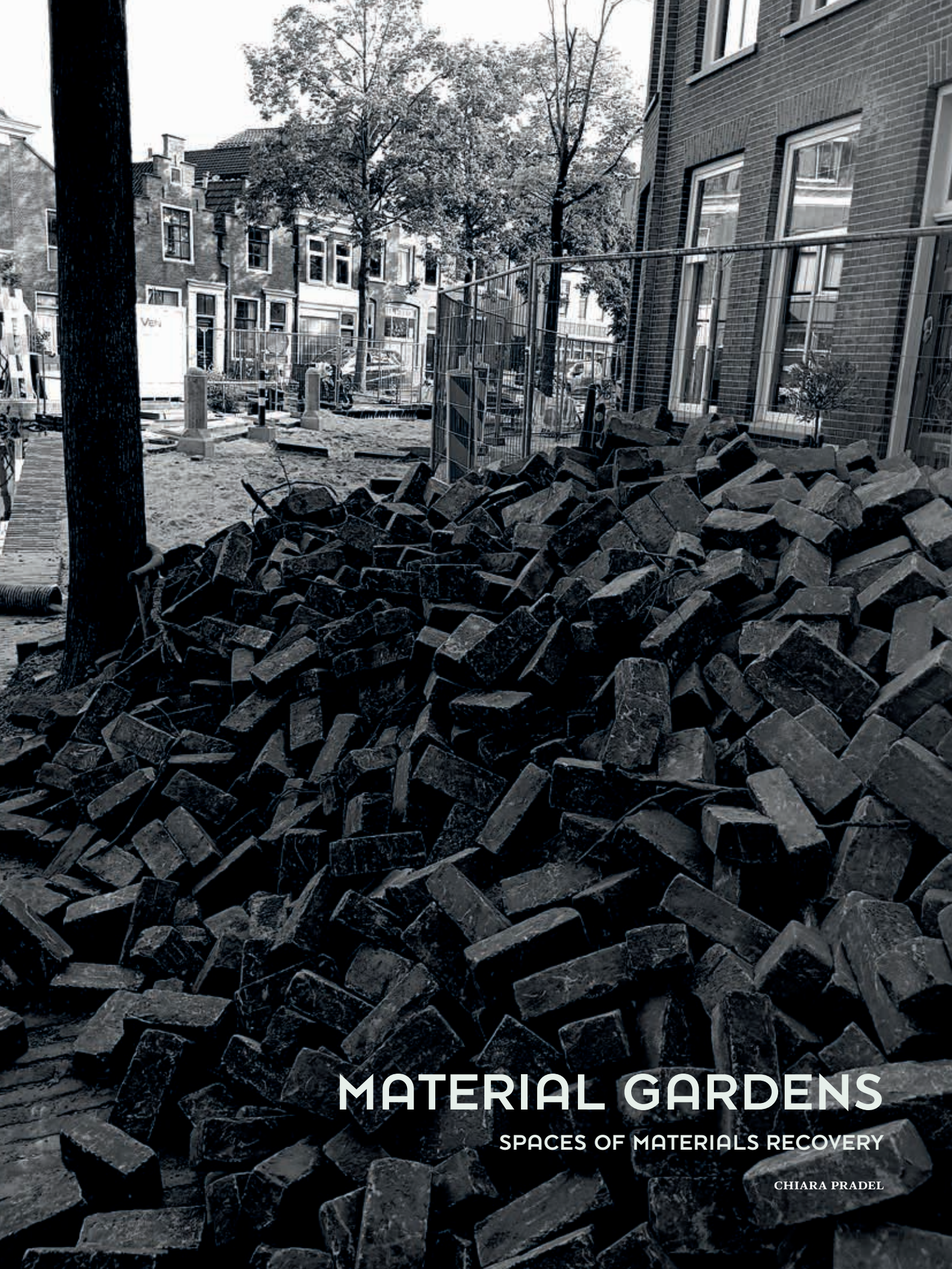

MATERIAL GARDENS

SPACES OF MATERIALS RECOVERY

CHIARA PRADEL

◄ 1. Construction site in Delft (photo C. Pradel)

▲ 2. Spanish Pavilion at the 55th Venice Biennale, Lara Almarcegui, 2013 (Photo by J. P. Dalbéra licensed under CC BY 2.0)

Recently, Amsterdamsestraatweg in Utrecht was repeatedly punctuated by piles and pallets of bricks and tiles and mounds of excavated soil due to road resurfacing works. Such interruptions to the streetscape are not a rare occurrence in Dutch cities. When traversing the urban landscape one often encounters piles of materials stacked on the periphery of roads and building sites (fig. 1). Although these are clearly temporary structures, they nonetheless capture the attention, whether due to their autopoietic, informal character, the contrast with their surroundings, or the shift in meaning they imply.[1]

