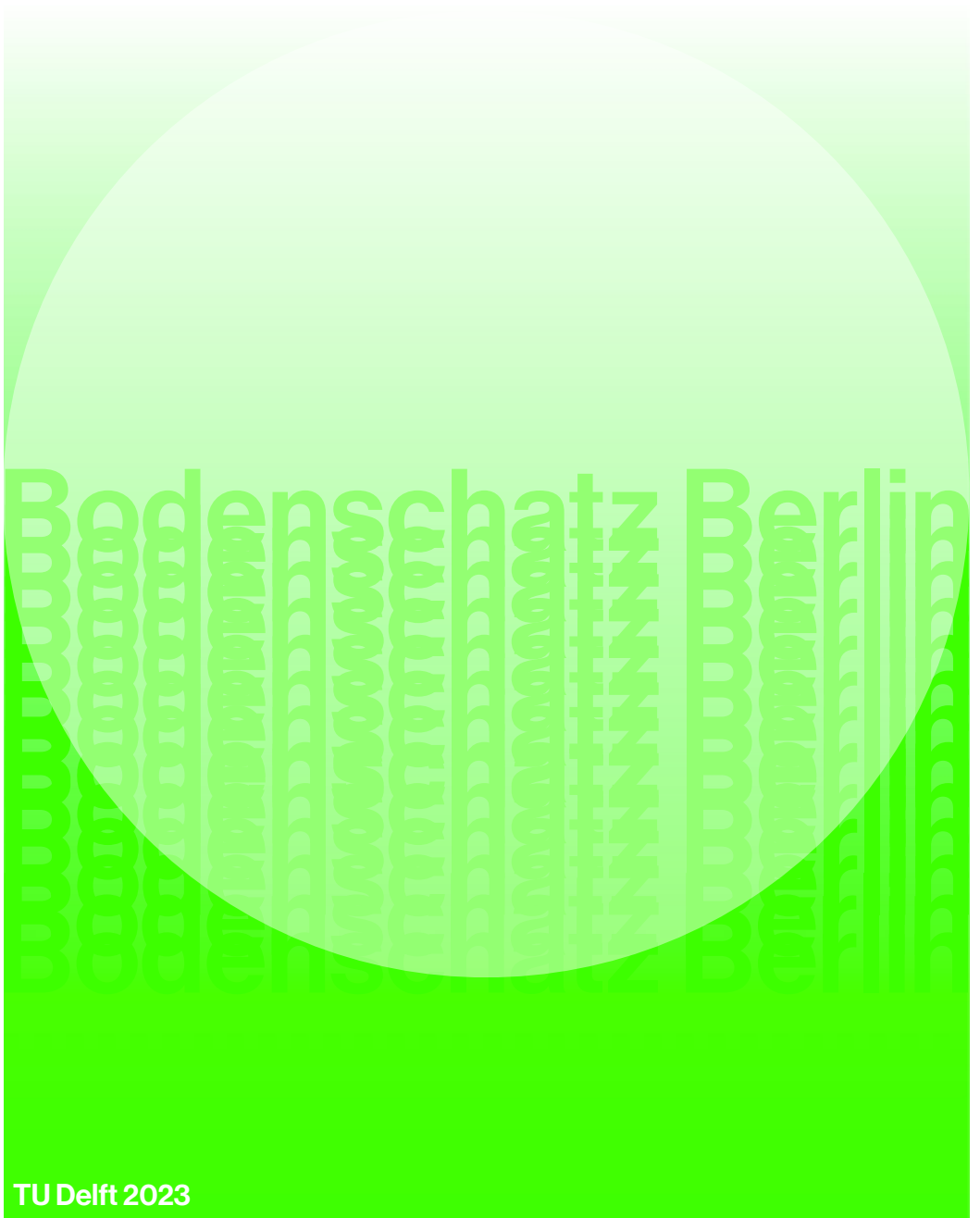


Bodenschatz Berlin

Preparing the Ground with Design Science Fiction

Fynn N Mengel



**Bodenschatz Berlin: Preparing the Ground with Design Science Fiction.
M.Sc. Architecture Thesis 2022/23
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A compelling economic science fiction is mathematics disguised in a well-crafted storyline (Noorizadeh, 2018)

The philosophers have only interpreted the world in various ways. The point, however, is to change it (Marx, 1845)

Strictly and precisely speaking, utopia is not a genre but a socio-economic sub-genre of Science Fiction (Suvin, 1972)

On the internet, no one knows you're a dog (Steiner, 1993)

Architecture is not simply about space and form, but also about event, action, and what happens in space. (Tschumi, 1979)

I think that out of this place of no law that is the Internet there will soon emerge a new law, completely different from that which organized our old metric space (Serres, 2014)

The essence of technology is by no means technological (Heidegger, 1954)

And we, spectators always, everywhere, looking at, never out of, everything!

(Rilke, n.d.)

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A compelling economic science fiction is mathematics

Ich danke meiner Familie und meinen Freunden, die mich in dieser Abgabe maßgeblich und vielfältig unterstützt haben. Besonderer Dank gilt meinen Eltern, Johann Steffens und Johannes Bergmann für ihre Expertise und ihr Feedback für den schriftlichen Teil der Arbeit.

Further I want to thank Rachel Lee, Georg Vrachliotis and Rufus van den Ban for their responses, references and reading in a process oscillating between thicket and thickness. They have aided me to maintain creative optimism throughout the project. With their help, an at times airy intuitive exploration was brought down to earth and became bodenständig.

Для Марии, которая должна отметить этот выпуск вместе с нами.

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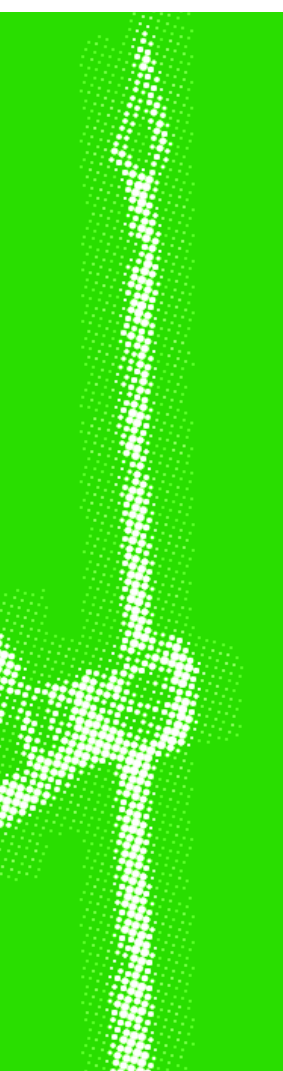
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PREFACE



FACE

The point, however, is to change it...

Karl Marx, 1845

Boden — a German term that can refer to soil and land, ground and floor, territory and habitat. Overhearing Boden in Berlin's streets these days will however oftentimes result in tuning into a conversation about land ownership, the soaring cost of living and the city in transition. People, it seems, are worried. They are increasingly affected by effects of market processes, speculation, a marginalising financial approach* towards the city. Therefore, "Boden" in Berlin has been conceptualised for discussing processes originating in and revolving around land tenure. In turn, the tangible qualities and positive notions are covered up, buried by a merely technical and somewhat pessimistic discussion. The inherent ambivalence is leaving Berlin's Boden, stripping it off its multiple social and ecological facets: Boden has become a bare quantifiable medium.

This overheard finding is the spark of this thesis. While unsuccessfully searching for a singular English translation of Boden, I started to discover more and more dimensions, relations, associations with the term (also see genealogy). Thus, the question arose: Can we solve the multi-dimensional issues Boden faces in Berlin by exploring its stratified character, its layers of meaning? How can Boden in the city become tangible, meaningful, a resource - Bodenschatz - again? Can Boden itself become an ally for the city's inhabitants to solve the Bodenfrage issues?

The resulting proposal, *Bodenschatz*, is a multi-layered exploration of dimensions comprised in Berlin's Boden. This is approached by science fiction: taking into account the status quo of science and research, it is reimagining urban futures as a fictional prototype of cyber-socio-ecological cohabitation on Berlin's Boden. Its main vector is not analysis but action towards re-taking socio-ecological urban agency in Berlin.

The aims of *Bodenschatz* are enveloped in a territorial legend of Berlin's prehistoric swamps. Mythological narratives have once paved the way for human habitation in the terraquaeous landscapes of Berlin's Urstromtal. The point of departure for the project is traced back to these eternal songs and alliances with a seemingly hostile territory. In the updated version of this myth, there is a magical connection with the ancient spirit whose songs spill over into today's swamps of land speculation, social marginalisation and missing socio-ecological understanding. As they did in the past, stories mediate between territorial entities from the anthroposphere, ecosphere and technosphere to lay the foundation of a renewed alliance. Complexities in the common quest of finding cohabitation in an all-entangled city are approached by engaging magical elements enchanting systemic interweavings, growth paradigms and pragmatic necessities in an all-encompassing, accessible science fiction utopia.



The songs of old-slavic deity Triglav are the point of departure for the project's narrative approach Contemporary representation via Müller & Bigl (2020), <https://image.jimcdn.com/app/cms/image/transf/none/path/sd2f448b6b36203f1/>

This thesis comprises of three strategies:

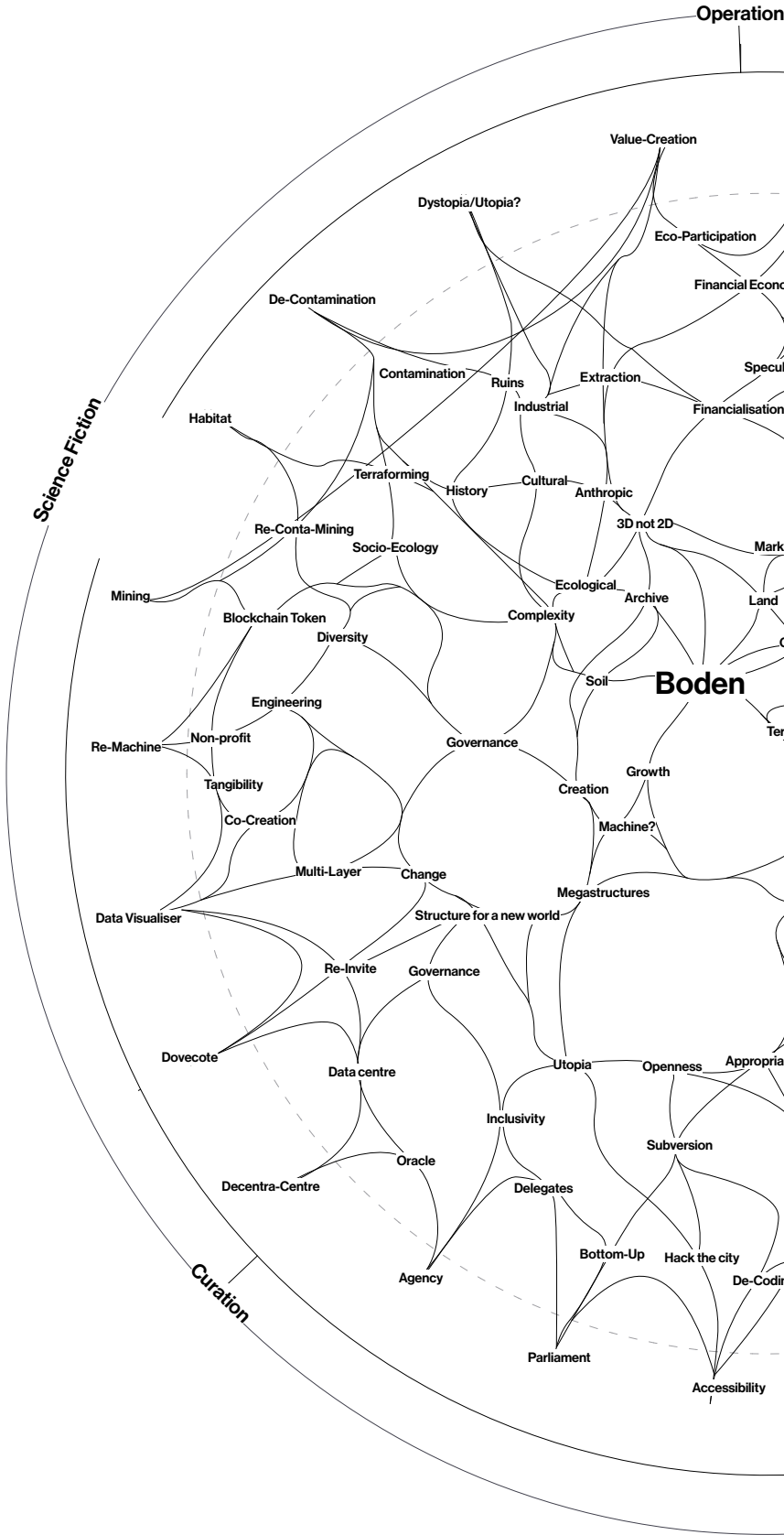
- I. Subversive counter-speculating within Berlin's land tenure complex
[Operation]**
- II. Capturing Boden's multi-dimensionality into inclusive narratives
[Narration]**
- III. Designing physicality of previously intangible urban processes
[Design]**

I. Operation lays out an acupuncture strategy for subverting land ownership in Berlin. The ground is prepared for inclusive socio-ecological futures by strategically using technology to create alliances between ecosphere, anthroposphere and technosphere. Rooting in theory like Michel Serres' *Natural Contract* (1991), multi-species cohabitation is reinterpreted along the involvement of „machines of loving grace“ (Brautigan, 1967). The outcome of this part is a White Paper in its character as a digital business venture roadmap, describing the theoretical, technical and operational framework of a prototype amalgamating Community Land Trust models, eco-inclusive urbanism and blockchain technology.

II. Narration is rooting in the territorial myth enveloping the whole project. The relationship with the ground is therefore redeveloped with a mythologising and enchanting approach of including non-human actors like machines and organisms into an optimistic sonic vision of future cohabitation. The field research has followed fragmentary visual and sonic traces in „audiovisual archaeology“. These samples are, on the one hand, used to create an open-source database of sonic elements, free to be used for building songs, chants, fictions. This part is made accessible for actors to be discovered, reworked, appropriated. On the other hand, the print format showcases an audiovisual representation and pairing of selected research samples. The main narrative string revolves around acknowledging non-human actors and their respective role in the spatial genesis of the city.

III. Design, the curative part, translates the concepts mentioned into a concrete physical form. It is an architectural approach towards the topics of soil, data and agency in the city. Three mostly intangible entities are physicalised with the aim of creating a locus of change in Berlin. The structure is a programmatic reflection of the other parts of the research, as it is following the science fiction approach by providing spaces for the successful implementation of the operative and narrative schemes. The building assumes form along the notion of machines and gardens, in this context revisiting theoretical and technological precedents and working towards the creation of a space of agency in a machine garden – or garden machine?

Each of the three strategies is rooting and relating back to the all-encompassing myth, which serves as the foundation of the project and is translated into the different bodies of work congregating to the resulting operative scheme, the science fiction prototype Bodenschatz.



Bodenmanifest

Science

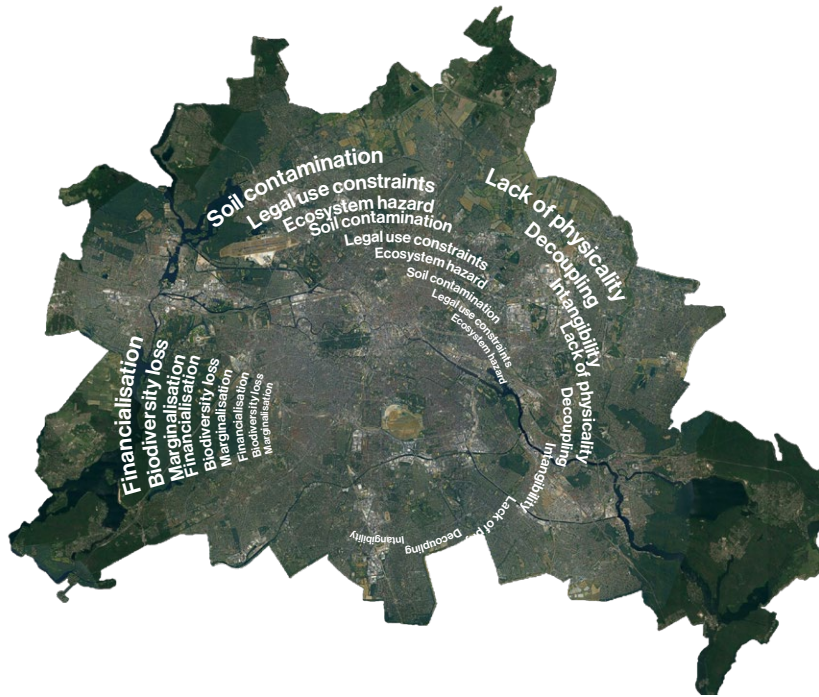
Berlin's *Bodenfrage* discussion, which this thesis is responding to, is critically engaging with the socio-economic transition of land from an urban social resource to a global financial asset, imposing changes and challenges on the city and its inhabitants. The temporal urgency of these financialisation processes in Berlin is accelerating: In the three decades from 1989-2019, a total of over 17'000'000 m² of public real estate has been commodified and sold to private investors (Schüsckke, 2019). This has already resulted in an ever-increasing housing affordability crisis and decreasing urban biodiversity due to profit-driven developments, over-densification and urban fragmentation. Out of the several urgencies linked to this, the project is therefore mainly motivated by the loss of public control and social agency over urban land, the linked implications on biodiversity and the high degree of socio-spatial marginalisation.

Berlin simultaneously comprises over 11'000 sites of anthropic contamination in its perimeter (Senatsverwaltung für Mobilität, Verkehr, Klimaschutz und Umwelt, 2022). This number raises several urgent concerns: First, contaminated land is legally constrained in its use, so urban land scarcity exacerbates accordingly. Second, contamination threatens biodiversity. Berlin's 5800 ha of fallow brownfields are gladly seen habitats for ecological actors, yet are - if contaminated - on the long run dangerous, for instance limiting organisms' reproduction and in some cases halving their lifespan (Meuser, 2012). Third, contamination is a hazard for the ecosystem and therefore human health. As pollution particles like VOCs transition into air and (ground-)water, they become nearly unavoidable parts of systemic cycles. With Berlin's groundwater levels rising, this becomes even more urgent: 20% of the city centre's groundwater already overshoots critical levels (KWS Geotechnik, 2012).

Both of these challenges of Berlin's Boden are affecting the human and non-human inhabitants of the city. At the same time, they lack (spatial) physicality. Only symptomatic glimpses of the urgency are visible and traceable. For the wider public, let alone the actors of biodiversity's realm, these glimpses are inaccessible and intangible: The effect is decoupled from its cause. This third problem, a shared issue of the two prior challenges, is also to be addressed with this project.

Fiction

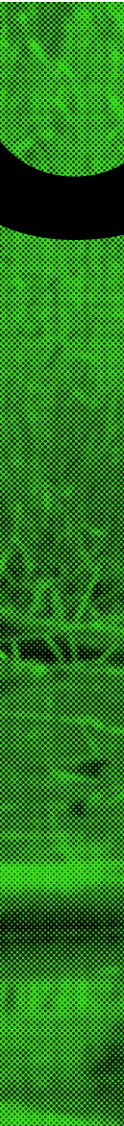
The thesis reflects in the neo-mythological narrative around the resurfaced old-Slavic deity Triglav. The mythological point of departure is emblematic for my overall approach which roots in science yet results in fictitious products. Architecture is understood as a vehicle of spatialising ideas and therefore tangibilising "what-if" scenarios, speculations, suggestions. By overlaying spaces of fiction with spaces of fact, a new sphere opens up between them - science fiction. Proposals to mitigate urban financialisation and ground contamination are spatialised to become the foundation of debates. The project is inviting in associations, responses and ideas from its audience, which is its main impact. My science fiction is a fickle path, a non-judgmental scenario that could be read both a utopia or dystopia, but is in any case a relatable, imaginable future.



Bodenfragen

Which role can uncovering, embracing and spatialising the definitional thickness of German *Boden* play in resolving urban challenges like land inaccessibility, soil contamination and ground alienation? How can the dimensions of the term be remixed towards an anticipatory science fiction along?

SCIENCE FICTION



FINANCE ACTION



Ground Chants

Recovering Berlin's
Indigenous Alliances
in the Machine Age

INTRODUCTION	20	Triglav A long-lost companion?
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TRIGLAV

Triglav is a pagan deity of ancient Slavic mythology with three heads. Its myth is the narrative with unifying power for this work, but also a kind of spatial code: Landscapes and their configuration, habitation and ultimately their architecture are decoded with its power; the myth speculates on the complex interactions of an eco-cyber-social urban future. The animistic myth of a figure whose songs and chants made landscapes navigable even in the original narratives is now intended to act as map, territory and prophecy, as it were - an approach to landscape as reconciliation between anthroposphere and ecosphere. Transferring the power of the real-magical territorial narrative of Triglav from the eponymous swamps of proto-Berlin to today's city and giving it an update is the underlying thesis of this paper. For the Boden has since been understood as Schatz, treasure, as capital and investment for the few. But how can this treasure be lifted to open up an inclusive living space of the future for the community of the many?

We humans, who as rationalising entities open up the territory and make it habitable for ourselves, breathe life into it as curators, as it were. The city is thus recognised and promoted as an idealistic garden and common living space of social and ecological actors. The Stadtboden, urban ground, is a fertile source of co-determination and cohabitation, diversely and in the best case inclusively discussed by all who live or work there. The dynamism and flexibility of such metaphysical narratives allow for spaces in which actors can realise themselves and intervene in history: They are all in the role of gardeners who can influence and shape the landscapes.

Triglav ist eine heidnische Gottheit der alt-slawischen Mythologie mit drei Köpfen. Ihr Mythos ist für diese Arbeit das Narrativ mit verbindender Kraft, aber auch eine Art räumlicher Code: Landschaften und ihre Konfiguration, ihre Habitation und schlussendlich ihre Architektur werden mit seiner Kraft entschlüsselt; der Mythos spekuliert über die komplexen Wechselwirkungen einer öko-cyber-soziale Stadtzukunft. Der animistische Mythos einer Figur, deren Lieder und Gesänge Landschaften schon in den ursprünglichen Erzählungen navigierbar machten, soll heute gleichsam als Karte, Territorium und Voraussage wirken – ein Zugang zur Landschaft als Versöhnung zwischen Anthroposphäre und Ökosphäre.

Die Kraft der real-magischen Territorialerzählung des Triglav aus den namensgebenden Sümpfen Proto-Berlins in die heutige Stadt zu übertragen und ihr ein Update zu verpassen, ist die zugrundeliegende These der vorliegenden Arbeit. Denn der Boden wurde schon lange als Schatz begriffen, als Kapital und Anlage für die wenigen. Wie aber kann dieser Schatz gehoben werden, um der Gemeinschaft der vielen den inklusiven Lebensraum der Zukunft zu eröffnen?

Wir Menschen, die als rationalisierende Entitäten das Territorium erschließen und für sich bewohnbar machen, hauchen ihm gleichsam als Kuratoren Leben ein. Die Stadt wird so als idealistischer Garten und gemeinsamer Lebensraum von sozialen und ökologischen Akteuren anerkannt und gefördert. Der Stadtboden ist fruchtbarer Ursprung der Mitbestimmung und Cohabitation, divers und im besten Fall inklusiv diskutiert von allen, die dort leben oder arbeiten. Die Dynamik und Flexibilität solcher metaphysischen Narrative lässt Freiräume zu, in denen sich Akteur:innen verwirklichen und in die Geschichte eingreifen können: Sie alle sind in der Rolle der Gärtner:innen, die die Landschaften beeinflussen und prägen können.

