Greenways as Agroecological Armatures for Adaptation
Co-creating the Tarantasio Trail in Northern Italy

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Abstract

Urban greenways enhance ecological health and give communities critical access to the benefits of nature (Horte & Eisenman 2020). Most greenway planning overlooks their potential role in rural areas, where the economics of agriculture conflict with biodiversity goals (Govindan et al. 2016). Like cities, rural areas face global pressures for change. Hitchings and Rouse (2022) identify four key economic, social, technological, and environmental drivers that will shape rural landscape transformations. Furthermore, the European Commission's "no-net-land take by 2050" goal underscores the need to preserve croplands, pastures, and forests, which are crucial for carbon storage and flood protection. Despite the Council of Europe Landscape Convention (2000) emphasizing participatory decision-making, rural communities are often excluded from these processes, as development interests and economic considerations dominate (Gullino, Devecchi, & Larcher, 2018). As agricultural land is repurposed for new functions, greenway planning could become an armature for new ecologies and relationships between humans and the natural world.

This paper presents a Participatory Action Research (PAR) project to develop an agroecological and solidarity-based greenway system in Northern Italy's Bergamo region. The initiative involved landscape architecture students and faculty from the University of Maryland (UMD) and Consorzio FA, a social cooperative supporting vulnerable groups, including foster children, single-parent families, and adults with disabilities, through three hubs: Villaggio Solidale (VS) in Lurano, Corte Solidale in Castel Cerreto, and the Social and Education Center (CSE) in Pontirolo Nuovo. Over three years, more than 175 participants—including residents, service users, and nonprofit representatives—engaged in cyclical reflection, planning, and action to co-create a "social" master plan for a landscape district rooted in agroecology and solidarity. Centered on the Tarantasio Trail, a bikeable greenway connecting farms, heritage sites, and community spaces, the project integrates nature-based interventions (NBIs) to support public health and ecological resilience (Fig. 2).

Background and literature review: Rural greenways as infrastructure for ecological and social well-being

Greenways are critical tools for advancing and healing ecosystems, benefiting communities with improved livability and access to nature (President's Commission of American Outdoors 1987, see Horte and Eisenman 2020). They define greenways as a "living network" that provides "people with access to open spaces close to where they live...and link together rural and urban spaces" (2020, p. 2). Despite many populations in the United States and Europe living in peri-urban or rural settings, greenway researchers have largely focused on urban and peri-urban areas. Although one in four Europeans and one in five Americans live in rural settings (https://ec.europa.eu/eurostat; www.census.gov), we know less about the role of greenways in enhancing the quality of life and ecological health of rural communities, where agricultural production often drives decision-making.

Like cities, rural areas are undergoing changes that will affect their future. Hitchings and Rouse (2022) explored the key drivers of change that are most likely to shape future transformations in landscapes, categorizing them into four broad areas: economic, social, technological, and environmental. These drivers include economic restructuring, shifts in the workplace, advancements in artificial intelligence and new technologies, and environmental concerns such as food security, water availability, and climate adaptation. Social drivers, such as aging populations, health, housing access, and safety, will also require change and impact communities and landscapes differently. In rural regions, policies surrounding synthetic protein production, regulations on CO2 emissions, water scarcity, and reduced commodity crop production will have profound implications for rural landscapes. As more land is repurposed for various uses and economic purposes, greenway planning could be the tool to manage these landscapes and their conservation.

In 2011, the European Commission announced its objective of 'no-net-land take by 2050' to preserve soil, protect biodiversity, and enhance quality of life. In Europe, land conversion to artificial surfaces has primarily affected urban and commuting zones, resulting in disruptions to ecological functions and ecosystem resilience due to reduced land for crops, pastures, forests, and biodiversity. Achieving the EU's goals requires actions to reduce land conversion by 2030, make room for carbon storage, stormwater management, and reforestation for air quality and heat mitigation (Desjardins et al. 2024).