Recalling the obsessive repetition of materials portrayed in Iain Baxter's *Portfolio of Piles* (1968), contemporary piles constitute a kind of 'weak monument' to everyday construction and demolition flows (fig. 2), positioning themselves within the spectrum of what is no longer, what is still, and what is not yet architecture.[2] The stark and minimal appearance of these deposits calls into question the act of building, as well as the foundations of industrial culture, by referring to the primary units of a pre-architectural lexicon rather than to an intentional composition.[3]

On the one hand, this type of material accumulation exhibits a hybrid character, determined either by the properties of individual objects or by the object plus the human or mechanical piler's imagination or lack thereof.[4] On the other hand, when observing these piles, one is immediately prompted to question how waste resources are stored, sorted and maintained to

ensure that they can become accessible again and acquire a new life.

To follow the movements of huge stacks of paving bricks and to acknowledge their host places, or 'reciprocal landscapes', implies the necessity to move beyond an abstract concept of material flows and the macro-economic mapping of produced and reused goods.[5] The focus turns towards physical sites where re-used components are kept accessible for potential reintegration into cycles of use and reuse. Situated as an intermediate step within fluctuating and transformative processes – between construction and deconstruction, between scarcity and redundancy – material deposits, along with their operational logic and configuration, are often-overlooked spaces that fundamentally embody a paradigm shift: various types of matter deriving from demolitions, renovations or surpluses on construction sites – which would otherwise be destined for waste and obsolescence – are saved to retain or regain both significance and utility. Their presence (or absence) is made visible not only physically, thanks to their storage, but also conceptually, as enduring products of human labour that challenge narratives of unconscious waste and decay and reshape (architectural) imaginaries.

Transitioning from conditions of material shortage to those of renewed availability requires specific spatial organization and enabling conditions, as well as new practices of care and interaction: piles of construction materials and architectural artefacts must necessarily claim space and appropriate positioning within urban landscapes. Networks of hubs dedicated to material recovery and repair may thus be understood as networks of 'banks': sites where the notion of availability is concretely translated into the allocation and management of (material) reserves, that remain potentially accessible while retaining their value and staying connected to the flows of supply and demand.

PUBLIC DEPOSITS AS BANKS

In the Netherlands, deposits known as *Grondstoffendepots*, or 'material banks', are sites where surpluses and shortages are managed, and where everyday construction elements and materials are eventually repaired and stockpiled. According to the Cambridge Dictionary, the verb 'to pile' refers specifically to the accumulation of a supply of something, especially during a shortage or an emergency, to keep it available for future use. One or more 'material brokers' then match the specific characteristics of the recovered materials with public works under construction and with their designers, assisting with organizing deconstruction, dismantling and reclassification.

The role of these increasingly widespread banks has become more relevant over the past decade in the Netherlands. During recent energy crises, energy supply shortages have raised both the direct and indirect production costs of essential materials such as bricks and concrete. For example, the cost (input price) of new housing building materials in the Netherlands has risen steeply over the past five years, impacting bricks and concrete in particular.[6] Across Europe construction costs have risen significantly, with most countries, especially since 2021, experiencing a double-digit increase in construction prices according to Eurostat (2024).[7] These conditions clearly favour the reuse of materials and practices of recovery and restoration.

In 2016, the Netherlands set itself the goal of achieving a fully circular economy by 2050. This ambition needs to be underpinned by a new design agenda for availability, oriented towards the rethinking and repurposing of existing resources, rather than the continued extraction and consumption of new ones. In response to this objective, within the private sector, a network of dealers in reclaimed building materials and construction fragments, supported by well-known digital platforms such as Salvo or Material Reuse Portal, has expanded and gained prominence.[8]

Research projects like Interreg FCRBE, or Assemble's and ROTOR's practice and research, serve as key references in this context.[9] In addition, a number of Dutch municipalities and provinces have produced municipal or regional strategic visions and programmes. However, these programmes tend to focus on urban governance, discussing policy analysis and management directives rather than focusing on the spatial requirements and landscape impact within the urban context.

My aim here is to expand and diversify the abstract idea of 'materials' by analysing the first step in the reuse trajectory of three different typologies, namely *bricks and tiles*, *soil* and *trees*.

Bricks and tiles are materials that often have 'standard' characteristics and widespread use. Furthermore, their reuse is more easily linked to an economic benefit. Soil reuse is an overlooked issue that has a large and complex impact on both construction and landscape. Finally, trees are an important material from the perspective of increasing urban greenery and mitigating urban heat, managing maintenance costs and increasing biodiversity.[10] In this regard, the article briefly examines three types of spaces that host these materials, comparing their characteristics and the interpretations of 'availability' they entail.