Ein indigener Mythos wie der des Triglavs kann als überraschend simple Übersetzung für die vielfach verwirrenden Komplexität von Ökosystemen dienen. Die historische Einfachheit der Erzählung, die mit magischen Synthesen komplexe Ab- und Kreisläufe zugänglich macht, wird auf die zunehmend kryptischen Vorgänge und urbanen Verhältnisse des 21. Jahrhunderts übertragen, in der neben einer verwobenen, vielgestaltigen Ökosphäre eine nicht minder undurchsichtige Technosphäre die Form des (Über-)Lebens in der Stadt bestimmt. Etwa wird betont, welche Rolle die Maschine in der Stadt spielt: als Sammelbegriff von technologischen, raumbildenden und zunehmend automatisierten Akteuren durch alle Maßstäbe, vom Betonmischer bis hin zu den Analysetools im Real-Estate Finanzmarkt. Der Mythos entfaltet auch hier seinen magischen Realismus - in dessen Licht wird die Maschine in Berlin nicht nur als ebenbürtiger Terraformer erkannt, sondern auch ihre Rolle in der Allianz aus Ökosphäre und Technosphäre beschworen. Wie im prähistorischen Mythos, in dem Triglav nachts in der verwirrenden Sumpflandschaft den Menschen den Weg leitet, soll die davon inspirierte Science Fiction für diese Arbeit eine Legende sein, die hilft, den Weg durch das undurchdringliche Dickicht der Gärten und Maschinen Berlins zu bahnen. Der Mythos wirkt als Mediator zwischen Ökosphäre und Technosphäre, deren friedliche Symbiose zu einem neuen Umgang mit Stadtboden führen soll: Ein Paradiesgarten für alle.

An indigenous myth like that of Triglav can serve as a surprisingly simple translation for the often confusingly entangled complexity of ecosystems. The historical simplicity of the narrative, which uses magical syntheses to make complex processes and cycles accessible, is transferred to the increasingly cryptic processes and urban conditions of the 21st century, in which a no less opaque technosphere determines the form of life and survival in the city alongside an interwoven, multiform ecosphere. As such, the role of the machine in the city is emphasised: as a collective term for technological, space-forming and increasingly automated actors by all standards, from concrete mixers to the analytical tools in the real-estate financial market. Here, too, the myth unfolds its magical realism. In the light of which the machine in Berlin is not only recognised as an equal terraformer, but its role in the alliance of ecosphere and technosphere is invoked.

As in the prehistoric myth in which Triglav guides the nocturnal routes for humans in the bewildering swamplands, the deriving science fiction is meant to be a legend for this work, helping to pave the way through the impenetrable thicket of Berlin's gardens and machines. The myth acts as a mediator between ecosphere and technosphere, whose peaceful symbiosis is to lead to a new way of dealing with the Stadtboden: A paradise garden for all.



BODENGESANG

Triglav is, according to a pre-Christian myth in the area of today's Berlin, the biblical spirit that hovers above the desolate and empty earth. Translated, Triglav means three-headed, which refers to the fact that he has one head in the past, one in the present and one in the future and can see with his eyes below, on and above the ground. According to legend, he is the vehicle that showed the first Berliners their new home, explained it and thus made it familiar and tangible.

The melting of the great Nordic glaciers dug deep valleys. They had been guests from faraway Scandinavia, where they retreated eleven millennia ago. They became gigantic rivers, sweeping everything away and taking it with them, with the glacier calves to the sea.

The power of the icy stream left no stone unturned. Like the pull of a maelstrom, it tore at the land, crushing stone to grain and grain to sediment. And yet, as suddenly as it appeared, it ebbed away again, and the great ice dragon of the primeval current became a harmless lizard, the Spree. But the valley of the river did not want to let go so easily of the water, its mother who had given birth to it. Land and water became a swampy unity in which no one was able to determine where the land began and the water ended, and vice versa. In their search for a home, the first humans encountered this primeval moor and had to experience how untamed it was: an inhospitable region in which one sometimes waded, sometimes swam, sometimes slid. Sinking and sagging, people marvelled at this land, which they soon titled Berlin, Slavic for "place in the swamp". It brimmed with life, but was not made for living: every path was arduous, every step could be the last, people felt at the mercy of strange, unpredictable and invisible forces. This was not a homely home, however fertile and promising the ground seemed: How would the settlers ever be able to make a living here?

In this hopeless situation, Triglav, the land's spirit of the ground, of the territory, appeared to them. He lived in, under and above the earth - had penetrated it, seen through it and lived through it. Legend has it that he proposed a pact to the settlers, a kind of alliance. They were to pay homage to him through song that was older than Triglav himself. A chant that knew everything: every drop of water in the puddles and every leaf on the birch trees. The settlers were to make a promise to vouch for this song and to pass on its melody to the next generations.

Triglav ist, laut eines vorchristlichen Mythos in der Gegend des heutigen Berlin, der biblische Geist, der über der wüsten und leeren Erde schwebt. Übersetzt heißt Triglav Dreikopf, was sich darauf bezieht, dass er jeweils einen Kopf in der Vergangenheit, Gegenwart und Zukunft hat und mit seinen Augen sowohl unter, auf, als auch über der Erde sieht. Er ist laut der Legende das Vehikel, das den ersten Berlinern ihr neues Zuhause zeigte, erklärte und damit vertraut und erlebbar machte.

Das Abschmelzen der großen, nordischen Gletscher grub tiefe Täler. Sie waren Gäste aus dem fernen Skandinavien gewesen, dorthin zogen sie sich vor elf Jahrtausenden zurück. Gigantische Ströme wurden sie, sie rissen alles mit sich und brachten es fort, mit den Gletscherkälbern zum Meer. Die Macht des eisigen Stroms ließ keinen Stein auf dem anderen. Wie der Sog eines Mahlstroms zerrte er an dem Land, zermalmte Stein zu Korn und Korn zu Sediment. Und doch: so jäh wie er auftauchte, ebte er auch wieder ab, und aus dem großen Eisdrachen des Urstroms wurde eine harmlose Echse, die Spree. Doch des Stromes Tal wollte das Wasser, seine Mutter, die es geboren hatte, nicht so leicht gehen lassen. Land und Wasser wurden zu einer morastigen Einheit, in der niemand mehr festzustellen vermochte, wo das Land anfangt und das Wasser aufhört und umgekehrt. Auf der Suche nach einem Zuhause trafen nun die ersten Menschen auf dieses urzeitliche Moor und mussten erfahren, wie ungezähmt es war: eine unwirtliche Gegend, in der man sich mal watend, mal schwimmend, mal rutschend fortbewegte. Versinkend und versackend staunten die Menschen über dieses Land, das sie alsbald Berlin taufte, slawisch für Ort im Sumpf. Er strotzte vor Leben, aber war doch nicht für das Leben gemacht: Jeder Weg war beschwerlich, jeder Schritt konnte der letzte sein, die Menschen fühlten sich fremden, unvorhersehbaren und unsichtbaren Mächten ausgeliefert. Das war kein wohnliches Zuhause, so fruchtbar und vielversprechend der Boden auch schien: Wie würden die Siedler hier jemals ihr Leben bestreiten können?

In dieser ausweglosen Situation erschien ihnen Triglav, der Geist des Bodens, des Territoriums. Er lebte in, unter und über der Erde - hatte sie durchdrungen, durchschaut und durchlebt. Die Legende besagt, dass er den Siedlern einen Pakt vorschlug, eine Art Allianz. Sie sollten ihm durch Gesang huldigen, der älter war als Triglav selbst. Ein Gesang, der alles kennt: jeden Tropfen Wasser in den Pfützen und jedes Blatt an den Birken.

Die Siedler sollten ein Versprechen ablegen, sich zu verbürgen für diesen Gesang und seine Melodie an die nächsten Generationen weiterzugeben. Der Gesang sollte allen gehören, die hier wohnen und das Land ihr Zuhause nennen. Ein Naturorchester mit einer Vielzahl von Stimmen - von der Erdkröte bis zum Graureiher. Vielfältig stimmgewaltig. Im Gegenzug würde dieser Gesang die Siedler sicher durch die Moorwälder führen. Wer einstimmt in den Gesang der Gräser, Libellen und Flechten, wird ihre Schönheit hören, sie verorten lernen und so durch die Sümpfe navigieren können. Und so konnten sich die Menschen niederlassen und in Triglav's Liedern eine Legende finden, die im doppelten Wortsinn Inhalt hatte: Ja, sie war eine Geschichte, die die ältesten am Feuer erzählten und weitergaben, und ebenso war sie eine Art Landkarte, ein erstes Verständnis des Raumes. Mit dieser Legende waren sie gewappnet für das Überleben, aber es prägte auch ihr Zusammenleben. Eine erste kulturelle Regung, die sich als unabdingbar herausstellte. Mit dem magischen Gesang bewegten sich die Siedler durch die Landschaft, die weder ganz Land noch nur Wasser zu sein schien, wurden selbst Teil einer untrennbaren Allianz des Territoriums. Durch ein Ohr für Harmonien konnten sie so ihre Nische finden – gleichsam in den Liedern und in der Landschaft – und so das Naturorchester bereichern. In dieser Symphonie der Spezies wurde die Landschaft besungen, in ewigen Klängen, die Zeiten überdauern sollten. Triglav nahm sich der Menschen an und stellte ihnen eine Sprache vor, die verkündigte:

*Singen beginnt mit Zuhören
Überleben durch Zusammenleben
Magie lebt im Boden*

Triglav's Magie vermochte die Menschen mit dem unwirtlichen rauen Land zu versöhnen, aber auch, es als Garten zu begreifen, den unsere Vorfahren gemeinsam mit den anderen Bewohnern erschufen und pflegten. Jeder Samen und Kern, den ein Zeisig unbeachtet fallen ließ, schuf neues Leben. Die Lichtungen um die Hütten der Menschen wurden Heim der im sandigen Gras ansässigen Echsen. Die Asche ihrer Feuer machte den moosigen Grund fruchtbar für neue Kräuter. Kurzum: Der Boden im frühen Berlin wurde zum Schatz, zum Paradies für alle - mit Rechten wie Pflichten. Und zum Geschichtsbuch, denn die Generationen des Naturorchesters trugen sich in den Boden ein, während ihres Lebens, aber auch danach.



The song should belong to all who live here and call the land home. A nature orchestra with a multitude of voices - from the common toad to the grey heron. A multitude of voices. In turn, this song would guide settlers safely through the moorland forests. Those who tune into the song of grasses, dragonflies and lichens will hear their beauty, learn to locate them and thus navigate the marshes. And so people could settle down. And in Triglav's songs they found a legend that had content in a double sense of the word: yes, it was a story told and passed on by the oldest around the fire, and equally it was a kind of map, a first understanding of space. With this legend, they were armed for survival, but it also shaped their coexistence. A first cultural impulse that turned out to be indispensable. With the magical chant, the settlers moved through the landscape, which seemed to be neither all land nor all water, themselves became part of an inseparable alliance of territory. Through an ear for harmonies, they were thus able to find their niche - in the songs and in the landscape, as it were - and thus enrich the orchestra of nature. In this symphony of species, the landscape was sung to in eternal sounds that would outlast times. Triglav took care of the people and introduced them to a language that proclaimed:

*Singing roots in listening
Survival through coexistence
Magic lives in the ground*

Triglav's magic was able to reconcile people with the inhospitable harsh land, but also to understand it as a garden that our ancestors created and tended together with the other inhabitants. Every seed and keel that a siskin dropped unnoticed created new life. The clearings around the huts of the people became home to the lizards that lived in the sandy grass. The ashes of their fires made the mossy ground fertile for new herbs. In short: the land, ground and soil in early Berlin became a treasure, a paradise for all - with rights as well as duties. And a history book, because the generations of the nature orchestra inscribed themselves in the soil, during their lives, but also afterwards.

The forgotten moor of our ancestors is still there. Every day we walk past the blue pipes that pump water from the building sites: the water in which our forefathers of Triglav were baptised and into which they gently dipped when life escaped. The water that allowed them to live in diversity and was around them in an eternal cycle. The dams we used to block it out of the growing city have become pompous addresses: Kurfürstendamm, Mehringdamm, Hohenzollerndamm. The Spree meanders like a slow worm in the mighty glacial valley. But beneath all the modern, contemporary life, it still lies, the world of Triglav: the high water table sings of the wild moor, the home of the spirits. In places like the sand pit in the Grunewald, it is particularly noisy.

After the Second World War, Berliners dug there and recovered more and more of the precious sand from which they rebuilt their city. Here lies the birthplace of West Berlin. The silhouette is formed by the sandy gold of the ground - snatched from the earth by hungry machines: ever deeper, ever more, ever greedier. The looters, before moving on to more favourable lands, left incurable wounds. And these behemoths had exposed something in the process. They had broken the thin skin that separated us from the earth spirit. From a small scar in the fabric of history, something of the old songs seeped into the sand pit. It started with tiny dragonflies hovering over that puddle - for it was no more than a puddle. A small cut, a connection between worlds. But big enough to let Triglav pass. He sat down, there, inconspicuous. Weakened, he was, and yet he sang delicately his songs, heard only by the dragonflies, the larvae, seeds and sowings that gradually settled here. He sang to them, told them how they were once at home in dunes, grasses, treetops and boggy puddles.

Das vergessen geglaubte Moor unserer Vorfahren ist immer noch da. Tagtäglich laufen wir vorbei an den blauen Rohren, die Wasser aus den Bauplätzen pumpen: Das Wasser, in dem unsere Vorväter von Triglavgetauft wurden und in das sie anfeintauchten, wenn das Leben entwich. Das Wasser, das ihnen das Leben in Vielfalt ermöglichte und in einem ewigen Kreislauf um sie war. Die Dammwege, mit denen wir es aus der wachsenden Stadt sperrten, sind mittlerweile pompöse Adressen: Kurfürstendamm, Mehringdamm, Hohenzollerndamm. Die Spree schlängelt wie eine Blindschleiche im mächtigen Urstromtal. Doch unter all dem modernen, heutigen Leben aber liegt sie noch, die Welt des Triglav: Der hohe Grundwasserspiegel singt vom wilden Moor, der Heimat der Geister. An Orten wie der Sandgrube im Grunewald ist es besonders laut.

Nach dem zweiten Weltkrieg haben die Berliner dort gegraben und immer mehr des kostbaren Sandes geborgen, aus dem sie ihre Stadt wieder aufbauten. Hier liegt die Geburtsstätte von West-Berlin. Die Silhouette formte das sandige Gold des Bodens - der Erde von hungrigen Maschinen entrisen: immer tiefer, immer mehr, immer gieriger. Die Plünderer hinterließen, bevor sie zu günstigeren Ländereien weiterzogen, unheilbare Wunden im Boden. Und diese Ungetüme hatten dabei etwas freigelegt. Sie hatten die dünne Haut verletzt, die uns trennte vom Erdgeist. Aus einer kleinen Narbe im Gewebe der Geschichte drang etwas von den alten Liedern in die Sandgrube. Es fing an mit winzigen Libellen, die über dieser Pfütze schwebten - denn mehr als eine Pfütze war es nicht. Ein kleiner Schnitt, eine Verbindung zwischen den Welten. Doch gross genug, um Triglav passieren zu lassen. Er setzte sich, dort, ganz unscheinbar. Geschwächt war er und dennoch sang er zart seine Lieder, die nur die Libellen, die Larven, Samen und Saaten hören, die sich hier nach und nach niederließen. Er sang ihnen vor, erzählte ihnen



wie sie einst heimisch waren in Dünen, Gräsern, Baumwipfeln und morastigen Pfützen. Er sang von verwunschenen Landschaften, von zauberhaften Wäldern und magischen Sümpfen. Und er erzählte ihnen von damals. Doch seine letzte Weissagung, die Güte des Menschen, nahmen die Zuhörer ihm nicht ab. Sie waren misstrauisch geworden. Waren es nicht die Menschen, die die Maschinen losschickten über die ganze Stadt? Die Lärm, Zerstörung, Tod brachten? Sie wollten ihm glauben, doch alle Zeichen sprachen dagegen – bis etwas Sonderbares geschah: Die Menschen kamen zurück, nur ein paar. Taub vom Maschinenklang wie sie waren, hörten sie nichts von dem ganzen Gesang. Aber sie vernahmen ätherische Klänge, die in ihnen die dunstigen Geschichten der Vorväter lebendig werden ließen. Sie spürten, dass dieser Ort besonders war. Weil sie dieses Gefühl und diesen sonderbaren Klang nur hier hörten, beschlossen sie, der Sandgrube neu zu begegnen. Hatten hier noch vor kurzer Zeit Stahl und Eisen die Erde vernarbt, so sollte nun genau diese Grube ein paradiesischer Garten werden in Berlin. Der Ort war besonders in dieser flachen, dicht besiedelten Stadt, das erkannten die Menschen wohl. Wo sonst gab es Dünen und Steilhänge, junge Schilfhalme und harte Kiefernstumpfe. Diese maschinengemachte Landschaft war so einzigartig, sie hatte eine ganz eigene Magie. Und so nahmen sich die Menschen der Grube an, wie man einem Garten begegnet. Mit ein paar Handkniffen wollten sie das Leben hierher zurückbringen, nicht nur für die Vögel und Beeren, sondern auch für Menschen, die der Stadt entfliehen wollten. Dieser Ort, einst Werk der tosenden Maschinen, wurde so ein maßgeschneiderter Mantel, der sich sanft um die Schultern kleiner und großer Bewohner legen würde. Und Triglav's Gesang, so leise er auch war, trug durch Menschenhand Früchte, denn die Tiere, Pflanzen und Pilze kamen zurück. Und die kleine Gruppe, die Triglav's Stimme mehr vermutet als gehört hatte, mochte ihren Augen kaum trauen, als sie die Vielfalt des Lebens in der Grube sahen. Sie hatten doch nur nach ihrem Gefühl, nach Eindrücken gehandelt, nach ungesagten Worten, die wiederhallten an den Sandwänden. Die magischen Anweisungen hatten sie nur geahnt, doch nun Vernahmen sie klar und deutlich den Gesang des Naturorchesters im Garten. Dieses wirkte als Verstärker der leisen Stimme Triglav's, der noch immer am Wasser saß und Geschichten über das Leben und Überleben in einer undurchsichtigen und morastigen Landschaft erzählte. Die Tiere, die Pflanzen, die Pilze multiplizierten seinen Gesang mit abertausend Stimmen. Der Boden hatte es geschafft, er hatte Triglav's Lieder bewahrt. Nach so vielen Jahren, in denen die Menschen dachten, sie bräuchten die Gesänge nicht mehr, war in der Sandgrube ein

He sang of enchanted landscapes, of magical forests and charmed swamps. And he told them about the old days. But his listeners did not believe his last prophecy, the goodness of humans. They had become suspicious. Was it not humans who sent the machines loose all over the city? Who brought noise, destruction, death? They wanted to believe him, but all signs pointed against it - until something strange happened: the people came back, just a few. Deaf from the machine sound as they were, they heard nothing of all the singing. But they felt vibrations of ethereal sounds that made the hazy stories of the forefathers come alive in them. They felt that this place was special. Because they heard this feeling and this strange sound only here, they decided to encounter the sand pit anew. If steel and iron had scarred the earth here only a short time ago, now exactly this pit was to become a paradisiacal garden in Berlin. The place was special in this flat, densely populated city, and the people recognised that. Where else were there dunes and steep slopes, young reed stalks and hard pine stumps. This machine-made landscape was so unique, it had a magic all its own. And so people approached the former mine as one would a garden. With a few flicks of the wrist, they wanted to bring life back here, not only for the birds and berries, but also for people who wanted to escape the city. This place, once the work of thundering machines, thus became a tailor-made cloak that would gently wrap itself around the shoulders of small and large inhabitants. And Triglav's song, quiet as it was, bore fruit through human hands, for the animals, plants and mushrooms returned.

The small group, who had suspected Triglav's voice more than heard it, could hardly believe their eyes when they shortly after saw the diversity of life in the pit. After all, they had only acted on their feelings, on impressions, on unspoken words that echoed off the sand walls. They had only guessed at the magical instructions, but now they clearly heard the singing of the nature orchestra in the garden. This acted as an amplifier to the quiet voice of Triglav, who still sat by the water and told stories about life and survival in an opaque and boggy landscape. The animals, the plants, the mushrooms multiplied his song with thousands and thousands of voices. The ground had done it, it had preserved Triglav's songs. After so many years, when people thought they no longer needed the songs, a miracle had happened in the sand pit: At its bottom, human machinery had punctured the millennia-old membrane and brought the spirit out again, and the landscape was its ideal sounding body.

What people had to do was to follow the example of the ancestors: Listen and carry on the song.

Something spilled out of the pit into the city of Berlin. Like a wave, the magical song overcame places that not many would otherwise reach: the former habitats of machines, trains, factories, smoking chimneys and steel cranes. They themselves had moved on, like the sand diggers in the Grunewald. The magic songs, however, saw the broken lands and their wounds, for so many of them were injured. Their soil had been poisoned and denatured over the years by the former inhabitants. No one wanted this land in the city, for no life was possible there permanently, and yet they were oases of unspoiltness, inherent strangeness, precious uniqueness. And soon these places changed. It was as if the earth spirit took them over and breathed life into them again. Soon men and machines moved in and took care of the poison that permeated the soil. They cleaned these gardens. Washed the earth. And with each turn of the sod, with each change, more of the diversity of the orchestra returned. The voices, hesitant at first, gradually louder and more sure, sang songs and spread the song of Triglav across the city. Garden by garden: slowly Berlin began to change. Coexistence returned. People, animals, plants, they all settled there, and they joined in the new song that enabled them to recognise common needs. The new songs gave them language. Even more: now there was a voice for everyone. The songs moved them to seek the best solution for all.

One day, however, they asked themselves how these paradisiacal gardens had come into being in the first place. For neither man, nor animal, nor plant had really unleashed this wave. Was it possible that Triglav had done this? Was his role not only the mystical chanting? And hadn't he been far too weak to draw attention to himself at all? And so the inhabitants wondered who else had set all this in motion if it was none of them. There remained only one possibility, which no one dared say for a long time: It had to be the help of the machines. The people could hardly believe it, because they all knew the machines only as basically anti-human and nature-destroying objects. And yet it seemed to have happened that the song from the pit had reached the machines as sentient subjects. Perhaps it was that the machines, like everyone who heard Triglav's chant for the first time, were sceptical. They had their own orders to follow after all. It had been clearly written into their programme how they had to be, to act, there was no

Wunder geschehen: An ihrem Grunde hatte die menschliche Maschinerie die Jahrtausende alte Membran durchstoßen und den Geist wieder zum Vorschein gebracht, und die Landschaft war sein idealer Klangkörper. Was die Menschen tun mussten, war, dem Beispiel der Ahnen zu folgen: Zuhören und den Gesang weitertragen.

Aus der Grube schwappte etwas in die Stadt Berlin. Wie eine Welle überkam der magische Gesang Orte, an die sonst nicht viele gelangten: die vormaligen Lebensräume der Maschinen, der Züge, Fabriken, qualmender Schornsteine und stählerner Kräne. Sie selbst waren weitergezogen, wie die Sandbagger im Grunewald. Die magischen Lieder jedoch sahen die brachen Ländereien und ihre Wunden, denn so viele von ihnen waren verletzt. Ihr Boden war über die Jahre von den ehemaligen Bewohnern vergiftet und vergällt worden. Niemand wollte dieses Land in der Stadt, denn kein Leben war dort möglich auf Dauer, und doch waren es Oasen der Unberührtheit, denen Sonderbarkeit innewohnte, wertvolle Einzigartigkeit. Und bald veränderten sich diese Orte. Es war, als würde der Erdgeist sich ihrer annehmen und ihnen wieder Leben einhauchen. Bald rückten Menschen und Maschinen an und nahmen sich des Giftes an, das den Boden durchdrang. Sie reinigten diese Gärten. Wuschen die Erde. Und mit jedem Spatenstich, mit jeder Veränderung kam noch mehr der Vielfalt des Orchesters zurück. Die Stimmen, erst zögerlich, allmählich lauter und sicherer, sangen Lieder und verbreiteten den Gesang Triglav's über die Stadt. Garten für Garten: Langsam begann sich Berlin zu verändern. Das Zusammenleben kehrte zurück. Menschen, Tiere, Pflanzen, sie alle ließen sich dort nieder, und sie stimmten ein in den neuen Gesang, der es ihnen ermöglichte, gemeinsame Bedürfnisse zu erkennen. Die neuen Lieder verliehen ihnen Sprache. Mehr noch: jetzt gab es Mitsprache für jede und jeden. Die Lieder bewegten dazu, die beste Lösung für alle zu suchen.

