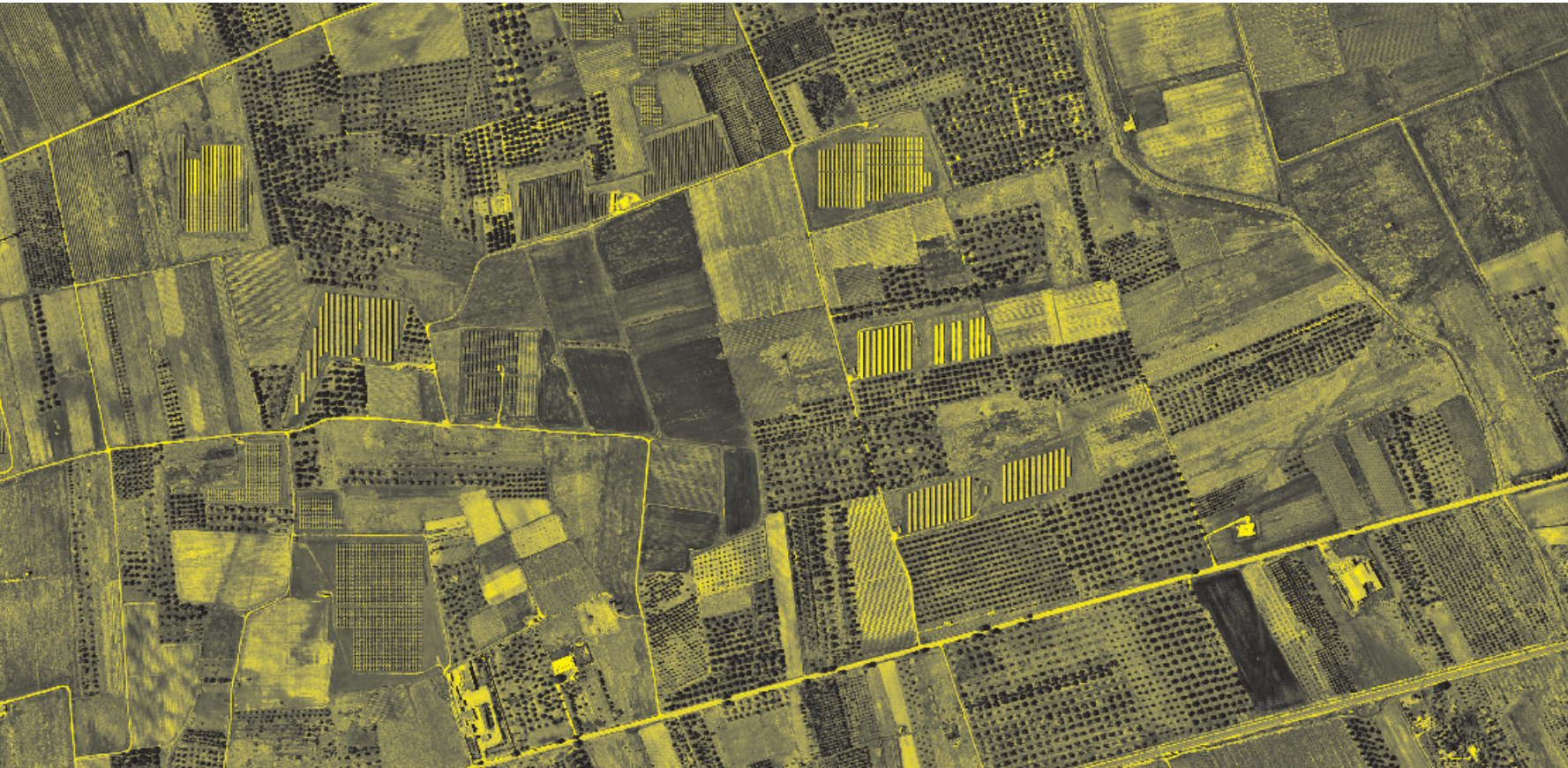
DESIGNING FORMS FOR FUTURE SOLARSCAPES

A VISION FOR THE ITALIAN PALIMPSEST

EDITED BY
ELENA VIGLIOCCO



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DESIGNING FORMS FOR FUTURE SOLARSCAPES

