

OPEN GROUND

Depaving

Urban

Surfaces

Eds. Andrea Bortolotti
Chiara Geroldi
Cecilia Furlan

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EDITORS:

Andrea Bortolotti, Chiara Geroldi, Cecilia Furlan

COVER AND LAYOUT DESIGN:

Ivone Martínez Fera

PHOTOS:

Tommaso Mola Meregalli

SCIENTIFIC COMMITTEE:

Sara Favargiotti (Landscape Architecture, Università degli Studi di Trento)

Nikos Katsikis (Urbanism, TU Delft)

Eugenio Morello (Urban Planning, Politecnico di Milano)

Sara Protasoni (Landscape Architecture, Politecnico di Milano)

Marco Ranzato (Urbanism, Università degli Studi Roma Tre)

Giulia Setti (Architecture, Politecnico di Milano)

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ON REGENERATIVE DESIGN AND DESEALING

Cecilia Furlan, Francesca Rizzetto

OPEN GROUND: A RESEARCH BY DESIGN¹

Andrea Bortolotti, Chiara Geroldi

Increasingly, the sealed surfaces of our cities are being transformed, either through spontaneous processes of degradation and neglect, or through soil desealing interventions aimed at regenerating the ecological functions of the soil. The spontaneous landscape can break and gain space within paved surfaces too. What design approaches and tactics can be employed to modify this mineral crust, minimizing impacts while maximizing increased permeability and new spatial qualities? How can we reuse the aggregates resulting from the demolition of this mineral crust on site? Starting from these questions, this book showcases a reflection about creative forms and processes of depaving and material reuse to trigger new aesthetics and ecological processes. It presents the results of the Open Ground Idea League Summer School hosted by the Politecnico di Milano in July 2024 and jointly organised by researchers from the Department of Architecture and Urban Stud-

1 The two authors jointly conceived this chapter. Andrea Bortolotti authored Section 2; Chiara Geroldi authored Section 3; sections 1 and 4 were co-written.

ies of the Politecnico di Milano, TU Delft Faculty of Architecture and the Built Environment, Latitude Platform and Italia Nostra Centre for Urban Forestation. The Summer School was funded by IDEA League, an alliance of five European science and technology universities – RWTH Aachen University, Politecnico di Milano, TU Delft, Chalmers University of Technology, ETH Zürich.



← Abandoned shack and concrete pavement in Porto di Mare.

Connected with two research projects involving the Department of Architecture and Urban Studies – the Horizon Europe-NATI00NS and National Biodiversity Future Center, Spoke 5 Urban Biodiversity – the Summer School invited students and researchers to confront the complex and urgent challenges of soil desealing, reclamation and reuse in urban areas. It also offered a



↑ Spontaneous vegetation.

unique opportunity to experience interdisciplinary collaboration between educators, master's and PhD students from the disciplines of landscape design, architecture, and urban planning, but also environmental engineering, physics, and computer science.

EXPLORING INTERDISCIPLINARY DESIGN COLLABORATION IN SOIL DESEALING

Soil desealing can range from minimal interventions, such as enabling the recovery of ecosystems that have been degraded, damaged, or destroyed, to more intensive operations involving heavy equipment for demolition, earthworks, and soil replacement. These processes often require a broad spectrum of expertise to understand the mechanisms governing ecosystem dynamics and soil conditions. Driven by advances in urban ecology, there has been a growing attention over the past decades to

spontaneous forms of urban nature that transcend the speculative or utilitarian potential of seemingly vacant urban spaces. Seminal examples include the work by botanists Paul Duvigneaud and his colleagues in Brussels (Duvigneaud, 1990) and Herbert Sukopp in West Berlin after World War II (Gandy, 2013), but also subsequent developments in North America (Forman, 2013). Geographer Matthew Gandy (2022) describes these spontaneous urban nature spaces as an “interdisciplinary terrain” that links renewed interest in urban biodiversity with alternative interpretations of vernacular ecologies and landscape design.