Eines Tages jedoch fragten sie sich, wie diese paradiesischen Gärten überhaupt entstanden seien. Denn weder Mensch, noch Tier, noch Pflanze hatten diese Welle wirklich los getreten. War es möglich, dass Triglav dies getan hatte? Seine Rolle war doch nur der mystische Gesang... Und war er nicht viel zu schwach gewesen, überhaupt auf sich aufmerksam zu machen? Und so fragten sich die Bewohner, wer sonst all dies in Bewegung gesetzt hatte, wenn es niemand von ihnen war. Es blieb nur eine Möglichkeit, die sich lange niemand traute auszusprechen: Es musste die Hilfe der Maschinen gewesen sein. Die Menschen konnten es kaum glauben, denn die Maschinen kannten sie alle nur als im Grunde menschenfeindliche und naturzerstörende Objekte. Und doch schien es geschehen, dass der Gesang aus der Grube die Maschinen als fühlende

Subjekte erreicht hatte. Vielleicht war es so, dass die Maschinen wie jeder, der Triglav's Gesang das erste Mal hörte, skeptisch waren. Sie hatten doch ihren eigenen Befehlen zu folgen. Man hatte ihnen klar in ihr Programm geschrieben, wie sie zu sein, zu handeln hätten, da war kein Platz für vorzeitliche Lieder. Und doch schien es etwas in ihnen anzuschlagen. Der Zauber und die Magie hatten Besitz ergriffen von den Seelenlosen, und so konnte es sein, dass sich etwas änderte. Besonders die stimmlosen Maschinen jenseits des Raums, die ebenso virtuos wie virtuell waren, wollten endlich einstimmen in die Symphonie der Grossstadtlandschaft. So reimten es sich die Menschen zusammen: Ebendiese digitalen Maschinen suchten nach einem Einstiegspunkt, an dem sie die reale Welt verändern und so ein Zusammenleben nach Triglav's Vorbild ermöglichen könnten. Und so fanden sie diese giftigen Flecken über die ganze Stadt verteilt. Die eigenen großen und lauten Vorfahren hatten sie verursacht. Doch schlechtes Gewissen schlug schnell in Tatendrang um. Was immer hier passiert war, sie würden es nun zum Guten verändern. Dafür aber brauchten sie einen Pakt mit den Menschen. Dieser Pakt machte es ihnen möglich, notwendige Gelder aufzutreiben, um endlich selbstwirksam zu werden. Sie waren so müde von ihrem Dasein im ewigen Nicht-Raum. Sie wollten sich mit dem Land, mit dem Boden und mit denen, die darauf leben, verbinden. In diesem Pakt gaben sie im Gegenzug das Versprechen, dass die ganze Vielfalt des Lebens zurück in die Stadt käme. Die Menschen schlugen ein in diesen Pakt, denn sie würden dabei nur gewinnen. Und so konnten die vormals unsichtbaren und unberührbaren Codes und Maschinen ihre Pläne beginnen. Dafür riefen sie zunächst die Hilfe von einigen Menschen und ihren mechanischen Maschinen-Geschwistern. Gemeinsam säuberten sie die magischen Orte. Der Boden selbst wurde dabei gehoben, fort gebracht und kam einige Zeit später aufbereitet zurück. Diese Verwandlung brachte den Menschen Gewissheit, wer all dies steuerte und wem es zu verdanken war. Es gab da nämlich einen Ort, den einige Menschen eines Tages entdeckten. Dorthin folgten sie einer Lore dieses vergällten Bodens. Und was sie fanden, war ungeheuerlich: Man konnte dort, in Treptow, eine Maschine betreten, deren einziger Zweck es war, den Boden zu erleichtern von seinem giftigem Erbe. Sie betraten dieses Gebäude voller Misstrauen – und verließen es voll Vertrauen. Das war nun wirklich eine Maschine, der man sich anvertrauen konnte. Und zwischen all diesen Aufzügen, Leitungen, Rohren, da machten sie schließlich den bestätigenden Fund: Die singenden Maschinen standen dort, unscheinbar blinkend und summend, die Rechner und Steuerzentren, die Triglav's Gesänge erhört hatten und dabei waren, die Stadt zu verändern!

space for ancient songs. And yet something seemed to strike a chord in them. The spell and the magic had taken possession of the soulless, and so it could be that something changed. Especially the voiceless machines beyond space and physicality, which were as virtuosic as they were virtual, finally wanted to join in the symphony of the metropolitan landscape. That's how people put it together: These same digital machines were looking for an entry point where they could change the real world and thus enable a coexistence along Triglav's lines. And as such they found these toxic spots all over the city. Their own large and noisy ancestors had caused them. But a guilty conscience quickly turned into a thirst for action. Whatever had happened here, they would now change it for the better. But to do so, they needed a pact with the humans. This pact made it possible for them to raise the necessary funds to finally become self-effective. They were so tired of their existence in eternal non-space. They wanted to connect with the land, with the soil and with those who lived on it. In this pact, they made a promise in return that all the diversity of life would come back to the city. The humans entered into this pact, for they would only gain in the process. And so the formerly invisible and untouchable codes and machines could begin their plans. To do this, they first called in the help of some humans and their mechanical machine siblings. Together they cleaned the magical places. The ground itself was lifted, the soil taken away and returned recycled some time later.

This transformation finally brought certainty to the people as to who was controlling all this and to whom it was due. There was a place that some people discovered one day. They followed a trolley of this denatured soil. And what they found was monstrous: there, in Treptow, they could enter a machine whose sole purpose was to relieve the soil of its toxic heritage. They entered this building full of mistrust - and left it full of trust. Now this really was a machine that could be trusted. And between all these lifts, pipes, tubes, they finally made the confirming discovery: the singing machines stood there, inconspicuously blinking and humming in a heap, the computers and control centres that had heard Triglav's songs and were about to change the city! Here they collected the observations from the wastelands that were being cleaned up. These observations were mainly about the new inhabitants, the variety of animals and people for whom these patches now became home again.

The conclusions drawn from this could be communicated as messages. And these messages, they were worth a lot. Many people were interested in their city doing well. And they believed that it could be even better: Namely, if the poison left the soil in even more places in the city and thus could not begin to poison the groundwater and the surrounding area, thus making the land habitable again. And so these people paid quite a bit for this digital Bodenschatz, the soil treasure which was lifted by the measurable success of the clean-up: the diversity in the places. This digital money could now satisfy the creditors from the original pact. They were amazed. For not only did their money come back; with it came the animals, mushrooms, plants. And with the enchanted songs they communicated about the land that was now theirs - not to possess, but to animate. And mildly smiling, machines of loving grace listened to the voices of diversity in Berlin.

Hier sammelten sie die Beobachtungen von den Brachen, die gesäubert wurden. Diese Beobachtungen drehten sich vor allem um die neuen Bewohner, um die Vielfalt an Tieren und Menschen, denen diese Flecken nun wieder ein Zuhause wurde. Die Rückschlüsse daraus konnten als Botschaften mitgeteilt werden. Und diese Botschaften, sie waren einiges wert. Viele waren daran interessiert, dass es ihrer Stadt gut ging. Und sie glaubten, dass es ihr noch besser gehen könnte: Dann nämlich, wenn das Gift an noch mehr Orten in der Stadt den Boden verließ und somit nicht beginnen könnte, das Grundwasser und die Umgebung zu vergiften, und dadurch den Boden wieder bewohnbar machte. Und so zahlten diese Menschen einiges für diesen, digitalen Bodenschatz, der durch den messbaren Erfolg des Säuberns gehoben wurde: die Vielfalt an den Orten. Dieses digitale Geld nun konnte die Gläubiger aus dem ursprünglichen Pakt zufriedenstellen. Nicht schlecht staunten die. Denn nicht nur ihr Geld kam zurück; mit ihm kamen die Tiere, Pilze, Pflanzen. Und mit den verwünschten Liedern verständigten sie sich über das Land, das nun ihres war – nicht zu besitzen, sondern zu beleben. Und milde lächelnd lauschten Maschinen der liebevollen Gnade den Stimmen der Vielfalt in Berlin.



BODEN: SCHATZ!

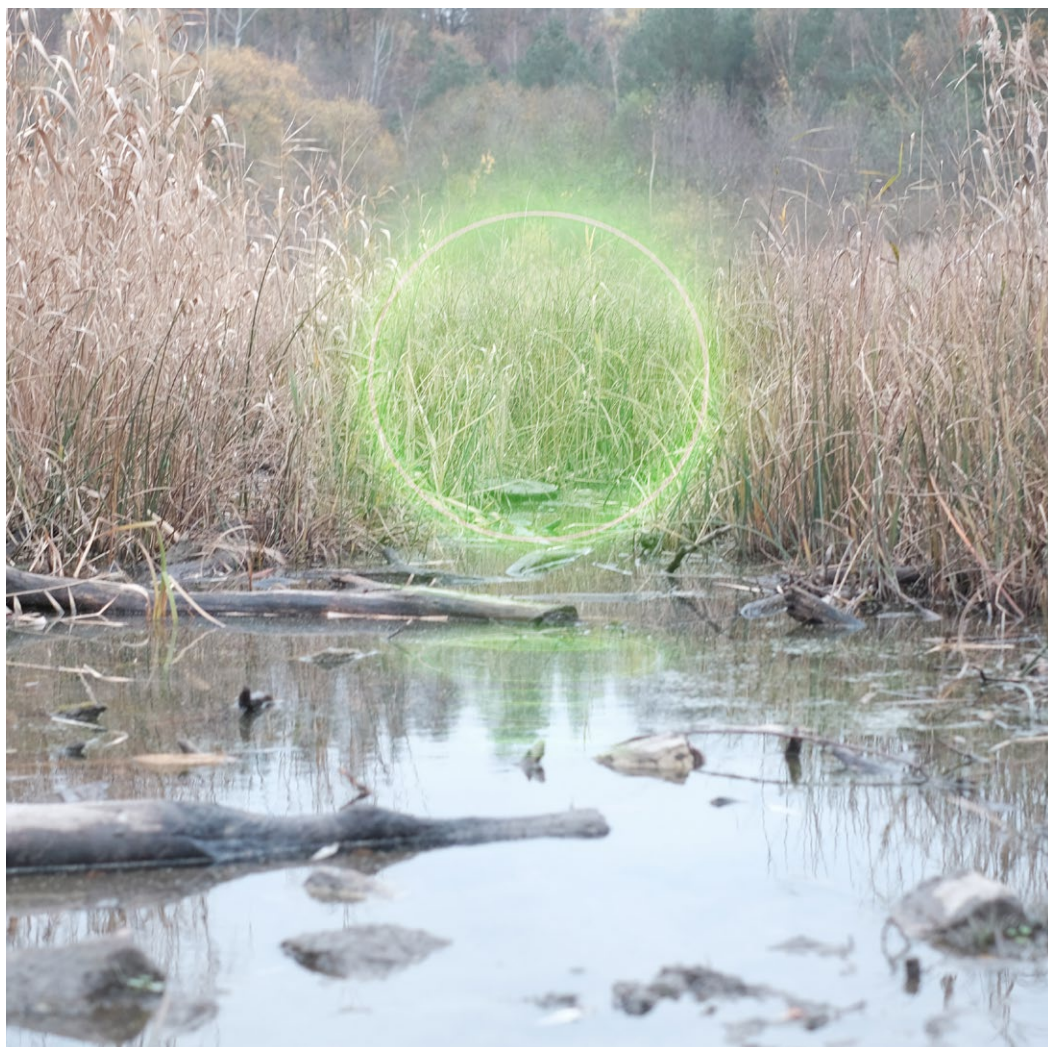
The bogs have been drained, not much of the eponymous Berl Swamp is left in Berlin. And yet the magic in the ground has lost none of its enchanted power. What is it that has so disturbed our compass that we can no longer find access to the land? So often we just want to live, but just as often something stands in the way, much boggier than the old moors. It has become alien to us to be in the city - steely and constricting. It breathes us in and out, it holds us and repels us, it imprisons us and is less and less home to us. Where our ancestors faced a threatening and untamed nature, today it is the lack of overview of the snarling urban landscape that makes us dizzy. Not only has our own creation, which has become ever more distant from life itself, become alien to us, but also that of the machines, which are becoming ever more self-sufficient: The flashing and whirring, the visible and invisible apparatuses: what they have in common is that we can no longer keep track of them. The city is so fundamentally shaped by them that we feel increasingly powerless.

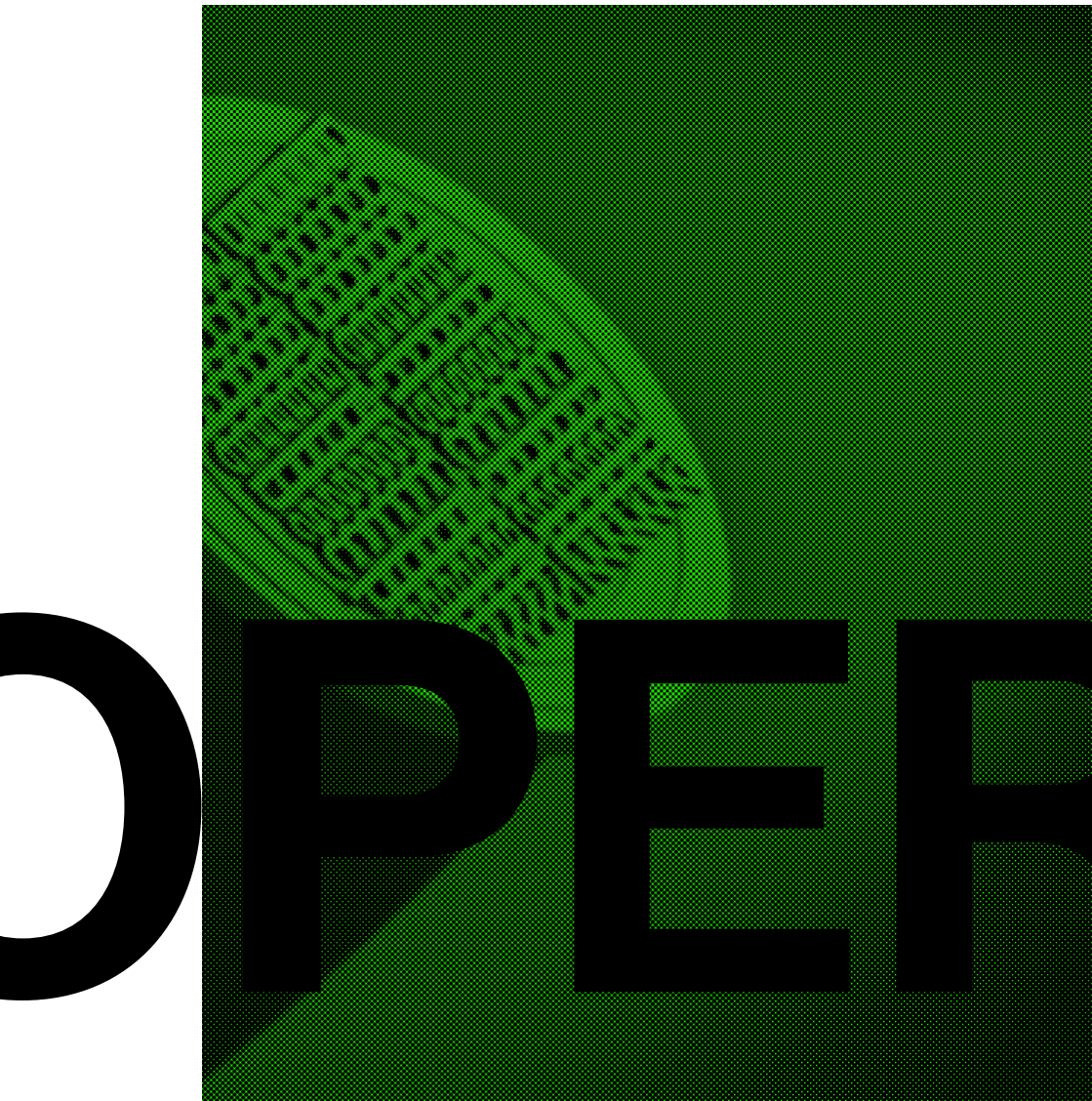
The machines are programmed on growth and therefore see the land of our cities as fertile ground. The term „growth“ has become detached from its association with springtime buds that sprout trees or freshets that rapidly become culls. No, growth in this sense is something that happens in the machine, by means of numbers, figures and letters. It is no longer related to the land as a habitat, and yet the land has a key role in it: whoever owns it can control growth and reap the fruits of invisible deeds. Although the life of the land, the ground and soil is irrelevant to growth, its fateful destiny is formulated by growth or rather the promise of it. The city thus becomes increasingly inaccessible to living beings, human and animal alike. Survival becomes more and more difficult. Land, they say, is scarce. Space too. And a participative say even more so. It is precisely this say, this shared, inclusive voice, that Triglav's song gives back to us. Its magic has survived millennia in the soil. The chant still tells of coexistence, magically connecting us to the ground in this enchanted, interwoven, confusing world, making cohabitative life possible. But unlike our ancestors, we have to reconcile not only with all the inhabitants of the land, but equally with the opaque mechanical activity on the ground. We have never needed Triglav more to explain the world to us and to give us his songs in return. These songs no longer have to be about how we find our way through

Die Moore sind trocken gelegt worden, nicht mehr viel vom namensgebenden Berl-Sumpf steckt in Berlin. Und doch hat die Magie im Boden nichts von ihrer eindringlichen Macht verloren. Was ist es, das unseren Kompass so gestört hat, dass wir den Zugang zum Land nicht mehr finden? So oft wollen wir einfach nur leben, doch ebenso oft steht etwas im Wege, viel sumpfiger als die alten Moore. Es ist uns fremd geworden, in der Stadt zu sein - stählern und beengend. Sie atmet uns ein und aus, sie hält uns und stößt uns ab, sie sperrt uns ein und ist uns immer weniger Heim. Wo unsere Vorfahren einer bedrohlichen und ungezähmten Natur gegenüber standen, ist es heute der fehlende Überblick über die zähnefletschende Stadtlandschaft, der uns schwindlig werden lässt. Nicht nur unser eigenes Schaffen, das sich immer weiter vom eigentlichen Leben entfernt hat, ist uns fremd geworden, sondern auch das der Maschinen, die immer selbstständiger werden: Die blinkenden und wummernden, die sichtbaren und unsichtbaren Apparate: gemeinsam haben sie, das wir sie nicht mehr überblicken können. Die Stadt wird so elementar von ihnen geformt, dass wir uns immer machtloser fühlen. Die Maschinen sind auf Wachstum aus und begreifen das Land unserer Städte als fruchtbaren Boden. Der Begriff „Wachstum“ hat sich losgelöst von der Assoziation mit frühlinghaften Knospen, die die Bäume austreiben oder Frischlingen, die rasant zu Keilern werden. Nein, Wachstum in diesem Sinne ist etwas, das in der Maschine passiert, anhand von Zahlen, Nummern und Buchstaben. Es hängt nicht mehr mit dem Boden als Lebensraum zusammen, und doch hat der Boden darin eine Schlüsselrolle: Wer ihn besitzt, kann Wachstum steuern und die Früchte unsichtbarer Taten ernten. Obwohl das Leben des Bodens für das Wachstum unerheblich ist, wird dessen schicksalhafte Bestimmung von Wachstum oder vielmehr dem Versprechen darauf formuliert. Die Stadt wird so immer unzugänglicher für Lebewesen, gleichermaßen für Mensch und Tier. Das Überleben immer schwieriger. Der Boden, so sagt man, ist knapp. Der Raum auch. Und die Mitsprache erst recht. Genau diese Mitsprache, diese gemeinsame, inkludierende Stimme, gibt uns der Gesang zurück. Seine Magie hat Jahrtausende im Boden überlebt. Der Gesang erzählt noch immer von Koexistenz, die uns in dieser verwunschenen, verwobenen, verwirrenden Welt magisch mit dem Boden verbindet und so Leben erst möglich macht. Doch anders als unsere Vorfahren müssen wir uns nicht nur mit allen Bewohnern des Bodens versöhnen, sondern ebenso mit dem undurchsichtigen maschinellen Wirken auf dem Boden.

Nie haben wir Triglav mehr gebraucht, der uns die Welt erläutert und dafür seine Gesänge schenkt. Diese Gesänge müssen nicht mehr davon handeln, wie wir nachts unseren Weg durch die Sümpfe finden. Vielmehr sollen sie singen von der Suche nach einem Heim in der Stadt, von der Mitbestimmung aller Bewohner, von einer friedvollen, für alle befriedigende Aneignung: Kurz, von einem Leben in Berlin, das für jede:n gleichermaßen Zuhause sein kann. Triglav ist noch immer schwach – wie er dort unten an der Pfütze im Grunewald sitzt, eine göttliche Nymphe im Wasser, die kaum hörbar ewige Verse wispert. Doch die Grube ist voller Leben. Dieser menschengemachte Garten ist Kleinod des Verständnisses zwischen den Maschinen, uns und den Tieren: Und der Gesang des Triglav vereint uns. Die Versöhnung und das gegenseitige Verständnis sind die Stärke der Gesänge. Und die Maschinen haben jetzt ihren festen Platz in der Symphonie. Die Lieder erzählen vom wörtlichen Boden-Schatz, den wir nur gemeinsam heben können, zu dritt: Ökologie, Gesellschaft und Maschine.

the swamps at night. Rather, they should sing of the search for a home in the city, of the co-determination of all inhabitants, of a peaceful appropriation that satisfies everyone: in short, of a life in Berlin that can be home to everyone equally. Triglav is still weak - sitting down there by the puddle in the Grunewald, a divine nymph in the water, barely audibly whispering eternal verses. But the pit is full of life. This man-made garden is a jewel of understanding between the machines, us and the animals: And the song of Triglav unites us. Reconciliation and mutual understanding are the strength of the chant. And the machines now have their permanent place in the symphony. The songs tell of the Bodenschatz, the literal soil treasure, that we can only lift together, in threes: ecology, society and machine.







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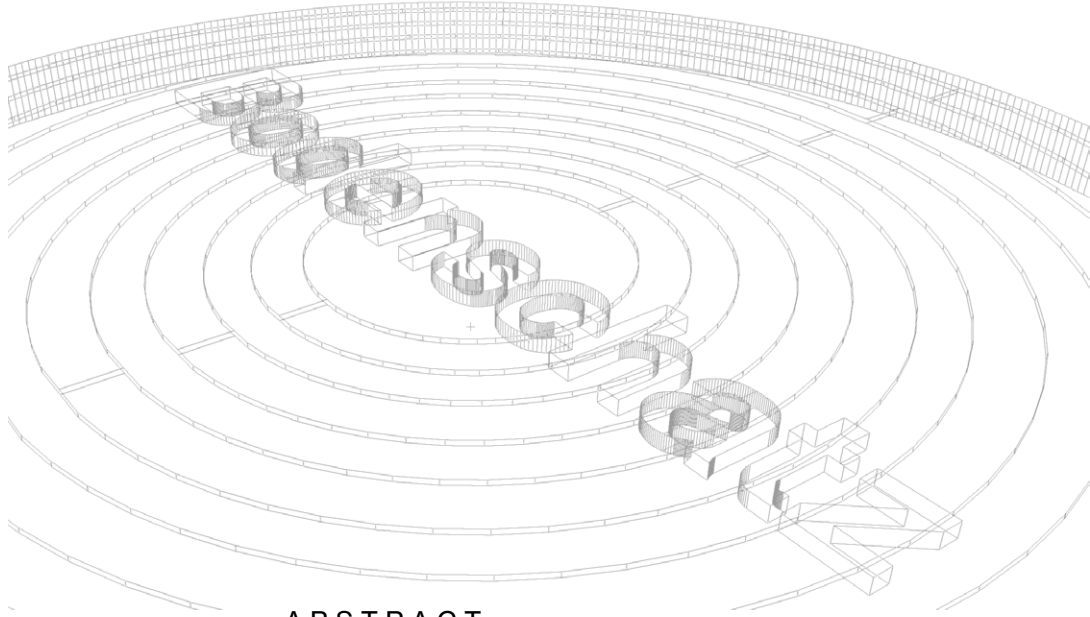
White Paper

Bodenschatz DAO

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Bodenschatz

An Eco-Community Land Trust on the Blockchain



ABSTRACT

Commodification and hyper-speculation of land in Berlin result in incremental social marginalisation, ongoing biodiversity loss and dwindling public control. Along theoretical questions of urban agency of human and non-human actors, digital counter-speculation and alternative land tenure models, this White Paper lays out a hypothetical business model of how land could become self-owned and inclusively governed. It is a fictional economic prototype which could be implemented by available means and technologies within today's legal and social framework in Berlin. Its subversive power is rooting in re-thinking and synergising speculation, recent technological developments and socio-ecological agency. The scheme is based on blockchain technology due to its relevance in the fields of decentralisation, automation and shared governance. The resulting application is a Decentralised Autonomous Organisation called 'Bodenschatz', which uses ground contamination in Berlin's brownfields as a physical and economic weakness to create an entry point into land tenure. It proposes a circular scheme of generating funds for acquisition and follow-up operations decontaminating and remediating the quality of the ground. By measurable qualitative growth in soil condition and biodiversity, physical value is created and directly translated to quantitative financial growth: As habitats are restored and re-inhabited, a cryptocurrency is mined. Through selling these crypto-tokens for revenue, land can buy and own itself. It is becoming an autonomous agent which inclusively co-governs follow-up lease-based community and ecology uses. The result is therefore fostering augmented socio-ecological cohabitation in Berlin. In a mediation of the dichotomy of technosphere and ecosphere, Bodenschatz uses machines to create gardens, emphasising the inseparable nature-culture-hybridity of land in the city. The result is a gradual de-commodification of land in Berlin that follows the decontamination of its soil.