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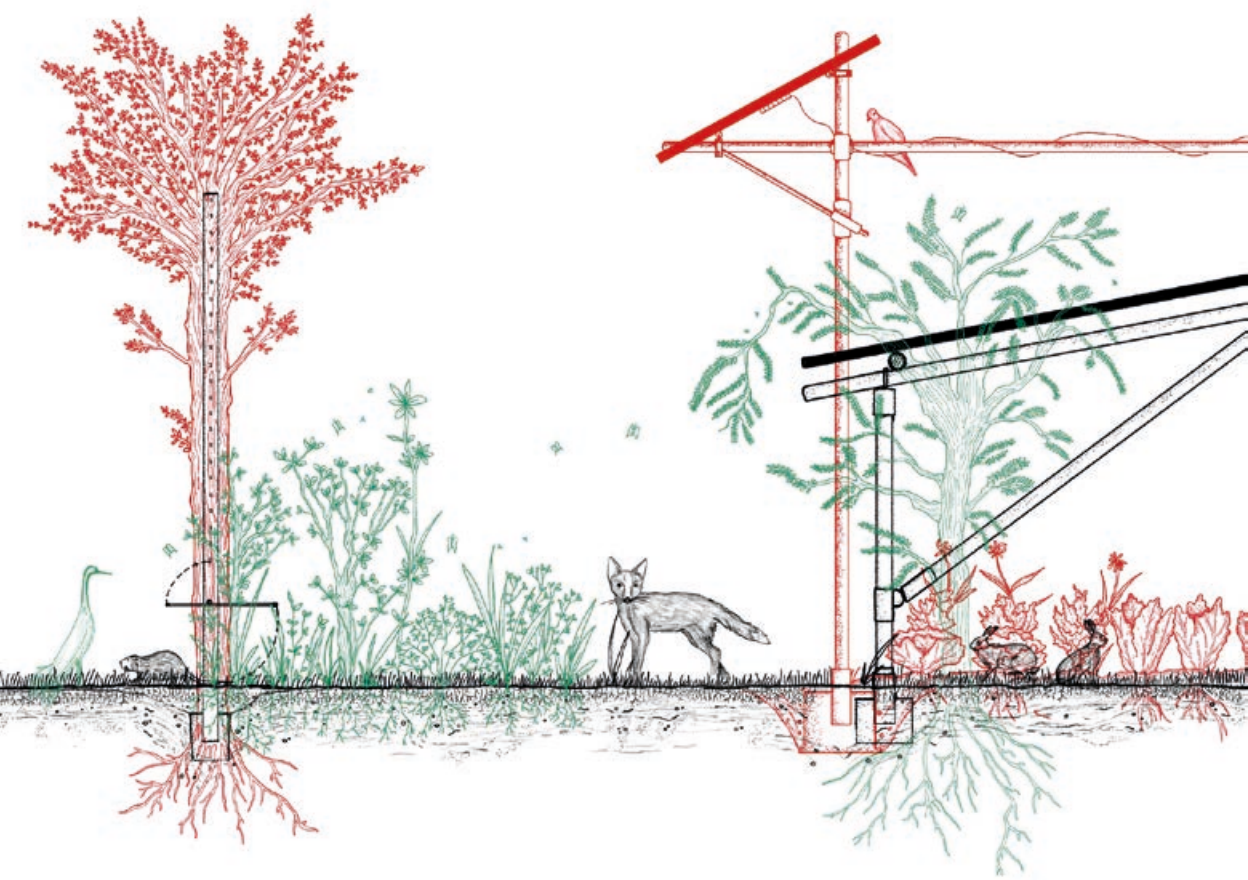
CONTENTS

NEW PERSPECTIVES

INSIGHT

DESIGN THE DECOMMISSIONING

GIULIA CAZZANIGA - SARA ANNA SAPONE[1]



Decommissioning as a project of becoming

The concept of landscape, within the contemporary debate, is understood as an increasingly complex and layered system where the process is not merely part of its definition but constitutes the landscape itself. Landscape is a dynamic process and moves beyond static objects to represent the continuously evolving outcome of negotiations and relations among ecological, geological, and human factors, such as management and stewardship[2]. This understanding incorporates and intertwines the ecological and cultural spheres. "Nature" is rethought, building upon James Corner's theories[3], as an autonomous yet fundamental force that shapes the physical environment, within which design practice operates to induce further changes over time. This approach shifts the focus to phenomena like hydrology, soil structure, and succession, with design capitalizing on these dynamic systems. Conversely, drawing on the work of André Corboz, landscape is rooted in the material expression of the soil itself, functioning as a repository of knowledge, history, and cultural meanings inscribed and overwritten by different eras and agents[4]. This emphasizes that the ground is a palimpsest, a stratified surface where traces of past human intentions and natural events persist and inform ongoing change. More recently, research such as Timothy Mortons introduces the concept of "hyperobjects", entities that transcend local scale and traditional mapping[5], instead referring to global dynamics. Given this inherent fluidity, the project of landscape architecture must act in harmony with this ever-changing reality, rendering a static view of design as a finite solution obsolete.

This chapter, within the context of a broader exploration of energy-productive landscapes and their evolution, aims to reposition the decommissioning phase of a photovoltaic field. Decommission is viewed as more than the end-of-life (EOL), a technical or ecological requirement, but rather as a critical moment of design agency, a projective act that can redefine the meaning and role of the landscape within a productive system. In this sense, the end-of-life of the photovoltaic plant is viewed as a series of phases, a project in itself subject to ongoing mediation, always in the process of becoming

1 The two authors jointly conceived this chapter, defining its theoretical frame and outline. Giulia Cazzaniga authored the section *Decommissioning as a Project of Becoming*, Sara Anna Sapone authored the section *Design the decommission through scenarios of change*. The section *Qualitative description of three solar landscapes* was co-written by both.

2 «Regardless of how landscapes are studied, they are always formed by the interaction between humans and nature». Hilde Tobi, Adri van den Brink, *A process approach to research in Landscape Architecture,* in Adri van den Brink, Diedrich Burns, Hilde Tobi, Simon Bell, *Research in Landscape Architecture*, London-New York, Routledge, 2017, pp. 24-34.

3 James Corner (ed.), *Recovering Landscape. Essays in Contemporary Landscape Architecture*, New York, Princeton Architectural Press, 1999.

