between model sophistication and interpretability. Stakeholders consistently emphasized the need for transparent models and easily comprehensible indicators, even if this required simplifying some components. Another tension involved balancing harmonized, European-wide data structures with the need for local relevance. While harmonization supports comparability, it risks obscuring important local conditions or management practices, leading to skepticism among practitioners.

A third tension emerged between users' desire for flexibility in creating custom scenarios and the need to maintain analytical rigor and prevent misuse or misinterpretation of model outputs. Addressing these tensions required continuous negotiation between system developers and domain experts, underscoring the socio-technical nature of environmental DSS development. This aligns with findings in the socio-technical literature, which emphasize that trust in systems emerges from transparency, accountability, and comprehensibility [17][18].

D. Co-creation recommendations

Overall, co-creation activities have provided valuable input to the DSS design team, emphasizing the importance of reducing dashboard complexity, providing guidance on the EFMIs, which are strongly related to forest ecosystem services [19], and providing feedback on how output should be structured to fit with relevant policies.

Based on these observations, the OptFor-EU project recommends the following for future EU-funded projects:

At the *policy level*, establish co-creation as a core principle in multidisciplinary projects that solve real-world, local-to-higher-level problems. This should be an incentivized component of EU-funded projects, where applicable. Unless co-creation is embedded throughout work packages, it can easily become secondary to other objectives.

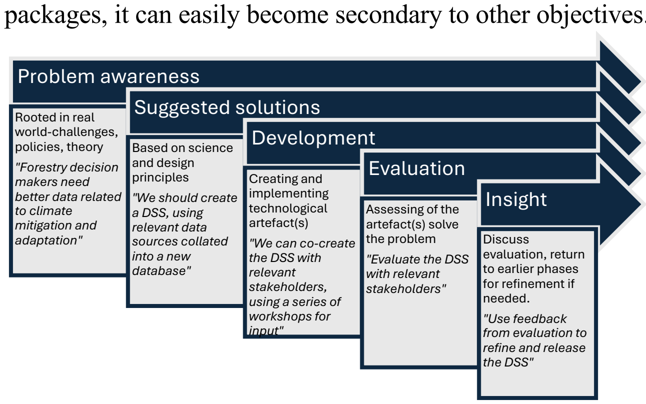

Figure 2. Co-creation design science process. Based on [12].

The principle of co-creation requires clear and comprehensive guidelines and best practices for successful integration into projects. It is easy to think of co-creation as an additional activity, but for it to succeed, it must be a core activity to which every project partner is committed.

Building on the previous point, support capacity building by investing in EU-wide training programs for project teams and stakeholders on co-creation and design thinking.

At the *practical level,* projects aimed at creating a digital artifact should also use design thinking as their methodology and consider employing design science research [12] as their research methodology. Resources for co-creation activities need to be allocated in the budgeting process. The project timeline should include activities, such as design thinking workshops for insight and ideation, stakeholder workshops for idea development and user feedback, and the evaluation of the artifact. Figure 2 illustrates this process.

V. Results and Lessons Learned

The project successfully produced an operational DSS prototype capable of simulating forest management scenarios across diverse European contexts. The project delivered an integrated modeling framework, a functional DSS platform, stakeholder engagement mechanisms, and validated case studies demonstrating applicability across different forest regions.

However, long-term success ultimately depends on adoption beyond the project itself. Several lessons emerged during development. Interdisciplinary collaboration required significant effort to align terminology and conceptual frameworks among partners from forestry, climate science, and Information Systems. Data harmonization consumed considerably more time and resources than initially expected. Building user trust required sustained engagement, transparency, and demonstration of system value. The project also demonstrated that Information Systems expertise plays a crucial role in environmental digitalization initiatives, as technical integration and adoption challenges often dominate implementation success.

Overall, the project illustrates that technological capability alone does not guarantee adoption; socio-technical considerations remain equally important.

VI. Discussion

This paper set out to explore how data-driven DSSs can support forest management under uncertainty, which socio-technical challenges emerge in their development, and what lessons can be drawn for designing and implementing such systems in complex governance contexts. Based on the OptForEU project, several key insights emerge.

A. Supporting forest management under uncertainty

The findings demonstrate that a data-driven DSS can significantly enhance forest management decision-making by enabling the systematic evaluation of alternative strategies across multiple dimensions and time horizons. By integrating heterogeneous data sources—including climate projections, forest ecosystem models, and environmental indicators—the DSS provides a structured way to explore trade-offs between carbon sequestration, biodiversity, and economic outcomes.