MATERIAL BANK

As part of the European-funded Preuse project, the city of Utrecht recently opened a pilot public depot.[11] In 2023, the city decided to acquire a plot of land of approximately four and a half hectares for the storage of materials salvaged from demolitions or from public

3. Material bank, view from the Amsterdam-Rijnkanaal, Utrecht (photo C. Pradel)

works, with the aim of facilitating their repair and cleaning, and making them available for subsequent projects.[12] The depot site, located in the Lage Weide district on the industrial periphery of the city, provides both covered and uncovered space for the storage of street furniture and materials salvaged from public projects, particularly road renewal works: paving bricks, stones and concrete tiles.[13] The municipality has currently singled out six standard types of paving material (commonly used materials are easier to reuse in new city projects) along with several less frequently occurring types. Overall, the materials are organized into around twenty different categories. For example, piles of paving bricks from the aforementioned Amsterdamsestraatweg have been stored ready to be reused in future road projects. The Preuse project report notes that the city of Utrecht has seven million square metres of pavements.

Road access to the depot is flanked by a railway embankment, which isolates the strip of land close to the canal from the rest of the industrial area to the west. This embankment, along with high fences and a gate, helps limit and control access. Looking east from the bank of the Amsterdam-Rijnkanaal – which offers an important dock for materials transported by barge and is bordered by orderly rows of regular freestanding and semi-detached houses with well-maintained gardens – the storage space is clearly visible (fig. 3). It is precisely this side that effectively reveals the actual connection with the urban realm, making for a dynamic horizon that is close to the water as well as to the residential area. Artificial mounds of materials give form to a kind of 'jumbled museum' of stones, bricks, tiles and small-sized furniture, choreographing a landscape of 'heaps of rubble tossed down in confusion'.[14]

4. Material bank and changing landscape, Utrecht (photo C. Pradel)

Unlike a bank institution, where accumulation of funds reflects the health of an account, a certain ambivalence is evident in depot sites: surface deposits convey the idea of a material reservoir for the city, but are also suggestive of a misalignment between the supply and demand for reusable materials, as well as overproduction and obsolescence. Conversely, an empty space might signify an active, rapid alignment of material exchange between deconstruction and construction projects, an effective urban metabolic dynamic and high transformity of architectural objects and processes.[15] The perception of space lends itself to another dichotomy: it is difficult to disassociate piles of extraction-based materials from the depletion, dispossession, mining and energy consumption they entail. Yet, in this instance, accumulation isn't strictly about profit, since the materials aren't sold externally, and are instead managed within the city. In fact, these depots represent a radically different distribution of materials, one that is closer to a cooperative bank. Moreover, one might almost see these material landscapes as a 'naturalization' of the view, as if the mine dump had always been there, undergoing continual modulations.[16] 'Materials shape-shift as they move in and out of human controlled systems, challenging us to think of them as both formed through human action and also as having lives of their own' (fig. 4).[17]

The interstitial depot in Utrecht starts to reveal a spatial potential, somewhere between the ordinary and the extraordinary, that falls outside the scope of standard planning and diverges from urban design principles.[18] This becomes even more apparent when considering soil deposits. If one extends one's gaze beyond the Utrecht Public Material Bank, immediately behind the embankment an even more variable horizon opens up. Delineated by mounds of earth in various colours is another materials bank, in this case one that specializes in the recovery of polluted soil (fig. 5).

SOIL BANK

In the Netherlands, a *grondbank* is a physical site and an organization that regulates the logistics of soil flows released during excavation works. It receives and classifies parcels of soil in line with environmental regulations such as those laid down in the Soil Quality Decree (Besluit bodemkwaliteit). The site can be regarded as a temporal archive where diverse typologies of soil (from costly, different-sized gravels, to more common and less expensive sand) are collected and stored. In these banks, partitions made of recycled concrete blocks are frequently used to temporarily organize piles of earth, thereby creating distinct 'materials rooms'. At the perimeter of the deposit area, 'monumental walls' made of lower-quality and industrial soils mixed with cement are constructed.[19] They

serve as both visual and noise barriers, especially on sites adjacent to residential areas or infrastructure (figs. 6, 7). These deposits are connected by land and water to a large network that extends well beyond national boundaries. As such, they are tied to a complex constellation of landscapes that are continuously being excavated (construction sites and quarries, for example) and filled (renaturalized areas, dams or agricultural land), involving substantial movements, transactions and flows, backflows and reflows of materials.