We proposed to delve into this terrain for interdisciplinary collaboration, working on the notion of “ecological connection” and focusing on the reuse of discarded materials on site. The term “open ground” is taken from the French *la plaine terre*, conventionally used to describe “natural soils”. However, soil scientists increasingly refer to an “open soil gradient” (Grandin et al., 2022), which encompasses a range of conditions characterised by different types of surface cover, vertical continuity and depth, physical, chemical, biological quality, compaction, and permeability. Beyond these measurable criteria, we interpret the “openness” of soil, as opposed to its “enclosure,” as its ability to mediate exchanges between different environments, such as the atmosphere, subsoil, and groundwater. In this sense, the open ground – with its many forms and soil compositions – becomes a dynamic medium for transformation, adaptation, and regeneration.

Soil is now high on the European political agenda (see the European Green Deal of 2019 or the Circular Economy Action Plan of 2020). Indeed, soil is increasingly scarce and endangered due to constant urbanisation, soil sealing, and degradation of agricultural lands. On the other hand, cities are filled with underused and abandoned areas that have been paved over with concrete or asphalt – spaces where soil could be given a second chance and left to urban nature. Following a long phase of brownfield regeneration that began in the 1980s with the redevelopment

of former industrial sites and rail yards, European cities are now more often confronted with the challenge of repurposing smaller, more scattered areas, such as infrastructure cutouts, logistics spaces, and oversized parking lots. Although small, these spaces can be numerous and thus represent both a spatial resource and a management challenge. For example, the public administration of Milan has surveyed and mapped over 150 vacant or built-up lots in a state of abandonment or awaiting new functional destinations.

These areas can offer ecological opportunities for the city and are therefore increasingly being integrated into climate action plans and programs (see the City of Milan's *Piano Aria Clima*). Their reclamation and revegetation are often seen, sometimes overly optimistically, as a panacea to the dense city problems, such as flooding, heat waves, and air pollution. However, rehabilitating these “minor” brownfield sites is hindered by the lack of dedicated budgets for this purpose, as funding is conventionally incorporated into construction costs. It is therefore necessary to reconsider these spaces precisely because of their marginal and spontaneous character as important elements of urban nature. The Summer School focused on a site slated for desealing that exemplifies the aforementioned challenges. The site is located within a cluster of lots formerly occupied by small manufacturing activities, part of a large publicly owned urban regeneration area in the southeastern outskirts of Milan called *Porto di Mare*. Once cleared of existing structures, these sites remain as paved surfaces awaiting new destinations. Some of these lots along *Via San Dionigi 91* have been recently placed under the stewardship of the environmental association Italia Nostra, which has initiated a cleaning and maintenance process (see the interview with Gianluca Vargiu in this volume).

Concurrently, just across the street, an offshoot of the Politecnico di Milano (Off Campus Cascina Nosedo) opened in 2022 within a repurposed rural building. This space was intended to serve as a privileged observatory for conducting action-re-

search and educational activities focused on the neighbourhood and its environmental challenges. The convergence of these two events prompted the exploration of soil desealing in a real-world setting through design and within the context of the Summer School, which took place in the Off Campus.

DESEALING AS A DESIGN OPPORTUNITY: WORKING WITH MATERIALS, SOIL, AND ECOSYSTEMS

Although conventionally approached as a technical procedure, desealing can offer design opportunities. During the Summer School, we encouraged attitudes that integrate the reuse of discarded materials from desealing into new projects. There are several challenges connected to this operation. A crucial one concerns the potential presence of contaminated soil beneath the sealed surfaces, particularly in brownfield sites. In such cases, desealing typically requires soil contamination analyses and, if necessary, land reclamation activities. Sometimes, the sealed layer can play a positive function, for example, by avoiding rainwater infiltration into contaminated soil. Another challenge involves the possibility of reusing demolished materials on site (e.g., concrete and construction debris), which also depends on different regulatory frameworks in different countries. Examples of landscape design involving desealing and on-site reuse of discarded materials are growing and offer innovative references for new projects. These include the work by D.I.R.T. Studio, Wagon Landscaping, GLT Landschaftsarchitektur, and Openfabric – each offering valuable insights in terms of design strategy, process, and form.

