

TEIVAALANHARJU

Balancing Ecological Integrity & Recreation



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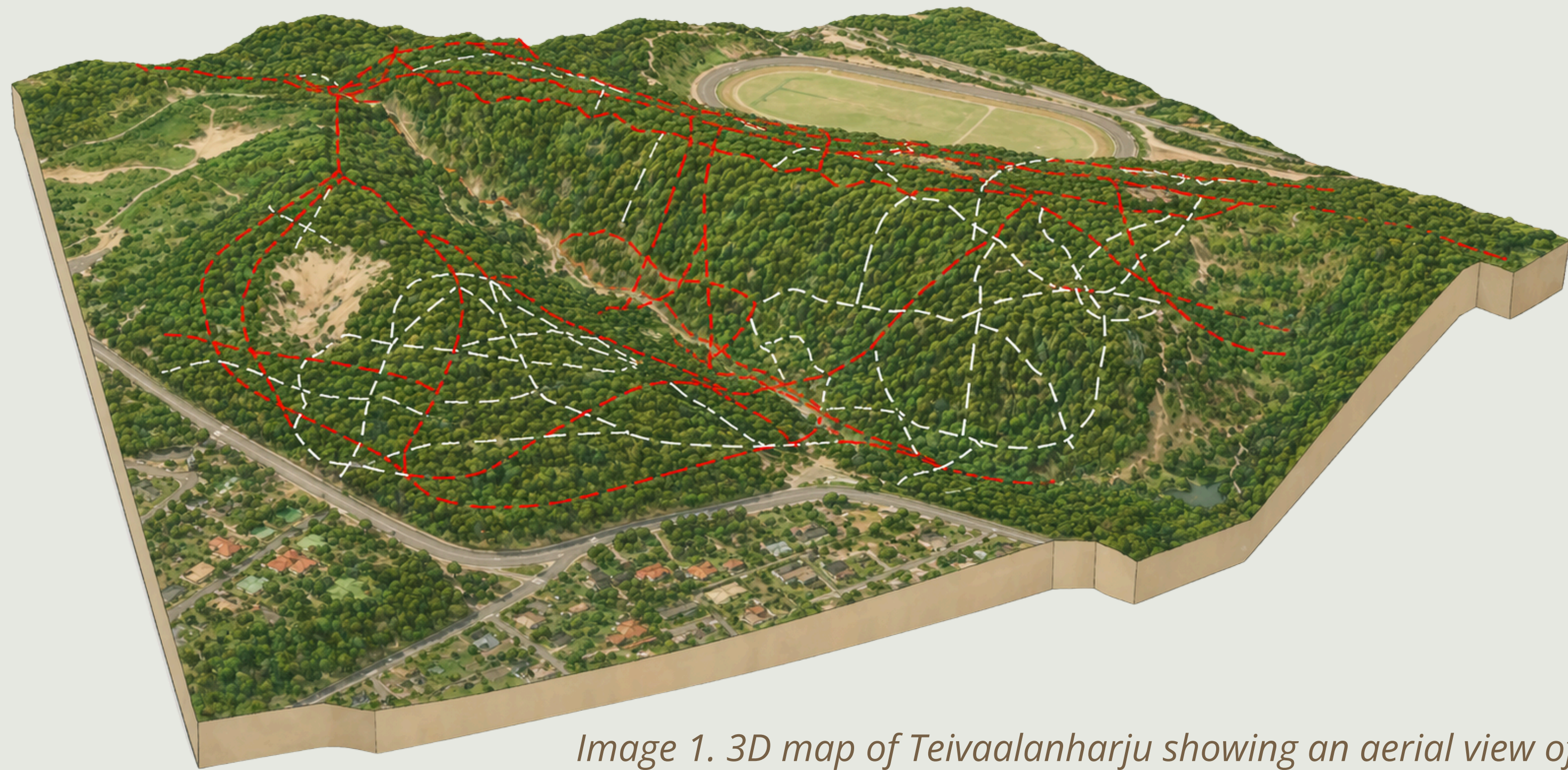


Image 1. 3D map of Teivaalanharju showing an aerial view of official (red) and unofficial (white) paths, created using QGIS. The map is a generalized representation and should not be considered fully accurate.



Trail design

The first phase of the solution is trail design. Recreational forests face ecological risks, but data-driven planning can reduce them. Tools like GIS are used to map erosion-prone areas and guide route design, while using landscape architecture principles enhances the connection between nature and visitors.