Unlike the publicly managed Utrecht materials bank, many well-known *grondbanks* are private enterprises. A medium-sized private *grondbank* company such as Grondbank GMG, which currently operates some 25 bank sites, provides services for the collection, temporary storage and reuse of soil.[20] It is linked to several West-European extraction landscapes and construction sites that generate excavated soil and recyclable materials. Because the demand for natural raw materials surpasses domestic availability, recycled aggregates represent a huge and expanding market opportunity, which currently represents roughly 20-35 per cent of newly extracted raw materials.[21] This huge movement of soil is largely overlooked. For example, a recent study of the demolition process in Antwerp, conducted by the Testaccio Collective of TU Delft University, showed how approximately ten thousand tons of soil produced by the excavations for the demolition and reconstruction of a school, were directly transported by ship to two different Grondbank sites.[22]

5. Soil bank in Utrecht (photo C. Pradel)

6 AND 7.
Construction of an earth wall along the perimeter of a soil bank in Utrecht (photo C. Pradel)

8 AND 9.
Kesselse Waard, renaturalization and deposition of soil, Maren-Kessel (photo C. Pradel)

In particular, more than half of this material was used to fill a former clay quarry on the river Maas, as part of the renaturalization of the river basin and its shorelines, as part of a Natuurmonumenten strategic project (figs. 8, 9). Supported by renaturalization plans, these regular soil disposal activities aim to offset environmental impacts. However, despite the compensatory intent, the global scale of soil and sand flows presents significant challenges with respect to reliable traceability, without which the reuse and deposition of materials in natural environments may well introduce ecological risks, including potential inaccuracies in the mapping of sand flux and sediment flows, and the flawed quality control of materials used for filling.

Because of the public interest involved, municipalities are also taking the initiative here. For example, since 2008 the municipality of Apeldoorn has established a series of public soil banks with the express aim of reducing expensive movements of soils, controlling their quality, facilitating their reuse in a circular economy, and more effectively managing the exchange between demand and supply. Such local soil and sand depots are 'able to operate as a node in the logistic system of the soil and sand market, where supply and demand can converge, facilitating inspection procedures and the immediate availability of this resource, which is not easily worn out'.[23]

The first depot, established concurrently with a housing block development in the Zuidbroek district, occupied about 14,000 square metres, and on average handled a material flow of up to about 23,000 cubic metres a year.[24] Following the closure of this initial site, the municipal 'bank' was relocated to its current open-air site, which is also situated on the periphery of the town and is easily visible from the nearby highway, serving as a changing landmark for those approaching Apeldoorn from the north.[25] Indeed, depending on the time of year and the scarcity or abundance of soils, different cones and landforms created by earth-moving machines present a kind of geo-accelerated morphology. Heaps are perpetually changing over time, subsiding in accordance with the inherent physical and structural characteristics of each material, increasing and decreasing based on supply and demand. The presence of piles of various soil types on which vegetation can spontaneously grow, lends itself to the proliferation of an ecological mélange: these 'unintentional landscapes' are indeed 'typified by an array of so-called pioneer species, specially adapted for the colonization of new substrates, which can engender rapid and unexpected changes in the appearance of urban landscapes.'[26]

In shape and dimension of composition, it recalls the Chris Reed's Stock-Pile garden (Boston, 2011), in which different materials used in the making of urban landscapes, such as soil, sand and gravel, were stacked in an urban yard, planted with ancient ferns and allowed to progressively settle, to test their adaptability over time.[27] Similarly, the installations and projects of Landing Studio, such as Time Lapse Capture (Boston, 2011) and Piles (New York, 2016) works that explore the spatial impact and temporality of sand and road salt stockpiles, interpreting them as temporary choreographies and form-making structures within the urban environment. What makes these examples particularly interesting is that they engage with active and functioning storage and distribution sites, simultaneously soliciting the collective engagement of citizens, making the sites accessible, inviting them to acknowledge, through critical participation, the physical manifestation of the city's global material availability.

TREE BANK

The material bank managed by the city of Utrecht and the soil bank managed by the city of Apeldoorn, do not permit actual interaction with the community, nor are they freely accessible under current regulations. In contrast, another type of bank that is starting to catch on in the Netherlands involves a more proactive role on the part of non-conventional local actors. Temporary tree repositories, or Tree Hubs, are based on the active participation, at various levels, of volunteers and ordinary citizens. These kinds of storages may be conceived as 'tree banks' that facilitate the distribution of excess trees.[28] Indeed, they are in many ways similar to material banks. Instead of construction materials, however, these banks host 'surplus' plants that may have been removed (mainly from November to March), for instance, from a development site, a mound or railway embankment, a construction site, or from an urban park or forest.

