

Article

Exploring the Future of Forest-Based Cultural Heritage Tourism: A Scenario Planning Approach

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Abstract

Forest-based cultural heritage landscapes associated with traditional potash, tar, resin, and charcoal (PoTaRCh) production constitute valuable socio-ecological systems with considerable potential for sustainable tourism and rural development. However, little is known about how these destinations may evolve under future environmental, social, and governance uncertainties. The objective of this study was to identify the key drivers and critical uncertainties shaping the future development of PoTaRCh-based tourism systems in Europe by 2040 and to develop alternative scenarios to support strategic planning and adaptive governance. The research adopted the Intuitive Logics approach to scenario planning and the Scenario-Based Strategic Planning framework, combining a two-round Delphi study with 42 experts from 15 European countries and qualitative scenario development. Four key drivers were identified: forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand. Their interaction resulted in five internally consistent scenarios: Forest Harmony, Guardians’ Forest, Tourist Forest, Forgotten Forest, and Regenerating Forest. The findings demonstrate that the resilience of PoTaRCh-based tourism systems depends on the dynamic interaction between ecological conditions, governance capacity, local stewardship, and tourism demand rather than on any single driver. To facilitate the practical application of the scenarios, the study also proposes a Scenario Monitoring Framework and Scenario Cockpit that translate qualitative scenario narratives into monitoring indicators for early detection of emerging development pathways. The study advances tourism futures research by providing one of the first comprehensive foresight analyses of forest-based cultural heritage tourism systems and offers practical guidance for destination managers and policy-makers seeking to strengthen the long-term sustainability and resilience of heritage landscapes.

Keywords: forest-based cultural heritage; scenario planning; tourism futures; regenerative tourism; socio-ecological systems; destination governance; adaptive governance



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1. Introduction

Forests have historically represented multifunctional socio-ecological systems that provided economic resources, ecological services, and cultural meaning for rural communities across Europe [1,2]. Beyond timber production, forest ecosystems supported a wide range of traditional extractive and processing activities associated with non-timber forest products and forest-based livelihoods, including potash production, tar extraction, resin collection, and charcoal burning. These practices, collectively conceptualized within the PoTaRCh (potash, tar, resin and charcoal) framework, shaped rural economies, settlement structures, cultural identities, and local knowledge systems for centuries [3]. Although many of these activities declined during industrial modernization and technological transition processes, their material traces, cultural narratives, and intangible heritage values remain embedded within numerous European forest landscapes [4]. Increasing attention toward cultural ecosystem services, heritage-based rural development, and regenerative tourism has renewed interest in the tourism potential of these historically rooted forest practices [5]. At the same time, tourism systems connected with forest heritage landscapes are increasingly exposed to multiple structural transformations and uncertainties. Climate change, biodiversity loss, demographic decline in rural regions, digitalization of tourism experiences, evolving visitor expectations, sustainability transitions, and changing governance structures are reshaping the future of nature-based and heritage tourism destinations across Europe [6,7]. Forest ecosystems are becoming particularly vulnerable to climate-related disturbances such as droughts, pest outbreaks, wildfires, and changing biodiversity patterns, while rural communities often face depopulation, ageing populations, and economic marginalization [8,9]. Simultaneously, growing demand for authentic, experience-based, and environmentally responsible tourism creates new opportunities for destinations capable of combining heritage preservation, ecological stewardship, and community participation [10,11].

Within this broader context, forest-based cultural heritage tourism system represents a particularly interesting but still underexplored component of sustainable tourism development. Existing research addressing PoTaRCh products has predominantly focused on ethnographic documentation, industrial archaeology, environmental history, traditional forestry systems, or heritage conservation practices [12,13]. Many studies examine these activities primarily as disappearing rural livelihoods, historical production systems, or elements of intangible cultural heritage requiring preservation [3,14,15]. These studies have frequently emphasized historical reconstruction of production techniques, local customs, vernacular architecture, and the socio-economic role of forest-based extractive activities in pre-industrial rural economies. Other contributions have explored the environmental consequences of historical forest exploitation, the transformation of traditional forest management systems, or the conservation of industrial heritage that remains associated with charcoal kilns, tar pits, resin collection sites, and potash production areas [16,17]. However, considerably less attention has been devoted to understanding how these heritage resources may function as components of contemporary tourism systems or contribute to future-oriented models of sustainable rural development. More specifically, the tourism dimension of forest heritage remains fragmented and conceptually underdeveloped within existing literature. Studies examining tourism in forest-based cultural landscapes often focus more broadly on ecotourism, nature-based tourism, industrial heritage tourism, or rural tourism without specifically addressing the distinctive socio-ecological characteristics of forest-related landscapes and practices [6,7]. As a result, the tourism potential of these heritage systems is frequently mentioned only indirectly or treated as a secondary outcome of heritage conservation rather than as a complex development process involving governance, visitor experience design, local entrepreneurship, and ecosystem management.

Existing studies rarely examine how traditional forest practices may be transformed into experiential tourism products, interpreted through participatory heritage approaches, or integrated into broader regenerative tourism strategies [3,5,18]. Similarly, limited attention has been given to the role of local communities as active co-creators of tourism experiences and stewards of forest heritage knowledge [18,19].

An additional limitation of current research concerns the relatively weak integration between ecological and socio-cultural perspectives within heritage tourism studies related to forest landscapes. Some tourism studies continue to treat cultural heritage and environmental sustainability as separate analytical domains [20,21]. Consequently, insufficient attention has been devoted to understanding how forest ecosystems' integrity, biodiversity conservation, climate pressures, tourism infrastructure development, and intangible cultural heritage interact within the same destination system. This gap becomes particularly important in the context of forest landscapes because the historical practices themselves emerged directly from long-term human-forest interactions and remain strongly dependent on ecological conditions, resource availability, and landscape authenticity [22]. The sustainability of tourism development in such destinations therefore cannot be understood solely through economic or cultural indicators but requires a broader socio-ecological systems perspective. Furthermore, existing literature remains largely focused on present-day conditions and retrospective analyses, while futures-oriented perspectives remain relatively limited [23]. Most studies addressing traditional forest heritage landscapes examine current conservation challenges, tourism potential, or historical significance without systematically exploring how these destinations may evolve under conditions of long-term uncertainty [12,23]. At the same time, forest-based tourism systems are increasingly exposed to multiple interacting pressures, including climate change, biodiversity decline, demographic transformation, digitalization of tourism experiences, changing visitor expectations, rural depopulation, and evolving environmental governance frameworks. These structural transformations create significant uncertainty regarding the future resilience, authenticity, and sustainability of forest-based cultural heritage tourism systems. Nevertheless, relatively few studies attempt to explore how such interacting drivers may shape alternative future development trajectories [24].

Similarly, while scenario planning approaches have been increasingly applied in tourism [25,26], environmental governance [24,27], and sustainability transition studies [28,29], their application to forest-based cultural heritage tourism systems remains relatively limited [30]. Existing tourism foresight studies most commonly focus on broader destination competitiveness, technological innovation, smart tourism, climate adaptation, mobility transitions, or changing tourism demand patterns [31–33]. Many scenario studies examine tourism at national [34], urban [35], coastal [36], or global [37] scales, while comparatively fewer studies address rural forest landscapes characterized by strong interdependencies between ecological systems, cultural heritage, and local communities [38]. Even within sustainable tourism futures research, there is still limited attention to traditional forest-based heritage systems as complex adaptive socio-ecological destinations. In particular, insufficient research has examined how the interaction between ecosystem integrity, heritage preservation, community participation, governance quality, tourism entrepreneurship, and visitor demand may shape different long-term trajectories of forest heritage tourism development [7]. Existing scenario studies also rarely integrate intangible cultural heritage practices, local ecological knowledge, and rural resilience into broader tourism futures frameworks [27]. As a result, important questions remain insufficiently explored regarding how forest heritage destinations may respond to increasing tourism commercialization, ecological degradation, sustainability transitions, or regenerative tourism agendas in the coming decades.

The present study seeks to address these gaps by combining a socio-ecological perspective on forest heritage landscapes with a futures-oriented scenario planning approach. Rather than treating forest heritage solely as an object of preservation, the study conceptualizes forest-based cultural heritage destinations as dynamic tourism systems shaped by interactions among ecological, governance, socio-cultural, and market-related drivers. Scenario planning provides a useful framework for addressing such complexity and uncertainty because it enables the exploration of multiple plausible futures rather than attempting to predict a single outcome. Unlike forecasting approaches based primarily on trend extrapolation [39], scenario planning allows the examination of interactions among environmental, socio-cultural, governance, technological, and market-related drivers under conditions of uncertainty. This is particularly relevant for forest-based cultural heritage tourism systems, where future development trajectories are likely to depend on the dynamic relationships between ecological sustainability, community participation, tourism commercialization, governance quality, and changing visitor expectations. Scenario approaches have been widely recognized as valuable tools for strategic planning in contexts characterized by long-term uncertainty, systemic interdependencies, and sustainability challenges [40–42]. They also support more adaptive and resilient policy thinking by helping stakeholders anticipate both desirable and problematic development pathways [43]. The growing importance of regenerative tourism, nature-based tourism, and heritage revitalization further increases the relevance of futures-oriented approaches for forest-based tourism systems. Regenerative tourism perspectives emphasize not only minimizing environmental impacts but also actively contributing to ecosystem restoration, community wellbeing, cultural revitalization, and long-term destination resilience. In forest heritage destinations, this implies moving beyond traditional tourism growth models toward more integrated approaches that connect biodiversity conservation, local identity, participatory governance, and sustainable rural development. However, the extent to which forest-based cultural heritage tourism systems may successfully transition toward such models remains uncertain and depends on a range of interacting structural drivers and institutional capacities.

