Developing collective knowledge as territorial practice: Transdisciplinary citizen science in the CARPINO project

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Abstract

This paper reflects on a transdisciplinary citizen science project carried out in Carpaneda, Vicenza (Italy): CARPINO (CARPaneda for INclusion and Observation of biodiversity changes). CARPINO investigated the socio-ecological transformation of a contested peri-urban territory through a threefold model that combined artistic performances, an oral history school, and a science camp. The project fostered an alternative, situated form of collaboration in which diverse knowledge practices coexisted, interacted, and generated new forms of territorial awareness. Engaging with debates on sustainable transition and the politics of knowledge production, the paper frames peri-urban territories as governance frontiers—liminal spaces where ecological, institutional, and epistemic tensions converge. Within such a territory, CARPINO operationalized citizen science not as a data-driven outreach tool, but as a performative and political practice. The paper argues that initiatives like CARPINO, while fragile and incomplete, are essential for rehearsing alternative modes of governance and knowledge production in complex urban landscapes. It suggests that transdisciplinary citizen science, when rooted in local struggles, can expand the epistemic and institutional conditions for more just, situated, and imaginative forms of territorial transformation.

Keywords

Peri-urban territories; Citizen science; Transdisciplinarity; Participatory approaches; Collective knowledge production; Experimentation

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1. Introduction

The transition towards more sustainable and conscious models of territorial governance requires drawing on multiple fields of knowledge and recognizing the inherently transdisciplinary nature of governance itself (Gualini, 2001). Within this transition, the role of territorial planning is to design and implement processes capable of steering change while addressing interconnected issues of water management, land use, food, energy, and social justice. At the same time, the field is placing growing emphasis on citizen participation in both territorial analysis and transformation—through practices such as citizen science and co-design. These bottom-up approaches are reframed as potential *innovation niches*: protected contexts where social transformations can evolve before interacting with broader systemic structures (Moore et al., 2015). They are particularly valued for their capacity to (i) foster the accumulation of individual and collective knowledge and (ii) reorient the economic and power relations that sustain environmental, social and economic vulnerabilities (Allen et al., 2017; Catalanotti et al., 2020; Muraca & Neuber, 2018; Visconti, 2021).

Current challenges underscore the need for tools capable of identifying innovation niches and activating scaling mechanisms—not only diffusion (*scaling out*), but also institutional embedding (*scaling up*) and cultural transformation (*scaling deep*) (Concilio et al., 2023; Moore et al., 2015)—thereby reconfiguring relationships among human and non-human actors with particular attention to socio-ecological issues. This need is especially urgent in peri-urban territories—*liminal* (Capasso, 2013; Solnit, 2001; Turner 1969) and *hybrid* (Haraway, 2018) spaces where ecological degradation, social marginality, and land-use tensions converge. Too often treated as residual or transitional in planning discourse, peri-urban areas are in fact dynamic and politically charged terrains where new forms of environmental and institutional experimentation are emerging.

Within this broader framework, the paper seeks to address a specific question: How can transdisciplinary citizen science operate as an epistemic and political infrastructure? More specifically, it examines: (i) how hybrid practices—scientific monitoring, oral history, and arts-based inquiry—interact to generate shifts in territorial awareness and alliances; (ii) the possibilities and limitations of *agonistic co-production* (Mouffe, 2000, 2005, 2013) within transdisciplinary citizen-science initiatives; and (iii) the conditions and constraints under which peri-urban territories function as governance frontiers.

The analysis focuses on the case study of CARPINO (CARPaneda for INclusion and Observation of biodiversity change), a project carried out in Carpaneda, on the outskirts of Vicenza in northeastern Italy. Conceived and implemented through a collaboration between local activists, artists, scientists, researchers, and institutions, CARPINO sought to protect and reactivate a degraded yet socially significant rural-urban fringe. The project aimed not only to produce quantifiable data or artistic outputs, but also—and perhaps most importantly—to generate collective knowledge capable of supporting community-driven governance processes and shaping the future of the area and its commons.

Through this case study, this paper reflects on how transdisciplinary citizen science can serve as both a tool of knowledge production and a form of political action. To this end, it draws on current theoretical debates on transdisciplinarity (Doucet & Janssens, 2011; Gasper, 2010; Rendell, 2004) and citizen science (Austen et al., 2024; Haklay, 2015; Irwin, 1995), examining their interaction in an action-oriented, community-based project.

The paper does not present CARPINO as a replicable model, but as a contextual and operational example of how complex territorial issues can be addressed—particularly in peri-urban areas, which are often overlooked or underserved by traditional planning and governance frameworks. In this sense, it contributes to current international debates on the role of hybrid knowledge production, grassroots innovation, and participatory governance in shaping more equitable and resilient urban futures.

2. Methodology

The author participated directly in the design and coordination of CARPINO. As a result, this paper draws on research that is both situated and analytical, shaped by the author's involvement in the process as well as by a broader disciplinary inquiry into the transformative potential of community-based initiatives in urban and peri-urban governance.