4 André Corboz, *The Land as Palimpsest*, in "Diogens", n. 121(31), pp. 12-34.

5 Timothy Morton, *Dark Ecology*, New York, Columbia University Press, 2014.

Previous page. Hand drawing by Simone Baccaglini, 2025.

something possible, never fully accomplished. In addressing this, landscape architecture could play a role considering the potential of design to «set up the conditions for life to evolve, utilizing natural processes like an open-ended, dynamic medium to achieve resilient, adaptable, and self-organizing environments»[6].
In the common understanding of photovoltaic solar plant decommissioning, three main strategies are generally recognized[7]. One approach is Total Decommissioning, which refers to the complete removal of the plant, ancillary structures, and the infrastructures that make it accessible, intending to return the land to its original condition. Items such as machinery and plant components are removed and made available for reuse within the company or on the secondary market. Alternatively, Revamping entails a partial and rotational decommissioning of the photovoltaic plant, which, divided into sectors, involves targeted removal and replacement of components based on a hierarchical order. All structures are progressively upgraded and continuously upgraded during this process. The size and appearance of the newly replaced parts may vary due to ongoing technological advances. This cycle is repeated over time, also encouraging internal reuse and integration of components alongside new ones. The third one is the Transition to a new productive typology, where partial, total, or no decommissioning of the photovoltaic system may occur to create recreational or educational spaces. Components can be reused, sold, or repurposed for different uses, land changes, or other programs. This EOL model offers alternative business opportunities and fosters better connection between the facility and its surrounding area.
Building on these technical definitions, our aim is to investigate these three operational strategies through landscape architecture projects. To achieve this, the first step was to shift from an acknowledgment and representation of data as a deductive system of quantitative references to an interpretation and reorganization of that data. This enables a transition to a qualitative expression of main characteristics, such as tendencies toward particular traits or behaviors. These "tendencies" are already present in the ground, air,

6 James Corner, *Lifescape–Fresh Kills Parkland in Topos*, in "The International Review of Landscape", 2005. pp. 14-21.

7 Among the various books on the topic we referred to the position expressed in Heidi Kolbeck-Urlacher, *Decommissioning Solar Energy Systems Resource Guide*, Lyons, Center for Rural Affairs, 2022. It explicitly lists the options as «reuse, refurbishment, or repowering» versus «fully discontinuing operations and decommissioning the project», which includes «recycling and disposal».

water, and elements that compose the landscape, and through design practice, they can be unveiled to inspire new possibilities for the project. Inspired also by Pierre Bélanger's theories, which strongly advocate for an outlook where design data and representations are not neutral or objective, but are fundamentally interpretations shaped by designers' intentions and political/ideological contexts[8], we adopt a design-driven research approach that pursues unconventional solutions for an uncharted issue. With the majority of solar fields constructed at the turn of the century – and an average lifespan of thirty years – there is currently a lack of built solutions and researches addressing photovoltaic decommissioning from a landscape architecture standpoint.
By radicalizing design concepts, such as the total decommissioning or the revamping, we intend to stir up hypotheses and potential answers regarding the transformation of the productive landscape that have not yet been fully focused on or recognized as established architectural strategies. This approach necessitates intentionally setting aside immediate social factors and conventional feasibility constraints to prioritize the full exploration of systemic and territorial possibilities.

Qualitative description of three solar landscapes

Considering as the starting point the morphological reorganization suggested by the Politecnico di Torino research team, we read the characteristics of three territorial contexts. The envisioned project-driven approach necessitates the use of specific lenses – transversal tools designed to read different landscape typologies, ensuring the vision is both site-specific and capable of finding common "ground" across case studies. From a landscape architectural perspective, these lenses address questions of form, scale, and continuity[9]. Specifically, we read the territory through its Rural-Urban Development Relationship, given our focus on productive landscapes and the interaction between human and non-human systems. Secondly, we investigate the specific Spatial Relations that have shaped these lands, involving the morphology of the region, its hydrological and infrastructure networks, and the proximity to the urban environment. Furthermore, the Energy Distribution

8 Pierre Bélanger, *Is Landscape Infrastructure?*, in Gareth Doherty, Charles Waldheim (eds.), *Is landscape...? Essays on the Identity of Landscape*, London, Routledge, 2015, pp. 190-212.

9 This frame relates to the theoretical precedents expressed in the text by Sara Protasoni in this volume.

Next page. The representation of the three landscapes. From data to interpretation.

Grid is an essential lens as it constitutes the main feature and objective of the research-to place the future energy productive landscape at the center of the reflection. Finally, observing Biodiversity and Ecological systems contribute to a broader reflection on the territory, intended not as a juxtaposition of different elements but as a complex living body.

To fully explore the complexity of energy-productive landscapes, three distinct context are described[10] – San Pietro Vernotico, Lugo, and Fossano – each characterized by the integration of large-scale photovoltaic energy production into established rural systems. By describing the specific historical settlement patterns, dominant agricultural practices, and key ecological features, we establish a framework for understanding how the tension between past agrarian use and present energy demands shapes the contemporary landscape and could change once decommission occurs.