Against this background, the present study explores possible future trajectories of forest-based cultural heritage tourism systems in Europe by 2040 using a scenario-planning approach grounded in the Intuitive Logics tradition and scenario-based strategic planning framework. The study aims to identify key drivers and critical uncertainties shaping the future development of tourism systems rooted in forest-based cultural heritage landscapes historically associated with potash, tar, resin, and charcoal production. Through the construction of alternative future scenarios, the research seeks to examine how different combinations of ecological conditions, governance arrangements, community participation, and tourism demand may influence the long-term sustainability and resilience of these destinations. More specifically, the study addresses the following research questions:

1. Which key drivers and critical uncertainties are likely to shape the future development of forest-based cultural heritage tourism systems in Europe by 2040?
2. How might different combinations of ecological, governance, socio-cultural, and tourism-related factors influence alternative development trajectories of forest-based cultural heritage tourism systems?
3. What types of opportunities, risks, and sustainability challenges may emerge under different future scenarios of forest-based cultural heritage tourism development?

Beyond addressing the identified research gap, this study makes several theoretical contributions. First, it advances tourism futures research by integrating socio-ecological systems theory, regenerative tourism, adaptive governance, and scenario planning into a

unified conceptual framework for analyzing the long-term evolution of forest-based cultural heritage tourism systems. Second, the study extends existing knowledge by demonstrating that future destination trajectories are shaped not by isolated ecological, institutional, or market factors, but by their dynamic interactions, highlighting the importance of feedbacks between ecosystem integrity, governance, community participation, and tourism demand. Third, it expands the application of scenario planning within tourism research by conceptualizing PoTaRCh landscapes as complex socio-ecological systems and by proposing an integrated foresight framework that combines participatory Delphi analysis, scenario development, and a monitoring framework to support adaptive governance under conditions of uncertainty. In addition to these theoretical contributions, the findings provide practical guidance for policymakers, destination managers, heritage organizations, and local communities seeking to develop more resilient, adaptive, and sustainability-oriented approaches to the governance and management of PoTaRCh-related tourism destinations in Europe.

2. Materials and Methods

This study employs a scenario-planning approach to explore plausible future trajectories of PoTaRCh-based tourism systems in Europe by 2040. Scenario planning is particularly suitable for complex socio-ecological systems characterized by high levels of uncertainty, multiple interacting drivers, and long-term sustainability challenges [44,45]. The study is grounded in the Intuitive Logics tradition of scenario planning, which emphasizes the identification of critical uncertainties and the construction of internally consistent scenario narratives. More specifically, the research adopts the Scenario-Based Strategic Planning framework developed by Brands et al. [46], which has been widely applied in strategic foresight and sustainability-oriented planning contexts [47–50]. The methodological process consisted of six consecutive steps, while the overall research design combined a two-round Delphi study involving experts from multiple European countries, systems mapping techniques, impact–uncertainty analysis, cross-consistency assessment, and scenario narrative development. The first Delphi round was conducted between August and September 2025, while the second round was completed between November and December 2025. A total of 71 experts were invited to participate in the first Delphi round, of whom 42 completed the questionnaire (response rate: 59%). All experts who completed the first Delphi round also participated in the second round, resulting in a participant retention rate of 100%. Consensus was achieved through the iterative Delphi process, whereby experts anonymously evaluated, refined, and reconsidered the identified factors after receiving controlled feedback between rounds. The second round resulted in a stable set of key drivers and uncertainties, which formed the basis for the subsequent scenario-building process.

Step 1. Definition of scope. Following the Framing Checklist logic [46] (pp. 70), the first step requires defining the overall goal of the scenario exercise, the strategic level of analysis, the actors involved in the scenario development process, the participants engaged in the 360° stakeholder process, and the temporal horizon of the analysis. The goal of this research is to explore realistic long-term futures for PoTaRCh-based tourism systems in Europe by 2040. Also, the objective is to identify key drivers and critical uncertainties that may shape the evolution of tourism systems rooted in forest-based cultural heritage landscapes historically associated with potash, tar, resin, and charcoal production. The strategic level of analysis is defined primarily at the level of the regional PoTaRCh-based tourism system. This system is conceptualized as a destination-level socio-ecological configuration in which forest ecosystems, tangible and intangible heritage assets, local communities, tourism enterprises, governance arrangements, and visitor markets interact.

The regional tourism system represents the primary analytical unit because, at this level, destination governance decisions, entrepreneurial innovation, visitor experience design, and community participation connect [51,52]. At the same time, the analysis adopts a multi-scalar perspective. Regional tourism systems are part of a broader macro-level European structural system, including climate change trajectories, sustainability transitions, digitalization of tourism, demographic shifts, and evolving EU environmental and cultural policies [53,54]. At the micro-level, capacities such as community engagement, local entrepreneurship, and visitor co-creation mechanisms are considered integral components influencing system resilience [55]. This multi-scalar framing enables the examination of cross-level interactions.

Experts were recruited through purposive sampling using multiple complementary sources to ensure both thematic expertise and geographical diversity. The primary recruitment channel was the COST Action CA22155 European Network on Potash, Tar, Resin and Charcoal Heritage (PoTaRCh) (Poznan, Poland), which provided access to specialists working on forest-based cultural heritage across Europe. Additional experts were identified through authorship of peer-reviewed publications indexed in the Web of Science Core Collection and Scopus, participation in European research initiatives (e.g., COST Actions and Horizon Europe projects), and professional affiliations with universities, forestry institutions, heritage organizations, destination management organizations, protected area administrations, public authorities, and NGOs. Experts were invited based on demonstrated expertise and a minimum of five years of professional or academic experience in fields relevant to PoTaRCh-based tourism systems. The countries themselves were not predetermined selection criteria; rather, the final panel reflected the geographical distribution of experts meeting these eligibility criteria and ensured representation from European regions with historical PoTaRCh traditions.

Following the expert recruitment process, a structured 360° stakeholder panel comprising 42 experts from 15 European countries was established (Table 1). Participants were selected through purposive sampling based on demonstrated expertise and professional experience in domains directly relevant to PoTaRCh-based tourism systems. Inclusion criteria required either (i) a minimum of five years of professional or academic engagement in forest-based cultural heritage, sustainable tourism, rural development, environmental governance, bioeconomy transitions, or tourism innovation, or (ii) documented involvement in policy design, destination management, or heritage site administration related to forest landscapes. The panel included academic researchers, heritage managers, forest sector specialists, policy advisors, destination management professionals, and representatives of rural development initiatives, all coming from European regions characterized by historical forest-based extractive traditions, including Central, Eastern, Northern, and South-Eastern Europe (Table 2).

Table 1. Geographical distribution and principal expertise of Delphi panel experts.

Country	Number of Experts	Main Expertise Represented
Serbia	7	Sustainable tourism, cultural heritage, geography, destination management
Poland	5	Forestry, forest ecology, forest heritage, bioeconomy
United Kingdom	4	Forestry, forest engineering, forest economics
Türkiye	4	Heritage management, tourism futures, scenario planning, sustainability

Table 1. *Cont.*

Country	Number of Experts	Main Expertise Represented
Croatia	3	Cultural heritage, rural tourism, destination management
Romania	3	Rural development, sustainable tourism, environmental management
Italy	3	Heritage conservation, cultural landscapes, tourism planning
Portugal	3	Bioeconomy, environmental governance, sustainability transitions
Czech Republic	2	Forest ecology, heritage conservation
Slovakia	2	Forestry, nature-based tourism
Slovenia	2	Sustainable tourism, protected area management
Hungary	1	Tourism development, destination governance
Finland	1	Forest policy, ecosystem management
Sweden	1	Forest ecosystems, biodiversity conservation
Estonia	1	Digital heritage, rural innovation
Total	42	

Table 2. Professional background of Delphi experts.

Expertise	No.	%
Academia/Research	21	50.0
Forestry	8	19.0
Heritage management	5	11.9
Destination management/Tourism	4	9.5
Public administration/Policy	3	7.1
NGOs/Rural development	1	2.5
Total	42	100.0

Although academic researchers constituted 50% of the Delphi panel, the remaining participants represented forestry, heritage management, destination management, public administration, and non-governmental organizations, providing complementary practical perspectives. Because the objective of the Delphi process was to identify plausible long-term drivers and uncertainties rather than to statistically represent stakeholder groups, emphasis was placed on selecting participants with demonstrated expertise. To further reduce potential disciplinary bias, the study employed two anonymous Delphi rounds, incorporated experts from multiple European countries and professional backgrounds, and triangulated the identified factors through documentary analysis of relevant policy documents and scientific literature. The time horizon for the scenario analysis is set to the year 2040. This long-term perspective allows sufficient temporal distance to capture structural transformations in tourism systems, including sustainability transitions, technological diffusion, generational change in rural communities, and ecological adaptation processes. The selection of 2040 aligns with European climate neutrality targets and long-term biodiversity and sustainability agendas, which are expected to significantly influence nature-based and heritage tourism paths [56,57].

Step 2. Perception analysis. This step had an aim to identify, structure, and evaluate the range of factors that could shape the development of PoTaRCh-based tourism systems. The perception analysis was implemented through a two-step Delphi design. In the first step, experts were invited to identify and describe factors they considered

likely to significantly influence PoTaRCh-based tourism systems by 2040. In total, approximately 274 individual factor references were identified. In order to make the results stronger and less dependent on the perception of the experts themselves, the initial list of identified factors was further justified and supported by specific documentary analysis. This included a review of relevant European sustainability and biodiversity strategies, rural development agendas, tourism transition frameworks, academic literature on nature-based and heritage tourism futures, and sectoral reports addressing forest governance and bioeconomy innovation. After removing duplications and cleaning data, the research team conducted a structured consolidation process. Items that overlapped conceptually were combined together, and some formulations were simplified, while similar statements were combined to form analytically consistent variables. The consolidation resulted in a refined list of 68 factors representing environmental, socio-cultural, technological, economic, governance, and market-related dimensions. The full list is available in Appendix A (Table A1). In the second Delphi round, experts were asked to evaluate each of 68 factors along two dimensions: (1) the expected impact of the factor on the development of PoTaRCh-based tourism systems by 2040 (1—weakest impact, 10—strongest impact), and (2) the degree of uncertainty associated with its future manifestation (1—most certain, 10—most uncertain).