Proactive Maintenance

Proactive maintenance focuses on identifying early signs of wear before damage crosses critical threshold & becomes almost irreversible. Using tools like high-resolution 3D Digital elevation models from LiDAR or drone photogrammetry and comparing the models over time reveals subtle changes like soil erosion rate, trail widening, vegetation or soil loss, etc., (image 3).

Moreover, using PPGIS and anonymized volunteered GPS data, such as Strava heatmaps, real movement patterns in Teivaalanharju, including informal “desire paths,” can be mapped (image 4). Combining these methods with ecological data reveals where high use overlaps sensitive areas, enabling targeted early interventions.

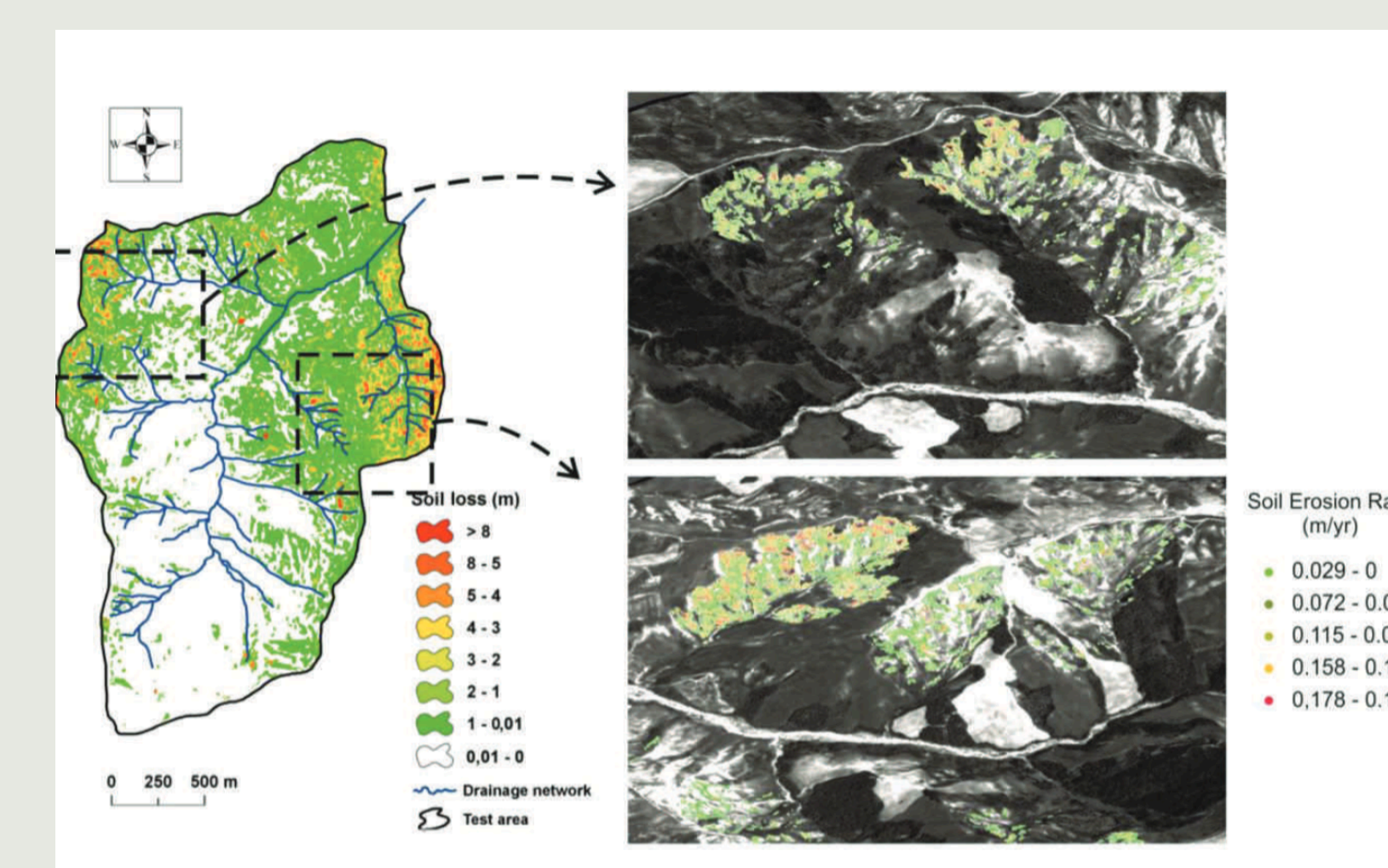


Image 2 (Aucelli et al., 2016).