The ASLA winning project *Urban Outfitters Headquarters* in Philadelphia, United States, by D.I.R.T. Studio showcases the reuse of concrete slabs of varying dimension to create new pavements

and the accumulation of construction debris for landscaping; the *[Park]ing* project in Courtrai, Belgium, by Wagon Landscaping explores the implementation of precise geometrical cut-outs into asphalt to host new plantations; other projects, such as the *Jardin des Joyeux – la Maladrerie* in Aubervilliers, France, by Wagon Landscaping and the *Conversion Airfield Bonames* in Frankfurt am Main-Bonames, Germany, by GTL Landschaftsarchitektur adopt a



← Recolonization and concrete degradation.

wild aesthetic, breaking up sealed surfaces to encourage the emergence of spontaneous vegetation; the *Via Amadei Garden* project in Mantua, Italy, by Openfabric conquers new spaces for biodiversity on an urban street. These examples also show how cutting/desealing operations can be a project in themselves, leading to certain types of spaces and forms. Ultimately, *Frantoio Sociale* in Milan,

Italy, by Gisto, and the work by the collective Hypereden experiment with urban furniture design through the reuse of crushed materials. Although more technically oriented, there is also a growth of interesting operations dealing with the construction of artificial topsoils with rubbles. Depaving operations performed through bottom-up, participatory initiatives are also increasing.

Based on these observations, the Summer School set out to reflect on the issues of soil desealing, design and resource circularity through three distinct, but interconnected dimensions involved in these operations: “designing with materials” (S), “designing with soil” (M), and “designing with ecosystems” (L). “Designing with materials” asked participants to study the material resources on site – both in terms of quantity and quality, also considering the thickness and degradation of the existing concrete slabs – questioning their potential reuses, either by leveraging spontaneous degradation and colonization processes, or through more designed interventions. “Designing with soil” stressed the need to think in terms of cut & fill operations, mixing and overlapping materials to construct new topsoils, and to reflect on the impact of the new topographies on water runoff, storage, and infiltration. Ultimately, “designing with ecosystems” focused on the mosaic of ecosystems in which the project site is located, challenging participants to explore multispecies thinking, including other-than-human actors in the design process, and reusing discarded materials to create new habitats.

MAPPING, DESIGNING, AND EXPERIMENTING ON SITE: THE OPEN GROUND PROJECTS

The following chapters collect the five interdisciplinary groups’ design proposals developed during the Summer School by

public park working on the cracks existing on the paved surface. This is interpreted as a temporary park, that anticipates future transformations. Experimentation on the soil (de)construction is accompanied by detailed, technologically advanced, and AI-supported monitoring of concrete cracks and interventions for the accelerated degradation of the mineral surface.

Circul(Art) builds on an inventory of waste materials to inform possible art interventions. A decision tree structure supports this process of material recovery and reuse. Selective cutting of the edges of concrete slabs allows for controlled rewilding and creating “rooms” that can accommodate various art and temporary installations. Materials with the potential to support soil and ecological regeneration are concentrated in the centre of the area, while others are reused in scattered forms in installations and street furniture.

Ground to Mound proposes the entire de-sealing of the impervious surface and accumulation of crushed materials and

↑ Piles of demolition rubble in the project site.



excavated ground into mounds². At the same time, the mounds keep visitors away from contaminated areas and demarcate new plantations selected for phytoremediation experiments. In the first phase, the depaving and reconfiguration of the topography allow for phytoremediation and bioremediation of the contaminated soils; the second phase provides accessibility to the entire area.

Eco-Dwellings focuses on designing for non-human species and the biodiversity linked to the presence of water on the site and it experiments both with precise cuts and wilder aesthetics. It investigates the potential of various waste materials accumulated on-site to provide shelter and create protected habitats for wildlife through minimal intervention. A ten-year scenario envisages the evolution of the site, considering unexpected developments. Elevated paths for humans allow observation of unhampered wild species on the ground, such as rodents, frogs, and lizards on sunning spots in the meadow.

Ultimately, the project **Watering Sensorscape** envisages a didactic garden to improve human-ecological interactions. The project is organised in three rooms along an educational path, guided by the concepts of margin and boundary between different ecosystems. The rooms include: i) an organised, linear system with crops and herbaceous spaces in asphalt cuts; ii) a regularly planted forest with circular holes in the pavement for tree planting; and iii) a spontaneous, anti-geometric forest. Soil is equipped with sensors to monitor environmental parameters (including temperature, humidity, pH, salinity, and nutrients), whereas machine learning technology optimises watering needs and plant health over time.