Step 3. Trend and uncertainty analysis. The impact and uncertainty scores obtained during the second Delphi round were aggregated by calculating the arithmetic mean for each factor using Microsoft Excel 365 (Microsoft Corporation, Redmond, WA, USA). The aggregated values were subsequently plotted in an Impact–Uncertainty Grid (Figure 1), which was created in Microsoft Excel using a scatter plot with impact scores on the *x*-axis and uncertainty scores on the *y*-axis. The grid served as the basis for identifying structural trends, critical uncertainties, and secondary elements. This analytical tool allows the relative importance and predictability of the identified factors to be evaluated simultaneously by mapping their perceived systemic impact against the uncertainty of their manifestation. In this way, factors shaping the future of PoTaRCh-based tourism systems can be categorized into structural trends, critical uncertainties, and secondary elements. Factors located in the lower-impact area of the grid were first identified as secondary elements. Secondary elements are factors that experts perceive as having relatively limited influence on the tourism development. Although these factors may still contribute to contextual developments, they are unlikely to play a crucial role in shaping PoTaRCh-based tourism systems. In total, nine factors were classified as secondary elements and they were excluded from the next stages of the scenario-building process.

Following the identification of the factors influencing the future development of PoTaRCh-based tourism, the initially collected variables were refined through a process of aggregation and systems mapping. To visualize the interrelationships among the aggregated factors, a causal influence diagram was developed using Vensim PLE 10.4.0 (Ventana Systems Inc., Harvard, MA, USA), a system dynamics software widely used for conceptual system modelling and causal loop analysis. The software was employed to organize the identified factor clusters into an integrated network of causal relationships and to illustrate the direction of influence among the major components of the PoTaRCh tourism system. The resulting influence diagram does not represent a quantitative simulation model but rather a qualitative conceptual representation of the system structure, supporting the identification of the most influential drivers and feedback mechanisms that informed the subsequent scenario-building process. Similar and overlapping factors were merged in order to reduce analytical complexity and highlight the most influential elements shaping the system. This process resulted in a final set of ten key factors, which were subsequently organized into ten interconnected clusters representing the core structural components

of the PoTaRCh tourism system. The relationships among these clusters were visualized through a causal influence diagram (Figure 2), where arrows indicate the direction of influence between individual elements of the system. Based on their structural position and connectivity within the network, several clusters emerged as particularly influential. Forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand demonstrate a high degree of centrality due to their multiple linkages with other elements of the system. These clusters influence both environmental sustainability and socio-economic outcomes, including heritage preservation, tourism entrepreneurship, and rural economic resilience. These clusters were interpreted as key uncertainties (or drivers) shaping the potential future trajectories of PoTaRCh tourism development.

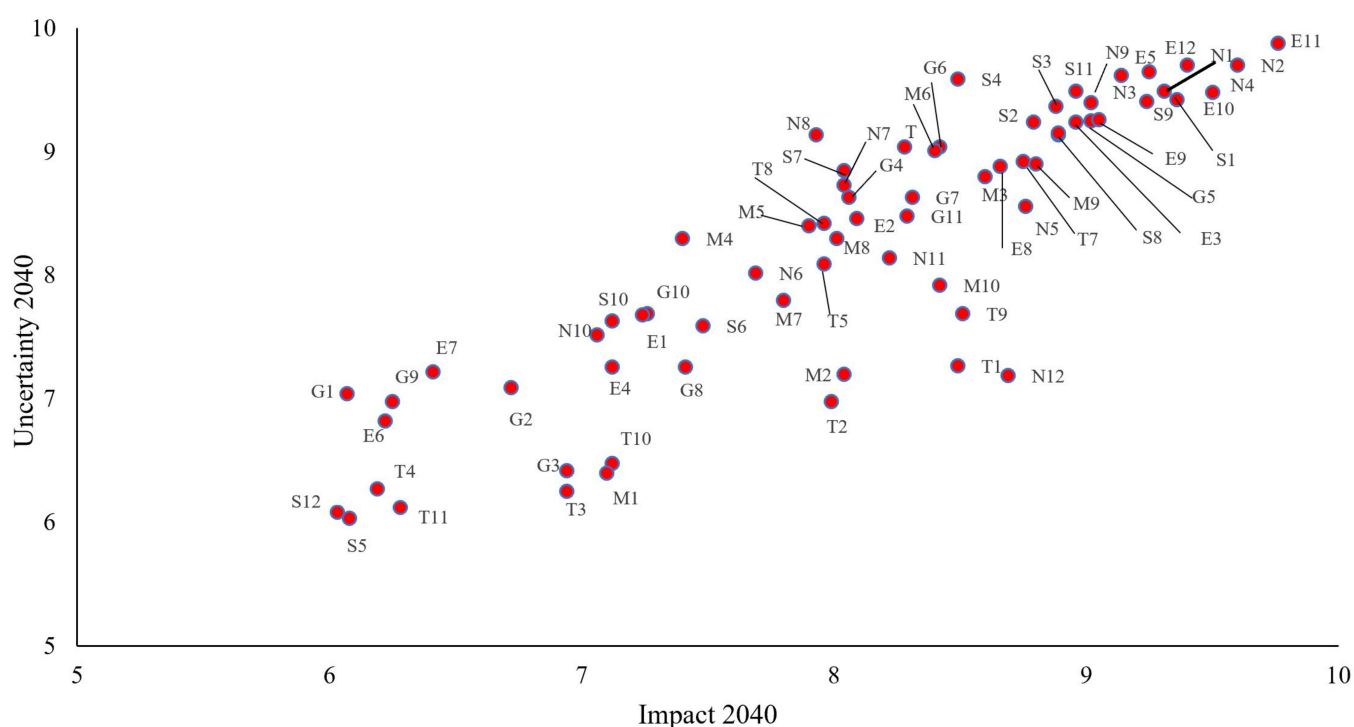


Figure 1. Impact–Uncertainty Grid for the development of PoTaRCh-based tourism systems by 2040. Note: For ease of visualization, each of the 68 factors was assigned an alphanumeric code according to its thematic category: G = governance, E = environmental, S = socio-cultural, T = technological, N = natural/climate-related, and M = market/economic factors. The complete coding scheme is provided in Appendix Table A1.

The causal influence diagram (Figure 2), developed in Vensim PLE 10.4.0, revealed several highly interconnected clusters representing the core structural components of the PoTaRCh tourism system. Based on their structural position and connectivity within the network, forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand emerged as the most influential drivers shaping alternative future trajectories. One important reinforcing loop connects heritage preservation, visitor experience, tourism demand, and rural economic resilience. Improved preservation and interpretation of forest-based cultural heritage enhance destination attractiveness and visitor satisfaction, which in turn stimulates tourism demand. Increased tourism activity can generate additional income for local communities and strengthen rural economic resilience, thereby providing new resources for heritage conservation and landscape management. A second reinforcing loop links community participation, destination governance, and tourism entrepreneurship. Inclusive governance frameworks

and participatory decision-making processes encourage local engagement and support the development of small-scale tourism enterprises and innovative tourism products. These entrepreneurial initiatives contribute to improved visitor experiences and further stimulate tourism demand. At the same time, the diagram highlights several balancing mechanisms that may constrain tourism development. Increased visitor flows and infrastructure expansion may generate additional pressure on forest ecosystem integrity, particularly if tourism growth is not carefully managed. Degradation of forest landscapes can negatively affect the authenticity and attractiveness of heritage sites, ultimately reducing tourism demand. Furthermore, climate pressures represent an external driver that may affect ecological conditions, resource availability, and the long-term viability of forest-based tourism activities.

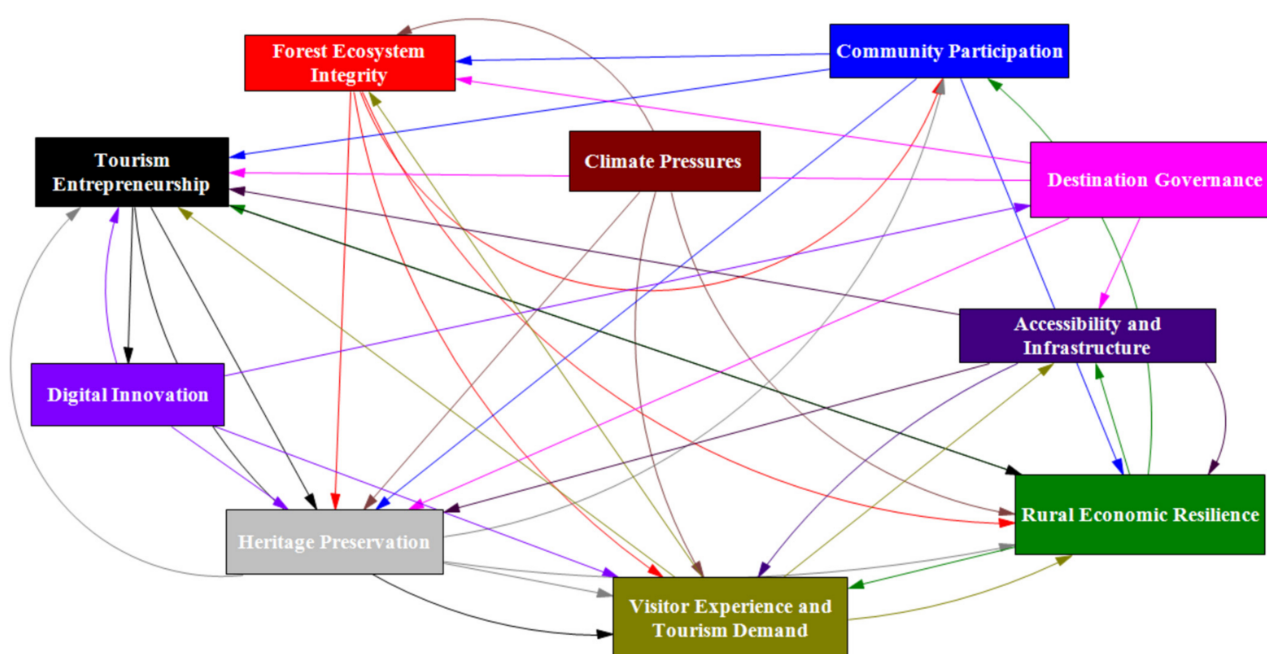


Figure 2. Influence diagram of the main factor clusters shaping PoTaRCh tourism development. Arrows between clusters denote significant causal relationships between system components. Source: Authors using VENSIM PLE10.4.0.