These storage hubs can be located on private land, but also on farms or in semi-public community gardens, where unwanted trees can be freely stored after being carefully removed by volunteers (mainly organized by community-led organizations, such as MEER-Groen or Meer Bomen Nu) to be distributed later free of charge to anyone who requests them (figs. 10). Meer Bomen Nu, in particular, provides a detailed online instruction kit for setting up a tree bank, as ideally any ordinary residual open space of ten square metres or more can be used for tree storage purpose. For example, a community garden on the northern periphery of Utrecht, which is open to the public on week days, periodically hosts a hundred small trees deposited in small heaps scattered across the five-hundred square metres of set-aside land and fallow fields. Trees (typically native species with a small diameter and from 0.5 to 2 metres high) can be temporarily stored for short periods on the open ground, or they can be dug in and later replanted elsewhere. This process of collection and re-distribution facilitates the maintenan-

10. Harvesting of trees for the tree bank (photo John van Loon, courtesy of Meer Bomen Nu)

ce of existing green public and private spaces, and also supports the processes implemented by various other nature-based solutions. The specimens are freely distributed during open days, preferably as a mix of both trees and shrubs, thereby establishing diverse planting palettes to ensure that ecological resilience is maintained.

The tree banks are not necessarily aesthetically pleasant natural landscapes. Rather, they are spaces that remain open and accessible to (episodic) care protocols, have a necessarily frugal design, and a dirty and 'unfinished' character that distinguishes them from the manicured context of the neighboring countryside. They represent a space linked to repeated gestures and unstated activities, showing 'the path to perceiving the maintenance of nature as a revolutionary practice', involving 'economy and repair in terms of materiality and attention to human and nonhuman living organism'.[29] A reconfigured system of resource exchange, based on reuse, reciprocity and circularity redefines the principles and logic of 'giving and taking', of sharing practical-poietic knowledge, and taking care of the environment, challenging the dominant 'take-make-waste' paradigm (fig. 11).

REFLECTIONS

Beyond highlighting the relevance of practices linked to material reuse and clarifying how different typologies of materials collection and storage occupy spaces and shape ever-changing landscapes, the three cases examined above can be interpreted as different articulations of spatial practices that might be termed 'designing for availability'.

Although these 'banks' are often both physically and conceptually linked to marginal zones, situated on the edges of industrial areas or located on residual lots between urban and rural contexts, they are anything but marginal. On the contrary, they are embedded within the very core of the constructive systems (processes) that shape urban and landscape transformations, providing a ground for rethinking the value of materials – whether mineral or natural – beyond the economic one, and beyond normativity and standard judgements. Spaces of availability are characterized, in particular, by:

LAYERED VALUES

In the three types of public 'banks' examined here, we see an emerging material value that is not exclusively monetary.[30] Significant ethical and ecological components often occur, together with a tacit but powerful invitation to (re)formulate a creative design approach to the resources' accessibility and readiness for reuse.[31] Designers, for example, might make experimental, or at least unpredictable, decisions based on the available materials and therefore shift the value from

11. Storage space close to the tree hub in Utrecht (photo C. Pradel)

the specific, final object to its design process. At the very least the materials may embody an historical, even geological, or emotional value connected to the place, the work, or the building from which they were recovered, and a sense of latent potentiality, which connotes available components and refers to their possible future transformations.[32]

In summary, the material banks stage the uncoupling of 'heaps' from their exclusive monetary/accumulative value and quantitative meanings, and open up broader and more stratified implications.

AVAILABILITY OF SPACE

In each of the examples discussed above the issue of availability and, conversely, scarcity, does not seem to relate exclusively to the materials themselves, but also to the space for their management.

Normally, materials are stockpiled on less valuable land for a limited time (around one to three years on average for the material banks, about three years for the soil bank, and one season for the tree bank). However, the need for additional spaces for recycling and storage is also urgent and not yet regulated. Some recent studies hypothesize the distances that would allow the optimal functioning of these storage deposits, minimizing transport and making the sorting of resources more efficient.[33] More radical reflections invite us to rethink the role of public space and to reappropriate the public realm, laying the foundations for a precise and responsive project based on a constellation of micro public depots, or micro technical places.[34] According to Hans Frei and Marc Böhlen, the authors of the 'Micro Public Places' manifesto, free and interstitial urban spaces can be rethought as areas (temporarily) dedicated to material storage, evolving collaboratively through the actions of many different actors.[35]

A NETWORKED ECOSYSTEM

Numerous areas dedicated to the storage of rocks, marble and stone flourished along the Tiber River between the first century BC and the ninth century AD. Their purpose was to collect, re-work and adapt materials before they were reused, thereby complicating the identity of the resulting constructions. In the history of ancient and medieval Rome, we encounter many such spaces, which were often open-air yards, for like the depots near the port of Ostia or the small open-air depots adjacent to the Temple of Portuno or to the Forum Pacis. They were called 'gardens of rocks' or, transposing the words, we might call them 'material gardens' (fig. 12).