Methodologically, the paper moves between two poles. On the one hand, participatory action research, in which knowledge and competencies are constructed collaboratively around a shared problem through continuous interaction between researcher and communities (Reardon, 2016; Saija, 2016; Saija et al., 2017). On the other, reflection-in-action, understood as the researcher's capacity to critically interpret their own actions and roles within the process (Finlay, 2008; Schön, 1983).

The proximity between researcher and context required

constant negotiation between engagement and analytical distance. While such an embedded position enabled access to processual details, it also introduced potential bias. Mitigation strategies included explicit reflexive memoing, separation between facilitation and analysis where possible, and triangulation across heterogeneous artefacts and accounts. A minimal epistemic infrastructure underpinned the fieldwork: lightweight, partly standardized practices—such as attaching basic provenance notes to datasets, publicly sharing maps and interview extracts, and organizing public talks—supported traceability and discussion across activities, while reducing error and stabilizing concepts in collective sense-making (Kirsh & Maglio, 1994; Mäntysalo et al., 2011). More elaborate procedural devices often discussed in the literature (e.g., rotating facilitation, scheduled decision re-openers) remained design intentions rather than formalized routines.

The material collected in CARPINO included outputs from the three main activities (science camp, oral history school, artistic laboratory), evaluation questionnaires completed by participants, policy documents and public statements, as well as field notes from assemblies and public events.

- *Science camp (environmental data)*. Five open datasets adhering to FAIR principles (soil quality, water quality, species surveys; herbaceous and tree species; butterflies), totaling 490 data points, along with two reporting posters and derived maps/graphs.
- *Oral history school*. Eight audio interviews (≈60–150 minutes each), photographs, and detailed notes; together they form an archive on the socio-cultural layers of Carpaneda. Recordings are archived with restrictions and have not been released in full; participants were credited or anonymized case by case in compliance with releases.
- *Artistic laboratory*. Qualitative materials including a field herbarium/journal, creative naming of herbaceous samples, participant impressions, and photographs, used to elicit sensorial/cultural readings of changes in the local landscape.
- *Participation and events*. 42 citizen scientists engaged across activities (28 women; 26 aged 25–49).12 bilateral stakeholder meetings and three public events were organized, along with a closing event combining agroecological maintenance and a public assembly (≈150 attendees).
- *Post-activity questionnaires*. Designed to assess social impacts such as community building/empowerment, inclusion, knowledge/skills, and attitudes/behaviors. Around 70% of respondents rated improvements in motivation/skills at 4–5/5, though several items showed ceiling effects due to pre-existing engagement.
- *Policy/organizational documents*. Materials include the Expression of Interest (EOI) for the reuse of the historical complex of *Cascina Carpaneda*, meeting minutes/notes, and public statements, used to connect and compare governance interfaces.

Fieldwork material was analyzed in three coordinated strands. Environmental datasets and qualitative responses from interviews were processed by the activity coordinators. Questionaries, developed according to the IMPETUS methodology, were analyzed by the project's scientific coordinator. Results were interpreted cautiously, given the small, self-selecting samples and evident ceiling effects. Across strands, public assemblies and shared documentation functioned as a minimal cross-laboratory infrastructure, keeping dissent on record and decisions provisional yet revisable. Where feasible, triangulation linked datasets, interview extracts, artistic artefacts, and meeting records to substantiate claims.

3. Horizontal knowledge production in peri-urban territories

This section outlines the theoretical framework of the research through three interconnected lenses: (i) the peri-urban as a spatial and political condition, (ii) transdisciplinarity as a strategy for addressing complexity, and (iii) citizen science as a horizontal mode of knowledge production. These lenses are not treated as separate theoretical domains but as dimensions of a single inquiry into how territorial knowledge is generated and mobilized within governance processes.

The sub-sections that follow reflect the structure of the problem itself. Peri-urban territories are approached as spaces where conventional distinctions—urban and rural, public and private, planned and unplanned—are blurred. Transdisciplinarity is introduced as a means of navigating and connecting diverse fields of knowledge, practices, and values. Citizen science is framed as a concrete, operational tool that supports inclusive and collaborative knowledge practices. Taken together, these perspectives provide the conceptual scaffolding for analyzing CARPINO as a situated and transformative initiative.

3.1. The peri-urban as a spatial and political condition

The peri-urban is often cast as a transient, residual zone—neither fully urban nor rural. Yet such a definition fails to capture the structural role that these territories play within contemporary urbanization. They host expanding infrastructures, fragmented governance

systems, and contested ecologies, making them a critical frontier for rethinking the relationship between urban development and environmental resilience.

Critical urban theory—particularly the work of Brenner and Schmid (2015)—challenges the urban/rural spatial binary by introducing the concept of planetary urbanization: an urban condition that extends across territories, infrastructures, and ecological systems. From this perspective, the peri-urban is not outside the city but integral to it. These territories host the metabolic operations that sustain urban life, while remaining institutionally and symbolically peripheral (Brenner, 2013, 2015).