For each of the four identified drivers, aggregate polar (opposite) values were defined by the members of the research team (Figure 3). These contrasting states represent alternative future conditions of the PoTaRCh tourism system and define the uncertainty space for the subsequent scenario-building process.

Step 4. Scenario building. The combination of the four identified drivers and their polar values theoretically produces sixteen possible scenarios (2^4). However, not all combinations represent internally consistent or plausible futures. Therefore, a cross-consistency assessment was conducted to evaluate the logical coherence of each combination. Based on this assessment, five plausible scenarios were retained and organized in an extended Scenario Matrix (Figure 4). The matrix was developed by the research team following the Scenario-Based Strategic Planning framework proposed by Brands et al. [46] and was graphically designed in Microsoft PowerPoint 365 (Microsoft Corporation, Redmond, WA, USA) to visualize the relationships among the retained scenarios. It does not represent a software-generated output but rather a conceptual synthesis of the cross-consistency assessment. For each of the selected scenario configurations, an instance of the system influence diagram was updated by assigning appropriate values to the identified factor clusters (Table 3). These values reflect the different states of the key drivers, including

forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand, as well as their interactions with the remaining clusters of the PoTaRCh tourism system. Based on these adjusted configurations of the influence diagram and supporting materials, including strategic policy documents related to sustainable tourism and forest governance, relevant academic literature on nature-based and heritage tourism development, expert interviews conducted during the Delphi process, and media and policy reports, narratives for each scenario were developed. The scenarios were given descriptive names designed to reflect their underlying development logic and the dominant governance–ecology–tourism dynamics shaping each trajectory. These symbolic titles were chosen to highlight the distinctive character of each scenario and to facilitate clearer interpretation of the alternative futures of PoTaRCh-based tourism systems. The scenario titles are symbolic metaphors intended to facilitate communication of the alternative futures rather than formal forestry classifications. Their conceptual meanings are summarized in Appendix B, Table A2.

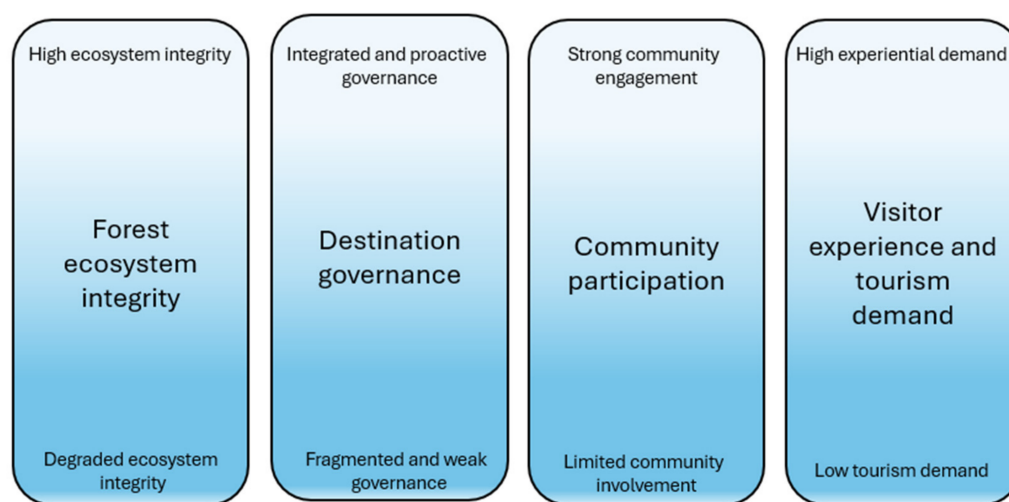


Figure 3. Polar values of the key drivers of PoTaRCH tourism development.

Step 5. Scenario Implications and Strategic Pathways. Following the development of the five scenario narratives, a structured interpretation process was conducted to identify their implications for the future management of PoTaRCh-based tourism systems. The objective of this phase was not to select a preferred scenario, but to explore how different combinations of ecological, governance, community, and market conditions may create opportunities and risks for destination sustainability. Each scenario was systematically assessed according to its expected consequences for heritage preservation, ecosystem integrity, tourism competitiveness, local economic resilience, community wellbeing, and adaptive governance capacity. Building upon the scenario narratives, a set of strategic pathways was derived. These pathways represent broad directions for policy and destination management that could enhance system resilience under different future conditions. Particular attention was given to interventions supporting ecosystem conservation, participatory governance, heritage interpretation, community entrepreneurship, and sustainable visitor management. The analysis focused on identifying adaptive measures capable of strengthening destination resilience across multiple future trajectories rather than optimizing performance under a single anticipated future.

Table 3. Scenario-specific configuration of key drivers and system components.

Scenarios	1. Forest Harmony	2. Guardians' Forest	3. Tourist Forest	4. Forgotten Forest	5. Regenerating Forest
Key drivers					
Forest ecosystem integrity	High ecosystem integrity maintained through conservation and sustainable forest management	High ecosystem integrity maintained through community stewardship	Declining ecosystem integrity due to tourism pressure	Degraded forest ecosystems	Moderate ecosystem integrity with gradual restoration
Destination governance	Strong integrated governance and long-term planning	Weak formal governance but active local initiatives	Strong governance prioritizing tourism growth	Weak governance and fragmented policies	Governance reforms and emerging coordination
Community participation	Strong community participation and benefit sharing	Strong grassroots leadership and stewardship	Limited community involvement; tourism dominated by external investors	Low participation and disengagement	Increasing community participation
Visitor experience and tourism demand	High demand for authentic heritage and nature experiences	Moderate demand focused on niche tourism	High demand driven by commercialization	Low tourism demand	Gradually increasing demand
Other uncertainties					
Heritage preservation	Heritage traditions actively preserved and interpreted	Heritage safeguarded through local knowledge and practices	Heritage commodified for tourism markets	Heritage practices disappearing	Heritage revitalization initiatives emerging
Tourism entrepreneurship	Diverse local SMEs and heritage-based tourism products	Small-scale community enterprises dominate	Large external investors dominate tourism sector	Limited tourism entrepreneurship	Growing mix of local and external enterprises
Rural economic resilience	Diversified rural economies supported by tourism	Moderate resilience based on local initiatives	Economic growth but uneven distribution of benefits	Rural economic decline and outmigration	Gradual economic diversification
Accessibility & infrastructure	Sustainable mobility and well-managed infrastructure	Limited but locally adapted infrastructure	Rapid infrastructure development supporting tourism growth	Aging and poorly maintained infrastructure	Selective infrastructure improvements
Knowledge, skills & innovation	Strong knowledge networks and heritage interpretation skills	Traditional ecological knowledge dominates	Innovation driven by external investors	Weak knowledge base and limited innovation	Emerging training and innovation initiatives
Climate and environmental pressures	Effective adaptation and ecosystem monitoring	Local adaptive practices mitigate environmental pressures	Increasing environmental pressures from tourism	Severe environmental degradation	Adaptive environmental management developing

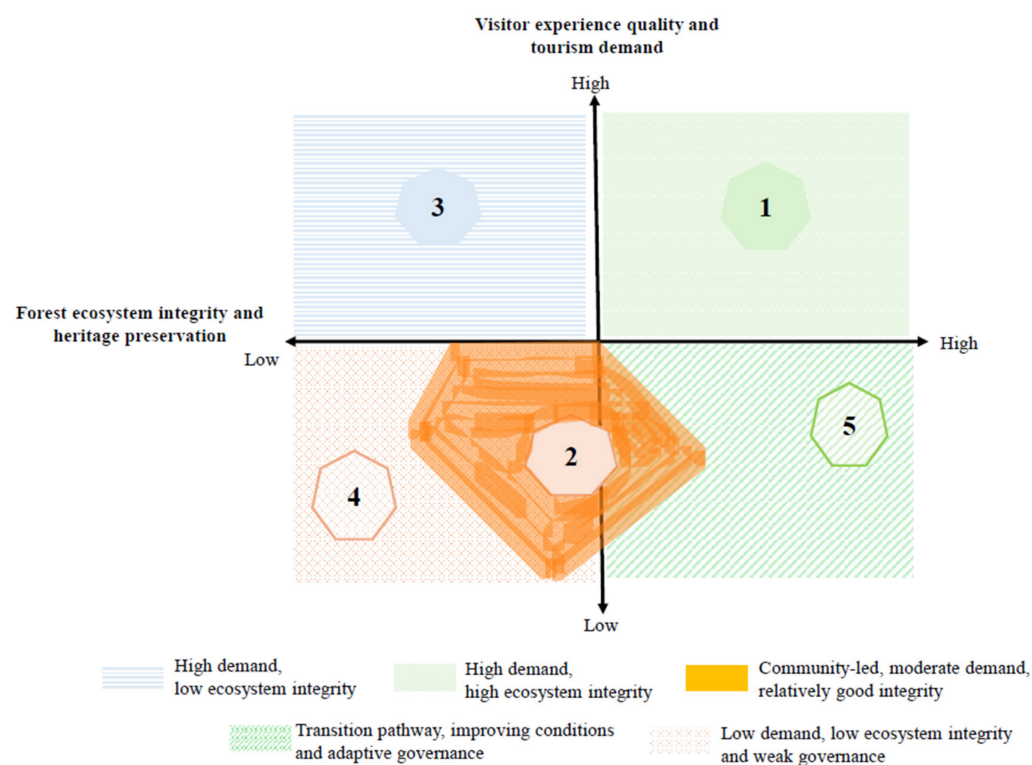


Figure 4. Extended Scenario Matrix for PoTaRCH-based tourism futures.