Rather than replacing expert judgment, the DSS complements existing decision-making practices by making assumptions explicit, enabling scenario comparison, and improving transparency. The use of ensemble-based modeling further allows decision-makers to assess the robustness of management strategies under varying climate and policy conditions. In this way, the DSS reduces uncertainty not by eliminating it, but by making it visible, structured, and analyzable.

B. Socio-technical challenges in co-created DSS

The development of the OptForEU DSS highlights that the primary challenges in environmental decision-support systems are not purely technical but socio-technical. Three recurring design tensions were particularly evident.

First, a tension between model sophistication and interpretability emerged. While advanced models increase analytical accuracy, stakeholders consistently prioritized transparency and comprehensibility. This required simplifying certain outputs and focusing on interpretable indicators rather than maximizing model complexity.

Second, a tension between harmonization and local relevance became apparent. The need to integrate data across European regions necessitated standardized indicators and data structures. However, this standardization risked obscuring local conditions, practices, and regulatory constraints, which are critical for practitioner trust and adoption.

Third, a tension between flexibility and analytical rigor was observed. Stakeholders expressed interest in customizing scenarios and exploring alternative assumptions, but unrestricted flexibility can lead to misuse or misinterpretation of model outputs. Balancing user autonomy with methodological robustness required careful interface and system design.

In addition to these tensions, the co-creation process revealed challenges related to differences in terminology, varying levels of digital maturity, and institutional diversity across countries. These factors significantly influenced how stakeholders interpreted system outputs and engaged with the DSS.

C. Lessons for design and adoption of environmental DSS

The OptForEU experience provides several broader lessons for Information Systems research and practice.

First, co-creation is essential but must be treated as a core design activity rather than a supplementary process. Continuous stakeholder involvement not only improves usability but also builds trust, aligns expectations, and uncovers implicit domain knowledge that cannot be captured through technical modeling alone.

Second, data integration is a central challenge that often exceeds initial expectations. Harmonizing heterogeneous datasets across spatial, temporal, and conceptual dimensions requires substantial effort and should be explicitly accounted for in system design and project planning.

Third, trust and adoption depend on transparency and interpretability as much as on analytical capability. Users are more likely to adopt systems that clearly communicate assumptions, limitations, and uncertainties, even if this comes at the cost of reduced model complexity.

Fourth, flexible system architectures are necessary to accommodate diverse user needs and governance contexts. Layered and modular designs enable adaptation to different regions and policy environments while maintaining a consistent analytical core.

Finally, the findings reinforce the importance of a socio-technical perspective in digital transformation initiatives. Successful deployment of DSS solutions depends not only

 ISBN: 978-1-68558-382-8

on technical performance but also on alignment with institutional practices, stakeholder expectations, and governance structures.

D. Contributions

This paper contributes to Information Systems research in three ways. First, it provides an empirical account of designing and implementing a large-scale, data-driven DSS in a complex, multi-stakeholder environmental domain. Second, it identifies key socio-technical design tensions that extend existing literature on DSS and participatory design. Third, it demonstrates how co-creation and design science approaches can improve the adoption and legitimacy of decision-support tools in real-world settings.

VII. Conclusion and Future Work

The OptForEU project illustrates both the potential and the complexity of applying digital technologies to environmental decision-making. A data-driven DSS can provide valuable support for climate-resilient forest management by enabling structured exploration of uncertainty and trade-offs. However, the success of such systems depends as much on socio-technical factors as on technical design.

For Information Systems researchers and practitioners, environmental DSS represents an important and growing application domain where digital transformation directly intersects with sustainability and climate policy. Addressing the socio-technical challenges identified in this study will be essential for ensuring that such systems are not only technically robust but also trusted, adopted, and impactful in practice.

Future research should further investigate methods for balancing model complexity and usability, explore scalable approaches to co-creation in large international projects, and examine long-term adoption and impact of DSS tools in operational forest management. In addition, there is a need to develop evaluation frameworks that capture not only technical performance but also trust, legitimacy, and institutional fit.

Acknowledgment

This study was conducted within and funded by the project "OPTimising FORest management decisions for a low-carbon, climate resilient future in Europe (OptFor-EU)" funded by the European Union Horizon Europe programme, under Grant Agreement n°101060554.