With this book, we intend to contribute to the debate on how to approach soil sealing through adaptive and site-specific design strategies. The experience

of the Summer School highlights the inherently interdisciplinary nature of desealing, underscoring the need for collaboration between architects, landscape architects, planners, and experts from fields such as geology, environmental engineering, and botany. Engaging with soil desealing in a real-world case study forced participants to reflect on processes and forms specifically tailored to the site. Most importantly, this experience highlights that desealing operations should be considered an integral part of the design process. Decisions about the size and form of broken pavement pieces directly influence future strategies for reuse, the process, design, and forms. This underscores the importance of early-stage (ex-ante) reflection on desealing practices and designers' involvement to enable more creative and effective use of recovered materials. Such an approach requires design thinking for coordinating and planning activities from the outset, a field still largely unexplored and ripe for collective and interdisciplinary research.

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ANDREA BORTOLOTTI

Andrea Bortolotti is an architect and Assistant Professor in Urbanism at the Department of Architecture and Urban Studies of the Politecnico di Milano. His research interests focus on urban waste and resource flows—their politics and infrastructure, which he investigates through both analytical and prospective approaches against the backdrop of sustainable and circular city programmes and projects. He has been part of Latitude Platform since 2012.

FEDERICO BROGGINI

Federico Brogini is an architect graduated at the Accademia di Architettura di Mendrisio. He is part of Latitude Platform for Urban Design and Research, an interdisciplinary collective of architects and urbanists based in Bruxelles, Venice, and Rome. He holds a PhD in landscape architecture at the RomaTre University with a particular focus on urban soils.

CECILIA FURLAN

Cecilia Furlan is an Assistant Professor at the Institute of Landscape Architecture at the BOKU University and a senior researcher the Department of Urbanism, TU Delft. Her focus is on sustainable urban landscape design and development amid resource scarcity, promoting the idea that cities and territories can achieve more with less for sustainable growth.

CHIARA GEROLDI

Chiara Geroldi is a PhD, architect, and Assistant Professor in Landscape Architecture in the Department of Architecture and Urban Studies at the Politecnico di Milano. Her research concerns the landscape design of discarded earthy fill, the landscape of energy and the regeneration of brownfields. She is part of the research group of the National Biodiversity Future Center (NBFC). She is the author of “Moved Earth: Designing Landscapes with Discarded Fill” (Routledge, 2026).

FRANCESCA RIZZETTO

Francesca Rizzetto is an architect and urban designer with over a decade of experience in practice. Her work focuses on environmentally sensitive urban design across scales with a societal eye. As a researcher at TU Delft, she explores spatial, ecological, and political dynamics in delta regions and teaches in the Transitional Territories master studio and bachelor's programs.

SARA ANNA SAPONE

Sara Anna Saponi is an architect, Research Fellow, and Adjunct Professor in Landscape Architecture at the Politecnico di Milano, where she earned her PhD in landscape architecture with the thesis “Precision Wildland: Designing Railyard Marginalia with Emerging Technologies”. Her research investigates the interaction between altered landscapes and their infrastructures, focusing on emerging technologies and energy production.

OPEN GROUND.

DEPAVING URBAN SURFACES

EDITORS

Andrea Bortolotti, Chiara Geroldi,
Cecilia Furlan

GRAPHIC DESIGN

Ivone Martinez
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PHOTOS

Tommaso Mola Meregalli

DRAWINGS' EDITING AND

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Ilay Lachin

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COORDINATORS

Andrea Bortolotti, Chiara Geroldi,
Cecilia Furlan

TEACHING STAFF

Federico Broggin, Sara Anna Sapone,
Francesca Rizzetto

PARTICIPANTS

Julian Ahl, Boris Bakker, Vaibhav Bansal,
Thomas Cabai, Josie Harrison,
Elies Horemans, Lindy Huang, Niklas Jansen,
Katarzyna Kedziarczyk, Ilay Lachin,
Jinzi Liang, Ayşe Melda Mercan,
Aleksandra Michalik, Alexandra Neagu,
Antonina Nikolic, Ethan David Tarragano,
Lan Wang, Xuanjia Ye, Yuhang Zhou.

CONSULTANTS

Giorgio Bressi, Stefano Micco,
Massimiliano Stock (Tecnitalia Servizi Srl),
Federico Broggin (Latitude Platform).

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