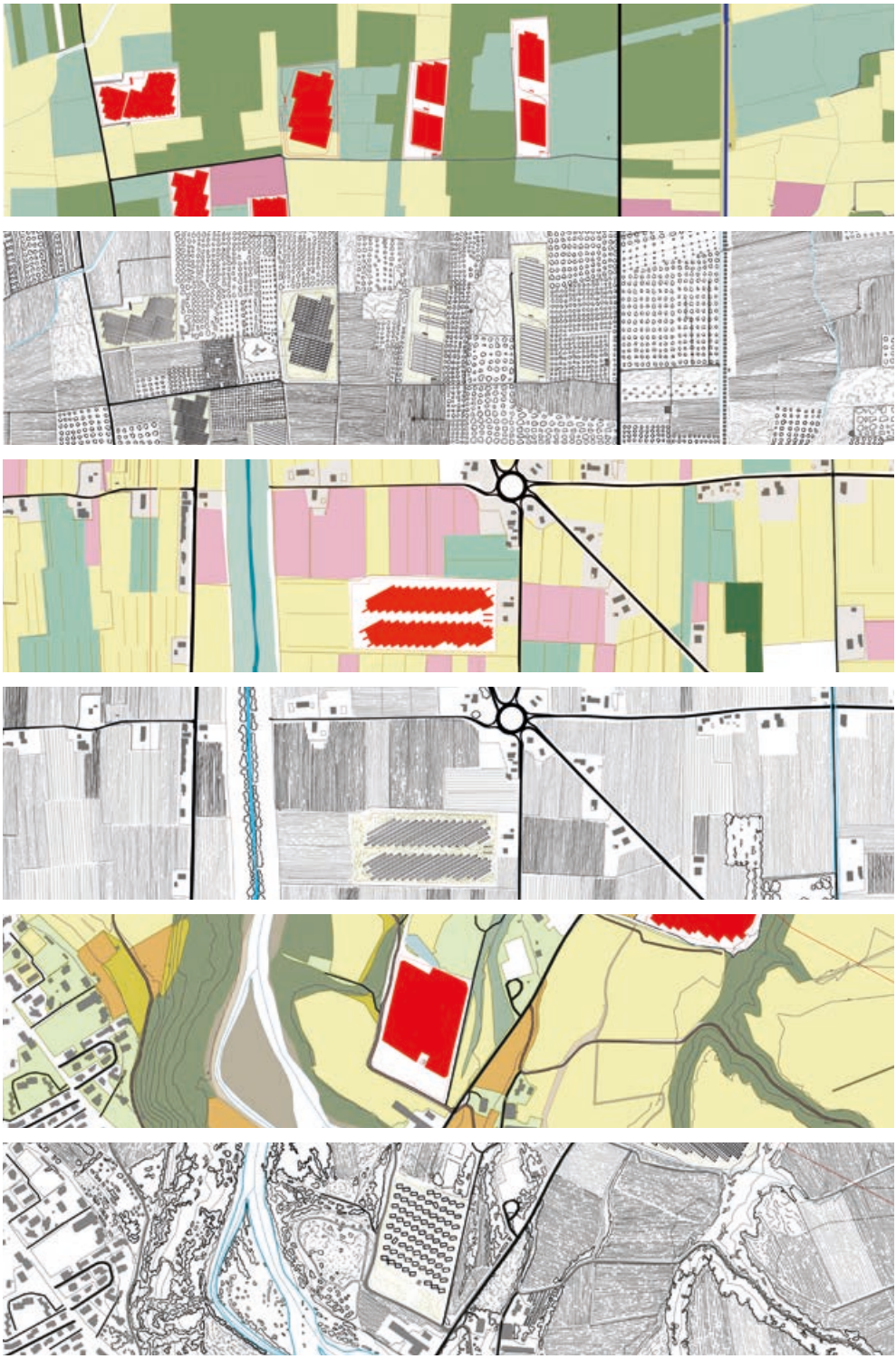
Design through Scenarios of Changes

Building on the understanding of the specificity of the three territorial contexts, our design approach involves creating Scenarios of Change[11]. This entails analyzing the current conditions, reading the "tendency"[12] of each site, and developing a theoretical proposal with a specific spatial layout, focusing on rethinking and reorganizing elements within a new relational framework. We select one particular future, a critical case, to test our research perspective and evaluate the site's potential for decommissioning. Although each site – San Pietro Vernotico, Lugo, or Fossano – has multiple possible futures, we identify the most probable one based on our assessment of local conditions. By exploring extreme options, we present the most radical alternatives, configurations that challenge conventional methods without necessarily considering their feasibility. These are not final design solutions but rather exploratory trajectories employing unconventional approaches. They may even radicalize ideological or conceptual positions to stimulate new questions about decommissioning, especially for issues that are not yet fully addressed or integrated into existing relational systems. By these

10 An extended description of the three landscapes is provided in the following pages.

11 «Developing scenarios of change and then projecting the possible landscape outcomes. He identified a series of decision points (or discursive moments as he called them) which appeared to be particularly important in shaping the way that the different futures were chosen». Adri van den Brink, Diedrich Burns, Hilde Tobi, Simon Bell, *Research in Landscape Architecture*, in *Research in Landscape Architecture*, New York, Routledge, 2017, p. 109.

12 Concept of *tendency* in design expressed in Julian Raxworthy, *Novelty in the Entropic Landscape: Landscape Architecture, Gardening and Change*, Ph.D. Thesis, Santa Lucia, University of Queensland Library, 2013.



three distinct scenarios, we aim to explore a taxonomy of potential afterlives for energy infrastructure, moving beyond simple removal to frame decommissioning as an opportunity for site-specific resignification.