It is becoming increasingly clear that to promote sustainability, state and local governments need to become more involved in sustainable rural planning (Govindan, Loisi, & Roma 2016). How should changes in rural, agriculture-dominated landscapes be envisioned and implemented? Who should have a say in setting future goals and strategies? The Council of Europe Landscape Convention (ELC) of 2000 provides guidance by framing the need to consider the landscape through people's perceptions. It also recognized a right to landscape and shared responsibility for stewarding it. To be resilient, transformative, and impactful, greenway planning necessitates co-creating future visions and shared stories of change, channeling individual ambitions into a unified shared vision (Ruggeri 2019). PAR offers a helpful model for such landscape change. It involves partnership, action, and value-driven, transdisciplinary, non-hierarchical research epistemologies (Park 1999; Horrigan 2006).

Researchers have found evidence that landscape experiences can positively impact health and well-being. Humans feel an affinity and a longing for nature and living things. These 'biophilic' connections are important because they help us connect with the cycles of life and find strength in them (Kellert 1997; Wilson 1984), especially for children (Louv 2008). However, people of any age also need nature-based experiences. Increased physical activity in nature can lower stress and fight depression, encourage social interaction, and aid healing (Cooper Marcus & Sachs 2013). Nature-based interventions make the rural landscape a therapeutic space, fostering social connections, developing capabilities, and promoting well-being (Obeng et al., 2023).

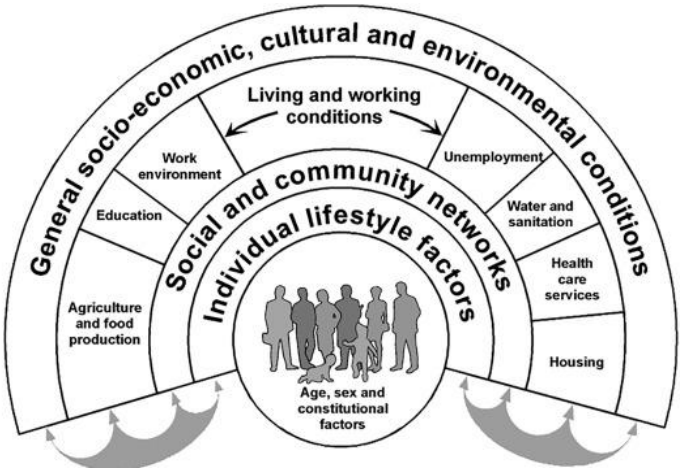

Figure 1: The rainbow model of the determinants of health (adapted from Whitehead & Dahlgren 1991)

The rainbow model of health determinants illustrates how personal experiences of health are shaped by the social, cultural, environmental, and economic contexts (Whitehead & Dahlgren 1991). In this model, agriculture, water, living landscapes, and housing provide a strong foundation for individual health. To these landscapes, we must also add the workplace, schools, heritage sites, and the recreational landscapes we engage with in our daily lives. Everyone should have opportunities to access the landscape right where they live and work, but this presents challenges for individuals with disabilities and the elderly. In 2017, in Italy, 600,000 individuals with disabilities lacked social support, and one out of five felt dissatisfied with life (www.istat.it). Future greenway planning should account for the well-being of the most vulnerable.

Author Erika Arban discusses the principle of solidarity in Italy as "a shared value for citizens… a principle that helps define their identity." She writes that solidarity "fosters equality, social rights, well-being, and friendship…" (Arban 2021, p.108). Solidarity also appears prominently in Italy's constitution (Article 2, 1947). The Solidarity Landscape project engages the perspectives of underserved communities to envision a future landscape that is adaptable, performs well, and fosters renewed bonds between people and nature.

Participatory Action Research as co-creation: The Tarantasio Trail garden.

Our PAR initiative is a collaborative effort between nonprofits associated with Consorzio FA and UMD's landscape architecture program. Together, we are reimagining the rural landscape as a resource for health, well-being, sustainable transportation, and agroecological practices, focusing on meeting the needs of underserved and vulnerable communities.

The proposed Tarantasio Trail greenway is located in Lombardy's Po Valley, a historically significant landscape once covered by a shallow wetland lake surrounded by forests and linked to the legend of the dragon Tarantasio, symbolizing harmony between humans and water (Conti 2018). Key to the region is the ecology of the *fontanili,* wooded springs near Villaggio Solidale that support recreation, education, and nature therapy. Water is a defining feature in the landscape and a precious resource for agriculture, cattle farming, and manufacturing in support of the needs of the vast Milanese metro area. However, recent droughts and rising temperatures have led to habitat degradation and biodiversity loss (Knutzen et al. 2025).