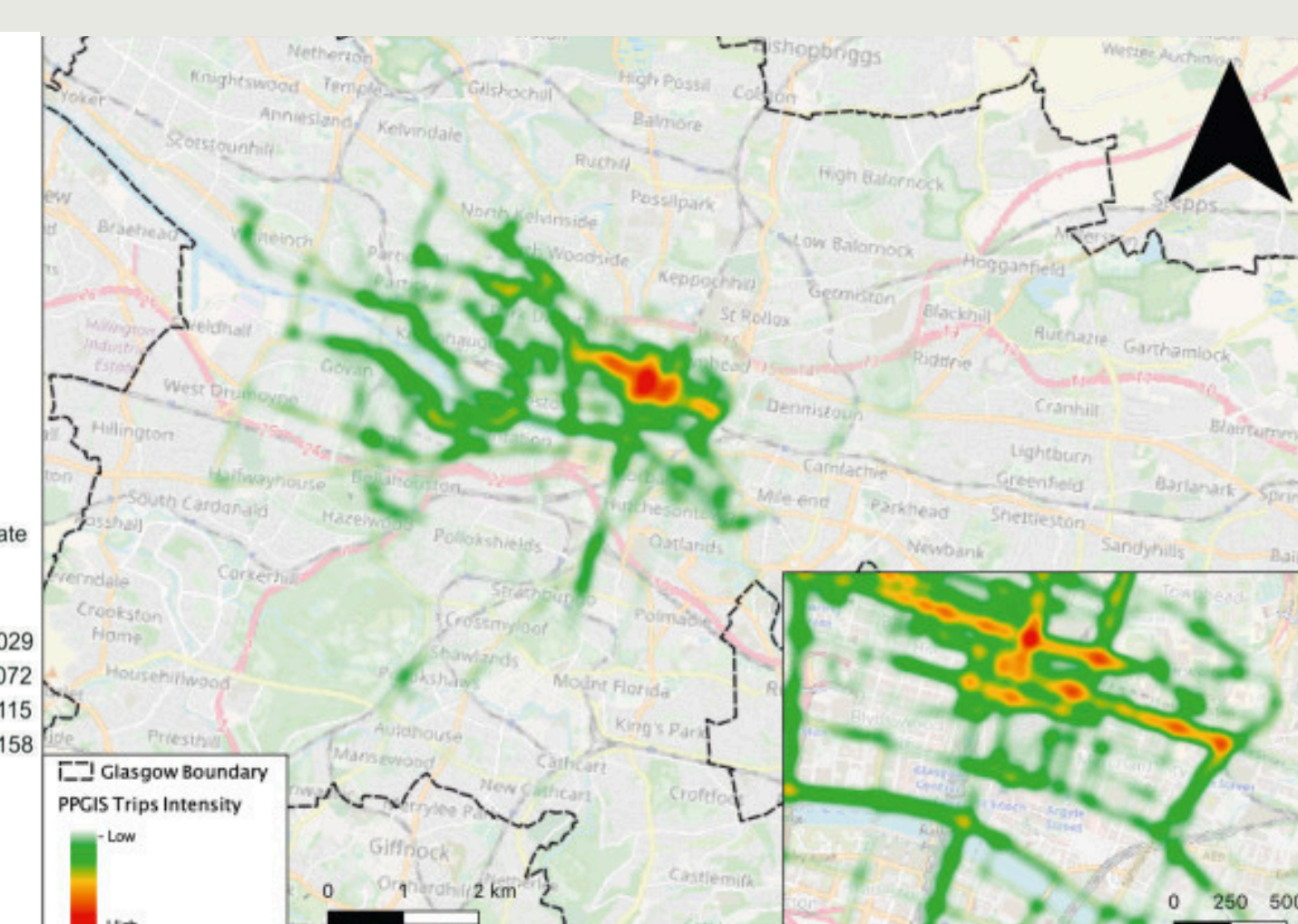


Image 3 (Alattar et al., 2021).