Step 6. Monitoring framework and Scenario Cockpit. In the final phase of the scenario planning process, a monitoring framework was developed to enable the early identification of emerging development trajectories within PoTaRCh-based tourism systems. Following the Scenario Cockpit approach proposed by Brands et al. [46], the monitoring framework translates the qualitative scenario narratives into a set of measurable indicators linked to the four key drivers identified during the analysis. First, suitable indicators were selected for each driver based on their conceptual relevance, data availability, and applicability across European forest heritage destinations. Second, expected indicator tendencies were defined for each scenario, reflecting the conditions described within the scenario narratives. The resulting monitoring framework enables destination managers and policymakers to track developments over time and assess whether observed trends are converging toward a particular scenario pathway. Rather than predicting future outcomes, the Scenario Cockpit serves as an early-warning and adaptive governance tool. By periodically monitoring changes in key indicators, stakeholders can recognize emerging opportunities and risks, evaluate the effectiveness of interventions, and adjust management strategies in response to evolving socio-ecological conditions.

3. Results

3.1. Scenarios for the Development of Forest-Based Tourism Systems

Based on the interaction between the four key drivers identified in the previous analytical phase (forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand), five future scenarios for the development of PoTaRCh-based tourism systems by 2040 were constructed. The scenarios reveal variation in the balance between tourism development, ecosystem conservation, local participation, and economic resilience. These scenarios provide a structured framework for understanding the uncertainty space surrounding the future development of PoTaRCh tourism systems in Europe. The five scenarios should not be interpreted as forecasts or predefined destina-

tion typologies, but as theoretically informed future archetypes derived from the interaction of the four key drivers identified through the Delphi process. Each scenario represents a distinct configuration of ecological conditions, governance arrangements, community participation, and tourism demand within the broader socio-ecological system. Collectively, they operationalize the conceptual framework presented in the Introduction by illustrating how principles of socio-ecological systems, regenerative tourism, heritage tourism, and adaptive governance may combine to produce different development trajectories for PoTaRCh-based tourism systems.

Initially, 68 factors influencing the future development of PoTaRCh-based tourism systems were identified through the literature review and the first Delphi round. Following expert feedback, conceptually overlapping factors were consolidated into 40 aggregated factors to facilitate the Impact–Uncertainty analysis. These aggregated factors formed the basis for identifying the critical uncertainties and developing the scenario framework. The Delphi assessment produced impact scores ranging from 6.03 to 9.76 and uncertainty scores ranging from 6.03 to 9.88. The Impact–Uncertainty analysis revealed that several factors combined both high expected influence and high uncertainty, making them particularly suitable as scenario drivers. Following the expert assessment, four overarching drivers—forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand—were selected as the critical uncertainties forming the basis of the scenario framework.

Experts consistently emphasized that the long-term viability of PoTaRCh tourism depends fundamentally on maintaining healthy forest ecosystems. According to the Delphi panel, ecosystem degradation would not only reduce biodiversity but also diminish the authenticity and attractiveness of forest-based cultural heritage experiences. The expert panel highlighted that governance quality extends beyond regulatory capacity and includes long-term coordination among public authorities, protected area managers, tourism organizations, and local communities. Experts stressed that fragmented governance was likely to undermine both heritage conservation and sustainable tourism development. Experts repeatedly emphasized that local communities should be regarded as active custodians of PoTaRCh heritage rather than passive beneficiaries of tourism. Maintaining traditional knowledge and strengthening intergenerational transmission were identified as essential conditions for long-term destination resilience. The Delphi panel noted that future tourism demand is expected to increasingly favor authentic, educational, and nature-based experiences. However, experts also cautioned that excessive commercialization could weaken heritage authenticity and reduce the distinctiveness of PoTaRCh destinations.

Further, the Delphi assessment grouped factors into four thematic categories: governance, environmental, socio-cultural, and tourism and market factors (Table 4). Environmental factors received the highest average impact (8.26) and uncertainty (8.61) scores, indicating that experts perceived ecological conditions as both highly influential and highly uncertain for the future development of PoTaRCh-based tourism systems. Socio-cultural factors also achieved high average scores (impact = 8.10; uncertainty = 8.48), highlighting the importance of community participation, cultural heritage, and stakeholder engagement. Governance factors exhibited moderate-to-high average impact (7.52) and uncertainty (7.86), while tourism and market factors showed comparable impact (7.51) but the lowest average uncertainty (6.97), suggesting that experts viewed market-related developments as relatively more predictable than environmental and socio-cultural processes.

Table 4. Summary statistics of Delphi impact and uncertainty assessments by factor category.

Category	No. of Factors	Mean Impact	Mean Uncertainty
Governance	11	7.52	7.86
Environmental	12	8.26	8.61
Social	12	8.10	8.48
Tourism	5	7.51	6.97

The five scenarios are presented as exploratory future pathways rather than normative or predictive visions. Each scenario represents an internally consistent combination of ecological, institutional, social, and market conditions derived from the interaction of the four key drivers identified through the Delphi process. None of the scenarios should be interpreted as the most desirable or most likely future. Instead, they are intended to stimulate strategic reflection, support adaptive planning, and enhance preparedness for a range of plausible developments.

3.1.1. Scenario 1—Forest Harmony

The “Forest Harmony” scenario represents the most balanced and sustainability-oriented future trajectory for PoTaRCh-based tourism systems. In this scenario, strong ecosystem integrity is successfully combined with integrated destination governance, high levels of community participation, and growing demand for authentic heritage and nature-based tourism experiences. The scenario is characterized by long-term strategic planning, collaborative governance structures, and effective coordination between environmental authorities, local communities, tourism organizations, and heritage institutions. Tourism development is carefully regulated in order to avoid excessive visitor pressure on sensitive landscapes. Protected areas, cultural landscapes, and traditional forest-use sites are managed through adaptive governance models that integrate biodiversity conservation with heritage interpretation and tourism activities. Environmental monitoring systems become highly sophisticated and are supported by digital technologies that enable real-time tracking of ecosystem conditions, visitor flows, and carrying capacities. Community participation represents one of the central strengths of this scenario. Local residents are actively involved in tourism planning processes, interpretation programs, and entrepreneurial initiatives connected with PoTaRCh heritage. Traditional ecological knowledge and intangible cultural practices related to tar production, charcoal burning, resin collection, and potash extraction are systematically preserved and transmitted through intergenerational learning initiatives, local educational programs, and participatory heritage workshops. Visitor demand in this scenario is driven primarily by increasing societal interest in slow tourism, experiential travel, environmental awareness, and authentic cultural encounters. Visitors seek immersive experiences connected with traditional forest livelihoods, local gastronomy, craft production, storytelling, and participatory activities within forest landscapes.

Tourism entrepreneurship in this future is dominated by small and medium-sized local enterprises offering diversified tourism products. These include interpretive heritage trails, eco-lodges, educational forest camps, artisanal workshops, ethnographic museums, and participatory cultural festivals. Technologies such as augmented reality interpretation, digital storytelling platforms, smart visitor management systems, and virtual heritage archives are used primarily to enrich educational and interpretive experiences. The scenario also assumes favorable institutional and policy conditions at the European level. Funding programs focused on rural resilience, biodiversity conservation, climate adaptation, and cultural heritage revitalization provide significant support for destination development.

Economically, the “Forest Harmony” scenario generates relatively stable and diversified local development.

3.1.2. Scenario 2—Guardians’ Forest

The “Guardians’ Forest” scenario represents a future in which local communities become the primary actors responsible for preserving and managing PoTaRCh heritage landscapes. In contrast to the highly institutionalized governance structures characteristic of the “Forest Harmony” scenario, this pathway is shaped by relatively weak formal governance systems, but exceptionally strong grassroots initiatives, local stewardship, and community solidarity. Forest ecosystem integrity remains relatively high because local communities maintain strong emotional, cultural, and economic connections with forest landscapes. Traditional practices associated with PoTaRCh heritage continue to survive primarily through informal local networks, family traditions, volunteer initiatives, and community-led conservation efforts. Tourism development in this scenario occurs at a smaller scale and is highly localized. Visitor demand remains moderate but stable, focusing mainly on niche tourism segments such as eco-tourism, heritage tourism, educational tourism, ethnographic tourism, and volunteer tourism. The destinations attract visitors interested in authentic rural lifestyles, traditional ecological knowledge, and participatory experiences rather than mass tourism consumption. Community participation reaches exceptionally high levels in this scenario. Residents actively organize heritage festivals, restoration projects, traditional craft workshops, and educational events connected with forest heritage. Economic activities remain relatively modest in scale, but they are deeply embedded within local social structures and cultural values. While some destinations adopt digital communication tools and online promotion platforms, technological modernization remains secondary to direct interpersonal experiences and local authenticity. Visitors are encouraged to disconnect from highly digitalized lifestyles and engage more directly with nature, local communities, and traditional practices.

Despite its strong social cohesion and high ecological awareness, this scenario also faces several structural limitations. Weak formal governance and limited institutional capacity reduce the ability of destinations to secure large-scale investments, coordinate long-term planning processes, or respond effectively to broader structural challenges such as climate change or demographic decline. Financial resources remain relatively limited, and many initiatives depend heavily on volunteerism and local enthusiasm. The scenario highlights the importance of social capital, place attachment, and grassroots participation in maintaining sustainable tourism systems rooted in forest-based cultural heritage.

3.1.3. Scenario 3—Tourist Forest

The “Tourist Forest” scenario represents a highly commercialized development pathway in which tourism growth becomes the dominant priority of destination development. In this future, strong governance structures and high tourism demand stimulate rapid tourism expansion, but ecosystem integrity gradually declines due to increasing commercialization pressures and unsustainable visitor growth. PoTaRCh heritage becomes increasingly commodified and transformed into tourism products designed primarily for visitor consumption rather than for cultural preservation or community wellbeing. Heritage interpretation becomes standardized and entertainment-oriented, emphasizing spectacle and visual attractiveness over authenticity and educational depth. Forest ecosystems experience growing pressure due to infrastructure expansion, increased visitor numbers, and intensified tourism activities. New accommodation facilities, recreational zones, transport infrastructure, and tourism attractions occupy increasingly large portions of forest land-

scapes. As a result, biodiversity loss, habitat fragmentation, soil degradation, and increased waste production become increasingly visible.