Yet planetary urbanization, though a powerful concept, risks abstracting from the lived entanglements, resistances, and contradictions that characterize specific sites. Peri-urban areas are not simply extensions of the urban—they are dense with ecological legacies, social frictions, and latent futures. This tension invites us to think beyond binaries and to consider the peri-urban as a *margin* in bell hooks' (2020) sense: not simply an edge, but a site of potentiality and resistance[1]. Here, the margin is both social and epistemological—a space in which dominant categories break down and alternative forms of life and governance can be negotiated; where conventional roles and structures are temporarily suspended and open to transformation (Turner, 1969; Capasso, 2013); where one is detached from both past identity and future definition, inhabiting a field of potential (Solnit, 2001).

This reterritorialized view is further enriched by bioregionalism, which offers a valuable counterpoint to planetary urbanization. Scholars such as Alberto Magnaghi (2014) have long argued for reorienting planning and governance around ecological coherence and local knowledge. His proposal for a "city–countryside pact" reframes peri-urban territories as connective tissues between urban centers and their agroecological matrices.

Bioregionalism foregrounds reciprocity and re-composition. Rather than absorbing the peri-urban into a planetary urban field, it calls for rethinking territorial development through ecological cycles, social cooperation, and multifunctional land use. This includes reimagining peri-urban agriculture not as residual, but as central to food sovereignty, landscape quality, and metabolic balance. It also entails reconfiguring infrastructural systems—water, waste, energy—in ways that respect territorial specificities and promote autonomy. In this view, the peri-urban becomes a space of possibility, where planning is co-produced rather than imposed from above.

Peri-urban territories, then, should be explored and practiced as governance frontiers—sites where civic actors, activists, and residents respond to institutional distance with experimental forms of self-organization and commoning, as suggested in recent work on food commons (Leitheiser & Horlings, 2021). To recognize the peri-urban in this way is to see it as both a product of urbanization and as a space of struggle and invention. This calls for transdisciplinary and situated methodologies capable of engaging hybrid realities rather than abstract typologies. In such territories, transdisciplinarity emerges not merely as a methodological choice, but as an epistemological and political necessity.

3.2. Transdisciplinarity as a strategy for addressing complexity

Transdisciplinarity responds to the growing complexity of societal challenges—particularly where single-disciplinary approaches prove inadequate for engaging with non-linearity, conflict, and uncertainty. In architecture, planning, and sustainability discourses, it is often presented as a normative call to integrate diverse perspectives and knowledge domains in the pursuit of shared problem-solving (Doucet & Janssens, 2011). Yet much of this framing blurs the distinction between transdisciplinarity and interdisciplinarity. While interdisciplinarity implies dialogue across existing disciplinary boundaries, transdisciplinarity suggests a more radical gesture: the production of knowledge through hybridization, mutual disruption, and embedded engagement—including non-academic actors and non-codified practices (Gasper, 2010). In this sense, it represents not only a methodological shift, but also an ontological and political repositioning—dissolving the boundaries between expert and lay knowledge, and between researchers and participants.

Institutional reorganization toward transdisciplinarity in architectural, urban, and territorial research remains uneven and largely incomplete. Despite widespread discourse around complexity and co-production, most academic and planning systems continue to reproduce siloed knowledge regimes and hierarchical relations between expertise and situated knowledges (Pasqui, 2018). In practice, transdisciplinary experiments are fragile—especially when constrained by rigid expectations or instrumentalized into consensus-building exercises (Häberli et al., 2001).

This paper builds on more critical accounts—particularly those of Rendell (2004) and Doucet and Janssens (2011)—to reframe transdisciplinarity as a mode of *agonistic co-production*. Following Mouffe's concept of agonistic pluralism, this approach interprets conflict as constitutive of the political and democratic practice (Mouffe, 2000; 2005; 2013). Agonistic co-production here denotes

collaborative knowledge- and policy-making that designs for disagreement—surfacing asymmetries and retaining dissent rather than seeking premature consensus. This stance resonates with recent work explicitly coupling co-creation/co-production with agonism: Carpenter, Horvath, and Spencer (2021) reconceptualize co-creation as an agonistic practice in Rio de Janeiro's Santa Marta favela, using creative methods to stage contestation productively while warning against depoliticized "participation." Similarly, in environmental governance, Turnhout, Metze, Wyborn, Klenk, and Louder (2020) argue for approaches that keep power, interests, and transformation at the forefront—an argument consistent with an agonistic stance. Policy-oriented applications are also emerging: Chivers, Barkley, and Short (2025) propose agonistic pluralism as a framework for co-designing agri-environment schemes, advocating "good-enough for now" decisions that remain revisable through continued contestation. Barbanente and Grassini (2024) document co-production with an agonistic tension as counter-hegemonic planning in Southern Italy.

In short, rather than pursuing epistemic coherence or procedural harmony, transdisciplinarity is understood here as a field of negotiation, friction, and partial translation. It is a space where dissonant perspectives, temporalities, and forms of knowledge co-exist without being subsumed. Haraway's (2018) metaphor of the *cyborg* is especially resonant in this context, pointing to the potential of impure assemblages that resist disciplinary closure and invite new compositions.