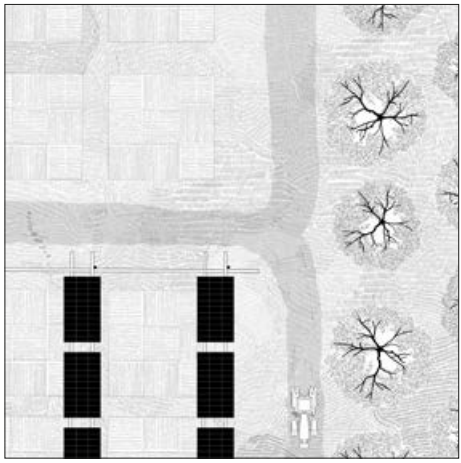
The first approach focuses on the countryside of Brindisi, close to San Pietro Vernotico, in the energy-intensive south, historically tied to olive cultivation. Thus, we envision a scenario of productive reprogramming, where the dismantling of solar fields becomes an opportunity to restore abandoned or weakened olive landscapes, capitalizing on the energy distribution infrastructure already in place. Rather than a return to pre-existing conditions, this scenario explores how decommissioned sites can serve as platforms for new agro-cultural economies – such as oil production, food networks, or landscape tourism – linking identity, ecology, and infrastructure. It suggests that the afterlife of energy fields can support not only biodiversity, but also social and economic regeneration, linking energy production to the appreciation of a composite landscape.
A second model is explored in Lugo, Ravenna province, through a Transitional Scenario toward Agrivoltaics. In this territory, where the centuriation grid and historical Piantata Padana – a traditional agroforestry system of vine and mulberry rows – still marks the landscape, we explore a transitional scenario toward agrivoltaics. Here, photovoltaic panels are not removed but repositioned and redesigned to accommodate a hybrid production model that merges renewable energy with small-scale, culturally resonant agricultural practices. The scenario reflects on how landscape form and spatial patterns – such as the rhythm of rows, the alternating texture of orchards and crops, and the logic of irrigation – can be reinterpreted through contemporary agrivoltaics strategies. Rather than erasing the energy infrastructure, this project seeks to suture it into the productive and cultural history of the territory, affirming landscape as a medium of continuity and invention.
Finally, in Fossano, a territory characterized by dispersed settlement, cereal monocultures, and ecological fragmentation in the province of Cuneo, we propose a scenario of total decommissioning. Here, the dismantling

of photovoltaic panels gives way to a long-term ecological succession process – a form of re-wilding that acknowledges the degraded condition of the agroecosystem while restoring continuity between fluvial corridors and fragmented habitats. Drawing inspiration from the site's existing riparian systems and the presence of the Foresta Fossile – a rare, fossilized forest along the Stura di Demonte river – we reimagine the energy field as a catalyst for habitat regeneration and landscape memory. Rather than returning to intensive agriculture, the area is allowed to evolve as an open-ended ecological matrix, fostering biodiversity and mitigating hydrological risks.

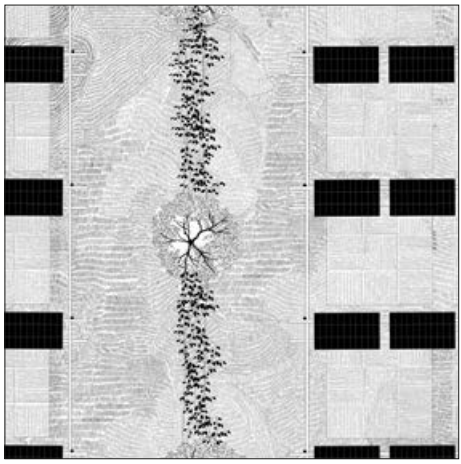
Through these three scenarios, we argue that the future of decommissioned photovoltaic landscapes depends on a shift from mitigation to design. Decommissioning must be conceived not merely as an end, but as a threshold, a transformative moment that mobilizes the agency of landscape architecture to reimagine the forms and functions of post-energy territories. Ultimately, our aim is to challenge the notion that energy infrastructures are inert technical objects with fixed lifespans. Instead, we see them as territorial figures-spatial configurations that are embedded in, and transformative of, the larger landscape.

Project matrix. Schemes to illustrate boundaries, technical structures, and biodiversity in their evolution, adaptation, and changes on site.

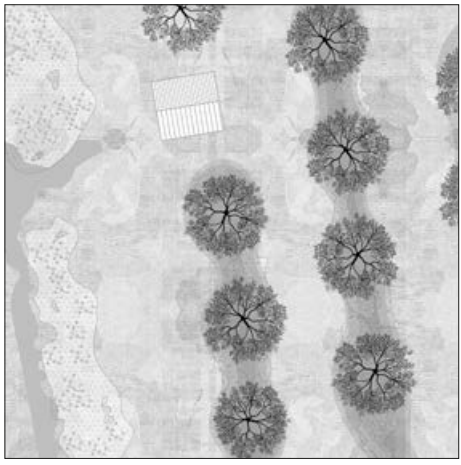
Diagrams by Marco Agosti, 2025.