Governance systems in this scenario remain relatively strong in organizational and managerial terms, but their priorities are heavily oriented toward economic growth and tourism competitiveness. However, environmental sustainability and community participation receive less attention within strategic decision-making processes. Local residents often become passive observers rather than active decision-makers within destination development processes. PoTaRCh destinations become fashionable tourism products promoted through international tourism markets and digital platforms. Visitors are attracted by highly packaged experiences, themed attractions, festivals, and recreational activities connected with forest landscapes and industrial heritage. Smart tourism technologies, immersive digital experiences, AI-driven visitor management systems, and large-scale digital marketing campaigns dominate destination operations. Heritage interpretation increasingly relies on virtual reality, gamification, and interactive entertainment. While these technologies enhance accessibility and visitor engagement, they also contribute to the transformation of heritage into commodified consumer experiences. Economically, the “Tourist Forest” scenario initially generates significant tourism revenues and rapid infrastructure modernization. However, the long-term sustainability of the system becomes increasingly uncertain. Environmental degradation, social tensions, loss of authenticity, and community dissatisfaction gradually weaken destination resilience. Over time, destinations risk entering a cycle of over-tourism, declining environmental quality, and reduced cultural distinctiveness.

3.1.4. Scenario 4—Forgotten Forest

The “Forgotten Forest” scenario represents the most pessimistic future trajectory for PoTaRCh-based tourism systems. In this scenario, weak governance, declining tourism demand, low community participation, and degraded forest ecosystems combine to produce widespread socio-economic stagnation and cultural decline. Forest ecosystems experience substantial degradation due to insufficient environmental protection, climate-related disturbances, illegal resource exploitation, and lack of coordinated management. Wildfires, pest outbreaks, biodiversity decline, and soil erosion become increasingly common across many forest regions. Destination governance in this future is highly fragmented and ineffective. Coordination between tourism authorities, environmental agencies, and local communities becomes minimal. As a result, many heritage sites and traditional landscapes deteriorate due to neglect and lack of maintenance. Community participation declines significantly as rural depopulation, ageing populations, and economic marginalization weaken local social structures. Intangible heritage connected with PoTaRCh traditions gradually disappears because intergenerational knowledge transmission becomes interrupted. Tourism demand in this scenario remains very low.

Tourism entrepreneurship also experiences significant decline. Many small tourism businesses close due to insufficient demand and lack of institutional support. Investment in tourism infrastructure becomes minimal, and abandoned heritage sites become increasingly common within rural landscapes. Digital innovation develops unevenly and remains largely inaccessible in many peripheral regions. Limited internet connectivity, insufficient digital skills, and weak institutional support reduce the capacity of destinations to compete within increasingly digitalized tourism markets. The economic consequences of this scenario are strongly negative. Rural economies become increasingly fragile and dependent on external financial assistance and social welfare systems. At the same time, cultural heritage loss reduces the symbolic and emotional attachment of local populations to forest landscapes. Despite its pessimistic character, the “Forgotten Forest” scenario

highlights the potential consequences of governance failure, ecological neglect, and insufficient investment in rural resilience. The scenario demonstrates that without coordinated sustainability-oriented interventions, PoTaRCh tourism systems may experience long-term decline and irreversible cultural and ecological losses.

3.1.5. Scenario 5—Regenerating Forest

The “Regenerating Forest” scenario represents a transitional and adaptive future trajectory characterized by gradual recovery and systemic transformation. Unlike the more stable and clearly defined scenarios, this future reflects a dynamic process of institutional learning, ecological restoration, and emerging sustainability transitions. Forest ecosystem integrity in this scenario remains moderate but shows signs of gradual improvement due to increasing investments in restoration programs, reforestation projects, and climate adaptation measures. Public awareness of environmental degradation grows substantially, encouraging stronger support for biodiversity conservation and sustainable forest management. Although ecosystems remain vulnerable in some regions, coordinated restoration initiatives begin to reverse earlier patterns of degradation. Governance structures become more collaborative and adaptive as policymakers recognize the limitations of fragmented management systems. New partnerships emerge between local governments, NGOs, tourism organizations, researchers, and community groups. Local residents become more actively involved in heritage revitalization projects, participatory tourism initiatives, and environmental restoration programs. Community engagement is often stimulated by external funding schemes, educational programs, and regional development initiatives focused on sustainability transitions and rural resilience. Visitor demand gradually increases as destinations begin repositioning themselves within growing markets for sustainable, regenerative, and nature-based tourism. Travelers increasingly seek destinations that demonstrate environmental responsibility, cultural authenticity, and meaningful community engagement.

Traditional forest practices and cultural narratives are rediscovered and reinterpreted as valuable resources for sustainable tourism development and local identity reconstruction. Museums, educational centers, and participatory cultural programs play a major role in reconnecting local populations and visitors with forest heritage traditions. Tourism entrepreneurship experiences moderate but steady growth. A new generation of tourism entrepreneurs emerges, often combining digital innovation, sustainability principles, and heritage-based tourism concepts. Hybrid tourism products integrating ecological education, creative tourism, wellness tourism, and cultural interpretation become increasingly common. Digital innovation supports the regeneration process by improving destination visibility, facilitating networking between stakeholders, and enabling more efficient visitor management systems. Online storytelling, virtual heritage archives, and digital marketing platforms help smaller rural destinations reach broader audiences without relying on mass tourism models. Economically, the “Regenerating Forest” scenario reflects cautious optimism. Tourism does not become a dominant economic sector immediately, but it gradually contributes to rural diversification, employment creation, and social revitalization. The scenario demonstrates that adaptive governance, ecological restoration, and community engagement can gradually rebuild more resilient and sustainable PoTaRCh tourism systems.

In order to compare and highlight the major differences among the five alternative futures, Table 5 summarizes their key characteristics. The comparison illustrates that no single driver alone determines future development; rather, it is the interaction among these dimensions that shapes the development of PoTaRCh-based tourism systems. While Forest Harmony represents the most balanced and sustainability-oriented pathway, Forgotten

Forest illustrates the cumulative consequences of weak governance, ecosystem degradation, and declining tourism demand. Tourist Forest demonstrates that strong tourism growth may generate significant short-term economic benefits but also substantial risks for ecological integrity and heritage authenticity. Guardians' Forest emphasizes the capacity of local communities to preserve cultural landscapes despite limited institutional support, whereas Regenerating Forest reflects an adaptive transition in which ecological restoration and collaborative governance gradually rebuild destination resilience.

Table 5. Comparative overview of the five future scenarios for PoTaRCh-based tourism systems.

Scenario/Dimension	Forest Harmony	Guardians' Forest	Tourist Forest	Forgotten Forest	Regenerating Forest
Ecosystem integrity	High	High	Low	Very low	Improving
Governance	Strong	Weak	Strong	Weak	Adaptive
Community participation	High	Very high	Low	Low	Increasing
Tourism demand	High	Moderate	Very high	Low	Growing
Heritage authenticity	Very high	High	Moderate	Very low	Recovering
Economic outlook	Stable	Moderate	High short-term	Declining	Improving
Overall sustainability	Very high	High	Medium	Very low	Medium-high

3.2. Scenario Monitoring Framework and Early Warning Indicators

The monitoring framework was developed directly from the scenario-building process. Rather than introducing new variables, it builds upon the four critical drivers identified through the Delphi process, impact-uncertainty analysis, and subsequent scenario construction. These drivers constitute the fundamental dimensions differentiating the five scenarios and therefore provide the logical basis for monitoring future developments. The development of the framework followed three consecutive steps.

First, each of the four key drivers was operationalized by identifying observable indicators that can be regularly monitored using existing statistical databases, destination management records, environmental monitoring systems, and tourism statistics. The selected indicators were chosen because they reflect measurable changes in the underlying processes represented by each driver and are applicable across different European PoTaRCh destinations. Second, expected directional trends for each indicator were identified for every scenario. Instead of assigning precise numerical threshold values, which would be highly context-dependent and vary substantially across destinations, the framework classifies indicator development according to qualitative trajectories such as high, moderate, low, increasing, or declining. This approach is consistent with the exploratory nature of scenario planning, where the objective is not to predict exact future states but to identify plausible pathways of system evolution. Third, the indicators were integrated into a Scenario Monitoring Framework (Table 6), allowing simultaneous assessment of developments across all four drivers. The framework functions as an early warning system by comparing observed trends with the characteristic profiles of each scenario. For example, continuous improvements in ecosystem integrity, governance coordination, community participation, and heritage-oriented tourism demand would indicate movement toward the Forest Harmony scenario. Conversely, increasing commercialization accompanied by declining ecosystem integrity and limited community involvement would signal convergence toward the Tourist Forest scenario, while simultaneous deterioration across all drivers would suggest the emergence of the Forgotten Forest trajectory. The proposed framework is intended primarily as a strategic monitoring instrument rather than a predictive model.

Its purpose is to support adaptive management by providing stakeholders with timely information on the direction of system development and by enabling proactive policy responses before undesirable trajectories become fully established.

Table 6. Proposed Scenario Monitoring Framework.