As Haraway (2016) reminds us, the metaphors, images, and practices we use shape the very worlds we inhabit. Her call to "think with" rather than "think about" encourages us to move beyond extractive epistemologies and toward horizontal forms of knowledge—where more-than-human actors, relational perspectives, and material practices play a central role.

Within this field, artistic engagement is central—not as a tool for communication or illustration, but as a method of inquiry in its own right. It privileges embodied and collective forms of knowing over abstract, technical reporting, and demonstrates how direct engagement with environmental questions can broaden the range of social actors and epistemic communities (Criscuolo & L'Astorina, 2022; Zinsmeister, 2013). Recent cross-domain experiences also show how citizen science can interface with accessibility, arts, and policy road-mapping within EU research infrastructures (Angelidakis et al., 2024). In CARPINO, artistic practices were not used to "translate" scientific content (see sub-sections 3.2 and 3.3); they operated as epistemic interventions—generating affective maps, triggering embodied memory, and expanding the scope of what could be witnessed, known, sensed, or narrated. In this sense, transdisciplinarity is not only a research framework but also a cultural and ethical practice. It involves embedded, relational, and experimental modes of inquiry—where design, ecology, activism, and art are not simply applied to problems but constitute ways of inhabiting complexity. It also requires recognizing and navigating the asymmetries of voice, visibility, and validation that inevitably shape collaborative work.

If transdisciplinarity provides the epistemological conditions for working across boundaries and incorporating multiple forms of knowledge, citizen science can be seen as one of its key operational tools. The following sub-section explores how citizen science enables situated, participatory, and politically significant forms of knowledge production in complex territorial contexts—and how it may evolve to embrace a broader range of scientific and experiential perspectives.

3.3. Citizen science as a horizontal mode of knowledge production

Citizen science is increasingly promoted as a means of democratizing science, enhancing environmental governance, and supporting data-driven policy. According to the European Commission (2013), it involves the active participation of the public in scientific research—particularly in relation to sustainability, biodiversity, and environmental monitoring. This definition positions citizen science as both a research tool and a democratic strategy, bridging gaps between institutions and everyday life.

Further elaborations frame citizen science within a logic of openness, informality, and inclusion, challenging the formalized practices of science. It operates as an alternative or complement to conventional approaches, particularly in addressing systemic challenges such as ecological degradation and sustainability transitions (Austen et al., 2024). Citizen science expands the scientific knowledge base by mobilizing lay, local, and expert knowledge, and by enabling research in places and at scales otherwise inaccessible (Newman et al., 2017; Turbé et al., 2019). Such activities often allow communities to monitor and understand their environments, preparing them for political engagement (Fraisl et al., 2022). Biodiversity-related projects are especially prevalent, contributing significantly to ecological data collection at landscape and continental scales.

Despite this progressive framing, citizen science has rarely been developed within a transdisciplinary framework. In most cases, it remains focused on data

collection and public engagement rather than shared epistemic authority. The possibility of combining citizen science with transdisciplinarity is emerging through bottom-up initiatives that not only involve publics in science but also reconfigure the very boundaries of what counts as science and who counts as a scientist (Criscuolo et al., 2023, 2024). Yet such initiatives remain marginal and often struggle to gain legitimacy within dominant institutional settings.

These tensions are especially acute in peri-urban territories such as Carpaneda, where citizen science cannot unfold under ideal conditions. Here, institutional presence is fragmented, ecological degradation is entangled with political neglect, and legitimacy is contested. In this context, CARPINO did not employ citizen science as a tool for formal monitoring, but as a means of recomposing territorial knowledge from below. This reframing transformed citizen science from a method into a performative act: a way of making claims, establishing visibility, and opening governance (Kirsh & Maglio, 1994).

Rather than treating "citizen" and "science" as fixed categories, CARPINO approached them as roles actively constituted in relation to material, institutional, and affective conditions. This resonates with Irwin's (1995) early work on the co-production of science and society, as well as with more recent calls to re-politicize citizen science as an infrastructural and epistemic intervention (Fortun & Fortun, 2005).

Citizen science can also be understood as part of a broader process of knowledge commoning. Ostrom's (1990) theory of collective rule-making, monitoring, and mutual accountability provides a foundational vocabulary[2] , while Federici (2010) extends the notion beyond a resource regime to encompass reproductive labor, civic autonomy, and experimental governance. In CARPINO, citizen science intersected with these dynamics—not by producing "useful data," but by enabling new forms of territorial subjectivity and grassroots governance.

Framed in this way, CARPINO's experience shows that, in peri-urban contexts, citizen science functions less as a methodological toolkit than as a situated performance. What counts as evidence, who is entitled to speak, and how findings become actionable are not pre-given, but the negotiated outcomes of collective practice.