Introduction

Teivaalanharju, a unique ridge environment in Ylöjärvi, Finland, has high recreational value and supports diverse outdoor activities. The planned development of the nearby Teivo-Mäkkylä residential area is expected to increase visitor numbers, placing additional pressure on this ecologically sensitive landscape. Increased use threatens long-term sustainability due to soil erosion,

vegetation damage, disturbance to the ridge ecosystem, etc.. However, as an important and accessible recreational area, strict access restrictions are not desirable. Hence, the key challenge is to balance ecological integrity with increasing recreational demand through integrated technical, social, and environmental strategies that support sustainable use while protecting the ridge.

Process

First, we visited Teivo-Mäkkylä and was introduced to the area by city of Ylöjärvi and different stakeholders. Many stakeholders expressed concerns about the ecological impact the development of Teivo-Mäkkylä would have. This sparked ideas about focusing the project on the Teivaalanharju esker.

Further research and stakeholder interaction proved that the topic is an important aspect of the development process. The fieldwork the group has conducted revealed that most initial concerns were topical. After a systematic review of literature and previous cases the group has narrowed down possible solutions applicable for the situation.

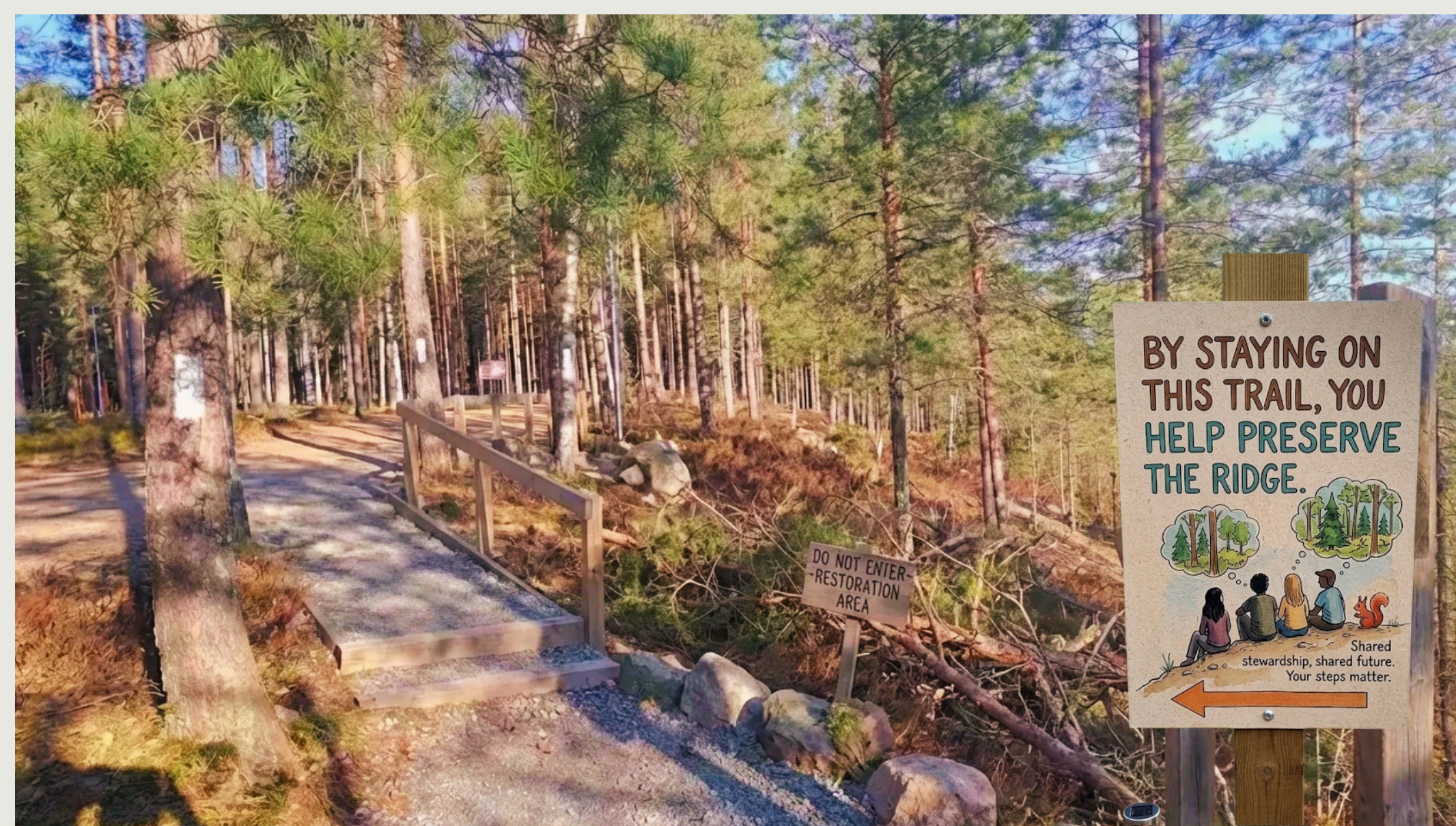


Image 4. and Image 5.

Guidance

The containment strategy guides visitors to durable, designated trails and discourages off-trail movement (Marion, 2016). It reduces ecological damage by concentrating use on resilient trails. Implementation includes reinforcing paths, restoring unsustainable routes, improving informal trails where necessary, and using effective, context-specific signage and natural materials to protect ecosystems while maintaining accessibility and high-quality nature experiences.

Currently signage in Teivaalanharju provides distances, routes, and warnings. Research shows signs should go beyond instruction to influence behavior (Goldstein, Cialdini & Griskevicius, 2008). Socially resonant messaging can improve visitor actions and engagement. Signs work most efficiently at action points and should be strategically placed along routes, sensitive areas, and key entry points for accessibility.