This concept effectively conveys the proliferation of spaces, of varying size and scope, that together constitute a structural network for material accumulation, strategic disposal and collection of architectural frag-

12. Forum Pacis in Rome (photo C. Pradel)

ments, reuse inventories, places for both official and unofficial exchange, sites where new social behaviours can take place and 'landscapes are made public'.[36] Moreover, the notion of gardens suggests spaces that are bounded and local, and, in times of scarcity, it carries inflections of minimalism, frugality or, vice versa, availability and sustainability.[37]

As Kiel Moe explains, 'architecture is an instantiation of building that inherently involves more resources – be it of matter, energy, information, wealth, ambition, desire, or labor...the constitutive resources necessary for building puts architecture in a nontrivial position in the metabolic economy of terrestrial material and energy systems'.[38] In the approaching era when reuse becomes the dominant paradigm, 'architectural design should not merely focus on an object, but on its terrestrial basis, and develop mutually reinforcing terrestrial systems. [Architecture should] design the object and the system, the log cabin and the forest.'[39]

Material gardens thus become places for exploring how operational characteristics of materials availability can expand the conventional realm of design.

I would like to thank Sonja Dijkman-Elskamp, Leon van Elzakker, and Noortje Voulon for sharing information and data on Apeldoorn and Utrecht material banks and on the soil banks of GMG company.

NOTEN

1 'Assemblages are ad hoc groupings of diverse elements, of vibrant materials of all sorts. Assemblages are living, informal, throbbing confederations that are able to function despite the persistent presence of energies that confound them from within.' In J. Bennett, *Vibrant Matter: A Political Ecology of Things*, Durham/London 2010, 24.

2 The *Weak Monuments* research presents a collection of seemingly insignificant architectures and public spaces, whose political, social and architectural relevance is brought into relief through contrast. T. Říha, L. Linsi and R. Reema (eds.), *Weak Monument: Architecture Beyond the Plinth*, Zürich 2018.

3 S. Franceschini, N. Hirsch and S. Papapetros (eds.), *Pre-Architectures*, Leipzig 2024.

4 L.R. Lippard, *Six years: The dematerialization of the art object from 1966 to 1972*, Berkeley/London 1997.

5 J. Hutton, *Reciprocal Landscapes: Stories of Material Movements*, London and New York 2020.

6 According to Statistics Netherlands (CBS), the cost of building materials for new dwellings increased by nearly fifteen per cent in 2021 alone. The 'Material intensity database for the Dutch building stock' shows that the material intensity (which measures the quantity of materials used to produce a good) in ordinary constructions – in particular in most demolished categories of buildings such as utility buildings, offices built after the 1970s and post-war residential buildings – mostly consists of concrete and clays.

B. Sprecher et al., 'Material intensity database for the Dutch building stock: Towards Big Data in material stock analysis', *Journal of Industrial Ecology* 26 (2022) 1, 272-280.

7 ec.europa.eu/eurostat/statistics-explained/index.php?title=Construction_producer_price_and_construction_cost_indices_overview.

8 See the Opalis map on professional dealers: opalis.eu/en/dealers/map

9 See, in particular, vb.nweurope.eu/projects/project-search/fcrbe-facilitating-the-circulation-of-reclaimed-building-elements-in-northwestern-europe/.

10 See, for instance, the EU Forest Strategy and commitment to planting three billion trees by 2030: eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0572.

11 The project, under the leadership of Rotor, aims to develop an effective and replicable strategy for the development of reuse centres for construction materials. Two pilot projects are in France, one is in the Netherlands, in Utrecht. See preuse.nweurope.eu/.

12 According to Noortje Voulon, strategic adviser to the municipality of Utrecht, part of the plot is currently rented to another company (interview with the author, 29 August 2025). This helps to cover the expenses, as the project required several interventions to renovate existing buildings and adapt the site to its new function.

13 Banks often emerge in response to specific projects, like the development of new residential neighbourhoods and housing, with storage sites chosen from undervalued, nearby spaces.

14 'Excavations form shapeless mounds of debris, miniature landslides of dust, mud, sand and gravel. Dump trucks spill soil into an infinity of heaps. The dipper of the giant mining power shovel is 25 feet high and digs 140 cu. yds. (250 tons) in one bite. These processes of heavy construction have a devastating kind of primordial grandeur and are in many ways more astonishing than the finished project —be it a road or a building. The actual disruption of the earth's crust is at times very compelling, and seems to confirm Heraclitus's *Fragment 124*, 'The most beautiful world is like a heap of rubble tossed down in confusion.' R. Smithson, *Earthworks*, New York 1968, 45.