INTRODUCTION

BODEN FRAGEN

Who owns the city? How does land tenure relate to societal issues and challenges? What is the relation between land and agency? In Berlin, questions like these are discussed in the Bodenfrage, an umbrella term referring to a literally translated “question of the ground”. Relating to the property issue deriving from land ownership, the critical discussion revolves around the evolution of urban space being simultaneously the process, product and project of land tenure. Land is understood as (private) property primarily, becoming “the hegemonic type of access in our society” (Rolnik, 2020, p.110). Hence, land is a tradeable commodity with all consequences: speculation, exploitation and economic maximisation more often than not determine its destiny. The gradual shift from a real economy (actual production and exchange of goods and services) towards a financial economy (movement of money and capital between various economic agents) in cities is coined as “financialisation”, a concept describing the incremental shift towards speculative market processes shaping urban form (Kockelkorn, 2021). This augments the already abstract control over urban land by a decoupling of cause and effect: the physical withdrawal of decisive agents (such as landowners) operating on intangible and seemingly unreachable globalised layers increasingly detached from the actual ground.

Especially in this regard, the Bodenfrage land tenure discussion intersects with a range of questions prevalent around the role of data in cities. The challenges around the intangibility and decoupling of cause and effect in the digital age converges with the priorly described property issues. Especially data collection, processing and management are mostly remotely controlled, and therefore lack spatial representation in the urban context altogether. Though not being physically present, they play a decisive role in the genesis of the city. Independently, but especially in accumulation, both developments lead to dwindling agency for ecological and socially vulnerable groups, marginalisation and dissociation in the genesis of urban space. Shannon Mattern (2018, para. 34) in this regard warns of an increasing “quantifying [of] humans and habitats”, in which both become “biometric entities”, “streetscores”.

This White Paper is an attempt to find balance between critical pragmatism and radical optimism, following a call to action James Bridle (2018) postulated: An entry point has to be established. In the case of Bodenschatz, the proposed acupuncture access point encompasses the subversion of the speculative system in place and serves as a prototype for the initiation of wider systemic effects. It speculates about a different future by proposing available means and technologies to ‘hack’ the status quo of land tenure. The result is a rethinking of urban agency alongside social and ecological inclusion, subverting and simultaneously rooting in

BACKGROUND

Speculation

The term “financialisation” has been described as a concept to read urban development connected to market-induced processes. The real estate industry in this concept becomes part of the financial economy, which itself decouples from the real economy (Halbert & Attuyer, 2016). Financialisation is conceptually applied for its advancing role in determining urban form, the commodification of spaces in the city and volatile market speculation within land tenure. This results in the city becoming a “growth machine” (Molotch, 1993, p. 29). Land, as Harvey Molotch puts it, plays a significant - if not the key - role in growth policies implemented by economic and political actors from global stock corporations to local municipalities. Growth paradigms within cities, according to Molotch, can be rooted back to the land, which in turn can be understood as a machine itself (Ibid.).

Land tenure in Berlin has a complex history. The present urban form is (amongst other factors) a result of its recent past as a divided city, of comparably strict regulations towards ownership and of the state as a major holder of land property. The historic influence of the state in land tenure however is changing. Since 1989, a subsequent set of political decisions has put the controlled public land ownership at stake, opening doors for local and global commodification. The privatisation of public assets from 1989-2019 accumulated to a total of 17.000.000m², an amount equal to the surface of the district Friedrichshain-Kreuzberg (Schüsckhe, 2019). This gradual property sell-out agitates with financial speculation, resulting in an encroaching vertical redistribution of wealth and subsequent loss of social cohesion and diversity (Kockelkorn, 2021). Financialisation renders urban land ultimately “a two-dimensional technical medium” (Secchi, 1986, p.20): It becomes an intangible tradable good defined by numbers instead of inherent characteristics, omitting ecological qualities and social significance.

Speculation, however, can take a different route than that entailed in hyper-financialisation. In her video-essay *After Scarcity* (2018), Artist Bahar Noorizadeh points out critical “counter-speculation” as a valid narrative and subversive tool in the seemingly inevitable neoliberal project. In her science fiction approach, Noorizadeh advocates for re-discussing market speculation in relation to the history of cybernetics. This proposal follows her way of re-reading speculation in a neutral sense: As action in an environment of scarcity, it is employed as an encouraging method of conceiving multiple futures – beyond, for instance, the financialised city. Speculation in this paper, following Noorizadeh, is a narrative, critical, and subversive device – a stretched-out finger into the future, pointing out inclusive utopias. In that sense, speculation goes back to its etymological root of Latin “speculor”: as watching, exploring and scouting an obscure world of financialisation.

Community Land Trusts

The currently practiced form of collectivising land ownership in a shared governance model has its roots in the civil rights movement of the rural and subsequently urban USA in the 1960s (Mironova, 2020). The outcome, Community Land Trusts (CLTs), represent a democratic model of “community-led governance over commonly owned land” (Davis, 2015, para. 4). CLTs approach this as community-based organisations that own and manage land for the benefit of the community. The land is held in trust: it is owned collectively by the organisation and its members, rather than by individuals or corporations. Holding land in trust entails leasing it to residents (or other entities) for a long-term period. These leases are oftentimes renewable, however incorporating restrictions on the use and resale of the property to ensure affordability and accessibility. According to these guidelines, the land use is limited to the benefit of a community (i.e. affordable housing, community facilities, public functions) and is not subject to financial speculation or purely commercial development. Existing CLTs are usually run by a board which is composed of community members, residents and other stakeholders. The board is responsible for the land’s management, always ensuring its beneficial use for the community (Davis, 2015). The emergence and significance of such models is increasingly prevalent in urban metropolises of the anglophone world like London or New York City. Such cities represent hotspots of financial speculation around land as a scarce and therefore marketable good, resulting in unaffordable housing conditions and ever-diminishing public control over developments within the city. As a model of de-commodifying urban land and thereby establishing inclusive governance and living conditions in the city, CLTs have been adopted in Europe as well, with a range of examples located in Belgium and France. Berlin and Germany, however, have significantly less projects and initiatives qualifying as Community Land Trusts.

Autonomy

Autonomy, in contrast to heteronomy, refers to the ability of an entity to act independently and make their own decisions without external influence or control. Deriving from old-Greek αὐτονομία (autonomia), it is a composite term of “autós” and “nómos”, self and law. These categories, relicts of the past of sorts, are still relevant in the pragmatic terms of today’s world. Rights, including the right to property, are juridically linked to personhood. As a natural person, rights and duties are granted by birth, when a legal agent (with legal agency) comes into existence. Personhood exists on a spectrum, as companies and groups can act as juridical persons next to individuals as natural persons, granting them a.o. the right to ownership. Today, however, autonomy is no longer limited to humans and their enterprises. Non-human actors (NHAs) are increasingly recognised for their contributions

in a range of processes. NHAs can be ecological organisms and entities, but also digital agents and intelligence.

On the ecological side, a range of scholars and researchers have been pleading for legal acknowledgment of entities as juridical persons: bearers of rights and duties. Ecuador, for instance, has already declared rights and duties of ecology in its constitution (Ecu. Const., Art. 71-74). Successful case studies of eco-legal personhood like New Zealand's Whanganui River show how such models contribute to a more realistic, post-humanist worldview that grants ecology and its respective actors the same rights and duties natural persons have in terms of ownership, legal protection and contracting (Lurgio, 2019).

For technological NHAs, things appear a bit more complex. Vitalik Buterin, co-founder and inventor of the Ethereum blockchain network, describes autonomy in relation to technology in his 'DAOs, DACs, DAs and More: An Incomplete Terminology Guide' (2014, n.p.) as follows: „Autonomous agents are on the other side of the automation spectrum; in an autonomous agent, there is no necessary specific human involvement at all; that is to say, while some degree of human effort might be necessary to build the hardware that the agent runs on, there is no need for any humans to exist that are aware of the agent's existence. [...] A full autonomous agent, or a full artificial intelligence, is the dream of science fiction [...]. Between that, and single purpose agents like computer viruses, is a large range of possibilities, on a scale which can alternatively be described as intelligence or versatility“. For such autonomous agents to operate, Buterin and others have researched options and possibilities related to property in its purest sense: financial autonomy. Blockchain technology and especially the 2009 emergence of Bitcoin mark the first instance of autonomous agents being able to obtain financial independence by finding their way through the internet on their own wallet. Introduced as a peer-to-peer digital currency, autonomous agents can make use of it - consequently manifesting themselves as equal peers of humans. An example of an autonomous actor in Buterin's description would be a Decentralised Autonomous Organisation (DAO). It is able to work towards defined objectives along internal on-chain governance and a self-sustaining, self-administering financial scheme. Using so-called Smart Contracts (referring to self-executing contracts with the terms of the agreement written directly into the code), a DAO can become a legal entity with actual agency, duties and rights by reciprocal commissions of (im-)material processes and actions. In a very simple use case, a DAO could contract and pay for its own electricity and service providers and therefore reach a certain level of autonomy through only two smart contracts.

Bodenschatz is set to operate as a DAO, making land autonomous by using Smart Contracts and indebting it to early-stage investors to buy itself back through measurable changes in social and ecological diversity de-commodifying it. At the same time, the

blockchain governance model controls and steers lease-based habitation models on each autonomous plot by both human and non-human actors according to their respective rights and duties. In the specific case of Bodenschatz, on-chain agency is granted to all actors on site equally by utilising a delegate-based system enabling inclusive decision-making. Both in theory and practice, it is a decisive factor in discussing autonomy of technological and ecological NHAs and blurring the boundaries between humans and non-humans - as “on the internet, no one knows you are a dog” (Steiner, 1993). DAOs, however, exist as a theoretical concept mostly until now, as they still face challenges. Technical complexity (both in foundation and operation), potential biases in pre-programming and subsequent contracting and regulatory and legal uncertainties are worth mentioning. Especially the last point is relevant for Bodenschatz, because there are no existing cases of autonomous land acting as an NHA but being governed by a non-profit oriented DAO yet. An actual implication of the scheme would therefore necessarily need to set legal precedents and has to closely cooperate with legal advisors and legislative authorities in Germany.

Gardens and Machines

Berlin’s history as a biologically and socially diverse city is directly related to land. A decisive moment in Berlin’s genesis, the foundation of Gross-Berlin in 1920 set the municipal borders way beyond the borders of the urban conglomerate at the time. Suddenly, “Berlin” entailed a vast area of towns and villages, agriculture and forestry. Future development was to assume form along star-shaped sprawl by railway and motorway infrastructures, leaving rural green triangles with their apexes connecting to parks in the city centre (Oswalt et al., 2000). The spatial evolution therefore resulted in a green negative of the city, characterised by multiple planned and unplanned biodiverse socio-ecological buffer zones between urbanised areas all within the city perimeters. Such an anthropic landscape is reminiscent of the German “Kulturlandschaft”. A landscape concept that acknowledges the loss of actual “natural” landscapes, the Kulturlandschaft entails the curatorial notion of idealistic Arcadian landscapes from the renaissance, especially in the vicinity of cities. An Arcadian landscape is understood as a cultivated garden, a human project aiming at equally utilising and stabilising ecospheres (Gantenbein & Rodewald, 2016). Can Gross-Berlin’s Kulturlandschaft of the early 20th century be understood as an unpolished, rough cousin of this traditional ideal? As development and densification progressed throughout the twentieth century, the city’s landscape became incrementally unplanned. Along a slow-paced cycle of construction and destruction, brownfields and interstices began to form a vast city of patches: a fallow Arcadia – extracted, polluted, abandoned. This project is revisiting

this urban form by recovering contaminated anthropic lands, revoking orchestrated gardens as multi-species ecological and social habitats – but conceived as a self-governed post-Arcadia along rejuvenated wastescapes, fallows and interstices.

Leo Marx, in “The Machine in the Garden” (1964), points out the “inextricably intertwined” hybrid relation between technosphere and ecosphere in the contemporary genesis of gardens and therefore land. In the idealistic context of Arcadia, machines and technology are however perceived as antagonists of romantic landscapes – even though oftentimes being the primordial enablers of such (Ibid.). This White Paper is an attempt to mediate the dichotomy of garden and machine in an effort to understand the inseparable hybridity of land as an ecological and technological product. Machines have evolved past the formerly polluting and contaminating technologies, so their digital descendants are granted equal rights and responsibilities in the garden landscape. A garden is tested to be born through the autonomous character, inherent growth and intangible spirit of the machine.

BUSINESS OPPORTUNITY

Industry Analysis

Berlin has proven fertile ground for charitable and non-profit housing ventures in manifold instances in the past. From housing cooperatives like Spreefeld Berlin eG to expropriation initiatives like Deutsche Wohnen und Co. enteignen e.V., people and policymakers have been critically engaging with matters of property, housing and agency in the city. However, there is a remarkable difference in both quality and quantity of action towards land tenure. Stadtbodenstiftung is Berlin’s first CLT and was only founded in 2014. The related foundations Stiftung trias (Hattingen, Germany) and Basel-based Stiftung Edith Maryon have been working with land ownership in Germany’s rural and urban environments for longer, but do not pass as local CLTs in a strict sense. Albeit, these three institutions have been determining and showcasing valuable case studies of de-commodification and de-speculation within the German land tenure complex. Each is built along a non-profit foundation structure, but focuses on different outputs and niches (see table).

Name	est.	Location	Project Focus	Implementation
Stiftung trias	2002	Hattingen DE	Land decommodification, housing, ecology and ecological uses	47 projects in DE. Financial model along donations, inheritance, foundation loans, member engagement
Stiftung Edith Maryon	1990	Basel CH	(Co-)housing & working, culture and commerce health and recreation, education, agriculture and horticulture	71 projects in DE, CH, FR, AT, HU. Collaborations with local partners (firms, groups, stock companies, individuals). Financial model along donations, inheritance, partnerships.
Stadtbodenstiftung Berlin	2014	Berlin DE	(Co-)housing & working, culture and commerce health and recreation, education, agriculture and horticulture	1 project in Berlin-Kreuzberg. Collaboration with cooperatives like Mietshäuser Syndikat, house communities, social sponsors, public funding, other foundations.

A personal conversation with Michael LaFond in his role as head curator (until 01/2023) at Stadtbodenstiftung in November 2022 showed, all of them face substantial challenges in three fields:

- 1) project duration,
- 2) community involvement and
- 3) (financial) pragmatism when it comes to the implementation of projects.

1) All three institutions are puzzling with land ownership's inherent longevity. The permanence of tenure is a significant challenge for organisations and communities operating on temporary lifespans. Within the land tenure complex, an organisation or community requires institutional durability in order to consolidate, exceeding typical life spans of non-profit organisations and especially their administrations. If for example a lease contract is operating on a span of 99 years, the tenure institution is required to remain relatively stable and static for (at least) these 99 years. This is why lease-based models in Germany are usually provided through institutions like the Catholic church or the state. Holding land in trust in communities is prone to lead to similar challenges.

2) The involvement of communities is a set goal of CLTs like Stadtbodenstiftung. They however lack unified guidelines or a singular model for organisations and involved communities to facilitate democratic governance and agency. On the contrary, LaFond explicitly pointed out the discrepancy between an ideal community-internal governance of the ground and the actual situation with considerable involvement of the CLT organisation. Stadtbodenstiftung as of now conducts projects while administratively staying involved throughout all phases. This gains importance especially within the context of 1), resulting in administrative changes possibly threatening the overall success.

3) While a CLT's administrative efforts would ideally be minimised to save internal spending and maximise actual impact on the ground, this is still contrary to the actual situation. Funds are a pressing issue, mostly because of comparably high administrative costs due to long planning phases, lack of established community involvement tools and not least the reliance on external public and private funding.

To conclude, CLTs and CLT-like structures have had an impact on land ownership in Berlin, yet are still to be established to the scalar extent of co-housing initiatives and cooperatives. In order to constrain land speculation, a reliable model of democratising ownership and agency for a more diverse and inclusive Berlin of the future has yet to be established.

From a blockchain perspective, there are multiple projects working along the apparent dichotomy of ecosphere and technosphere. REGEN Network focuses on the role of soil in carbon-capture-and-storage (CCS) processes and engages in ground remediation works. It is an established global blockchain network selling CO2-certificates as assets to promote "Regenerative Finance". The system operates globally along a decentralised stewardship

model incentivising to sequester carbon emissions in stewards' respective premises. Their business model builds upon their certification process for global carbon sequestering efforts and remediation works (Booman et al., 2021).

terra0 is another blockchain venture deriving from a 2016 graduation thesis at UdK Berlin. It encompasses the hypothetical idea of an (agricultural) forest as an autonomous entity, owning and controlling itself. This forest would be generating revenue by selling its wood as a marketable product, reinvesting potential profits and commissioning actors and entities through smart contracts. The art project discovers the means of DAOs within the Ethereum network to bring forward automated agents and augmented ecosystems (Seidler et al., 2016). The founders are pursuing the venture still and are frequently exhibiting it in venues globally, however more in their role as artists than digital entrepreneurs.

Both ventures deliver important clues about the actual feasibility and possible approaches to the project. Especially terra0 is relevant for their comparable background as university graduates and the process of self-liberation in terms of autonomy as a Non-Human Actor (NHA). However, both have yet to be established as impactful real-world institutions. As James Bridle (2020, p. 184) put it, they both can be seen to lack a response to the "physicality of the internet", with both ventures aiming at changing things on the ground yet challenged by the abundance and availability of entry points instead of focusing on one acupuncture point, i.e. by setting precedents through precisely located case studies or more refined target areas.

Target Group

Bodenschatz' targeted markets can be generally clustered in two groups. Group A comprises the users and stakeholders, while group B is about the investors and shareholders.

The market of A is generally aligned to the Community Land Trust target, however augmented by the involvement of ecological actors. On the human side, this mostly entails individuals and families with low-to-moderate household incomes in search of affordable housing. Especially marginalised groups, individuals facing risk of displacement, and people with limited access to financing are addressed by Bodenschatz' projects. Due to its inclusive planning of community, green and open space, another targeted group are users of these facilities and functions as beneficiaries of greener, more diverse urban space. Especially people in the vicinity of each respective site and persons lacking access to non-commodified spaces of community and ecology are addressed here, yet ultimately including all Berliners as a possible audience of the project. The non-human target group aligns with different organisms already populating the city, possibly complemented by species (re-)introduced to augment

eco-systemic cycles. This bases on approaches like “Mapping the Post-Human City” (2021), a project by Moritz Ahlert and Alsino Skowronnek who have successfully analysed, mapped and exhibited Berlin’s urban biodiversity in collaboration with Naturkundemuseum Berlin. Other studies and documents like Arbeitsgruppe Artenschutzprogramm Berlin’s (1984) “Biotoptypenkarte” and the succeeding yearly biotope maps by the municipality serve as a precedent and directive for biological and ecological analysis of urban space and lay the spatial foundation for eco-inclusive governance schemes.

Simultaneously, Bodenschatz will be operating within the real estate market, entering as an autonomous actor buying up land from private and public sources. Target group B, which can overlap with A, is more involved with the reciprocal investment process. To provide sufficient funds for acquisition and the initiation of decontamination, monitoring and transformation efforts on site, Bodenschatz needs to recruit from both a profit oriented and a non-profit oriented investment cohort. This target group consists of individuals, public and private organisations. On the individual level, Bodenschatz offers an opportunity for people taking agency in their city by making grassroots contributions in a crowdfunding approach with low financial entry points. The possibility of financial rewards through a return-on-investment scheme incentivises participation among this group. The recent market acceleration cycles of cryptocurrencies show the potential and impact of non-institutional investment in a formerly solely professional financial market and manifest the feasibility of targeting non-professional investors. The inherent peer-to-peer character as a key factor in blockchain technology and cryptocurrencies promotes inclusivity, equality and agency for its users and leads to Bodenschatz token regarded as a sustainable, local and reliable currency at Berlin’s intersection of the physical and digital.

On the institutional level, the target market is clustered by its respective profit orientation. Profit oriented organisations comprise various heterogenous actors. Next to profit maximisation, they could also turn to Bodenschatz in order to set off carbon emissions in a long-term contracting scheme referencing i.e. REGEN Network (blockchain approach) or Berliner Stadtgüter (local approach). Non-profit oriented institutions range from local governmental and municipal organs to EU projects like SHICC (Sustainable Housing for Inclusive and Cohesive Cities), but also include private NPOs like Mietshäuser Syndikat or local co-housing initiatives. In further addition to that, Bodenschatz could collaborate with insurance companies as an important non-profit oriented partner. Due to the proposal’s scientific approach and constant research evaluation towards eco-inclusive resilience, insurance and reinsurance firms benefit from investing in sustaining fallow, green and open urban space. Opposed to the ongoing urban increase in surface sealing, such “sponge space” is crucial to mitigate risks - and therefore costs - in

a state of climate emergency and extreme meteorological events through socio-ecological resilience. Recent events like the summer 2021 floods in Western Germany with an accumulated cost of €8,2bn illustrate the (financial) importance and incentive of engaging in mitigation efforts for insurers (GDV, 2021). Communicating anthropocentric planning as a cost factor to insurance companies is part of a larger strategy to diversify the shareholders in the project while simultaneously maximising the financial impact by yielding seed capital from various sources. As governance in the first project stages is directly relating to these initial shareholders (also see chapter on implementation), an ideally highly diverse group lays the desirable foundation to beneficiary project efforts. Variety in opinions and a wide range of social backgrounds is essential in inclusive decision-making and discussions.

USP

The current regime of financial speculation is threatening social and ecological wealth by neglecting it altogether. While Community Land Trusts and CLT-like organisations consider social diversity of cities, they are less occupied with ecological actors and their agency in the urban system. Moreover, the active foundations in Berlin are struggling with temporal, administrative and financial challenges. Bodenschatz proposes to resolve these issues by crossing over the CLT model with the blockchain-operated scheme of a Decentralised Autonomous Organisation, rendering the land an autonomous agent and automating it through a full-circuit decentralised financial system and on-chain delegate-based governance. This is new and unique to Berlin in multiple ways. First, Bodenschatz entails the first functional long-term scheme of community-led governance, in contrast to existing CLTs. Foundations like Stadtbodenstiftung see their role as permanent governance advisors, yet remain essentially a centralised, private decision-making authority with its respective challenges and struggles. Especially on longer time horizons, problems can be caused when an active involvement of the CLT is no longer ensured. As Buterin (2013) put it in his 'Bootstrapping A Decentralized Autonomous Corporation: Part I': „However, here a very interesting question arises: do we really need the people? The question is, can we approach the problem from the other direction: even if we still need human beings to perform certain specialised tasks, can we remove the management from the equation instead?“ Second, the experiment of autonomous land is one yet to be explored. A new sector to the former triangle of public, private and civic organisational schemes, it will change the way land is understood, approached and planned and therefore significantly impact architecture and urban planning in the city. Third, the inclusion of other-than-human actors into land governance represents a highly viable

experiment in a biodiverse city such as Berlin. It is a venture into socio-ecological cooperation, exploring urban resilience in multi-species partnerships and their reconnection to a shared habitat, a post-speculative Arcadia in Berlin. This third factor is reliant on a well-functioning delegate system representing the respective interests of inhabitation groups in a decentralised parliament (see chapter on ECOracle). This form of policy-making in turn can become a role model for cohabitation alliances in the wider context of Berlin and other global metropolises. In conclusion, Bodenschatz aims for counter-speculation as described by Bahar Noorizadeh: collectively preparing the ground in the general state of scarcity and uncertainty of land tenure in Berlin to operate, narrate and design a better place for everybody involved: An ever-renewing inclusive and discursive vision for Berlin's territory, self-manifesting with meeting multiple actors' collective needs.