4. Reclaiming the peri-urban: Citizen science and transdisciplinary action in Carpaneda

Carpaneda, on the fringe of Vicenza, is a peri-urban landscape shaped by overlapping and often conflicting land uses. It encompasses several hundred hectares of farmland—some still cultivated, including by organic farmers—interspersed with industrial warehouses, low-density residential developments, and infrastructures such as a recently constructed cycle-pedestrian path. At the heart of this patchwork lie two public assets: a 7-hectare urban forest planted by the municipality in 2009, and the adjacent *Cascina Carpaneda* (or *Ca' Carpaneda*), a publicly owned but abandoned rural farmhouse. Despite growing environmental pressures such as soil and water pollution, habitat fragmentation, and speculative urbanization, the area retains high ecological value and has become a point of convergence for diverse actors: residents, researchers, artists, educators, and environmental advocates (Fig.1).

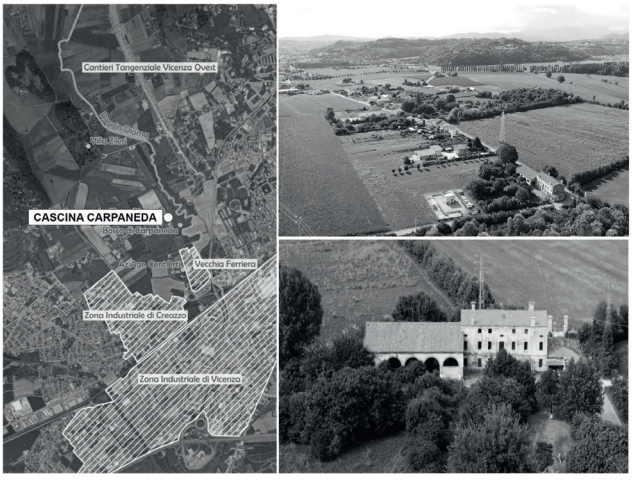


Fig. 1
Carpaneda's peri-urban territory: composite view. The map (left) locates Cascina Carpaneda within a hybrid landscape of farmland, forest remnants, and industrial areas; the aerial image (top right) shows the broader mosaic of fields and settlements; the close-up (bottom right) focuses on the Cascina, *a key site of experimentation and collective practice.* Elaboration by the author based on images provided by the Comunità Vicentina per l'Agroecologia.

In 2020, local activists launched a public campaign to prevent the sale of the rural farmhouse and to reimagine it as a *Casa dell'Agroecologia* (House for Agroecology)—a community hub and entry point to a future peri-urban Agricultural Park. This initiative led to the creation of the Assemblea per Cascina Carpaneda (Assembly for Cascina Carpaneda), an informal citizen group advocating for the recognition of the historic complex as an urban common and for a collaboration pact[3] between citizens and the public administration.

4.1. CARPINO: Actions and setting

CARPINO was developed in 2024 as a collective and experimental response to the socio-ecological and political challenges of Carpaneda. Its design was guided by three expectations: (i) producing shared diagnostics on biodiversity, soils, and water; (ii) strengthening socio-cultural recognition through oral history; and (iii) widening publics and repertoires of care through arts-based inquiry.

From the outset, the project placed knowledge co-production at the center of its strategy. Rather than applying predefined disciplinary tools, CARPINO activated multiple, interwoven practices—scientific, narrative, and artistic—designed to explore territorial transformations, generate new forms of awareness, and reinforce civic mobilization. These practices were rooted in the specific competences and motivations of the activists and researchers involved. The project thus emerged as a tailored recomposition of diverse ideas and energies already present on site.

The initiative unfolded in a highly contextualized way, responding to the specific conflicts and energies surrounding *Cascina Carpaneda*, and engaging a diverse set of actors through open and iterative processes. CARPINO was selected as one of the citizen science initiatives within the Horizon Europe-funded project IMPETUS[4]. The call—issued through a cascade funding program—explicitly supported projects aimed at enhancing biodiversity knowledge, facilitating institutional innovation, and promoting participatory responses to climate and environmental challenges. This funding framework shaped CARPINO's structure and goals, while leaving space for localized interpretation and adaptation.

The project was grounded in the idea that peri-urban territories are key sites for climate-related experimentation, not only in environmental terms but also socially, culturally, and institutionally. CARPINO therefore embodied the European agenda on biodiversity and inclusion as territorial practice. This meant not merely *translating* EU goals into local actions but also testing and contesting them through grassroots engagement and locally embedded experimentation.

4.2 Three laboratories, one ecology of practice

The core of CARPINO's activities consisted of three laboratories corresponding to distinct disciplinary domains—natural sciences, history, and performative arts—activated simultaneously within the framework of a public ecofestival held on site. Each lab proposed a specific mode of engaging with the territory, yet was conceived as a permeable space within a broader ecology of knowledge production.



Fig. 2
CARPINO, Science Camp, open-air workshop, 2024. Participants analyze soil samples. The activities of the workshop combined scientific observation with embodied practice, supporting the project's aim to generate shared ecological knowledge rooted in place and experience. Photograph by Anna Miola. Copyright and permission by the photographer.



Fig. 3
CARPINO, Oral History School, 2024. Collective discussion with participants working on notes, maps, and materials gathered through interviews to identify shared themes and prepare for public restitution. Photograph by Anna Miola. Copyright and permission by the photographer.