Key findings

The area's complex challenges require a multidisciplinary approach that integrates both technical and social strategies. Data-driven tools for planning and maintenance, such as GIS, PPGIS, LiDAR, and photogrammetry, support sustainable trail design, early detection

of environmental impacts, and more effective maintenance. Equally important are measures that guide visitor behavior, including accessible signage, visitor management, place-based activities, and community participation to support long-term preservation.

Community involvement

We advocate activating residents and visitors via low-threshold events, such as an “Outdoor daycare” for nature-based learning. The planned school could integrate into these, as proven by existing religious events in Teivaalanharju. This would boost local popularity and position Teivo-Mäkkylä as a sustainable urban cluster.



REFERENCES

- AUCELLI, P. P. C., CONFORTI, M., DELLA SETA, M., DEL MONTE, M., D'UVA, L., ROSSKOPF, C. M., & VERGARI, F. (2016). MULTI-TEMPORAL DIGITAL PHOTOGRAMMETRIC ANALYSIS FOR QUANTITATIVE ASSESSMENT OF SOIL EROSION RATES IN THE LANDOLA CATCHMENT OF THE UPPER ORCIA VALLEY (TUSCANY, ITALY). LAND DEGRADATION & DEVELOPMENT, 27(4), 1075-1092.
- ALATTAR, M.A., COTTRILL, C. AND BEECROFT, M. (2021). PUBLIC PARTICIPATION GEOGRAPHIC INFORMATION SYSTEM (PPGIS) AS A METHOD FOR ACTIVE TRAVEL DATA ACQUISITION. JOURNAL OF TRANSPORT GEOGRAPHY, 96, P.103180. DOI:HTTTPS://DOI.ORG/10.1016/J.JTRANGE0.2021.103180
- BALLANTYNE, M. AND PICKERING, C.M. (2015). THE IMPACTS OF TRAIL INFRASTRUCTURE ON VEGETATION AND SOILS: CURRENT LITERATURE AND FUTURE DIRECTIONS. JOURNAL OF ENVIRONMENTAL MANAGEMENT, 164, PP.53-64. DOI:HTTTPS://DOI.ORG/10.1016/J.JENVMAN.2015.08.032.
- MARION, J. L. (2016). A REVIEW AND SYNTHESIS OF RECREATION ECOLOGY RESEARCH SUPPORTING CARRYING CAPACITY AND VISITOR USE MANAGEMENT DECISIONMAKING. JOURNAL OF FORESTRY, 114(3), 339-351. HTTTPS://DOI.ORG/10.5849/JOF.15-062.
- COPLANAI. (2026). [PICTURE OF TEIVAALANHARJU UPGRADED TRAIL]. HTTTPS://COPLANAI.COM
- OPENAI. (2026). CHATGPT (GPT-5 MINI). [LARGE LANGUAGE MODEL]. HTTTPS:CHAT.OPENAI.COM/CHAT

NOTE: IMAGES 4 AND 5 WERE GENERATED WITH AI