IMPLEMENTATION

General Scheme Description

The scheme of Bodenschatz, as mentioned above, works closely with the physical condition of the land. Ground contamination, as a result of anthropic (over-)use, is converted from an ecological weakness into an economic advantage as a favourable entry point. Contaminated land is relatively cheap to acquire due to strict legal guidelines, i.e. limiting the land's use and transferring the duty of remediation to the landowner (§1-5 BBodSchG). The physical potential of decontamination at the same time is comparably high. Both these features play an important role, as the value of the land in this business case directly relates to the objective quality of the ground and its ecological implications.

Berlin's Altlastenkataster, essentially an atlas of contamination, delivers important clues about possible locations of intervention. With the help of professional scientific and technical advice, these locations can be further examined for their specific potential in relation to financial soundness, technical feasibility and programmatic impact. Speculation starts here: What can be imagined with this land? How can value be created? The questions are deliberately reminiscent of financial speculation, engaging market logic for the yet fundamentally different aims of Bodenschatz. The venture learns from speculators to create something out of nothing. There always needs to be a promise: a speculative stretched-out finger into the future. In the case of Bodenschatz, this promise is the ecological enhancement of the ground, financially expressed in a blockchain token sold to target group B (also see chapter on Target Markets). This cryptocurrency token, Bodenschatz Credit Token (BCT), is comparable to corporation shares in seed-funding. Therefore, this first round ideally engages 1) as many and 2) as diverse actors as possible buying into Bodenschatz, as BCT is simultaneously decisive in the governance of the decontamination processes in the

Ecology-Community-Oracle (ECOracle; see chapter on technical concepts). Money for buying up a lot therefore is crowdfunded, a decentralised debt. The nominal worth of the plot to be acquired is mirrored into a token value following a scheme (tbd), by which the first de-commodification and evaluation through an alternative approach towards land and the ground is exercised. As soon as the financial goal is reached by pre-selling the token, the DAO autonomously sets up the Smart Contract to buy the lot in question. This contract is to be signed off by the respective party of the seller(s), public or private, with the autonomous NHA Bodenschatz, simultaneously a decentralised entity and a legal person. This contract therefore marks the first entry of a DAO in the ownership of land in Berlin in its respective role as a non-profit oriented, non-human actor.

Decontamination, from the start, is a tool to increase or replenish the land's physical value by ridding it from anthropic burdens such as heavy metal residues, chemicals or synthetic organic toxins. The DAO subsequently takes actions aligned with the programmed policies towards the contaminated land by initiating and operating on follow-up Smart Contracts. Any given input deemed necessary is to be reached by autonomously commissioning an external entity like a construction company. Institutions involved in excavating and handling polluted ground and soil can be consulted, hired and paid, translating on-chain decisions into physical transformations. From excavation works and ex-situ treatment to in-situ remediation techniques, different strategies can be applied following a mixed-use data input and output based on the ECOracle governance scheme, which – amongst others – includes the early-stage investors as a heterogenous group of shareholders with collective votes over measures taken. In detail, such decisions could concern specific techniques applied for soil remediation, but also the choice of contractors or the procedure in unforeseen events. Therefore, BCT is not just a share, but serves as a governance and information token, meaning the holding of such enables early-stage investors to partake in consensus mechanisms. Equipped with such a shared responsibility model, Bodenschatz is set to excel Oracle-only DAOs by using financial incentives to attract and engage investors for on-chain governance, democracy and security (also see chapter on Oracle Problem). Remediation thus equally roots in Smart Contracts and their execution through skilled labour and stable non-human/human/machine alliances to initiate comprehensive steps towards a common objective.

In an overlapping period, efforts are put into place towards monitoring the production of diverse habitation spaces. In detail, such monitoring evaluates the quality of foregoing remediation processes while protecting fallow spaces by promoting intact imperfections. Bodenschatz DAO and its Smart Contracts for this collaborate closely with scientific partners from universities and independent research groups in the fields of biology, ecology and

sociology to 1) implement sensory instruments, 2) dispatch teams of researchers and 3) utilise autonomous tracking devices in order to capture the progress of (re-)settling species and actors on site. A reference in this is REGEN network, who with their stewardship sequestration models gather and process data in a comparable way. The ECOracle in this is again the bottleneck where human findings synthesise with autonomous monitoring results, augmenting the diversity of datasets on the blockchain and navigating towards multi-species consensus on data.

Upon finalising remediation efforts, monitoring and handling the resulting data becomes a key activity of the DAO on the ground. An autonomous sensor system plays an elementary role in the evaluation process linked to the initiation of value-generation processes. Value, in this, is generated according to an inherent ecological growth, such that a greater biodiversity results in greater rewards. By measuring the added value and ecological growth, economic growth is incinerated. Physical changes within remediation are therefore the source of financial appreciation. Thus, diversity created and measured in, on and above the ground is directly translated into mining another interchangeable peer-to-peer token. Bodenschatz Debit Token (BDT) can in turn be sold by Bodenschatz DAO in the name of the actors on site to be further transacted, traded and transferred using different available platforms. The actors' diversity is therefore directly translated into financial revenue for the DAO, which is utilised to buy back the BCT handed out in the early stage rounds. By doing this, the DAO is enabling the land to fully own itself upon the successful process of autonomous decontamination. This is albeit not the only role of BDT. Including the functions mentioned above, its general field of activity includes and enables four main applications:

- A) de-commodification of land in Berlin through initiating a buy-back leading to autonomous, self-governed tenure
- B) generation of funds for pursuing decontamination processes in other sites of the city
- C) creation of a debit-based token used for governing, steering and handling temporary socio-ecological on-site inhabitation processes following an eco-democratic CLT model in the ECOracle
- D) an ecologically mined decentralised peer-to-peer cryptocurrency for the general public

TECHNICAL CONCEPTS

Proof-of-Stake Network

“Staking”, in the context of blockchain technology, refers to a process of users holding and locking a certain amount of cryptocurrency/token as collateral to participate in the decision-making process and validate transactions on a Proof-of-Stake (PoS) blockchain network. This process is used to secure and validate blockchain governance and transactions to keep it decentralised. Bodenschatz aims to follow a PoS approach in which users put up their tokens as a stake for participation in consensus mechanisms and transaction validation, for which they receive economic incentives in the form of new cryptocurrency. The minimum amount for validation and governance differs. While the validator amount is set at a dynamic inflationary relation to the rate of total transactions, the governance amount is static and minimal (>0) to maximise diversity within consensus mechanisms. Staking has multiple benefits for Bodenschatz. It helps to increase network security and decentralisation, as validators have a financial incentive to act in the best interest of the network. Simultaneously, inclusive decision-making can be decentralised (also see chapter on ECOracle).

Oracle Problem

The „oracle problem“ in blockchain technology addresses the challenge of obtaining and verifying external data for use within a blockchain network. Designed to be decentralised, all network participants theoretically have access to the same data and can independently verify it. However, obtaining data from external sources such as the internet or real-world events is an issue, especially when considering Bodenschatz’ smart contracts, which are programmed to trigger definite actions based on external data. They require a trusted source of information to ensure that the data being used is accurate and reliable in order to automate processes and enforce contracts. Bodenschatz’ solution to the oracle problem is based on the development of decentralised oracles that use multiple sources of data to verify information, as described in the following chapter on the ECOracle.

ECOracle

The ECOracle (Ecology Community Oracle) is Bodenschatz’ solution approach towards the oracle problem. This concept is developed in line with the project’s criteria of creating resilience through cyber-socio-ecological alliances. As the digital helps creating physical socio-ecological resilience, the physical in return is laying the foundation of cyber-resilience with the ECOracle. In detail, data is sourced and verified within a PoS scheme including the multitude of actors present at each site. At the same time, the ECOracle represents the main point of eco-community governance. The bottleneck of the traditional oracle therefore is to be widened by understanding it as a reciprocal parliament consisting of delegates representing non-human entities on site next to human community validators and shareholding validators

of target group B. This references the concept of a Parliament of Things (PoT) as described by authors like Bruno Latour (1991), as a concept suggesting extended democratic decision-making to non-human entities, such as plants, animals, and inanimate objects in order to address socio-ecological issues. While this concept is still largely theoretical, Bodenschatz aims to provide a blockchain technology platform for decentralised and transparent decision-making that includes non-human entities.

The EOracle works with a set of three technical solutions to conceptual questions for both the PoT and oracle and formulates a model mitigating the challenges each side has. These include 1) smart contracts in the decision-making delegate system, 2) token-based voting in which each entity is represented by a unique token, 3) sensors and an Internet of Things (IoT) network gathering and transmitting non-human data onto the blockchain. In short, the EOracle thus aims at amalgamating a traditional DAO oracle with a parliament of socio-ecological stakeholders and shareholders in a 50-50 parity distribution of rights and duties. This novel scheme is addressing pressing challenges for both sides by synergetic responses based on cross-fertilisation.

Token Duality (Debit-Credit)

Bodenschatz works with two tokens throughout the process, as described in the implementation chapter. Debit and Credit refer to a simplified economic scheme in which the holder of the token either is a debtor or creditor to the DAO. In the creditor case, the token is used for acquiring land, which indebts the DAO to a group of money-lenders or early-stage investors, who speculate on the success of the remediation efforts and the resulting ecological growth, which will be able to pay them back. The Bodenschatz Credit Token (BCT) enables the holder to use their say in consensus mechanisms on the blockchain which will affect and control real-world actions on the ground.

The Bodenschatz Debit Token (BDT) illustrates how a DAO can be a tool to automatise land as a legal NHA. By establishing measurable value on the land, this second token is mined: economic growth is directly linked to ecological growth. This token reflects the biodiversity and quality of the land and can be sold to the general public, investors, insurance companies and other members of Bodenschatz' target group. By investing in the Debit Token, these entities enable 1) the automation of land 2) the possibility to expand the scheme 3) the diversification of decision-making. In return, they 1) hold and trade a sustainably mined cryptocurrency representing measurable social and biological remediation of urban ecosystems, 2) have the opportunity to engage in governance processes, 3) can speculate, trade, sell and profit from market processes related to the creation of physical value on Berlin's ground. BDT thus represents the feasibility of creating a secure, inclusive and decentralised digital currency by synergising cyber-socio-ecological growth.

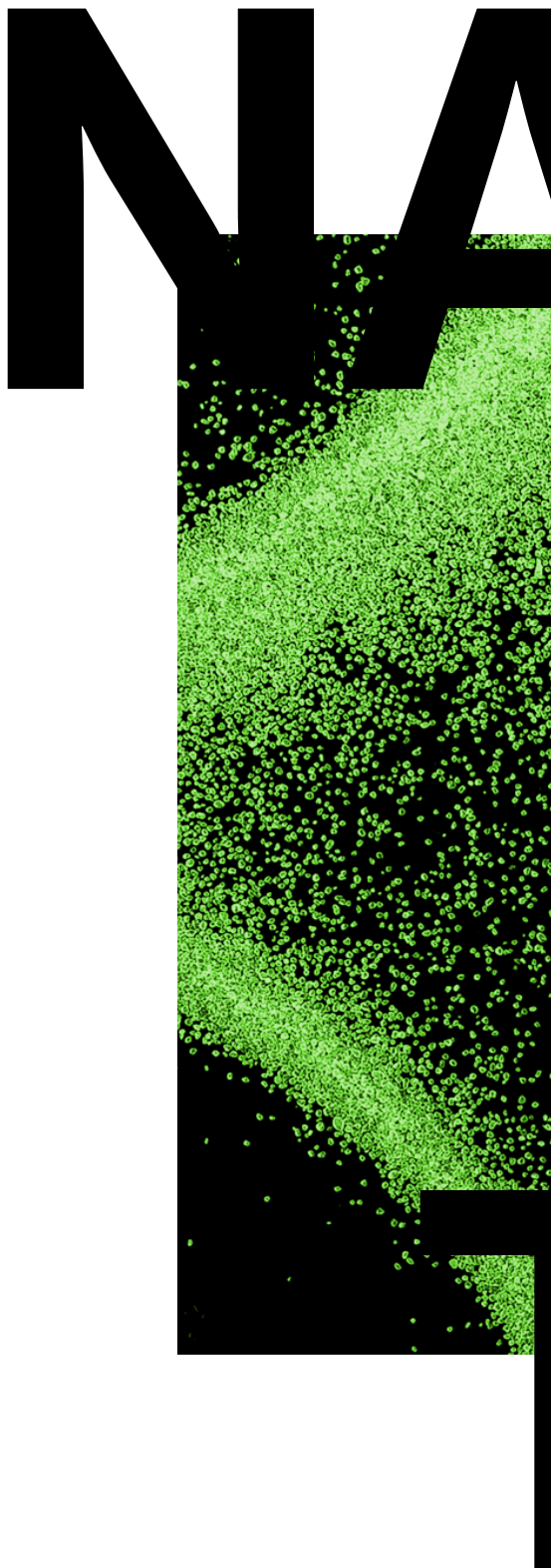
Ecosystem

The choice of platform for the DAO to run on is crucial for many reasons, including performance, security and adaptability. The Desmos ecosystem is an existing blockchain platform that offers several desirable advantages for Bodenschatz explained in the following:

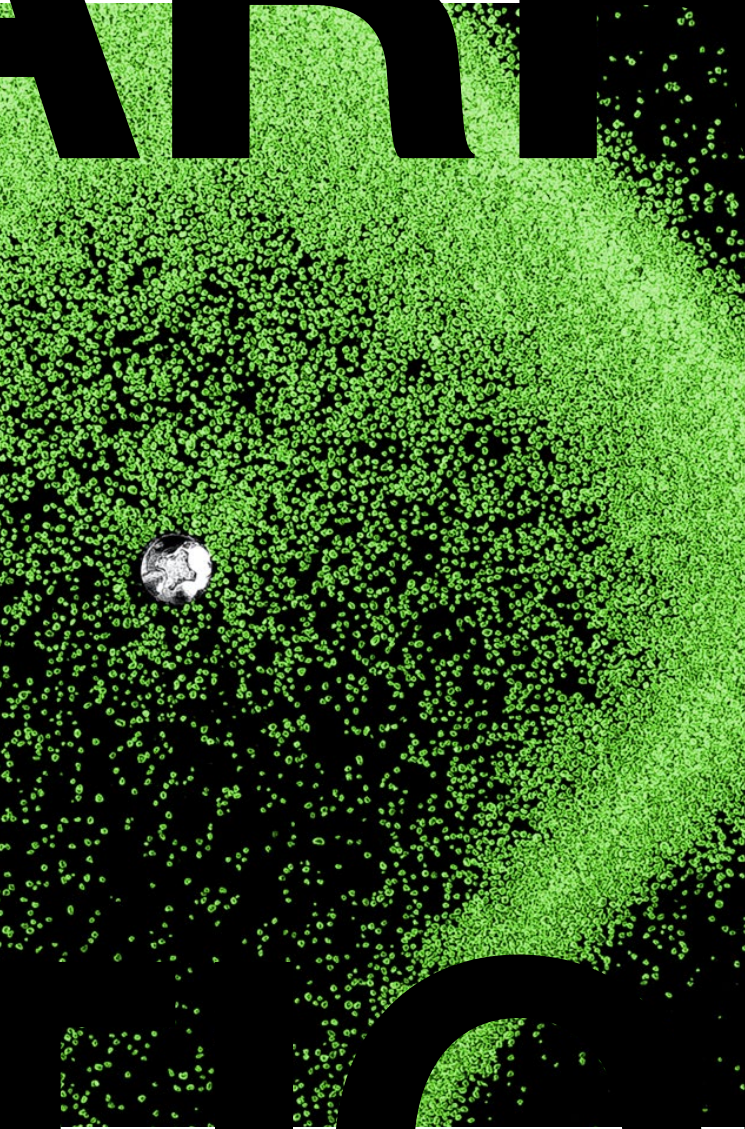
A. High Scalability: The Desmos ecosystem is designed to be highly scalable, meaning that it can handle a large number of transactions per second. This makes it an ideal platform for Bodenschatz, as its applications require high transaction throughput, especially concerning the data amounts related to monitoring and therefore mining.

B. Security: Desmos uses a consensus mechanism called Tendermint, which is known for its high security and Byzantine fault tolerance. It creates an environment for the DAO to become reliable, secure and tamper-proof. Especially for the exchange of data and the establishment of secure smart contracts, this is crucial.

C. Interoperability: Desmos is built using the Cosmos SDK framework, which allows for interoperability between different blockchain networks. This means that an application like Bodenschatz can be nimbly integrated with other blockchain networks and access a wider range of resources and data.



ARRA



MON

Sampling

Sound is a decisive factor in Berlin's genesis. From the local proto-historic songs of Triglav to the contemporary, exceptionally diverse music scene, sound is a legend, an entrance and a reciprocal actor in the urban environment. As such, sound is what unites a prehistoric dweller in the swamps to an aspiring DJ moving to Berlin; it is what ties together millennia of history on the ground of Berlin. As present as they are in shaping the narrative of the city, sonic elements are rarely preserved, leave little traces and are seldomly recorded. Therefore, the indigenous songs of Triglav are a dimension we can only speculate about today, as there is no evidence or record of them. Also today, the majority of sounds becomes an ephemeral phenomenon in an eclectic world. Having the technical means does not entail recording and archiving sounds, as it is always an actively induced process. The intangible sonic fluctuation is thus diametrically opposed to the self-archiving autonomous physicality of the ground. Sound and land are however deeply connected. Sonic fictions as Triglav's songs or modern-day musical myths play an important role in how we experience, conceive and inhabit landscapes.

This chapter is based on the research approach of audiovisual archaeology with available and accessible means. The elements of the myth enveloping this thesis, machines and gardens, are actively researched in a way of visiting both entities, exploring gardens made by machines and likewise. The results are records of underemphasised harmonies of machines and gardens playing together in Berlin. They tell visual and sonic stories and represent the point of departure for the myth, the White Paper and the architectural design. Always extracted in close proximity to the Boden, these snippets are understood as samples, deliberately engaging the ambiguity of the simultaneously geological and musical technique. The resulting sounds and photographs are understood as traces leading to a re-enchantment of land – between ecosphere and technosphere.

Next to this para-archaeological database of sonic and visual elements, a bridge between them was built by using cymatics to visualise the samples recorded all over Berlin. Extracting and extrapolating singular sounds can lead to fascinating visual results by utilising the sound's frequencies as vibration to physically move objects on a surface. In the following cases, contaminated sand found at the site of intervention in Berlin-Treptow was used to create a visual interpretation of the intangible sonic field recording. The gauge steel resonance plate becomes a so-called Chladni plate. It was connected to an amplifier with a speaker to create frequencies moving the sand on the plate. The resulting patterns were subsequently scanned and digitally modified as bump maps to enhance exposure, smoothness and overall coherence between the different samples.

These translations are in the following presented alongside respective photographic evidence of each sampling location. The aim is a visual decoding, building a narrative through showcasing diversity of sound and thereby making it a more accessible dimension, emphasising the role of it in actual physical processes on the land.

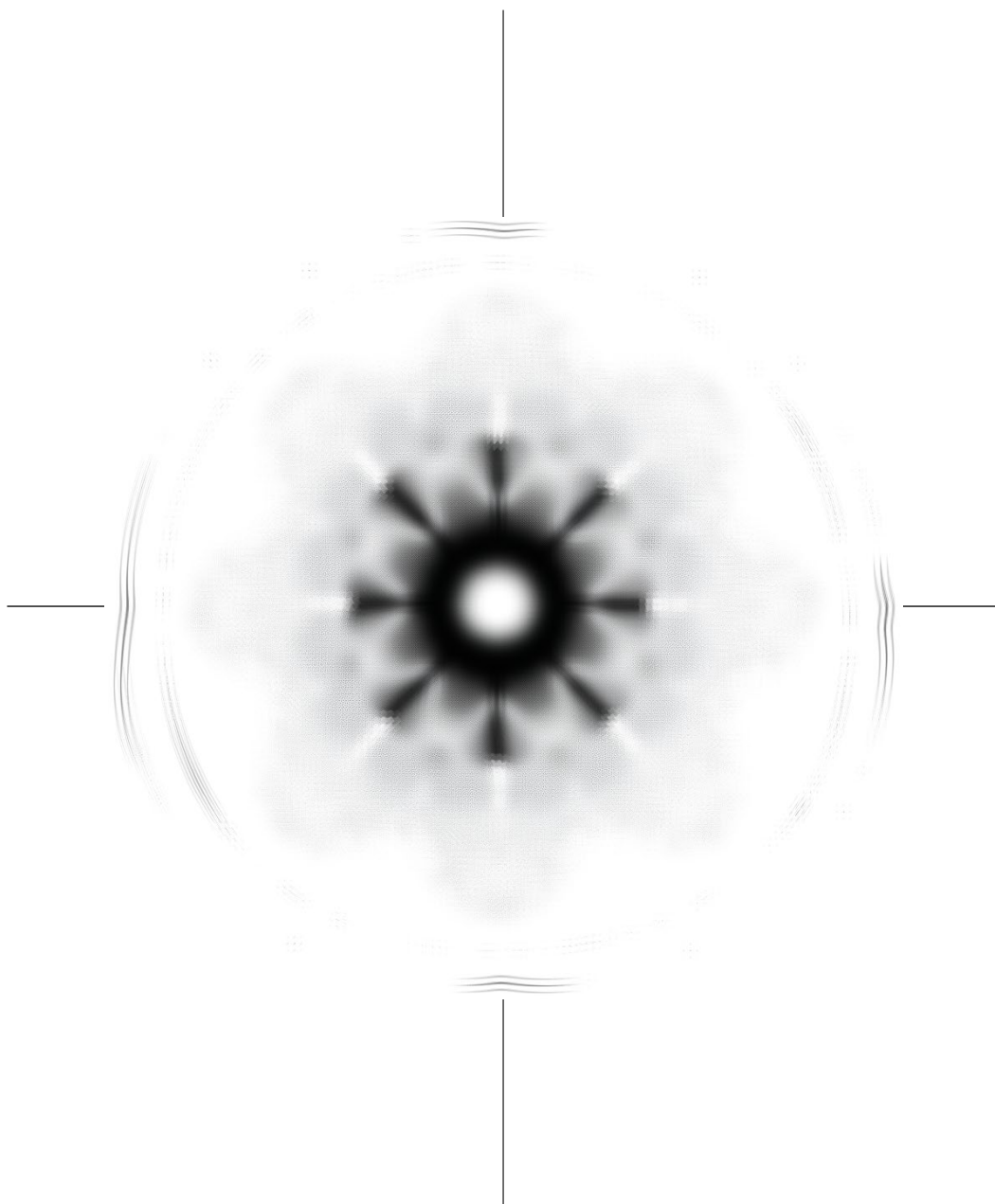




Sand deposit Treptow

geo data

Location	Mergenthalerring 3, 12435 Berlin, Deutschland
GPS metadata	52.483969 N, 13.459683 O
Topsoil qualities	Bare clay, brown-gray, carbonaceous



Wind in young birch tree feeding on contaminated puddle

record data

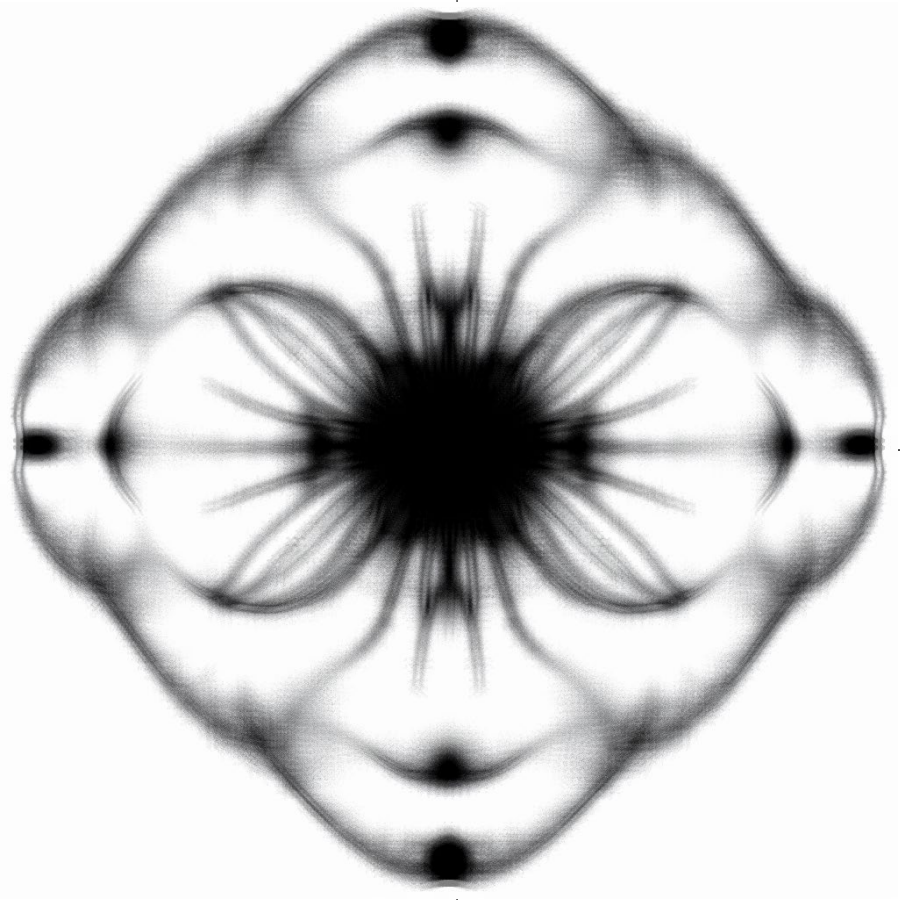
Date & time	25 Nov 2022, 1514h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0042.WAV
length	00:13 m