The science camp focused on biodiversity observation and ecosystem analysis. Participants—including residents and students—conducted fieldwork and environmental monitoring (e.g., flora and fauna mapping, soil sampling, water analysis). Activities were designed to be accessible and dialogic, enabling non-experts to contribute to scientifically relevant data while linking it to lived experience and everyday practices of care (Fig. 2).

The *Oral History School* invited participants to retrace memories and experiences of Carpaneda through testimonies and collective storytelling (Fig. 3). By layering personal and collective narratives, the school revealed affective and historical dimensions mostly neglected in planning discourse or environmental policy. Here, the past was approached not as static heritage but as a dynamic component of territorial identity and agency.

The artistic lab, developed through collaborative workshops, explored sensorial and symbolic relations to the site. Performances, installations, and visual interventions did not simply represent the territory but re-staged it—foregrounding silences, fractures, and latent possibilities (Figs. 4 and 5). Working across media and languages, the lab mobilized artistic practice to generate new grammars of care, resistance, and imagination.

Across laboratories, specific practice–artefact–effect linkages emerged. The natural sciences laboratory generated evidence (datasets, maps, protocols) that could circulate into institutional arenas, providing negotiation hooks and data-anchored agenda-setting. The oral history lab legitimized claims through reconstructed memories, broadening who counts as a stakeholder and stabilizing community narratives. The artistic lab mobilized publics through performative work, translating diffuse forms of care into visible routines and expanding participation (Marizzi & Bartar, 2020; Fattal & An, 2023). Taken together, the outputs of CARPINO acted as *boundary objects* (Balducci & Mäntysalo, 2013; Mäntysalo et al., 2011), facilitating circulation and exchange between community and institutional contexts, while public assemblies and shared documentation provided the minimal infrastructure to keep contestation traceable and decisions revisable.

Crucially, the three laboratories were not conceived as isolated modules. The intention was to allow participants and facilitators to move between them, carrying insights, experiences, and questions into different settings. Several joint moments were planned to encourage exchange and cross-contamination. In practice, however, the labs remained largely separate. Researchers and facilitators were often absorbed in hosting of their own activities, meeting expectations and managing logistics rather than interacting or co-producing content. Institutional and temporal pressures of project delivery frequently outweighed the project's integrative ambitions. As a result, transdisciplinarity functioned more as a guiding horizon than as fully realized condition.



Fig. 4
CARPINO, Artistic Laboratory, 2024. Participants explored the forest, transforming individual observations into a collective experience of performative movement. The activity concluded with a silent walk back to Cascina Carpaneda*, following an exercise in which participants wrote down and distilled their impressions into a single word.* Photographs by Anna Miola and Elisabetta Granara. Copyright and permission by the photographers.



Fig. 5
CARPINO, Artistic Laboratory, 2024. Left: final exploration of the forest. Right: preparations for an art installation that brought the forest and the Carpaneda landscape into the urban fabric as a collective restitution of the lab. Photographs by Elisabetta Granara and Anna Miola. Copyright and permission by the photographers.

5. Findings and critical appraisal

From an environmental perspective, CARPINO generated new data on local biodiversity and ecological pressures, produced maps and visual materials for public dissemination, and reinforced both the symbolic and practical value of the urban forest and surrounding ecosystem. It articulated a narrative of ecological continuity and vulnerability, weaving fragmented observations into a shared diagnosis.

From a social perspective, the project both strengthened existing networks and created new ones. It mobilized young people and previously uninvolved residents, supported intergenerational and intercultural exchange, and offered an inclusive framework for reflection and engagement. Rather than relying on expert-led communication, it opened space for participatory and plural forms of expression, where local knowledge was not merely acknowledged but made co-constitutive of the process.

At a political level, the project enhanced the legitimacy and visibility of the citizen campaign for *Cascina Carpaneda*. It provided tools, language, and alliances that helped shift the debate from protest to proposal—from resistance to co-design. It also fostered encounters between citizens and institutional actors, opening fragile yet meaningful spaces for negotiation and participatory governance.

Enablers included shared public rituals (the ecofestival, assemblies, and talks), open documentation, and basic comparability/provenance across outputs to foster procedural trust. Limitations, however, were significant: a short time frame; reduced and uneven participation; partial transdisciplinarity (with laboratories mostly working in parallel rather than in mutual reinforcement); minimal standardization of cross-cutting procedures; embedded researcher roles with potential representation bias; and institutional inertia that slowed stabilization. Taken together, these factors qualify the outcomes and point to design implications for subsequent iterations—clarifying which elements may *travel* and which remain context-bound.

CARPINO's outcomes were never meant to be final or self-contained, but part of an ongoing process of transformation in which disciplinary practices interact as components of a broader network of territorial care. The project does not present a replicable model but offers a set of situated tools and relations that demonstrate the potential of reclaiming peri-urban spaces through transdisciplinary action. In doing so, it both confirms and challenges the theoretical framework of this paper, underscoring the urgency, complexity, and fragility of acting transversally across knowledge systems, institutions, and landscapes (Fig. 6).