Driver	Possible Monitoring Indicator	Data Source
Forest ecosystem integrity	Forest cover change, biodiversity index, protected habitat condition, wildfire frequency	Copernicus, national forestry agencies
Destination governance	Number of integrated management plans, stakeholder partnerships, governance effectiveness index	Local governments, destination management organizations
Community participation	Number of community-led tourism initiatives, participation in heritage events, local tourism enterprises	Municipal statistics, tourism boards
Visitor experience & tourism demand	Visitor numbers, average length of stay, satisfaction scores, share of heritage-based tourism products	Tourism statistics, visitor surveys

To operationalize the proposed scenarios and facilitate their practical application, a Scenario Cockpit was developed as a strategic monitoring and decision-support tool (Table 7). The cockpit translates the qualitative scenario narratives into a structured framework that enables continuous observation of the four critical drivers shaping the future of PoTaRCh-based tourism systems. Rather than serving as a forecasting instrument, the cockpit is designed to identify early signals indicating that destination development is converging toward a particular scenario. The construction of the Scenario Cockpit was based on the assumption that changes in the four key drivers occur gradually and can therefore be monitored through regularly observed indicators. For each driver, a set of measurable variables was identified using existing environmental, tourism, governance, and socio-economic data sources. These indicators collectively provide information on the current direction of system development and allow comparison with the characteristic profiles of the five scenarios. Unlike quantitative forecasting models, the proposed cockpit does not rely on fixed numerical threshold values, since appropriate thresholds are likely to vary among destinations depending on their ecological conditions, governance structures, and tourism development levels. Instead, the framework adopts a qualitative assessment approach in which indicator trends are interpreted as improving, stable, or deteriorating. The simultaneous evaluation of all four drivers enables stakeholders to recognize whether observed developments increasingly resemble the characteristics of Forest Harmony, Guardians' Forest, Tourist Forest, Forgotten Forest, or Regenerating Forest.

The practical value of the Scenario Cockpit lies in its ability to support adaptive governance. Continuous monitoring of the selected indicators provides policymakers and destination managers with an evidence-based mechanism for detecting emerging trends before they become irreversible. For example, increasing community participation combined with improving ecosystem conditions and stronger governance coordination would indicate movement toward the Forest Harmony or Regenerating Forest scenarios. In contrast, rapid growth in visitor demand accompanied by declining ecosystem integrity and limited community involvement would represent an early warning signal of development toward the Tourist Forest scenario. Similarly, simultaneous deterioration across governance, ecosystems, participation, and tourism demand would suggest progression toward the Forgotten Forest pathway. Consequently, the Scenario Cockpit extends the role of the

scenarios beyond descriptive future narratives by transforming them into a dynamic monitoring framework capable of informing strategic planning, heritage conservation, and sustainable destination management. It provides a practical mechanism through which stakeholders can periodically evaluate the evolution of PoTaRCh tourism systems and implement timely interventions aimed at strengthening their long-term resilience.

Table 7. Proposed Scenario Cockpit for Monitoring the Future Development of PoTaRCh-Based Tourism Systems.

Indicator	Forest Harmony	Guardians	Tourist	Forgotten	Regenerating
Forest condition/Biodiversity	High	High	Declining	Low	Improving
Governance integration	High	Low	High	Low	Increasing
Community-led initiatives	High	Very high	Low	Low	Increasing
Heritage tourism demand/visitor satisfaction	High	Moderate	Very high	Low	Increasing

4. Discussion

The five scenarios developed in this study represent theoretically informed future archetypes rather than predictions or predefined destination typologies. Collectively, they demonstrate that the future of PoTaRCh tourism systems is shaped by dynamic interactions among forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand. Rather than acting independently, these drivers reinforce one another within a socio-ecological system, influencing the long-term resilience and sustainability of forest-based cultural heritage destinations. More specifically, forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand emerged as the four critical uncertainties shaping alternative development trajectories. This result reinforces socio-ecological systems perspectives which emphasize that tourism destinations function as interconnected systems in which environmental conditions, institutional arrangements, local communities, and economic activities continuously influence one another [1,2]. The prominence of ecosystem integrity as a key driver is consistent with previous studies highlighting the dependence of forest-based tourism on biodiversity conservation, landscape quality, and ecosystem services [7,11,58]. The scenarios demonstrate that ecological degradation not only threatens environmental sustainability but also undermines destination attractiveness, heritage authenticity, and long-term tourism resilience.

The identification of destination governance as a critical uncertainty confirms earlier research suggesting that governance quality plays a central role in balancing tourism development, conservation objectives, and stakeholder interests [51,52]. The contrast between alternative scenario pathways demonstrates that strong governance alone does not automatically lead to sustainable outcomes. Rather, governance effectiveness depends on whether policy priorities emphasize long-term sustainability and community wellbeing or short-term tourism growth. This finding aligns with recent discussions on tourism transition pathways and adaptive governance approaches that stress the importance of collaborative and sustainability-oriented decision-making processes [54,57]. Community participation emerged as another highly influential driver, supporting previous studies that identify local engagement, social capital, and place attachment as essential foundations for sustainable rural tourism development [52,55]. One of the scenario pathways further illustrates how strong community stewardship can compensate for limited formal governance structures and contribute to the preservation of both ecological and cultural values.

This finding resonates with research emphasizing the role of local communities as active co-creators of tourism experiences and custodians of cultural heritage rather than passive beneficiaries of tourism development [18,19].

The fourth driver, visitor experience and tourism demand, reflects broader transformations occurring within contemporary tourism markets. The positive trajectories identified in the Forest Harmony and Regenerating Forest scenarios are consistent with growing demand for authentic, experience-based, and environmentally responsible tourism products [5,10]. Conversely, the positive development pathways illustrate concerns raised within heritage tourism literature regarding the commodification of cultural resources and the potential erosion of authenticity under conditions of excessive commercialization [20,21]. The findings therefore suggest that future tourism demand may represent both an opportunity and a threat depending on how destinations manage the balance between economic development and heritage conservation. The five scenarios collectively support recent sustainability transition research arguing that tourism destinations are increasingly exposed to interacting environmental, social, technological, and institutional pressures [24,53]. Particularly noteworthy is the identification of a regeneration-oriented development pathway, which reflects the growing relevance of regenerative tourism approaches that seek not only to minimize negative impacts but also to actively contribute to ecological restoration, cultural revitalization, and community wellbeing. This scenario suggests that recovery and transformation remain possible even in contexts where degradation has already occurred, provided that adaptive governance, restoration initiatives, and stakeholder collaboration are successfully implemented.

Several findings of the present study extend existing tourism futures and heritage tourism research. First, unlike many destination governance studies that position governance quality as the dominant determinant of sustainable tourism development [51,52], the results suggest that forest ecosystem integrity exerts an equally important influence on future destination trajectories. The Tourist Forest scenario demonstrates that even strong governance structures may fail to ensure sustainability when tourism growth is prioritized over ecological resilience. Second, community participation emerged as a structural driver rather than merely a supporting governance mechanism. This finding differs from much of the tourism literature where participation is primarily viewed as a tool for stakeholder engagement. In PoTaRCh destinations, local communities function as custodians of traditional ecological knowledge and cultural practices, making participation central to system resilience. Third, the study challenges growth-oriented assumptions commonly found in tourism development research by showing that high tourism demand may generate either sustainable or unsustainable outcomes depending on its interaction with governance arrangements and ecosystem conditions. Finally, the identification of the Regenerating Forest scenario introduces a transition-oriented perspective that remains relatively under-represented in tourism foresight studies, emphasizing recovery, institutional learning, and ecological restoration as plausible future pathways rather than treating destination futures as fixed end-states. These differences likely reflect the distinctive socio-ecological nature of forest-based cultural heritage tourism systems, where environmental conditions, heritage authenticity, and community stewardship are more tightly interconnected than in many conventional tourism destinations.

The primary contribution of this study is the development of an integrated scenario-planning framework that combines participatory Delphi analysis, scenario building, and a Scenario Monitoring Framework to support long-term strategic planning for forest-based cultural heritage tourism systems. Beyond this principal contribution, the study makes three complementary contributions. First, it extends tourism futures research by applying scenario planning to PoTaRCh heritage systems. Second, it advances socio-

ecological systems and regenerative tourism scholarship by demonstrating how ecological, governance, social, and market drivers interact to shape alternative development pathways. Third, it provides practical guidance for destination managers and policy-makers through the proposed monitoring indicators and Scenario Cockpit, enabling adaptive governance and early identification of emerging trajectories.

5. Conclusions

The present study explored plausible future trajectories of forest-based cultural heritage tourism systems associated with PoTaRCh heritage in Europe by 2040 using a scenario-planning approach. Four key drivers emerged as the principal sources of uncertainty shaping future development: forest ecosystem integrity, destination governance, community participation, and visitor experience and tourism demand. Their interaction resulted in five internally consistent scenarios representing alternative pathways ranging from regenerative and community-led development to tourism commercialization and socio-ecological decline. Beyond the scenario narratives, the study also proposed a Scenario Monitoring Framework and Scenario Cockpit to support adaptive governance and strategic decision-making.

When it comes to the theoretical implications, this study contributes to tourism and heritage research in several important ways. First, it extends the literature on forest-based cultural heritage tourism by moving beyond the dominant focus on heritage preservation, ethnographic documentation, industrial archaeology, and historical reconstruction [12,14,15]. While previous studies have largely examined PoTaRCh-related practices as disappearing rural traditions or cultural assets requiring conservation [4,13], the present research conceptualizes them as dynamic tourism resources embedded within evolving socio-ecological systems. By adopting a futures-oriented perspective, the study addresses recent calls for greater attention to heritage transformation and long-term destination resilience under conditions of uncertainty [21,23].

Second, the study advances the integration of socio-ecological systems thinking within tourism futures research. Previous tourism studies have frequently examined environmental sustainability, cultural heritage, and tourism development as relatively separate analytical domains [20,22]. Building on socio-ecological systems theory [1,2], the findings demonstrate that ecosystem integrity, governance quality, community participation, and tourism demand operate as interconnected drivers that jointly shape destination futures. The results therefore contribute to a more holistic understanding of forest heritage destinations as complex adaptive systems whose sustainability depends on interactions between ecological processes and social institutions rather than on isolated management interventions. Third, the research expands the application of scenario planning within tourism studies. Previous tourism foresight research has predominantly focused on national tourism systems [34], urban tourism [35], coastal destinations [36], technological innovation [31], and climate adaptation [32]. Recent reviews have also highlighted the limited application of scenario approaches to heritage tourism and rural socio-ecological destinations [26]. By applying the Intuitive Logics tradition and the Scenario-Based Strategic Planning framework [46] to PoTaRCh-based tourism systems, this study broadens the empirical scope of tourism futures research and demonstrates the usefulness of scenario planning for exploring uncertainty in heritage-based rural destinations.