San Pietro Vernotico →

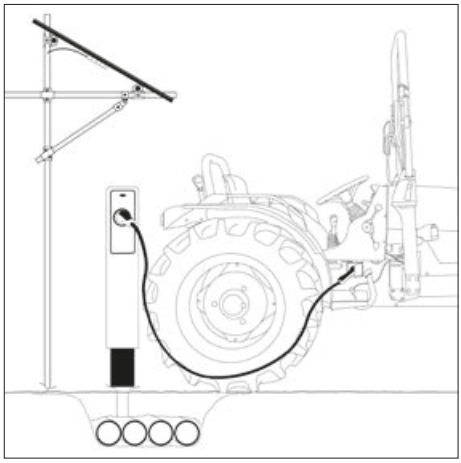


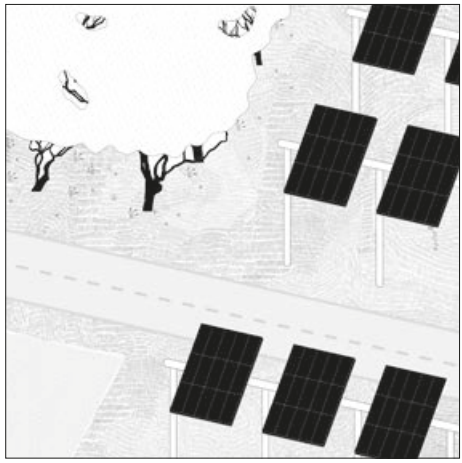
Lugo →

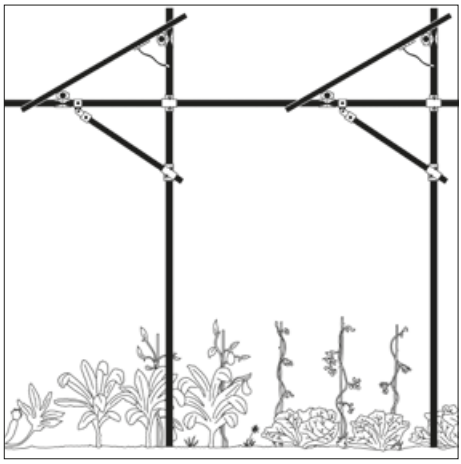


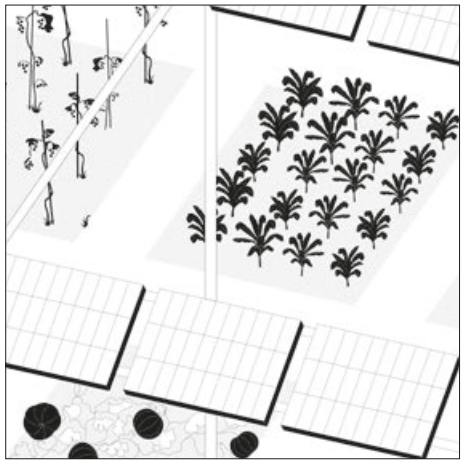
Fossano →

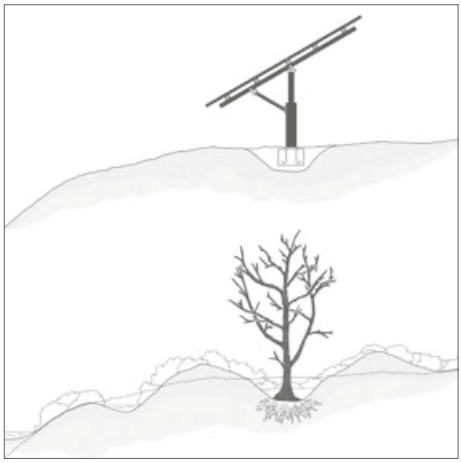
Boundaries











Structures

Biodiversity


N 40° 30' 50'' - E 17° 59' 15''


SAN PIETRO VERNOTICO

Fields and infrastructures

San Pietro Vernotico, in the northern Salento area of Puglia region, is a plainland characterized by wide open landscapes strongly shaped by agricultural production, fragmented by water management and mobility infrastructures. This infrastructured landscape initially supported regional food productivity but impoverished biodiversity. Subsequently, it became fertile ground for renewable energy production due to large available surfaces from decaying monocultures and favorable mediterranean weather. A key question now concerns the reuse of energy infrastructures nearing the end of their lifecycle, potentially to power new systems like precision agriculture and electric mobility, while improving local biodiversity.

Urban-Rural Development

The Puglia region is widely occupied by agricultural production, with 65% of its territory dedicated to agricultural fields. The area around San Pietro Vernotico belongs to the Brindisi plain, a flatland originally devoted to pastures and later dominated by crops, mostly of vines and olive groves, suited to the Mediterranean climate. The field layout is rooted in centuries of productive uses, tracing back to Roman centuriation systems. However, the cultivation does not strictly follow the Roman grid, featuring irregular planting schemes and varying density, mainly consisting of monocultural patches. The rural landscape is perceived as open, with few vertical elements, but its quality is evaluated as low to no ecological value also due to the prevalence of monocultures.

Spatial Relations

The regional landscape matrix is strongly defined by agricultural operations, including soil reclamation, field divisions, and different crops. There is a prevalence of medium-sized plots, regularly laid out by local roads and irrigation canals perpendicular to the coastline. These agricultural canals have significantly shaped farming practices and settlement growth, especially in the coastal

Next page. The conditions on the test site: borders, structures and biodiversity. Photos from San Pietro Vernotico by Sara Anna Sapone. 2025.






area, which is also influenced by marine ecology. Water channels are particularly present in this part of Puglia due to the sandy and clayey substrate and lack of natural inclination, requiring artificial channels to stabilize agricultural lands. The shape of San Pietro Vernotico and its surrounding fields are strongly influenced by the reclamation canals, characterized by an east-west directionality.