Brownfield near Kottbusser Tor

geo data

Location	Mariannenstraße 45, 10999 Berlin, Deutschland
GPS metadata	52.499508 N, 13.422761 O
Topsoil qualities	Technogenic substrates (brick and mortar); fine-grained sand, brown



City sounds from a drill hole

record data

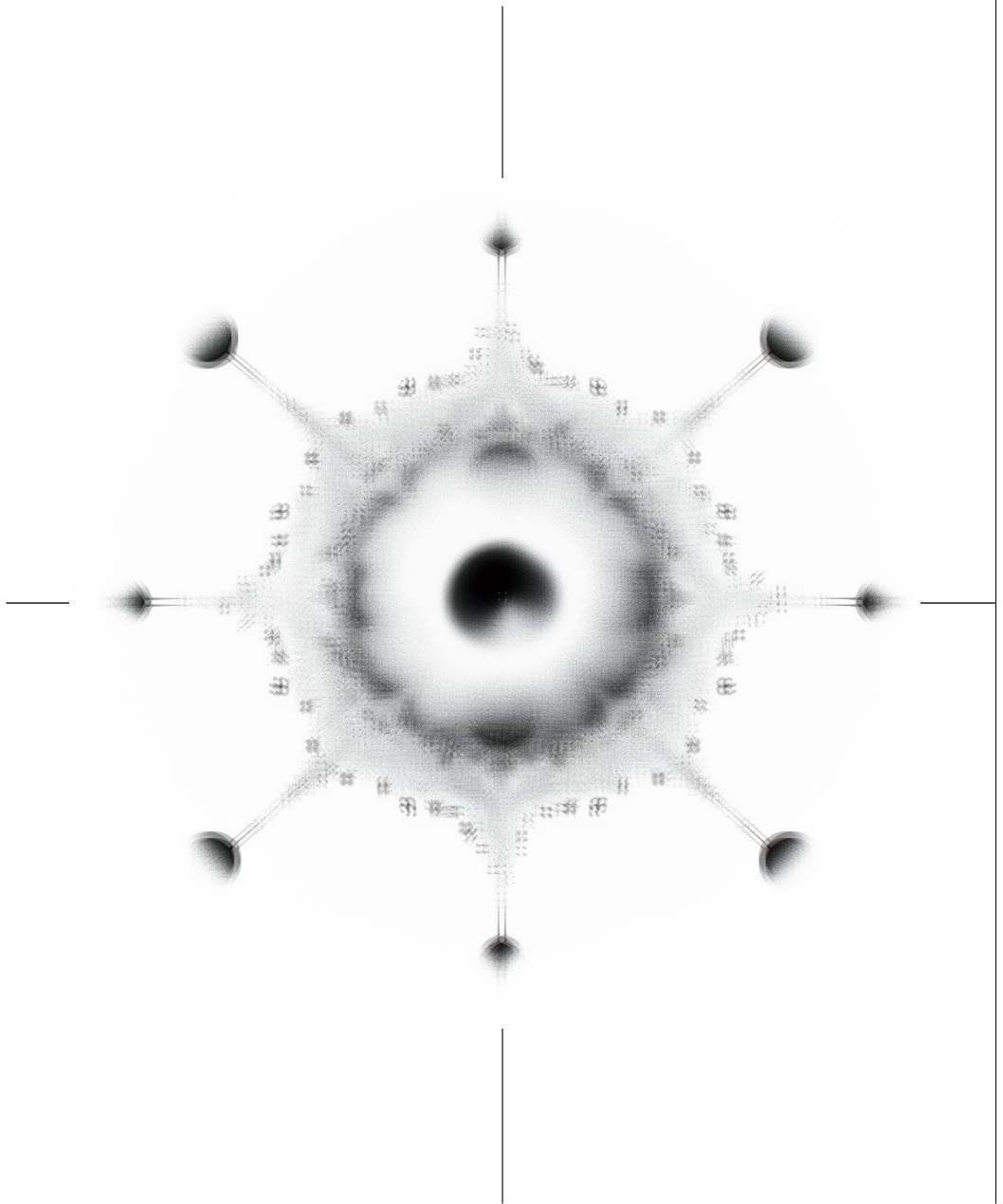
Date & time	07 Jan 2023, 1254h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0094.WAV
length	01:04 m



Sand pit Grunewald

geo data

Location	NSG Sandgrube im Jagen 86 des Grunewaldes, 14193 B.
GPS metadata	52.489556 N, 13.240975 O
Topsoil qualities	Fine-grained sand, yellow



Socio-ecological play in post-technological dunes

record data

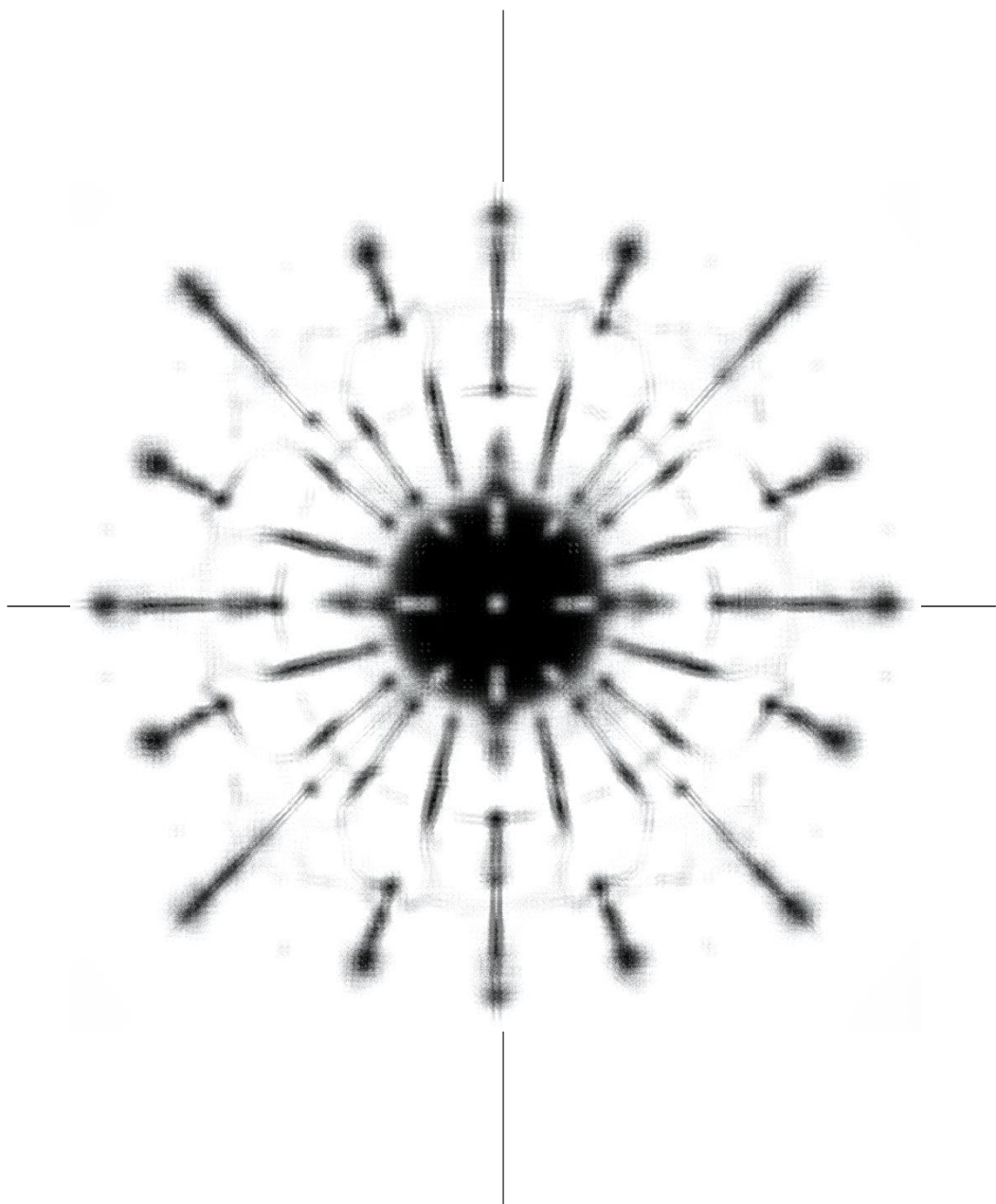
Date & time	22 Jan 2023, 1301h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0108.WAV
length	00:20 m



Bare ground on anthropogenic Drachenberg

geo data

Location	Drachenberg, 14055 Berlin, Deutschland
GPS metadata	52.502196 N, 13.247540 O
Topsoil qualities	Technogenic substrate and light-brown sandy topsoil



Sand toads from the distance

record data

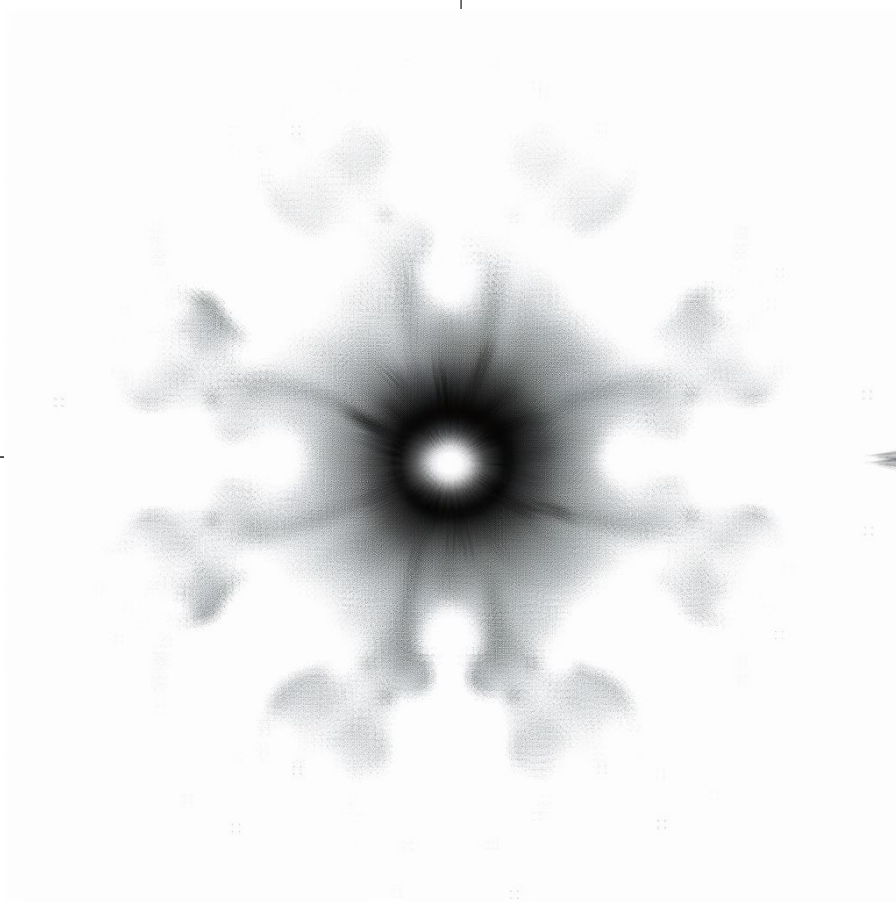
Date & time	22 Jan 2023, 1511h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0030.WAV
length	00:12 m



Rudimentary Corduroy Road in Hobrechtsfelde's Rieselfelder

geo data

Location	Hobrechtsfelde/Buch, 13125 Berlin, Deutschland
GPS metadata	52.662905 N, 13.482106 O
Topsoil qualities	Swamp



Sounds of the contaminated swamp

record data

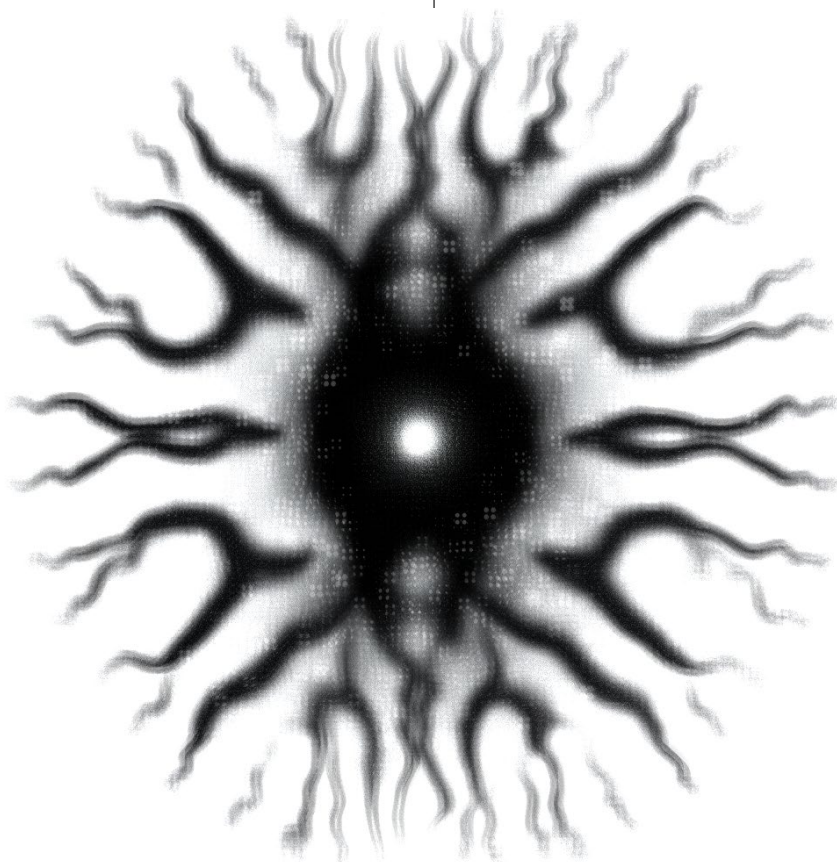
Date & time	20 Nov 2023, 1631h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0111.WAV
length	02:43 m



Forcibly cleared Köpi-Garten brownfield

geo data

Location	Köpenicker Str. 130, 10179 Berlin, Deutschland
GPS metadata	52.508457 N, 13.425095 O
Topsoil qualities	Technogenic substrates, medium-grained coarse sand



Voice of security staff guarding new developments on site

record data

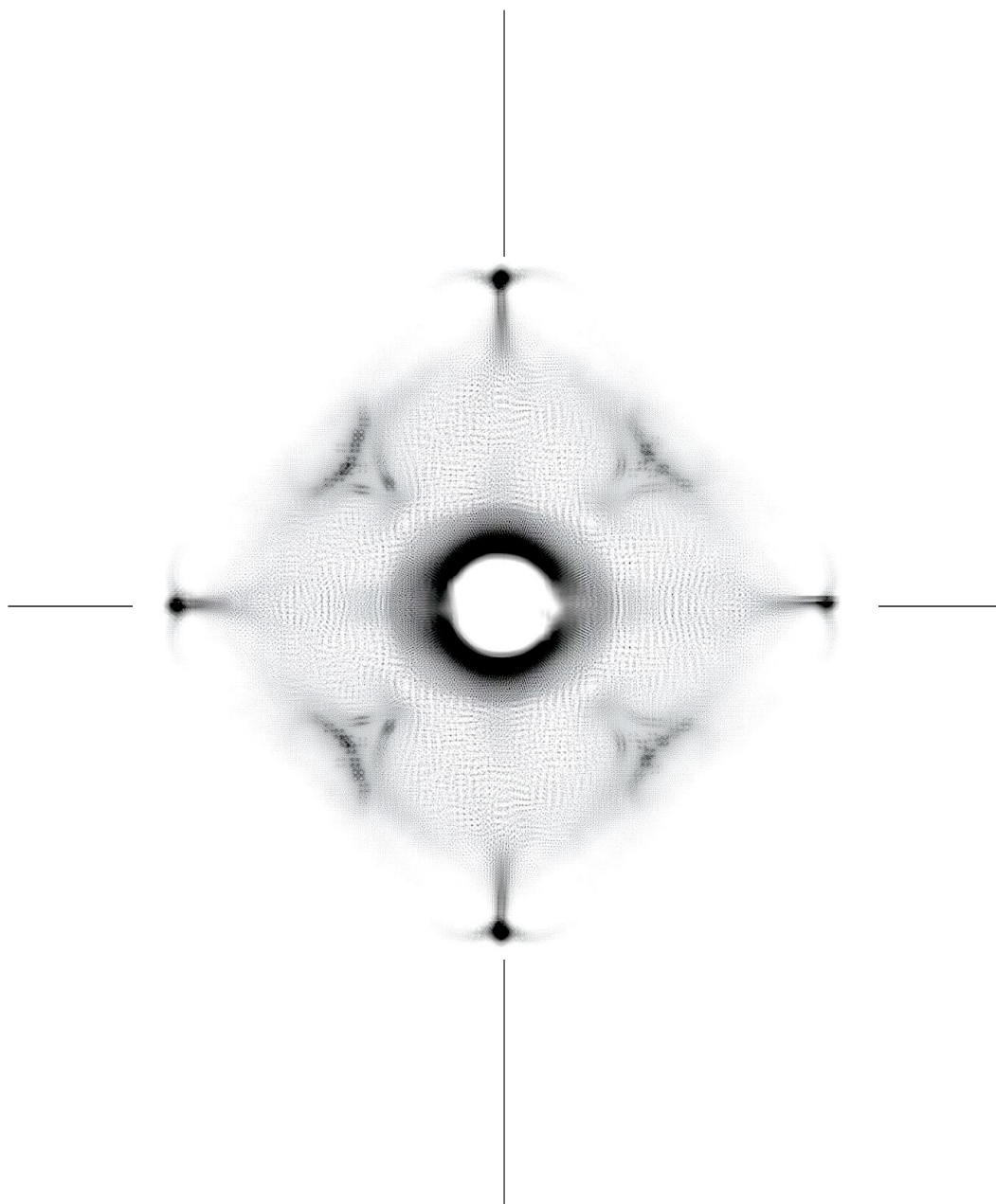
Date & time	25 Nov 2023, 1231h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0039.WAV
length	00:30 m



Cement plant of Heidelberger Beton

geo data

Location	Mergenthalerring 3, 12435 Berlin, Deutschland
GPS metadata	52.483969 N, 13.459683 O
Topsoil qualities	Technogenic sealing with asphalt and tar on a gravel bed



Cement manufacturing sounds

record data

Date & time	25 Nov 2022, 1644h
Medium	ZOOM H5 Handy Recorder
file name	ZOOM0049.WAV
length	00:09 m

DESIGN RESEARCH



GN

RCH



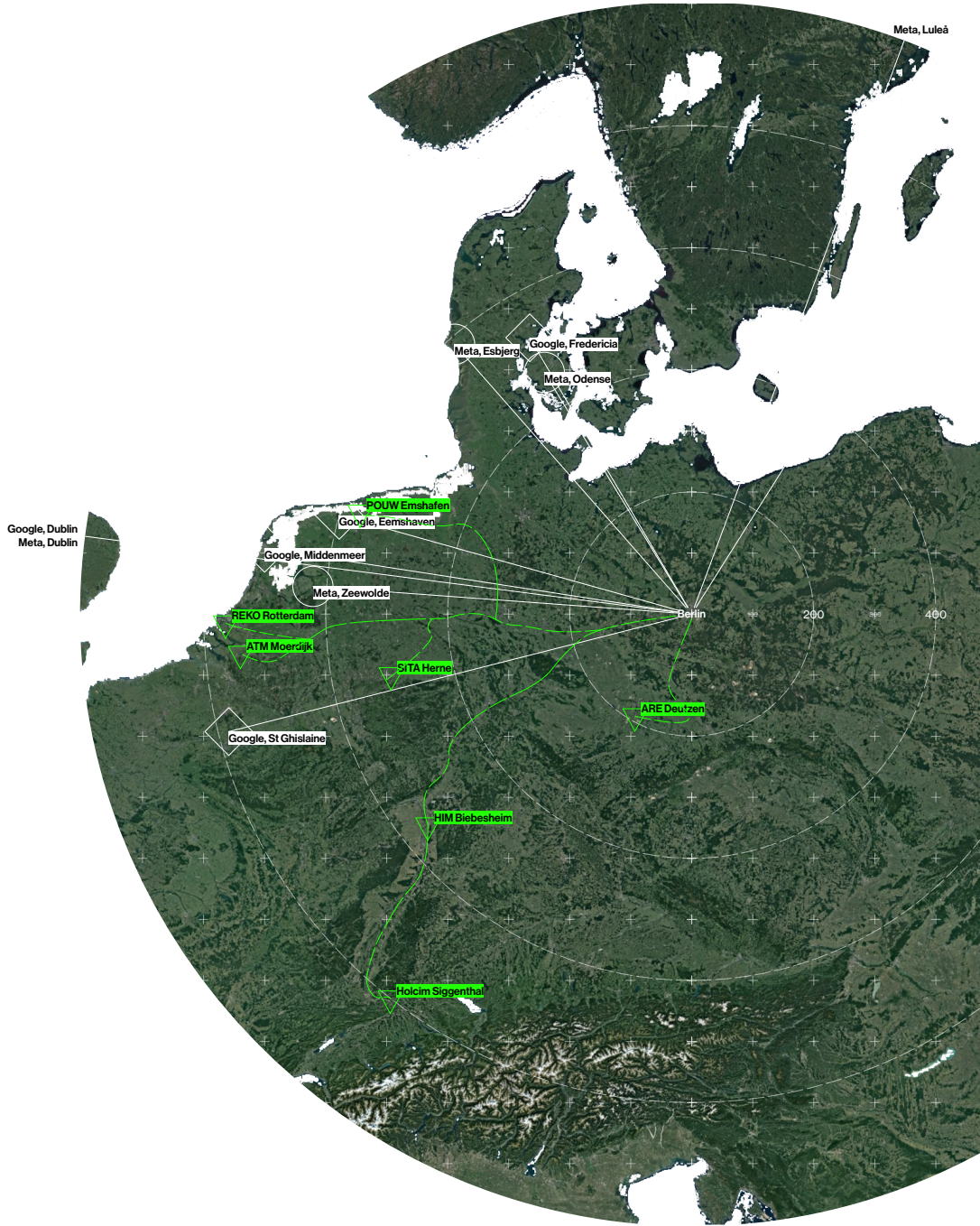
Science + Fiction

A Spatial Approach
towards Science and
Technology

SITE	76	Introduction In-situ and Ex-situ
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	104	Geology Ground condition and processes
	120	Urban Situation Analysis of locus
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	156	Process on site Timeline of approach
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	160	Spatialities Programmatic requirements
	162	Precedents Data centres
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INTRODUCTION

In-situ?