Fourth, the findings contribute to emerging discussions on regenerative tourism and sustainability transitions. While sustainable tourism research has traditionally focused on minimizing environmental impacts, recent scholarship increasingly advocates regenerative approaches that actively support ecosystem restoration, cultural revitalization, and community wellbeing [5,53]. The Regenerating Forest scenario reflects these prin-

ciples by illustrating how ecological restoration, adaptive governance, and community engagement may contribute to destination recovery and resilience. In this regard, the study extends theoretical discussions surrounding regenerative tourism by demonstrating how restoration-oriented development pathways may emerge within forest-based heritage destinations. Finally, the proposed Scenario Monitoring Framework and Scenario Cockpit contribute methodologically to tourism foresight and adaptive governance research. Existing scenario studies frequently conclude with narrative descriptions of alternative futures [43,44], whereas the present study translates qualitative scenarios into a structured monitoring system based on measurable indicators and early-warning mechanisms. By linking scenario planning with adaptive governance principles [24,27], the research demonstrates how foresight exercises can move beyond exploratory analysis and support ongoing strategic decision-making in tourism destinations facing environmental and socio-economic uncertainty.

When it comes to practical implications, the findings provide several implications for policymakers, destination managers, heritage organizations, and local communities involved in the management of forest-based cultural heritage destinations. For policymakers, the results highlight the importance of integrated governance frameworks that simultaneously address environmental protection, heritage preservation, rural development, and tourism planning. The Forest Harmony scenario illustrates that sustainable outcomes are most likely when governance systems promote long-term planning, stakeholder collaboration, and balanced development objectives. Consequently, public policies should encourage cross-sectoral cooperation between tourism authorities, forestry agencies, heritage institutions, and local governments. For destination management organizations, the study emphasizes the need to monitor ecosystem conditions and tourism development simultaneously. The Tourist Forest scenario demonstrates that strong tourism growth can generate substantial short-term economic benefits while simultaneously increasing ecological pressures and reducing heritage authenticity. Destination managers should therefore implement visitor management systems, carrying-capacity assessments, and sustainability monitoring mechanisms to prevent undesirable development trajectories.

For local communities, the findings reinforce the importance of active participation in destination governance and tourism development processes. The Guardians' Forest scenario illustrates that community stewardship can play a decisive role in maintaining heritage values and ecosystem integrity even under conditions of limited institutional support. Supporting local entrepreneurship, heritage-based tourism initiatives, and intergenerational knowledge transfer can strengthen both cultural continuity and economic resilience. For heritage organizations and conservation agencies, the study highlights the necessity of integrating tangible and intangible heritage preservation into broader tourism strategies. Traditional knowledge associated with tar production, charcoal burning, resin collection, and potash extraction should be incorporated into educational programs, interpretive experiences, and participatory tourism products in ways that preserve authenticity while enhancing visitor engagement. Finally, the proposed Scenario Monitoring Framework and Scenario Cockpit offer practical tools for adaptive destination management. By regularly monitoring ecosystem conditions, governance effectiveness, community participation, and tourism demand, stakeholders can identify emerging trends at an early stage and implement corrective measures before undesirable developments become entrenched. This transforms scenario planning from a purely exploratory exercise into a continuous strategic management instrument.

Several limitations should be acknowledged when interpreting the findings of this study. First, the study relies primarily on expert judgments obtained through a Delphi process. Although the expert panel represented diverse professional backgrounds and

geographical contexts, the resulting scenarios inevitably reflect subjective assessments regarding future developments. Different expert groups or stakeholder compositions may have identified alternative drivers or produced somewhat different scenario configurations. Also, although the Delphi panel included experts from diverse countries and professional backgrounds, the predominance of academic participants may have influenced the identification and prioritization of certain drivers. Future studies could further strengthen scenario development by increasing the representation of practitioners, private-sector stakeholders, local community representatives, and policy makers. Second, the research adopts a pan-European perspective on PoTaRCh-based tourism systems. While this broad perspective facilitates the identification of common patterns and structural drivers, it may overlook important regional differences in governance arrangements, ecological conditions, cultural traditions, and tourism development levels. Future studies could apply the framework to specific destinations or regions in order to generate more context-sensitive scenarios. Third, the scenarios remain qualitative and exploratory rather than predictive. Their purpose is to explore plausible futures rather than forecast exact outcomes. Consequently, the scenarios should be interpreted as strategic learning tools rather than predictions of future development. Although the Delphi process successfully achieved convergence through iterative expert consultation, no formal statistical indicator of consensus (e.g., Kendall's W or IQR) was calculated. Future studies could complement qualitative consensus assessment with quantitative measures of expert agreement. Fourth, although the monitoring framework identifies relevant indicators for tracking future developments, the proposed Scenario Cockpit has not yet been empirically tested in operational destination management contexts. Future research should examine the practical applicability, reliability, and usability of the framework through longitudinal case studies. Future research could therefore proceed in several directions. Comparative applications of the framework across different European PoTaRCh destinations would allow assessment of contextual variations in scenario dynamics. Longitudinal studies could evaluate how destinations evolve relative to the proposed scenarios over time. Additional research may also integrate quantitative modelling techniques, such as system dynamics or agent-based modelling, to complement qualitative scenario narratives. Finally, future studies should further investigate the role of digital technologies, climate adaptation strategies, and regenerative tourism practices in shaping the resilience of forest-based cultural heritage tourism systems.

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Appendix A

Table A1. 68 factors influencing the development of PoTaRCh-based tourism systems (experts surveys and literature review).

Governance	Economic	Socio-Cultural	Technological	Environmental	Market-Related
G1. Destination governance effectiveness	E1. Diversification of rural economies	S1. Condition of tangible PoTaRCh heritage sites (kilns, pits, tapping scars)	T1. Adoption of digital storytelling technologies	N1. Forest ecosystem health and biodiversity levels	M1. Growth of slow tourism and regenerative tourism markets
G2. Multi-level policy coordination (EU–national–regional)	E2. Degree of dependence on external investment	S2. Transmission of traditional knowledge and production skills	T2. Use of AR/VR in heritage interpretation	N2. Frequency and severity of climate-related disturbances (fires, droughts, storms)	M2. Demand for experiential and craft-based tourism
G3. Stability of sustainability policy frameworks	E3. Access to financing for tourism SMEs	S3. Intergenerational engagement in heritage practices	T3. Smart visitor management systems	N3. Long-term forest regeneration capacity	M3. Visitor awareness of forest-based heritage
G4. Administrative capacity of rural municipalities	E4. Local value retention from tourism activities	S4. Community attachment to forest-based identity	T4. Data-driven destination planning	N4. Landscape fragmentation due to infrastructure development	M4. International tourism volatility
G5. Transparency in land-use planning	E5. Youth employment opportunities in rural areas	S5. Risk of commodification of heritage narratives	T5. Accessibility of digital infrastructure in rural areas	N5. Soil degradation in former production areas	M5. Domestic tourism growth trends
G6. Regulatory balance between conservation and tourism use	E6. Integration of tourism into circular bioeconomy initiatives	S6. Social acceptance of tourism development	T6. Innovation capacity of local tourism entrepreneurs	N6. Availability of protected forest zones	M6. Market positioning of PoTaRCh destinations
G7. Access to EU and national funding programs	E7. Resilience of rural supply chains	S7. Level of community involvement in tourism planning	T7. Digital literacy among local stakeholders	N7. Investment in ecological restoration initiatives	M7. Price sensitivity of heritage tourists
G8. Long-term strategic planning capacity at destination level	E8. Income inequality within destination communities	S8. Trust between local actors and institutions	T8. Integration of immersive learning experiences	N8. Water availability and hydrological stability in forest areas	M8. Visitor expectations regarding sustainability standards
G9. Political prioritization of forest-based heritage tourism	E9. Cost of maintaining heritage sites	S9. Strength of local networks and cooperatives	T9. Use of social media in destination branding	N9. Impacts of climate change on forest accessibility	M9. Competition from other nature-based destinations
G10. Cross-border cooperation in forest tourism development	E10. Public investment in rural infrastructure	S10. Gender inclusion in tourism entrepreneurship	T10. Adoption of sustainable mobility technologies	N10. Integration of biodiversity conservation into tourism planning	M10. Branding differentiation of PoTaRCh tourism products
G11. Policy support for regenerative tourism models	E11. Availability of skilled workforce in tourism	S11. Migration trends affecting rural population structure	T11. Technological modernization of heritage site conservation	N11. Carbon footprint of tourism activities in forest destinations	

Table A1. Cont.

Governance	Economic	Socio-Cultural	Technological	Environmental	Market-Related
	E12. Economic resilience of tourism SMEs	S12. Cultural valorization of forest-based traditions in public discourse		N12. Perceived environmental authenticity of forest landscapes	

Appendix B

Table A2. Conceptual glossary of scenario names.

Scenario	Intended Meaning in this Study	Not Intended to Imply	Supporting Literature
Forest Harmony	A future characterized by a balanced relationship between ecosystem integrity, heritage conservation, governance, community participation, and tourism development.	Not a formal forest management category.	Scenario planning literature; regenerative tourism.
Guardians’ Forest	A metaphor for strong local stewardship, community custodianship, and protection of forest heritage through grassroots action.	Not a sacred forest, protected forest, or legal conservation designation.	Community-based conservation; stewardship literature.
Tourist Forest	A metaphor describing a future dominated by intensive tourism commercialization and visitor-oriented development.	Not a forest type or forest classification used in forestry.	Tourism commercialization literature; heritage commodification.
Forgotten Forest	A scenario representing institutional neglect, declining tourism demand, heritage deterioration, and ecosystem degradation.	Not abandoned forest land in forestry terminology.	Rural decline; heritage abandonment literature.
Regenerating Forest	A transitional pathway emphasizing ecological restoration, adaptive governance, and destination recovery.	Not a silvicultural regeneration stage.	Regenerative tourism; ecological restoration literature.

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