References

[1] J. Abildtrup, J. Laye, M. Laye, and A. Stenger, "Irreversibility and uncertainty in multifunctional forest management allocation," in Global Perspectives on Sustainable Forest Management, O. C. Akais Ed. InTech, pp. 263-274, 2012.

[2] T. McDaniels, T. Mills, R. Gregory, and D. Ohlson, "Using expert judgments to explore robust alternatives for forest management under climate change," Risk Analysis, vol. 32(12), pp. 2098-2112, 2012, doi: 10.1111/j.1539-6924.2012.01822.x.

[3] E. Walling and C. Vaneeckhaute, "Developing successful environmental decision support systems: Challenges and best practices," Journal of Environmental Management, vol. 264, 110513, 2020.

[4] A. Collalti et al., "Thinning can reduce losses in carbon use efficiency and carbon stocks in managed forests under warmer climate," Journal of Advances in Modeling Earth Systems, vol. 10(10), pp. 2427-2452, 2018, doi: 10.1029/2018MS001275.

[5] F. Irauschek et al., "Evaluating five forest models using multi-decadal inventory data from mountain forests," Ecological Modelling, vol. 445, 109493, pp. 1-11, 2021, doi: 10.1016/j.ecolmodel.2021.109493.

[6] F. Giorgi et al., "RegCM4: model description and preliminary tests over multiple CORDEX domains," Climate research, vol. 52, pp. 7-29, 2012, https://doi.org/10.3354/cr01018

[7] C. Asmus, P. Hoffmann, J-P. Pietkäinen, J. Böhner, and D. Rechid, "Modeling and evaluating the effects of irrigation on land–atmosphere interaction in southwestern Europe with the regional climate model REMO2020–iMOVE using a newly developed parameterization," Geoscientific Model Development, vol. 16(24), pp. 7311-7337, 2023, https://doi.org/10.5194/gmd-16-7311-2023

[8] M. J. Best et al. "The Joint UK Land Environment Simulator (JULES), model description–Part 1: energy and water fluxes," Geoscientific Model Development, vol. 4(3), pp. 677-699, 2011. https://doi.org/10.5194/gmd-4-677-2011.

[9] D. Schuler and A. Namioka (Eds.), Participatory design: Principles and practices. Boca Raton: CRC Press. 1993.

[10] S. Bødker, F. Kensing, and J. Simonsen, Participatory IT design: Designing for business and workplace realities. Cambridge, MA: MIT Press. 2004.

[11] C. Spinuzzi, "The methodology of participatory design," Technical Communication, vol. 52(2), pp. 163–174, 2005.

[12] A. R. Hevner, S. T. March, J. Park, and S. Ram, "Design science in information systems research," MIS Quarterly, vol. 28(1), pp. 75–105, 2004.

[13] K. Peffers, T. Tuunanen, M. A. Rothenberger, and S. Chatterjee, "A design science research methodology for information systems research," Journal of Management Information Systems, vol. 24(3), pp. 45–77, 2007, https://doi.org/10.2753/MIS0742-1222240302.

[14] P. R. Carlile, "A pragmatic view of knowledge and boundaries: Boundary objects in new product development," Organization Science, vol. 13(4), pp. 442–455, 2002.

[15] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," MIS Quarterly, vol. 13(3), pp. 319–340, 1989.

[16] V. Venkatesh, M. G. Morris, G. B. Davis, and F. Davis, "User acceptance of information technology: Toward a unified view," MIS Quarterly, vol. 27(3), pp. 425–478, 2003.

[17] R. C. Mayer, J. H. Davis, and F. D. Schoorman, "An integrative model of organizational trust," Academy of Management Review, vol. 20(3), pp. 709–734, 1995.

[18] G. Baxter and I. Sommerville, "Socio-technical systems: From design methods to systems engineering," Interacting with Computers, vol. 23(1), pp. 4–17, 2011.

[19] S. Linser et al., Report on a novel set of Essential Forest Mitigation Indicators (EFMIs). OptForEU deliverable 1.2. [Online]. Available from: https://optforeu.eu/wp-content/uploads/2025/04/OptFor-EU_D1.2_-EFMIs-_v02_20250314_BOKU.pdf [Retrieved: 31.03.2026]

 ISBN: 978-1-68558-382-8