Too often framed as a collaborative ideal, transdisciplinarity is rarely acknowledged for what it is: a deeply unstable process. It is not just collaboration—it is negotiation, friction, and uncertainty. When pursued seriously, it requires relinquishing disciplinary protections, role boundaries, and sometimes even efficiency (Doucet & Janssens, 2011; Häberli et al., 2001). This makes it inherently difficult—emotionally and organizationally demanding, and not always successful. Yet it is precisely this fragility that gives it the potential to generate genuinely innovative outcomes.

In CARPINO, transdisciplinarity remained more of a horizon than a fully realized condition. Yet that horizon still mattered: it shaped the project's architecture, opened new possibilities for connection, and redefined what counted as legitimate knowledge—and who was entitled to produce it.

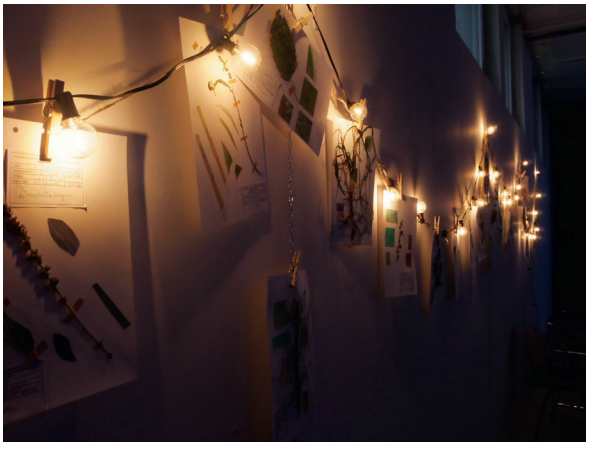


Fig. 6
CARPINO, artistic lab, 2024. A Herbarium weaving together plants, textures, and color studies from the Carpaneda landscape. Artistic methods were used to expand the scope of what could be perceived, felt, and narrated. Photograph by Anna Miola. Copyright and permission by the photographer.

CARPINO was also never intended to define what citizen science could or should become. Instead, it sought to perform a scenario long envisioned by the local assembly: a moment in which multiple practices, actors, and reflections could coexist—not in perfect harmony, but under a shared ethos and common struggle. During the three days of the ecofestival, researchers, artists, students, and citizens moved across the forest, the farmhouse, and the open fields, sharing questions, tools, and gestures. Even without full transdisciplinary integration, the intensity of presence, affective involvement, and emergence of a shared purpose created a palpable sense of urgency and commitment.

While citizen science is still too often framed within the narrow boundaries of outreach or crowdsourced data (Haklay, 2015; Newman et al., 2017), CARPINO showed that it can operate as a site of situated epistemology. Recognizing this not as an exception but as a possible trajectory invites a broader rethinking of the role participatory research can play in the transformation of peri-urban territories. CARPINO suggests that citizen science can become an instrument of transformation, not only by producing new data but by enabling alliances and helping communities to articulate and defend their visions for the future. To achieve this, it must be unbound from the logic of support to expert science and embraced as a generative practice within wider transdisciplinary ecologies (Callon et al., 2011; Irwin, 1995).

The project also underscores that the commons is not merely a legal or institutional category, but a performative and imaginative one (Dellenbaugh et al., 2015; Foster & Iaioe, 2016; Klein, 2001). This claim resonates with urban political ecology readings of commoning as a socio-natural dynamic shaping peri-urban territories (Karagianni, 2024). Through mapping, storytelling, artistic expression, and data collection, the participants did not simply study the territory—they re-signified it. They opened a space where multiple temporalities, agencies, and interpretations could coexist. This enactment, however ephemeral, disrupted everyday governance and offered a glimpse of a different institutional and territorial grammar (Federici, 2010).

Despite its symbolic and relational impact, CARPINO did not result in a consolidated or formalized process of bottom-up governance. The project opened spaces for negotiation, but structural conditions—political discontinuity, procedural gaps—continue to limit transformative outcomes. In particular, the scale and temporality of European project funding often fail to accommodate the slow, relational, and open-ended work that territorial transformation demands.

Still, CARPINO reaffirmed how bottom-up urbanism operates: not through stable models, but through situated interruptions, symbolic actions, and the ongoing redefinition of what territories are—and who they are for. In short, CARPINO's value lies less in its outputs than in the frictions, negotiations, and shifts it enabled. It reminds us that regeneration is not simply a matter of ecological restoration or technical design, but of building shared meaning, enabling collective presence, and reclaiming the peri-urban as a space of encounter, resistance, and imagination.

6. Conclusion

This paper has argued that the CARPINO project, though limited in duration and scale, enacted a situated and agonistic form of transdisciplinary experimentation within a contested landscape. By integrating scientific, artistic, and narrative practices, CARPINO contributed to reclaiming Carpaneda not simply as an ecological site, but as a commons-in-the-making—a space of collective knowledge, care, and civic agency, where territorial subjectivity could be articulated from below.