Energy Distribution Grid

Puglia region is one of Italy's top photovoltaic energy producers, with widespread solar fields presence. The region has the highest average area size per plant in Italy (36kW), with the majority being ground-mounted photovoltaic systems. Following European incentives starting in 2010, the region rapidly saw an increase in solar fields, converting unused agricultural lands for energy production. This resulted in a diffuse system of solar farms, fragmented and fenced off from the surrounding rural landscape. The potential exists for agrivoltaics to support local flora and improve connectivity, leveraging the heavily infrastructured territory. San Pietro Vernotico is near several energy processing facilities in the Brindisi province. The Centrale Termoelettrica Enel Federico II in Cerano, the closest large powerplant, is connected to the national high-tension network. Originally coal-fired, it was converted to a gas-fired station in 2021 to reduce pollution. The electric network also links to the Terna powerplant in Brindisi, part of the national high-tension network.

Biodiversity and Ecological Systems

The flatland surrounding San Pietro Vernotico, covered by large-scale monocultures, offers limited ecological variety and is defined in planning tools as having low-to-no ecological relevance. The substitution of traditional mixed-use cultivation with monocultures (olives and viticulture) further lowered biodiversity. Potential biodiversity along the multiple water channels has been hindered by the disorganized construction of secondary roads and urban settlements. Areas of ecological interest are concentrated on the coastal side and along the main water canals, such as the Siedi channel, which is surrounded by the Cerano woodland natural reserve. A vegetational gradient exists from the coast inland, shifting from holm oak and aleppo pines near the coast to sessile oaks, cerris, or hygrophilous plants like field elms. Other ecologically rich areas include the woodlands of Santa Teresa and Bosco dei Lucci, which host relict populations of mediterranean cork oak (*Quercus suber*). These areas support passeriformes, nocturnal birds of prey, small mammals, and reptiles. The highest biodiversity is found in the Cerano Natural Park and coastal areas, while in inner areas, it is mostly relegated to uncultivated edges and abandoned fields. Current planning suggests rethinking agrarian production to increment quality and potentially link it to tourism, which could push for a different relation with energy production needs, reusing existing infrastructure.

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N 44° 26' 32'' - E 11° 54' 22''


LUGO

Layered productive landscape

Lugo, in Italy's Emilia Romagna region, is a richly stratified and intensely managed rural landscape shaped by centuries of agriculture, water management, and infrastructural transformation. This flat, geometrically structured territory is now a critical case study for adapting post-agricultural landscapes to new functions like photovoltaic energy generation.

Urban-Rural Development

Emilia Romagna is one of Italy's most productive agricultural regions, with over 50% of its land cultivated. Lugo, in the Romagna plain, has been a model of rural intensification and agrarian efficiency. However, this inner plain isn't environmentally protected and is widely perceived as having low or negligible ecological value, often approached primarily as a space for the extraction of food, fiber, and now, energy. The territorial layout is still defined by the legacy of the Roman centuriation system, a rational orthogonal grid of roads and fields. Historically, this facilitated the Piantata Padana, a structured agroforestry system combining rows of mulberries and vines with herbaceous crops in geometrically organized plots. Today, much of this vegetative complexity and vertical layering has been lost. Traditional elements like tree-lined roads, hemp retting ponds (*maceri*), and drainage ditches have largely been filled in or converted to simple cropland. The centuriated layout remains legible, now hosting vast fields of monocultures – wheat, maize, rice, sorghum, soybeans, and sugar beets – outside urbanized areas. Lugo is marked by peri-urban sprawl, where low-density development coexists with high-intensity agriculture. While productive use is dominant, new occupations – industrial, logistic, and energetic – are reshaping the landscape's identity.

Next page. The conditions on the test site: borders, structures and biodiversity. Photos from Lugo. Simone Baccaglini, 2025.

Spatial Relations

The defining feature of Lugo's spatial organization is its regularity. The northeast-southwest orientation, inherited from Roman centuriation, structures farming and infrastructural development,

with each centuria (around 712 meters per side) still shaping the modular logic of land division. Beyond geometry, the space is deeply influenced by centuries of hydraulic engineering, with extensive drainage and reclamation systems transforming marshes into cultivable land from the Middle Ages through the Renaissance. The hydrological network has two main orientations: an east-west drainage axis parallel to the Po River and a north-south system of tributaries converging toward the Reno River. These overlapping flows create a multi-scalar web of canals, embankments, and ditches for efficient water management on the flat terrain. In the lower Romagna plain, the riverine character is more pronounced; meandering riverbeds, abandoned oxbows, floodable plains (*golene*), and river islands coexist with fields and tree plantations, often with poplar groves occupying former fluvial landscapes, reinforcing a hybrid space that is artificial, natural, productive, and geomorphic. The persistent centuriation and historical water management patterns imbue the area with a strong sense of continuity. These same patterns are now being adapted for new functions, particularly the spatially regular installation of photovoltaic fields, reprogramming historical spatial templates for emerging infrastructural uses.

Energy Distribution Grid
Lugo is significantly integrated into the regional and national energy grid, hosting key infrastructural nodes like the Lugo RFI substation and the TERNA substation in nearby Alfonsine, forming part of a broader energy corridor. This reflects a trend where rural landscapes are redefined as spaces for energy production and distribution. The morphological clarity and accessibility of the centuriated landscape, combined with flat topography, low ecological sensitivity, and large sun exposure, make it particularly well-suited for the deployment of photovoltaic systems. The regularity of the land division simplifies the planning and alignment of solar panels, but this shift raises questions about multifunctionality and identity.