Agriculture in the region faces challenges, including declining productivity, falling land values, and new policies and strategies. Drought and temperature increases have forced local farmers to adopt more sustainable practices to safeguard their livelihoods. In response, the European Union promotes sustainable, organic farming to adapt to climate change. The landscape also faces threats from urbanization and industrial development. A proposed highway linking Bergamo and Treviglio will cut through the landscape, endangering fragile ecosystems and heritage sites, and potentially attracting new land consumption by logistics and warehouses.

Methodology: Uncovering landscape meanings and possibilities through PAR

Our PAR process spanned over three years, following an iterative annual cycle that involved design education, online seminars through the Open Landscape Academy, and summer workshops within the community. UMD landscape architecture students led many co-creation activities, resulting in the design of a bikeable path connecting nodes that foster education, heritage, and ecology through solidarity-informed practices. In winter 2024, the project released a recruitment video to expand its partnership and launched the Tarantasio Trail vision.

The project began by selecting the United Nations' Sustainable Development Goals (SDGs) that reflected the community and its ambitions. In line with Consorzio Fa's mission, we envisioned advancing well-being for all ages (SDG 3) and job opportunities for vulnerable and able individuals (SDG 8). Other goals included repurposing architectural heritage for housing and community farming, reducing car use (SDG 11), protecting ecosystems for resilience against climate change (SDG 15), and adopting agroecology as a systemic approach to sustainability. Finally, we prioritized partnerships to expand collaboration and impact (SDG 17).

Our project combined in-person and remote engagement, including four week-long workshops (August 2022 - June 2024) involving more than 175 participants, with a fifth scheduled for June 2025. Methods such as co-design, drawing, deep listening, and interactive observation helped participants express their visions on the landscape, solidarity, well-being, and accessibility challenges (Table 1).

In addition to our participatory activities, we conducted extensive fieldwork to inventory the landscape's assets and liabilities. Traveling by bike allowed us to experience the diverse terrain, including farm fields, established bike paths, rural roads, and village lanes. Biking provided an intimate understanding of the landscape and its challenges. Through these explorations, we sketched a greenway loop connecting rural towns with heritage sites, ecologically valuable areas, and diverse agricultural practices. We supplemented the in-person engagement with year-round digital participation to maintain engagement across distances.

Offsite, our team conducted extensive GIS mapping to identify ecologically and culturally significant areas for conservation. We mapped subsurface and surface water flows, topography, and soil permeability to help farmers imagine a transition from commercial to agroecological farming, informing both the trail layout and the participatory design process.