15 Justus von Liebig used the term 'metabolism' to describe the exchanges of consumption and feedback that characterize biological systems. See J. von Liebig, *The Natural Laws of Husbandry*, New York 1863. Marx identified a fundamental disruption in the ecological relations between people and the material systems that support them, looking at the increasing divide between town and country. For a deeper understanding of the many implications of this idea in the urban context, see also: D. Peleman, B. Notteboom and M. Dehaene, 'Fragments of a Changing Natural History of Urbanisation', *OASE* 104 (2019), 1-11.

16 'This adaptability is more than the flexibility to accept a new situation. It is stronger than mere acceptance… as these landscapes finally…become an object lesson in provisionality, undergoing continual modulation as they host transformative earthworks, mounds of debris, inert waste' W. Kentridge, *Six Drawing Lessons*, London 2014, 88.

17 J. Hutton 2020 (note 5), 7.

18 For example, J. Hwang, 'Generatinve Zoning: Mining the City Toward Novel Ecologies', in N. Bouchard, *Waste Matters: Adaptive Reuse for Productive Landscapes*, Oxon 2021, 169-179.

19 The research project 'Monumental Ground' (2022), exhibited at the 19th International Architecture Biennale in Venice, maps the dislocation of millions of cubic meters of excavated inert material during the construction of the AlpTransit railway (1992–2020), and identifies, among others, the construction of 'monumental walls': artificial partitions or dykes made with excavated soil that have been displaced within the landscape.

20 According to Leon van Elzakker, project leader of the Grondbank GMG company, the operating radius of each bank for the collection and distribution of soil should not exceed about forty kilometers (interview with the author, 26 June 2025).

21 'The primary raw materials used in construction, particularly coarse and fine sands, face challenges in terms of supply. The total extraction of regularly used primary raw materials ranges from 55 to 80 million tons, with backfilling sand accounting for approximately 66% of this activity. The supply of coarse aggregates, mainly sourced from Limburg in the southeastern part of the country, constitutes only 7% of the total supply, resulting in a significant demand-supply gap for coarse aggregates. To meet this demand, around 70% of coarse aggregates are imported from countries such as Germany, Belgium (Wallonia), Norway, Scotland, and the UK, often requiring transportation over distances exceeding 100 kilometers.' See J. Hubert, F. Michel and L. Courard, 'Sand resources in North West Europe', in *INTERREG NWE CirMAP* (2024), 36.

22 The Testaccio Collective's research project is entitled 'De-Molire' and is led by Eireen Schreurs, Chiara Pradel, Peng Lee. See: www.tudelft.nl/bk/onderzoek/projecten/material-culture-collective. The research, alongside other insights, underlines how transporting soil by boat to deposit sites offers significant economic and environmental savings. A single boat can carry over three thousand tons of soil, while a truck normally carries a maximum of twenty cubic metres.

23 A.G. Entrop, 'Developments to come to a circular construction economy: Experiences in facilitating a local soil and sand depot', in *Earth and Environmental Science* 855 (2021), 5.

24 Entrop 2021 (note 25), 7.

25 According to Sonja Dijkman-Elskamp, project supervisor with the municipality of Apeldoorn and responsible for the city's circular banks, a new relocation of the soil bank is planned soon (interview with the author, 1 July 2025). The value of the municipal land hosting a *grondbank* may in fact increase over time making it economically disadvantageous to use it as a depot, or it may conflict with nearby urbanization projects. Furthermore, the space requirement for storing material tends to grow over time.

26 M. Gandy, *Natura Urbana: Ecological Constellations in Urban Space*, Cambridge MA 2022, 91-92.

27 The spontenous growth of vegetation on the mounds evockes Gilles Clément's concept of the Third Landscape, in which abandoned parcels of land, that have been altered by human activity, evolve without deliberate human intervention. See J.D. Hunt, *A World of Gardens*, London 2012, 432-433.

28 See C. Pradel, 'Tree Hubs: The city as a sustainable scenario of circular gardens and forests: The case of the Dutch Region', *Techne* 29 (2025), 61-68.

29 C. Malterre-Barthes, 'Maintenance as a Political Act', in V. Grossman and C. Miguel, *Everyday Matters*, Berlin 2022, 197-198.

30 'From a cost-saving perspective, you don't always have to opt for reuse,' says Matthijs Haveman, director of the Utrecht-based road construction company D. Van der Steen. 'Economically, a new tile is cheaper, for example. It might cost 50 cents to make such a tile, and in that case, you don't have costs for an intermediate storage site or transport to and from that location.' However, Haveman emphasizes, 'the depot is certainly more sustainable.' K. Marée, 'In the Utrecht raw materials depot, piles of stones and seesaw stand ready for reuse', *NRC*, 19 March 2025, www.nrc.nl/nieuws/2025/03/19/in-het-utrechtse-grondstoffendepot-staan-stapels-stenen-en-een-wipkip-klaar-voor-hergebruik-a4886913.