Biodiversity and Ecological Systems
Despite its visual openness and vegetative cover, Lugo's landscape currently offers limited ecological value. The simplification of the agricultural matrix and the eradication of semi-natural elements have caused significant habitat loss and reduced biodiversity. The former diverse mosaic of trees, vines, water bodies, and hedgerows is now a monocultural expanse with few ecological niches. Spontaneous vegetation is largely confined to marginal spaces like canal edges, field borders, and isolated uncultivated fragments. River corridors provide the most meaningful ecological continuity, acting as semi-natural axes in an otherwise poor environment, but they face pressure from intensive land use and infrastructural expansion.

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N 44° 33' 28'' - E 7° 45' 12''


FOSSANO

Rural and riverine landscape

Fossano, in the province of Cuneo, southern Piemonte, illustrates the tension between productive rural economies, infrastructural modernization, and ecological fragmentation. Anchored in cereal cultivation and intensive livestock farming, the territory reflects historical agrarian layering and challenges posed by high-pressure systems. Despite a regionally diversified land use (50% agricultural, 37% forest, 15.5% pastures), Fossano's plain is predominantly monocultures and large-scale animal husbandry. This results in a simplified agroecosystem with high water and energy demands, limited biodiversity, and growing pressure on soil and aquifer quality.

Urban-Rural Development

Piemonte has a legacy of social and political fragmentation, with territorial cohesion historically driven by industrial development. The Cuneo province features a complex network of isolated rural structures – historical farms (*grange* and *cascine*), towers, *tetti* – emerged through centuries of agrarian adaptation. Agriculture is the dominant land use (over 50%) in the Fossano area, with pastures notably accounting for roughly one-third of the utilized agricultural area, supporting a diverse agro-pastoral system that has resisted homogenizing pressures. The agricultural parcels are relatively small, characterized by undulating surfaces formed by gravelly alluvial deposits and a deep-water table. Historically, the rural landscape was viewed as a cultural extension of the garden and villa tradition, where the agricultural field was both an economic asset and an aesthetic object. Today, this complexity is challenged by land-use intensification and infrastructural development. The prevalence of maize and forage anchors Fossano's landscape in a deep agronomic identity. Scattered development combined with infrastructural modernizations suggests a hybrid territoriality where productive, residential, and infrastructural functions interlace.

Next page. The conditions on site, structure, and biodiversity. Photos from Fossano by Marco Agosti, 2025.






Spatial Relations
Fossano's landscape is shaped by geomorphology, water systems, and historic land divisions. The topography features gently rolling hills with powerful alluvial soils and deep aquifers, supporting a diversified agriculture. A dense network of irrigation canals, dating back to the 14th century, forms a fine-grained hydrological lattice that structures the territory. The historical settlement pattern is markedly dispersed, featuring isolated rural nodes anchored to agricultural production, like early grange complexes and later large cascinali surrounded by roads and canals. The legacy of this morphology is visible in toponyms and remnants like towers and isolated farmsteads. The Stura di Demonte river is a key element, acting as a powerful natural discontinuity. Its deep, steeply incised bed carves through the terrain, bordered by pioneer vegetation and narrow cobbled riverbanks. Riparian zones alternate between natural poplar-willow assemblages and managed poplar plantations. The infrastructural crossings of the Stura define the landscape's morphology and symbolic reading; the 19th-century railway bridge symbolizes early industrial modernization, while the contemporary A6 motorway bridge is a landmark of commercial connectivity and mobility. These two bridges act as both functional structures and cultural references.

Energy Distribution Grid
Fossano is strategically located within an energy corridor between two TERNA energy hubs (north toward Turin, south along the A33 highway). The nearby installation of an *E-Distribuzione* substation indicates ongoing efforts to modernize and densify local electricity infrastructure. This trend reflects the growing centrality of rural landscapes in Italy's energy transition. While not yet widespread, its open parcels, deep water table, and relatively low building density make it a plausible candidate for future solar development.

Biodiversity and Ecological Systems
Fossano's biodiversity is significant, even without official high-value recognition. The fluvial corridors, especially the Stura river, host valuable riparian habitats with pioneer vegetation and native species like black poplar and willow. These narrow ecological bands introduce heterogeneity, acting as reservoirs of spontaneous life in the cultivated landscape. The Foresta Fossile along the Stura is a site of exceptional paleobotanical and ecological significance, reinforcing the Stura corridor's value as a multifunctional system. Biodiversity faces critical pressures, primarily from the high density of intensive livestock farming. Manure spreading leads to nitrate and pathogen infiltration into groundwater, threatening aquifer health due to the local soils' poor natural filtering capacity. The dominance of maize monoculture also exacerbates ecological degradation, homogenizing the landscape and demanding substantial water and energy inputs that are unsustainable on gravel-rich soils. Ecological connectivity is weak, especially in cereal-dominated zones, with a low density of linear ecological

elements. The most valuable corridors (riverine systems) lack connective pathways, and their riparian vegetation is often degraded. Potential for regeneration exists through revitalizing hedgerows, restoring riparian buffers, and reconnecting fluvial corridors to enhance landscape permeability and biodiversity. Integrating dual-purpose land uses, such as agrovoltaic systems, offers a way to reconcile ecological restoration with energy transition goals.

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