At the same time, the experience exposed the fragility and incompleteness of such processes, reflecting the persistent ambivalence of bottom-up governance in peri-urban territories. CARPINO created symbolic and infrastructural openings, but these remained vulnerable to discontinuity. Governance from below does not emerge through programmatic models—it takes shape through intermittent gestures, relational labor, and the ongoing struggle to hold space within systems that remain misaligned or resistant. CARPINO's contributions are not to be measured by institutional consolidation but should be seen as rehearsals—temporary enactments of civic capacity and collective authorship.

The project also underscores the importance of methodological reflexivity in transdisciplinary research. Embeddedness offers privileged insight but also entangles the researcher in complex dynamics of representation, facilitation, and authority. CARPINO made visible how knowledge is co-produced not only through tools and methods, but through positionalities, affective involvement, and everyday negotiations. Reflexivity, in this context, is not an add-on: it is a critical method, essential for navigating the stakes of collaboration.

CARPINO's outcomes are exploratory and context-bound; any transfer should occur only at the level of design principles—such as the production of boundary objects, open documentation, assemblies, and

public talks. Future research could extend this work by: (i) following the case study longitudinally to track environmental indicators, participation dynamics, and policy uptake; (ii) tracing governance effects beyond symbolic openings (e.g., collaboration pacts, budgetary allocations, operational routines); (iii) testing conditions for sustained cross-lab integration—shared calendars, co-facilitation, common artefact sprints; (iv) formalizing and evaluating cross-cutting protocols (provenance sheets, dissent annotations, rotating facilitation, scheduled decision re-openers); and (v) adopting a comparative perspective—through paired-case or small-N cross-case designs, including "negative" cases.

Looking ahead, there is an urgent need to deepen the intersection between social sciences, humanities, and natural sciences—particularly where artistic and civic practices are positioned not as supplements, but as generative forces. The challenge, then, is not only methodological, but political. Projects like CARPINO offer small yet significant gestures in this direction: experimental, fragile, and incomplete, yet animated by a commitment to more just and situated forms of territorial transformation. Their value lies not in scalability or replication, but in rehearsing other ways of knowing and governing the urban—ways that remain responsive to place, conflict, and possibility.

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Project management: Gloria Marini and Anna Miola (La Piccionaia scs)

Artistic Laboratory: Elisabetta Granara, with the participation of Valentina Dal Mas and Irene Moresco

Science Camp: Davide Primucci (Comunità Vicentina per l'Agroecologia) and Luigi Conte (Scienza Radicata, Università Ca' Foscari Venezia), with the participation of Pietro Centorrino (Scienza Radicata), Andrea Della Bella (Università Ca' Foscari Venezia), Sebastiano Favarin (Università Ca' Foscari Venezia), Anna Mezzalira, and Flora Simonelli (Università degli Studi di Padova)

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Ethics

No personal data are used in this publication. All citizen scientists and research participants have provided approval and consent for the use of their pictures and data for communication and dissemination purposes.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author used AI tools (ChatGPT and DeepL) to improve language and readability. Following their use, the author reviewed and edited the content as necessary and takes full responsibility for the publication's final version.

Declaration of Competing Interest

The author declares that she has no known competing financial interests or personal relationships that could haveappeared to influence the work reported in this paper.

Notes

1. During the nineties, bell hooks theorised the "margin" not just as a spatial or social periphery but as a standpoint of epistemic potential—a site from which counter-hegemonic knowledge and cultural critique emerge. In this work, the margin is understood as simultaneously social (produced by racial, classed, and gendered exclusions), epistemological (an alternative place of knowing), and territorial (a material space shaped by urban and environmental disinvestment).
2. Ostrom challenged the "tragedy of the commons" thesis *(Feeny et al., 1990*) by demonstrating that communities can sustainably manage shared resources through collective rules and self-governance.
3. In Italy, "patti di collaborazione" (collaboration pacts) are instrumentsthat formalize agreements between local administrations and active citizens or informal groups to manage, care for, or regenerate common goods such as public spaces, buildings, or natural areas. They represent a shift from a top-down governance model to one based on co-production and subsidiarity, fostering civic participation in the stewardship of shared resources.
4. IMPETUS: setting a citizen science innovation programme for exploring innovative funding schemes and boosting recognition is a Horizon Europe-funded project that supports citizen science initiatives through a cascade funding mechanism—a form of "financial support to third parties" commonly used in Coordination and Support Actions (CSA). This strategy enables intermediary large consortia, able to secure and manage highly competitive grants, to issue open calls and distribute small-scale grants to local initiatives aligned with EU priorities on climate, biodiversity, and public participation.

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Biography

Cristina Catalanotti is an urban and territorial planner whose work focuses on sustainable cities and communities, with particular attention to socio-ecological transitions. Her research explores non-traditional tools for citizen participation in territorial transformation and the co-production of situated knowledge. She investigates the use of hybrid practices that emerge at the intersection of technical, experiential, and artistic forms of knowing, addressing urban challenges such as soil governance, food systems, and spatial justice. Her work draws on interdisciplinary action research and supports collaborative, place-based strategies for territorial change.