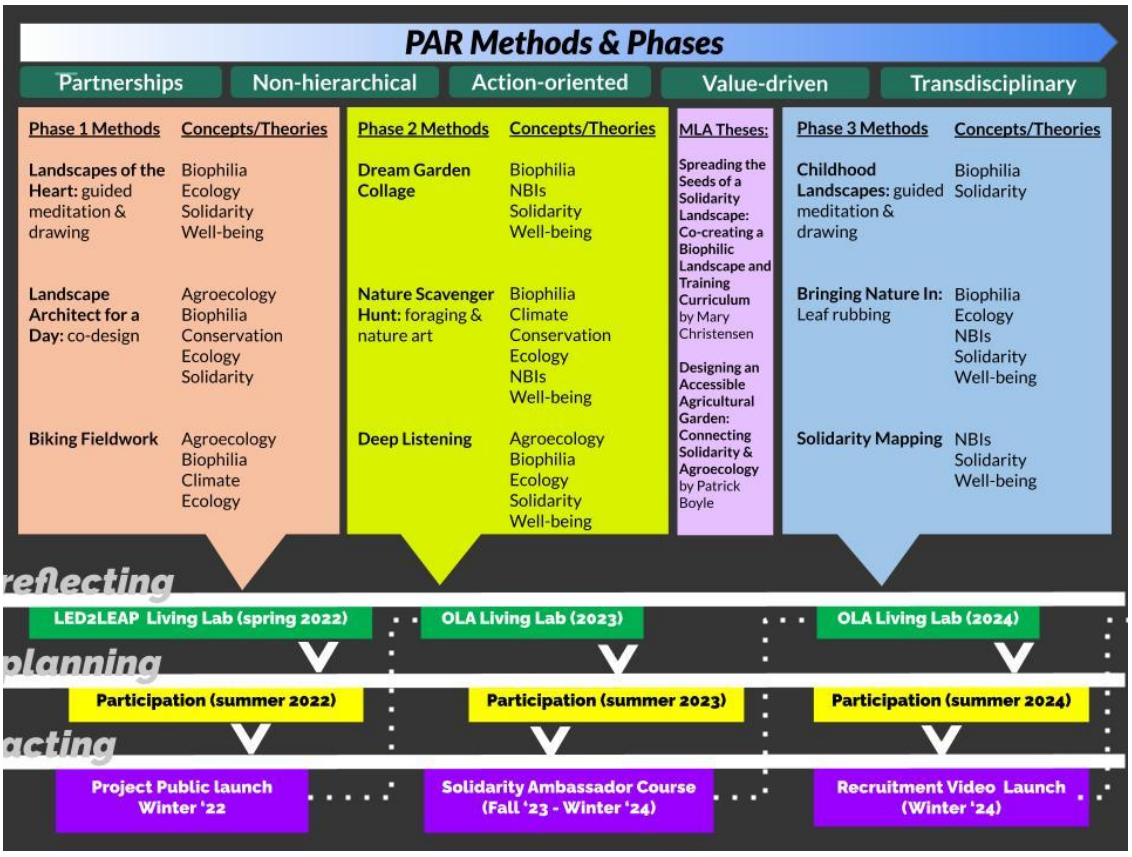

Table 1: The PAR process and sequencing of phases and activities used by the Solidarity Landscape Living Lab.

5. Findings: Co-creating a Greenway system from the bottom up

In co-creating a solidarity-driven rural greenway, we drew on the expressed needs and desires of VS residents, staff, local farmers, politicians, mobility activists, and community members. Findings from participatory activities were crucial in shaping the Tarantasio Trail and its potential impact on their lives. Through co-creation, collective drawing, and art, participants revealed landscape qualities that make their experiences meaningful and delightful. Drawings from 'Landscapes of the Heart' and 'Favorite Childhood Landscapes' highlighted expansive views of agricultural fields and the Italian Alps, and intimate depictions of landscapes of refuge and exploration (Hester 1979).

Through the 'Architect for a Day' and the "Dream Garden" collage activities, residents and staff shared visions for a future landscape - its uses, aesthetics, and daily practices. As designers, we supported their creative process and explored how their choices could improve their lives. Elementary and high schoolers drew their routes to school, envisioning them filled with plants and animals, drawing orchards, and spaces to eat, play, and study. Many extended their visions to the nearby springs, removing barriers that separate them from the site. A nature scavenger hunt revealed their favorite species, invasives, and edible native plants, culminating in an art exhibit of gathered materials. For residents with limited mobility, we 'Brought Nature In' offering tactile, sensory experiences like touching and smelling leaves and making colorful leaf rubbings. The participants' joy reflected the deep comfort biophilia can bring.

At Cascina Pelesa, farmer Fabio Proverbio shared the challenges of applying agroecological

practices in a landscape dominated by commercial farming. He emphasized the need for buffer zones, small water ponds, and weather-resilient infrastructure to protect crops from pesticides, pests, and hail. Fieldwork visits to two nature preserves: Renova Park in Pontirolo Nuovo and Ca'Matta in Bergamo, guided by project partners Marcello Fattori and Rossella Aldegani, deepened our understanding of ecological resilience. They inspired the inclusion of artificial vernal pools and forest patches in the greenway to support biodiversity and mitigate drought.

To ensure that the landscape of the Tarantasio Trail supports diverse abilities, we designed a training curriculum for VS staff to integrate nature into their work. Drawing on their expertise with fragile populations and their own landscape experiences, we co-designed accessible landscape nodes. One educator shared how outdoor experiences help alleviate anxiety in students with autism, while a middle school teacher emphasized the need for more time dedicated to outdoor education. Solidarity Mapping began by defining solidarity with VS staff and local educators. Together, we identified local places where solidarity is practiced and mapped areas where the greenway could foster further support and connections to healing and health.