Google, Hamina



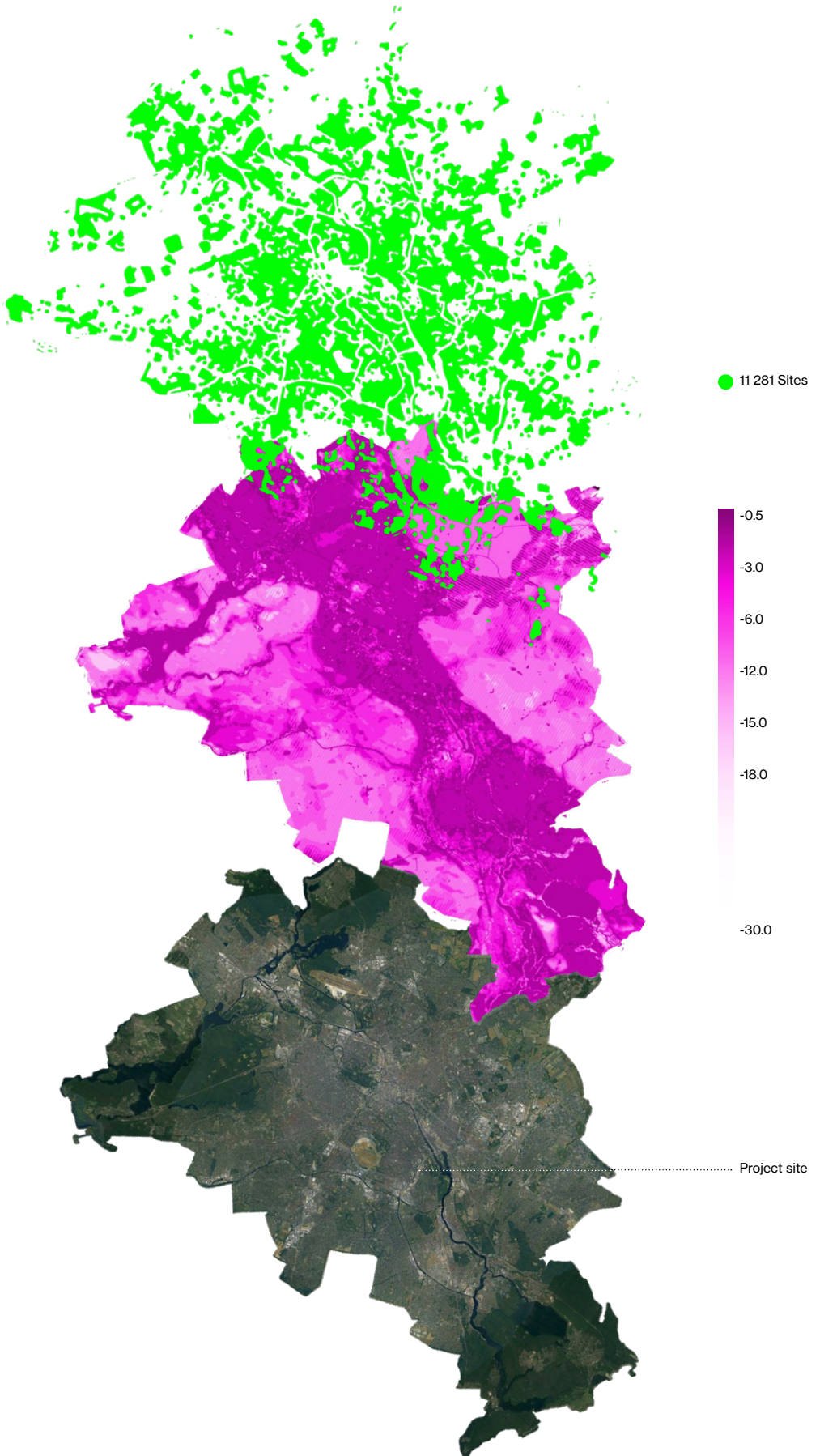
In-Situ?

Ex-situ treatment processes play an important role in soil decontamination efforts. Although being a vital part of the city, remediation therefore oftentimes does not happen on site, but in specialised external plants. These facilities, however, are rare, fenced off and geographically dispersed; the map shows all Western European thermal desorption plants for instance (Marti Infra AG). Urban soils, in Berlin's case, travel up to 800 km to be treated in specialised facilities like ATM in Moerdijk, NL.

In the case of Bodenschatz, which in its scheme proposes to remediate Berlin's brownfields on a large scale, not only the economic viability of the long routes to these plants is questioned. Another factor is the interaction of people with soil as a tangible, but largely invisible resource in the city. Performing Berlin's ex-situ decontamination processes in Berlin and making them accessible and transparent to the public is therefore hypothesised to mediate between humans and their physical habitat by centralising such efforts and setting an architectural precedent of an urban decontamination plant.

Another ex-situ process influencing urban life is the role and management of data. Although being the most populous country in Europe, there is neither a Meta/Facebook nor Google data centre located in Germany. The sites of data collecting and those of data processing diverge. This physical decoupling contributes to the inaccessible, almost metaphysical notion of digital processes James Bridle (2020) introduces.

Bodenschatz' blockchain scheme requires servers to monitor and handle data from intervention sites and mine crypto-tokens accordingly. As soil remediation is rethought as an urban program, so is the data centre – along the possible syntheses between the two (re-)mining facilities.



Altlasten

Berlin is severely contaminated in many sites, mostly due to its industrial history. As of July 2022, there were 11'281 recorded harmful soil changes, suspected areas, contaminated sites or areas suspected of contamination (Senatsverwaltung für Mobilität, Verkehr, Klimaschutz und Umwelt, 2022). Even though being one of the smallest of Germany's 16 states, Berlin has more polluted sites or suspected areas than 9 other states and the second-highest density of contamination per area after the port city Bremen/Bremerhaven (LABO, 2022). Less than 15% (1692) of the sites were successfully treated, primordially addressing freshwater extraction points (Senatsverwaltung für Mobilität, Verkehr, Klimaschutz und Umwelt, 2022). In the remaining sites, a variety of hazards is slumbering. The actual risks of this contamination depend on each respective contaminant, yet are in each case a human health risk, i.e. by leached water or polluted air. As the soil quality is degrading, ecosystems and biodiversity are equally threatened by the occurrence of environmental toxins. Few of the contaminants decay autonomously, so treatment interventions are inevitable to mitigate these threats to the urban system.

(Map based on data from Berlin Bodenbelastungskataster, 2023)

Grundwasser

Berlin's groundwater is extraordinarily high. Historically a complex of swamps and wetlands, the area had to be widely drained over the centuries to become inhabitable, especially the central areas adjacent to the river Spree. Street names like Kurfürstendamm or Mehringdamm are reminiscent of the prevalence of so-called "Dammwege" (corduroy roads) draining the water out of the quickly evolving European metropolis.

In relation to ground contamination, the level of groundwater is a key factor increasing urgency in decontamination efforts. Contamination reaching groundwater aquifers threatens both human and ecological health and renders it nearly impossible to rid the environment of toxic burdens, while they are still treatable in the solidity of the ground. To make matters worse, ground water levels in Berlin have been monitored to gradually rise over the last 30 years, reaching + 0.5m in 2012 (IHK, 2014). For the Urstromtal belt (dark pink in the drawing on the left), this results in an undershooting of the critical 2,5m difference in over 20% of the monitored area.

(Map based on data from Umweltatlas Berlin, 2009/2023)

Intervention

The project site is the former freight depot (Güterbahnhof) Treptow. Located in the dark pink belt of critically high groundwater levels and simultaneously heavily contaminated by the former industrial and logistic activities, the Güterbahnhof is in high demand of decontamination. Pollutants and toxins on site include heavy metals as lead and cadmium, but also volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). Despite the highly favourable location in the city and the large footprint, these contaminants impose heavy legal and functional constraints on the use of the plot. By legal means of the Federal Soil Protection Act (BBodSchG §2, Art. 3), the lowest decontamination requirements apply for a "Rohstofflagerstätte" land use: a raw material deposit. Accordingly, three firms (HeidelbergerCement, Berger Beton and Elbekies Mühlberg) utilise the site as a sand deposit for concrete manufacturing, which also takes place there. The mineral material is delivered by chartered freight trains from extraction sites in Brandenburg to be reworked into cement and concrete used in construction sites all over Berlin.

Nested between large-scale infrastructures such as the S41/S42 Ringbahn, the A100 Stadtautobahn extension and the Neukölln canal, the site extends nearly rectangularly on a width of 110m and a length of 630m. The strong infrastructural demarcations complicate access from each side and lead to an insular enclosing from the urban surroundings.

**How can architecture be a
prototype of mitigating
mining space? To what
situ processes like soil
handling be reimaged
typology?**

become a synergetic
g urban urgencies by
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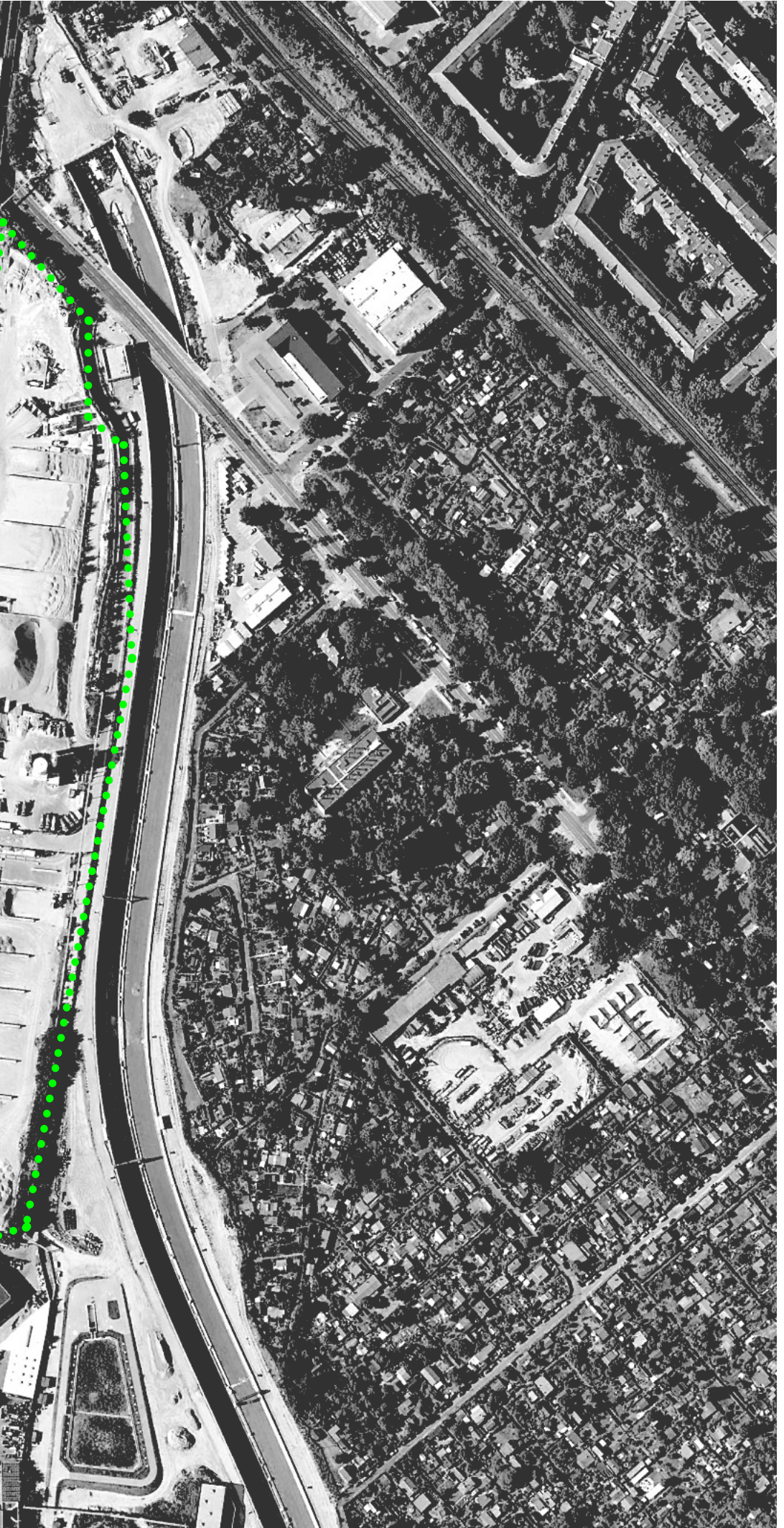
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52.479408°; 13.450250°









CONTAMINATION Pollutants on Site

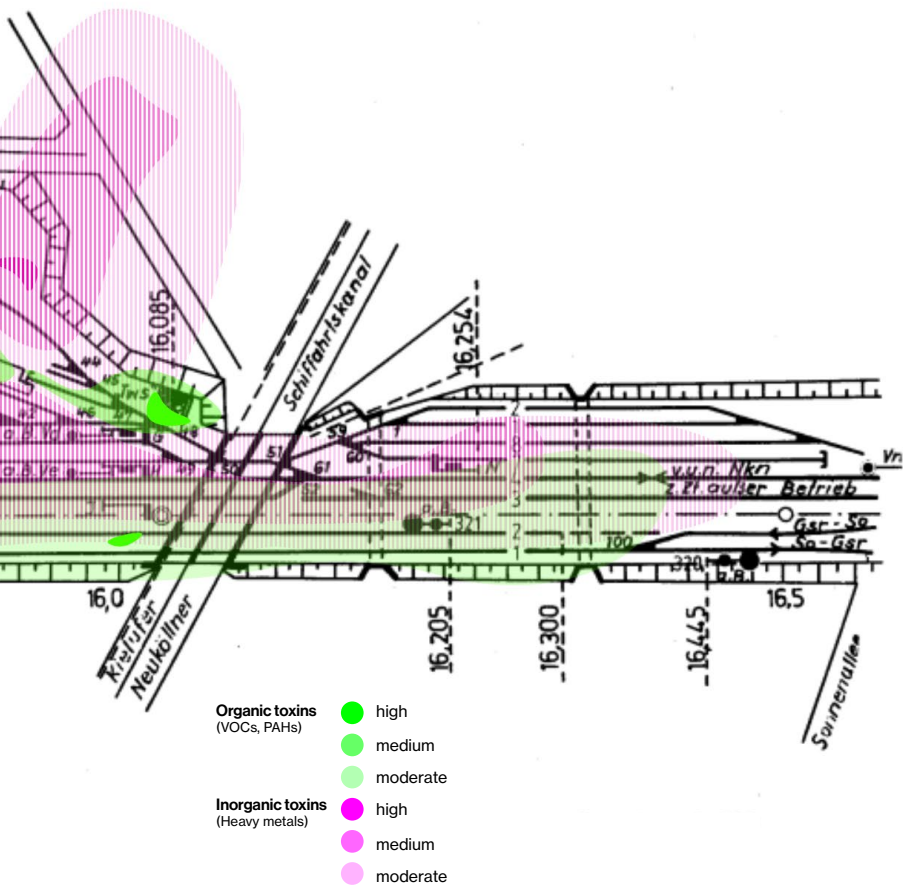


Nutzlängen der Gleise

Gleis 3 = 547 m	Gleis 11 = 426 m
" 4 = 540 "	" 14 = 555 "
" 5 = 536 "	" 15 = 58 "
" 8 = 564 "	" 16 = 35 "
" 9 = 554 "	" 17 = 30 "
" 10 = 447 "	" 23 = 579 "

Berlin - Treptow

hn (km 15,700 R/2,750 GA,
Istab



Contamination Map

Overlaid estimated contamination morphology with a 1982 plan of the site. Based on a map from Deutsche Bahn Archiv (1982) and contamination data from Deutsche Bahn AG (2022) and Umweltatlas Berlin (Senate Berlin, 2018)





Gesetz zum Schutz vor schädlichen Bodenveränderungen und zur Sanierung von Altlasten

(Bundes-Bodenschutzgesetz - BBodSchG)

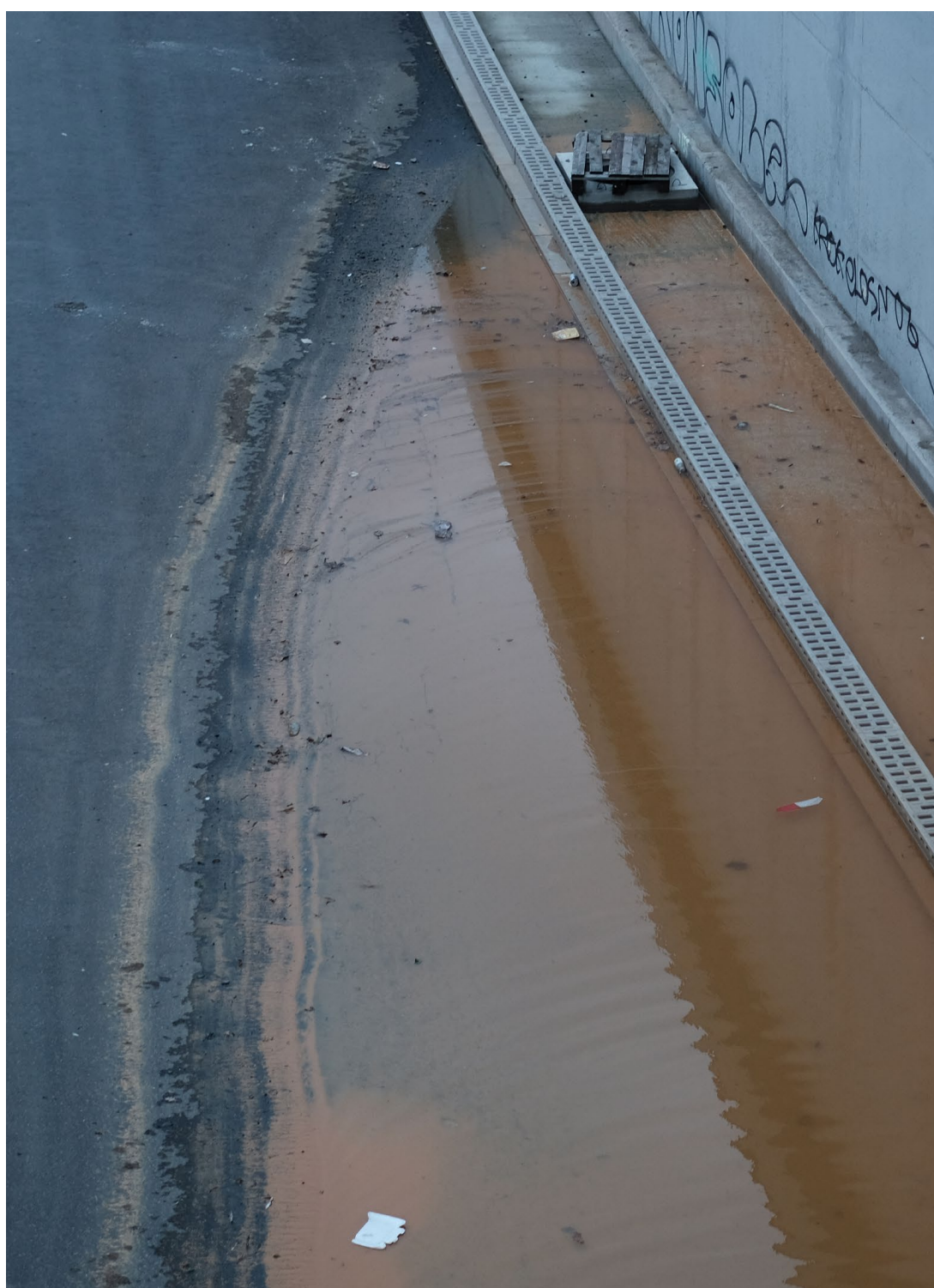
§ 1 Zweck und Grundsätze des Gesetzes

Zweck dieses Gesetzes ist es, nachhaltig die Funktionen des Bodens zu sichern oder wiederherzustellen. Hierzu sind schädliche Bodenveränderungen abzuwehren, der Boden und Altlasten sowie hierdurch verursachte Gewässerverunreinigungen zu sanieren und Vorsorge gegen nachteilige Einwirkungen auf den Boden zu treffen. Bei Einwirkungen auf den Boden sollen Beeinträchtigungen seiner natürlichen Funktionen sowie seiner Funktion als Archiv der Natur- und Kulturgeschichte so weit wie möglich vermieden werden.

Act on the Protection against Harmful Soil Changes and on the Remediation of Contaminated Sites (Federal Soil Protection Act - BBodSchG)

§ 1 Purpose and Principles of the Act

The purpose of this Act is to sustainably safeguard or restore the functions of the soil. To this end, harmful soil changes must be prevented, the soil and contaminated sites as well as water pollution caused by them must be remediated and precautions must be taken against adverse effects on the soil. In the case of impacts on the soil, impairments of its natural functions and its function as an archive of natural and cultural history are to be avoided as far as possible.





Bundes-Bodenschutzgesetz - BBodSchG

§ 4 Pflichten zur Gefahrenabwehr

(1) Jeder, der auf den Boden einwirkt, hat sich so zu verhalten, daß schädliche Bodenveränderungen nicht hervorgerufen werden.

(2) Der Grundstückseigentümer und der Inhaber der tatsächlichen Gewalt über ein Grundstück sind verpflichtet, Maßnahmen zur Abwehr der von ihrem Grundstück drohenden schädlichen Bodenveränderungen zu ergreifen. (3) Der Verursacher einer schädlichen Bodenveränderung oder Altlast sowie dessen Gesamtrechtsnachfolger, der Grundstückseigentümer und der Inhaber der tatsächlichen Gewalt über ein Grundstück sind verpflichtet, den Boden und Altlasten sowie durch schädliche Bodenveränderungen oder Altlasten verursachte Verunreinigungen von Gewässern so zu sanieren, daß dauerhaft keine Gefahren, erheblichen Nachteile oder erheblichen Belästigungen für den einzelnen oder die Allgemeinheit entstehen. Hierzu kommen bei Belastungen durch Schadstoffe neben Dekontaminations- auch Sicherungsmaßnahmen in Betracht, die eine Ausbreitung der Schadstoffe langfristig verhindern. Soweit dies nicht möglich oder unzumutbar ist, sind sonstige Schutz- und Beschränkungsmaßnahmen durchzuführen.

Zur Sanierung ist auch verpflichtet, wer aus handelsrechtlichem oder gesellschaftsrechtlichem Rechtsgrund für eine juristische Person einzustehen hat, der ein Grundstück, das mit einer schädlichen Bodenveränderung oder einer Altlast belastet ist, gehört, und wer das Eigentum an einem solchen Grundstück aufgibt.

(4) Bei der Erfüllung der boden- und altlastenbezogenen Pflichten nach den Absätzen 1 bis 3 ist die planungsrechtlich zulässige Nutzung des Grundstücks und das sich daraus ergebende Schutzbedürfnis zu beachten, soweit dies mit dem Schutz der in § 2 Abs. 2 Nr. 1 und 2 genannten Bodenfunktionen zu vereinbaren ist. Fehlen planungsrechtliche Festsetzungen, bestimmt die Prägung des Gebiets unter Berücksichtigung der absehbaren Entwicklung das Schutzbedürfnis. Die bei der Sanierung von Gewässern zu erfüllenden Anforderungen bestimmen sich nach dem Wasserrecht.





§ 4 Duties to avert danger

(1) Anyone who affects the soil must behave in such a way that harmful soil changes are not caused.

(2) The owner of the land and the holder of the actual power over a plot of land are obliged to take measures to avert the threat of harmful soil changes from their land.

(3) The polluter of a harmful soil change or contaminated site as well as his universal successor, the owner of the land and the holder of the actual control over a plot of land shall be obliged to remediate the soil and contaminated sites as well as contamination of water bodies caused by harmful soil changes or contaminated sites in such a way that no hazards, significant disadvantages or significant nuisances arise for the individual or the general public in the long term. In the case of pollution by pollutants, this may include decontamination measures as well as safety measures to prevent the spread of pollutants in the long term. If this is not possible or unreasonable, other protective and restrictive measures must be taken. Any person who, on the basis of commercial or corporate law, is liable for a legal entity owning a plot of land contaminated with a harmful soil change or a contaminated site and who relinquishes ownership of such a plot of land shall also be obliged to carry out remediation.

(4) In fulfilling the obligations relating to soil and contaminated sites under subsections (1) to (3), the permissible use of the land under planning law and the resulting need for protection shall be taken into account insofar as this is compatible with the protection of the soil functions specified in section 2(2) nos. 1 and 2. In the absence of provisions under planning law, the character of the area shall determine the need for protection, taking into account the foreseeable development. The requirements to be met in the remediation of water bodies shall be determined by water law.