31 'Ethics bears on what, qualitatively, a process can do, and in what direction that capacitation leads. It evaluates the singular how of "an immanent power's" mode of operation, as it consequentially unfolds. The project of a revaluation of values to give value its qualitative due takes the path of a processual ethics. Processual ethics is thoroughly relational. The immanently self-powering modes of existence it concerns come in multiples

and mutually inflect. This qualifies it as an ecology, in the broadest sense' B. Massumi, 99 *Theses on the Revaluation of Value: A Postcapitalist Manifesto*, Minneapolis 2018, 4.

32 'Tracing materials back to the land can reveal how certain properties (the durability of certain wood or the shininess of a stone, for example) are not merely 'useful' attributes, but how they are physically related to unique, local biophysical conditions'. Hutton 2020 (note 5), 7.

33 See, for example, the research by Tanya Tsui, Cecilia Furlan, Alexander Wandl and Arjan van Timmeren, which defines spatial parameters for locating circular construction hubs in the Netherlands. T. Tsui et al., 'Spatial Parameters for Circular Construction Hubs: Location Criteria for a Circular Built Environment', *Circular Economy and Sustainability* (2024) 4, 317-338.

34 See H. Frei and M. Böhlen, *Situated Technologies Pamphlets 6: MicroPublicPlaces*, New York 2009, and the research by Tomas Ooms and by Studio Tuin en Wereld, Mike Viktor Viktor architects on Micro Public Material Depots: studio-tuin-en-wereld.tumblr.com/post/673898190114832384/mp-md-2043-awarded-bwmstr-label-027-the-micro.

35 Among other examples, it is worth mention here the 'Holding Pattern' installation by Tobias Armborst, Daniel D'Oca, Georgeen Theodore at MoMA PS1 in Queens, New York. See T. Armborst, D. D'Oca and G. Theodore, 'Holding Pattern', *OASE 96* (2016), 19-23.

36 To make landscape public means to convey 'the imagination of a new public, the assembling of new groups around specific spatial projects'. In this way, 'landscape makes social developments tangible, and has the capacity to appeal to and make demands on the public'. M. Dehaene, B. Notteboom and H. Teers, 'Making Landscape Public/Making Public Landscapes', *OASE 93* (2014), 7.

37 N. Milthorpe (ed.), *The Poetics and Politics of Gardening in Hard Times (Ecocritical Theory and Practice)*, London 2019, 8.

38 K. Moe, 'Metabolic Rift, Gift, and Shift', in N. Axel et al. 'Accumulation: The Art, Architecture, and Media of Climate Change', Minneapolis 2022, 306.

39 K. Moe, 2022 (note 40), 308.

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MATERIAL GARDENS

SPACES OF MATERIALS RECOVERY

CHIARA PRADEL

Recently, the notion of material harvesting, collection, and reworking has gained significant attention as a crucial step in understanding essential aspects of building culture, particularly in relation to reuse, material scarcity, or, conversely, material availability. The 'Recycling Beauty' exhibition (Fondazione Prada, Milan 2022), which displayed Greek and Roman spolia, marble fragments, and pieces of sculptures placed alongside one other, alluded to practices of appropriation and possession, to the relationship between craftsmen and found resources, and to the need to store and preserve material in times of scarcity or political uncertainty. Similar questions have emerged in Dutch and Belgian contexts, for example, from research into the work of designer Marcel Raymaekers and his way of organizing salvaged materials (Marcel Raymaekers, pioneer in circular architecture, Vai, Antwerp 2023). Besides highlighting the relevance of practices linked to material reuse, exhibitions and installations also make clear by their very organization, how material collections take space and, at the same time, sculpt ever-changing landscapes.

Building on these premises, and shifting the focus towards contemporary and less curated cases, this article critically examines the purpose, spatial qualities and configurations of three material storage typologies in the Dutch context – bricks and tiles, soil, and trees – highlighting their pivotal role in relation to material accessibility and availability. These sites, termed 'material gardens', are understood as experimental laboratories or 'banks', where the notion of availability is translated into the allocation and management of (material) reserves.

Though often overlooked and considered marginal, such open spaces are in fact key sites where design and other creative processes are crucially tied to resource allocation and disposal, and impact collective imagination and practices. They are increasingly being positioned at the core of construction and deconstruction processes, raising relevant ecological questions and helping to shape tacit knowledge on material reuse.