Our work continued on the UMD campus, where our team reflected on workshop findings through theoretical and research lenses. Mary Christensen and Patrick Boyle shared their UMD Master of Landscape Architecture theses with local partners to achieve wide dissemination and informed the participatory activities in a continuous feedback loop typical of Action Research. The collective is now published through a dedicated website, serving as an open-access hub for sharing our PAR process and engaging current and future partners.

Discussion: Lessons from the field-the potential of rural greenways

The PAR process surrounding the co-creation of the Tarantasio Trail teaches us valuable lessons for future planning of rural greenways, which may help others as they approach a similar task.

1. This project highlights the vital role of rural greenways in sustainable development. They offer access to nature, support biodiversity, preserve resources, and foster a solidarity-based economy. In rural areas, traditional greenway benefits are amplified through engagement with agriculture, which participants identified as key to well-being and food literacy. Greenways link homes, gardens, farms, and greenhouses, creating inclusive, nourishing landscapes for all. Our PAR process revealed rural greenways as spaces for biophilic and communal connection, reinforcing the need to protect them. These processes deepen local understanding of place, rights, and stewardship, aligning with the ELC's vision of landscape governance shared by communities.
2. Unlike urban areas, rural landscapes are often viewed as private and beyond public accountability for justice, access, and community. However, listening sessions with organic farmers revealed a strong commitment to community care, with some seeing themselves as ambassadors for sustainable land use. Together, we explored ideas like widening field edges and windrows for public and recreational use. Farmers also shared challenges around limited collaboration, which forces them to work in isolation. While the Tarantasio Trail is still in early stages, partners are advocating with each municipality and planning offices to support its implementation..
3. The project also explored the relationship between landscapes and people's well-being, framing health as operating across scales, from the regional landscape to the individual home. On a regional scale, landscapes offer opportunities for recreation, physical activity, and improved air quality while fostering day-to-day interactions that bridge social divides

and combat loneliness. At the site level, greenways serve as connectors of affordances for nature-based healing and biophilia, reeducating society about the importance of mutually beneficial relationships with the environment. These connections strengthen individuals and communities, providing stability in the face of change.

4. The project's innovation lay in its participatory approach, centering the voices of underserved and differently-abled individuals. Through extensive listening and an open dialogue, we have gathered a broad coalition of residents, vulnerable individuals, children, social workers, nonprofits, municipalities, farmers, schools, and community activists. These exchanges created space for shared experiences and aspirations, fostering a collective "story of us" (Ganz 2001) that drives immediate and long-lasting change. Given the project's geographic scope, overlapping jurisdictions, and diverse landscapes, this shared narrative is essential for sustaining momentum and achieving implementation.

Conclusion: Rural greenways as living networks for future resilience

Designing greenways in rural areas is a multifaceted challenge. Unlike urban settings, rural greenways often lack precedents, span multiple municipal boundaries, and traverse landscapes fragmented by human activities such as industry and warehousing. While they may not always feature scenic views and must accommodate agricultural needs, rural greenways hold significant potential as dynamic networks for sustainable planning, ecological conservation, and restoration, while also supporting community well-being. Our engagement with people with disabilities highlighted their reliance on nearby landscapes for happiness and health, underscoring this potential.

Sustainable transformations depend on long-term, adaptable Participatory Action Research (PAR) processes that foster partnerships across diverse knowledge bases, professions, and perspectives. In rural contexts, farmers play a pivotal role in transitioning to resilient, sustainable landscapes that support future generations. Amid climate uncertainty and technological shifts, agriculture is increasingly embracing sustainable practices, responding to consumer demand for healthy, local food and clean air. Farmers are key to the creation of future biodiverse environments that promote healing and renewal for non-urban populations.

The Tarantasio Trail aims to serve as a framework for a shared identity and collective action to create and manage a landscape where people and nature thrive despite uncertainty. This requires designers to work with humility, recognizing that landscape transformations operate on timeframes, scales, and systems that may exceed full understanding. The creativity of co-creation and the iterative nature of PAR processes are essential to overcoming these challenges.

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