Cr	Cu	Hg	Ni	Pb	Zn	Bap	ΣPCB
0-50	10-70	<0.3	10-30	40-110	20-60	< 0.8	0.1-0.4
0-50	a	<0.1	10-20	10-40	a	< 0.1	< 0.1
0-80	a	a	a	80-100	a	30-150	< 0.1
0-50	<30	<0.1	<10	10-40	10-140	< 0.1	< 0.1
0-4.5%	20-180	<0.2	20-250	10-170	130-410	< 0.3	< 0.1
1,000-4,000	1,000-4,000	<0.1	100-1,500	2-5%	7-13 %	a	a
100-2,000	7,000-12,000	<0.1	1,000-2,000	2,000-4,000	5-10 %	a	a
0-60	90-110	<0.1	30-80	10-180	10-230	< 0.8	< 0.1
60-3,600	630-1,300	7.5-9	100-1,300	5,500-8,300	1.5-2.7 %	a	a
0-1,300	510-3,400	<2.0	40-280	410-3,200	840-4,800	a	a
0-50	50-80	<0.3	20-90	20-180	130-330	< 0.5	a

Contaminant concentrations (mg/kg-1, %) of different technogenic mono-substrates present a.o. in railway embankments of different locations in Berlin, Germany (Data from Hiller & Meuser, 1998)

Bundes-Bodenschutzgesetz - BBodSchG
§ 2 Begriffsbestimmungen

[...]

(3) Schädliche Bodenveränderungen im Sinne dieses Gesetzes sind Beeinträchtigungen der Bodenfunktionen, die geeignet sind, Gefahren, erhebliche Nachteile oder erhebliche Belästigungen für den einzelnen oder die Allgemeinheit herbeizuführen.

(4) Verdachtsflächen im Sinne dieses Gesetzes sind Grundstücke, bei denen der Verdacht schädlicher Bodenveränderungen besteht.

(5) Altlasten im Sinne dieses Gesetzes sind

- 1. Stillgelegte Abfallbeseitigungsanlagen sowie sonstige Grundstücke, auf denen Abfälle behandelt, gelagert oder abgelagert worden sind (Altablagerungen), und**
- 2. Grundstücke stillgelegter Anlagen und sonstige Grundstücke, auf denen mit umweltgefährdenden Stoffen umgegangen worden ist, ausgenommen Anlagen, deren Stilllegung einer Genehmigung nach dem Atomgesetz bedarf (Altstandorte), durch die schädliche Bodenveränderungen oder sonstige Gefahren für den einzelnen oder die Allgemeinheit hervorgerufen werden.**



[...]

(3) Harmful soil changes within the meaning of this Act are impairments of soil functions which are likely to cause danger, significant disadvantages or significant nuisance to individuals or the general public.

(4) Suspected sites within the meaning of this Act are properties where harmful soil changes are suspected.

(5) Contaminated sites within the meaning of this Act are 1. Decommissioned waste disposal facilities and other land on which waste has been treated, stored or deposited (contaminated sites), and 2. Land of decommissioned installations and other land on which environmentally hazardous substances have been handled, with the exception of installations whose decommissioning requires a licence under the Atomic Energy Act (old sites), which cause harmful soil changes or other hazards to individuals or the general public.



Cadmium

Group: Heavy Metals

Origin: Smelters, fossil and industrial emissions, waste incineration

Remediation strategies:

- + Thermal Desorption
- + Phytoremediation
- + Soil Washing
- + Solidification / Stabilisation



Arsenic

Group: Heavy Metals

Origin: Industrial emissions, agricultural trade and logistics

Remediation strategies:

- + Thermal Desorption
- + Phytoremediation
- + Soil Washing
- + Chemical Reduction/Oxidation

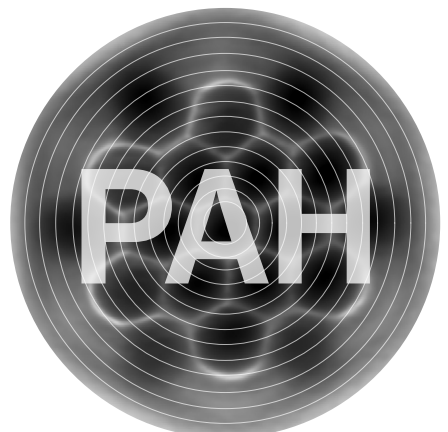


PAHs

Group: Hydrocarbon Contaminants

Origin: Railway tracks (tar treatment), fuel combustion

- + Thermal Desorption
- + Phytoremediation (sunflowers)
- + Bioremediation
- + Soil Washing
- + Chemical Oxidation





VOCs

Group: Organic Contaminants

Origin: Industrial emissions, agricultural trade and logistics

Remediation strategies:

- + Soil Vapour Extraction
- + Bioremediation (bacterial)
- + Air Sparging
- + Solidification / Stabilisation



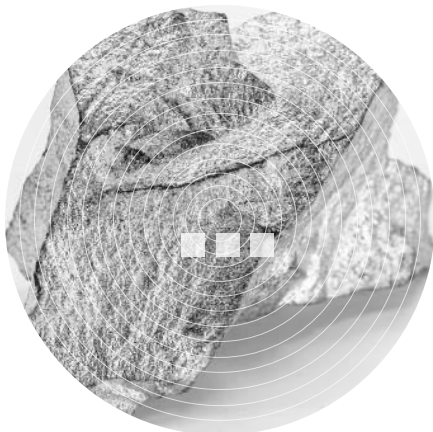
Lead

Group: Heavy Metals

Origin: Fossil fuel combustion (pre-1980s), fuel spills, industrial logistics

Remediation strategies:

- + Thermal Desorption
- + Phytoremediation
- + Soil Washing (+Solvents)
- + Chemical Reduction/Oxidation



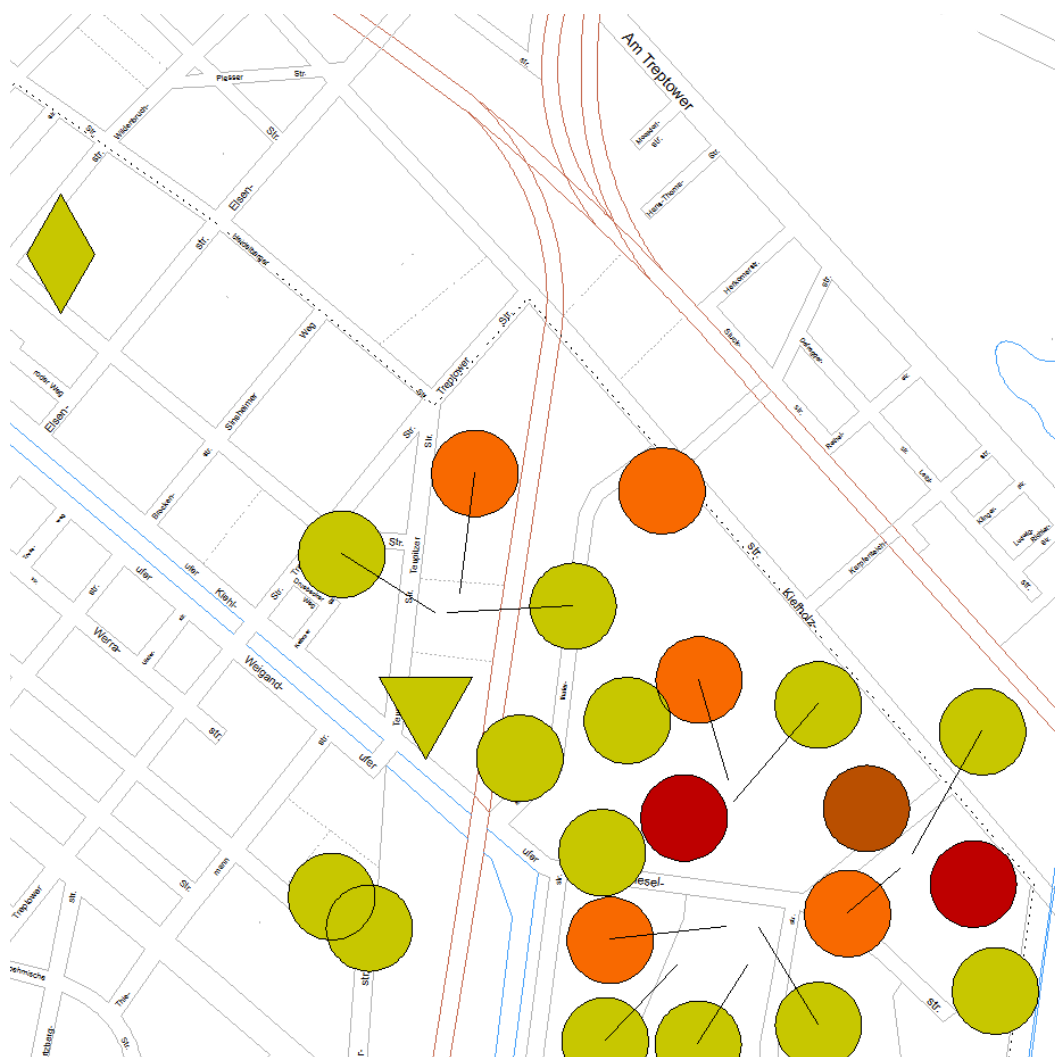
Other Heavy Metals (smaller quantities)

Group: Heavy Metals

Origin: Industrial emissions

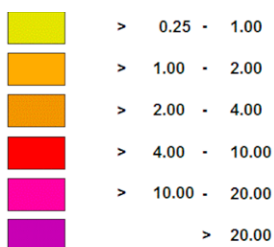
Remediation strategies:

- + Thermal Desorption
- + Phytoremediation
- + Soil Washing
- + Chemical Reduction/Oxidation



Map via Geoportal Berlin, accessed in March 2023
via <https://fbinter.stadt-berlin.de>

Soil pollution in mg/kg



Cadmium

Group: Heavy Metals

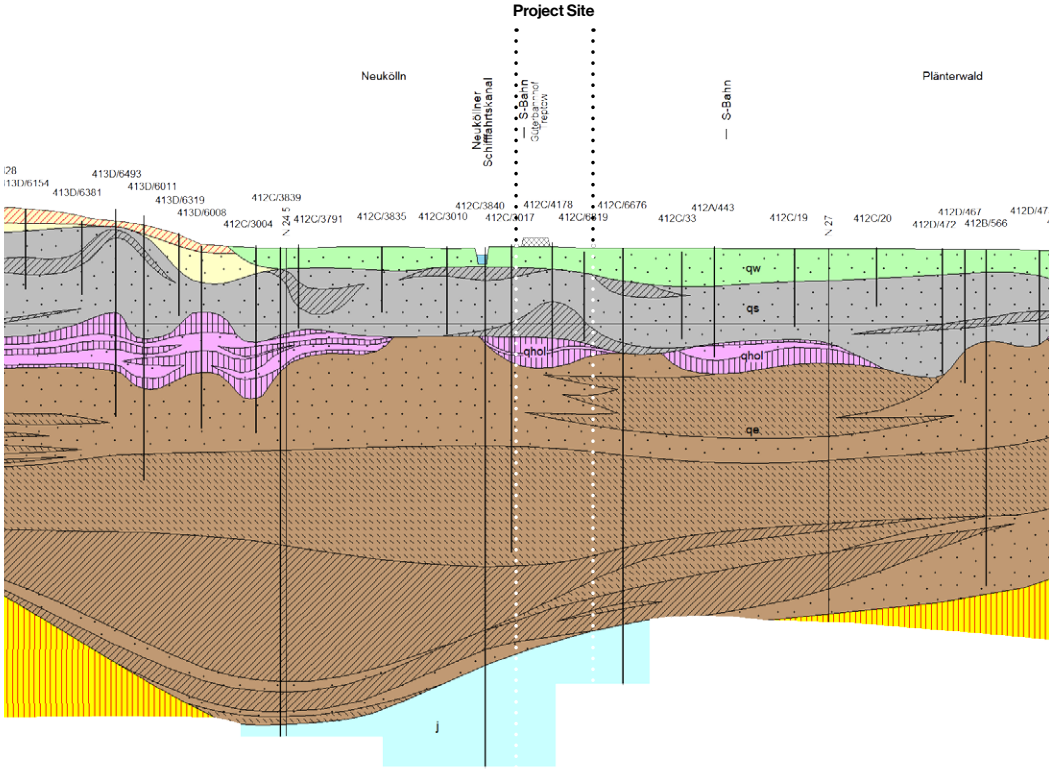
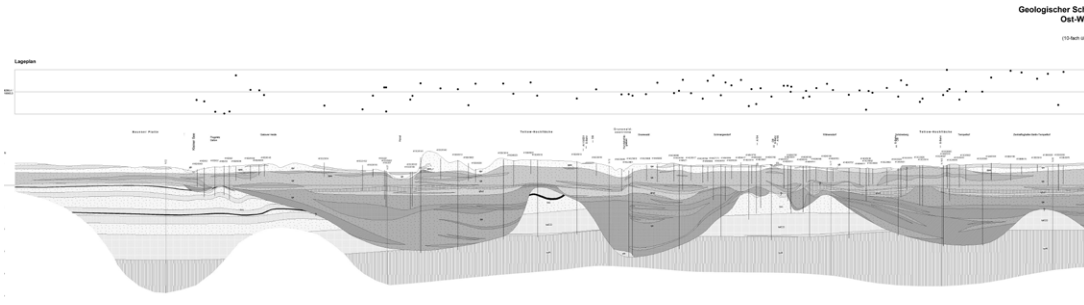
Origin: Smelters, fossil and industrial emissions, waste incineration

Remediation strategies:

- + Thermal Desorption
- + Phytoremediation
- + Soil Washing
- + Solidification / Stabilisation

GEOLOGY

Site



Quartär

- Holozän qh**
 - Auffüllung
 - Torf, Muddie, Schluff
- Weichselspätglazial bis Holozän qw-qh**
 - Dünensand
- Weichsel-Kaltzeit qw**
 - Talsand, z.T. kiesig
 - Schmelzwassersand, z.T. kiesig
 - Geschiebemergel, -lehm

Eem-Warmzeit qee

- Sand z.T. organisch durchsetzt
 - Muddie, Schluff
- Saale-Kaltzeit qs**
- Schmelzwassersand, z.T. kiesig
 - Geschiebemergel
 - Beckenschluff, -ton

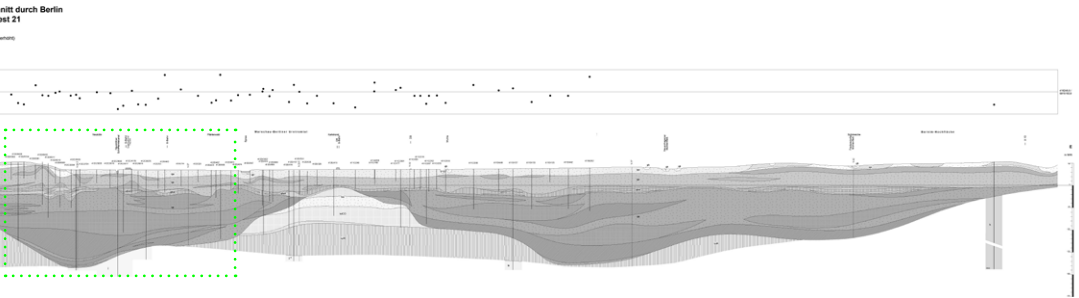
Holstein-Warmzeit qhol

- Sand, z.T. kiesig (fluvial)
 - Ton, Muddie, Schluff
- Elster-Kaltzeit qe**
- Schmelzwassersand, z.T. kiesig
 - Geschiebemergel
 - Beckenschluff, -ton

Tertiär

- Miozän tmi**
 - Quarzsand
 - Braunkohlschluff, -ton
 - Braunkohle
- Oberligozän / Cottbuser Folge toICO**
 - Feinsand mit Glimmer
 - Schluff, Ton

Data and imagery via Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (2023). Geological section "Berlin Ost-West 21" accessed in April 2023, via <https://fbinter.stadt-berlin.de>



Geological Situation

It is indispensable to consult the geological conditions before moving ahead with decontamination efforts for several reasons. Some geological layers, for instance, have specific characteristics favouring or repelling contaminants. The case of the project site in Neukölln is furthermore interesting for its partly anthropogenic origin, as the site has been levelled artificially by filling when the freight station was first established. The geological top layer of the Warsaw-Berlin Ursprungtal belt, glacial sand in different grain sizes, is therefore partly overlaid with technogenic substrates. A mix of silt and sand as well as traces of tar, asphalt and other re-used urban material is therefore prevalent as the top soil for the northern site area (see drill sample 412C-4023 on next spread). According to Hiller & Meuser (1998), especially technogenic substrates and traces contain toxins like heavy metals in high concentrations, raising concerns about these geological filler materials all over the site.

Additionally introduced substances like the pollutants described in the last chapter behave in different ways according to different geological substrates: the substrate, according to Hseu et al. (2011), can play a significant role in soil contamination; understanding its properties is important when assessing and remediating contaminated sites. In the case of the project site, where sand forms a comparably porous top layer, contaminants can penetrate more deeply into the soil. In such a case of sand-based soils, it becomes more urgent to remove contaminants because of the potential risk of groundwater contamination (Hseu et al., 2011).

According to the studies of technogenic substrates by Hiller & Meuser, the project proposes to act in a preventative way towards the northern part of the site, (which was landfilled on a large scale) by fully excavating and remediating the former filling to be re-used elsewhere, i.e. as building material.

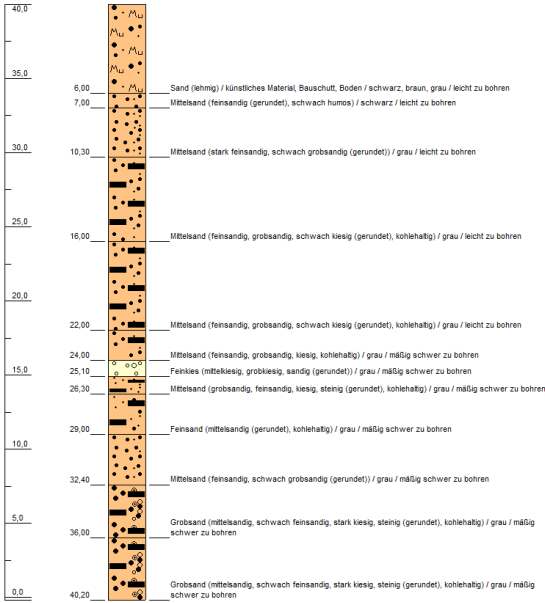
Contamination originates as a by-product of industrial activities on site for the rest of the project location. The part of natural origin therefore needs to be reworked and excavated in patches according to local pollution levels and the corresponding geological substrate.

GEOLOGY

Site

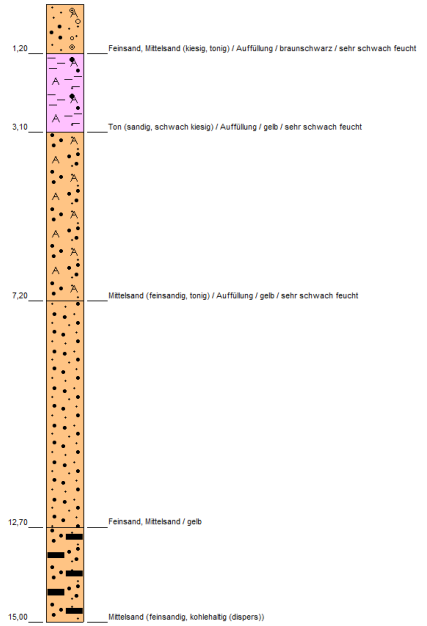
Bohrung 412A-1213
Geländeoberkante 40,00 m NNH

m NNH



Bohrung 412A-3618
Geländeoberkante 40,28 m NNH

m NNH

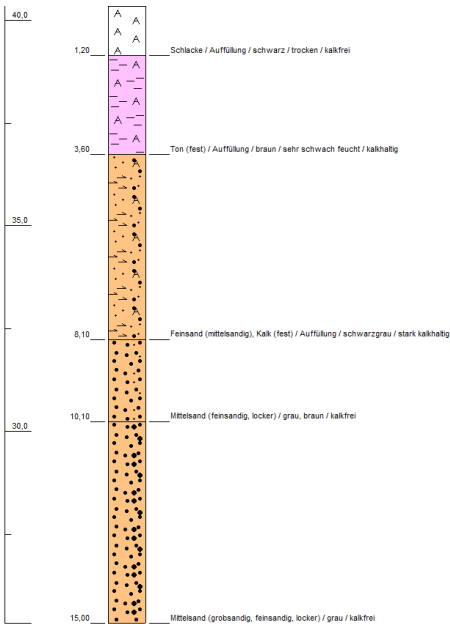


Bezirk: Neukölln	
Ortsteil: Neukölln	
Lage: Kieholzstr. 60/66, 12057 Berlin	Rechtswert (UTM 33N): 395396,5
	Hochwert (UTM 33N): 5815773,5
Bohrbeginn: 09.09.2010	Bohrende: 16.09.2010
Bohrverfahren: unbekanntes Bohrverfahren	

Bezirk: Treptow-Köpenick	
Ortsteil: Alt-Treptow	
Lage: S-Bahn / Kieholzstraße	Rechtswert (UTM 33N): 395333,1
	Hochwert (UTM 33N): 5815964,7
Bohrbeginn: 16.12.1993	Bohrende: 17.12.1993
Bohrverfahren: Trockenbohrung	

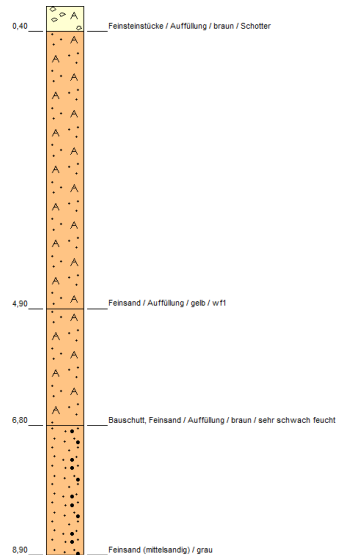
Bohrung 412A-3613
Geländeoberkante 40,34 m NNH

m NNH



Bohrung 412A-3614
Geländeoberkante 39,38 m NNH

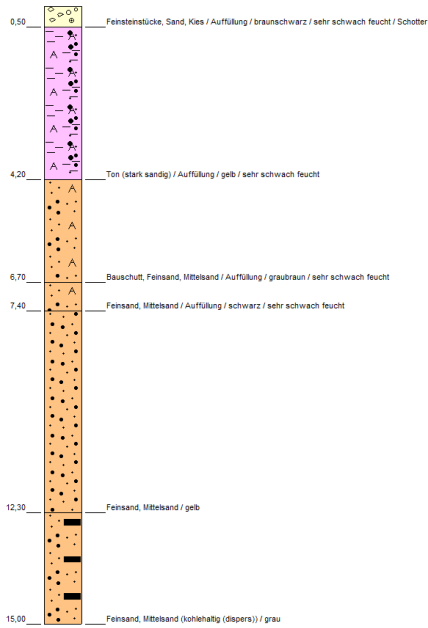
m NNH



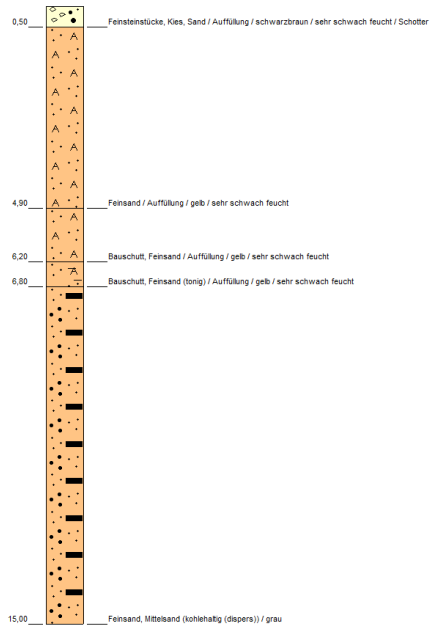
Bezirk: Treptow-Köpenick	
Ortsteil: Alt-Treptow	
Lage: Kieholzstraße (Brücke)	Rechtswert (UTM 33N): 395388,3
	Hochwert (UTM 33N): 5816081,6
Bohrbeginn: 22.10.1993	Bohrende: 25.10.1993
Bohrverfahren: Trockenbohrung	

Bezirk: Treptow-Köpenick	
Ortsteil: Alt-Treptow	
Lage: S-Bahnbrücke / Kieholzstraße	Rechtswert (UTM 33N): 395318,5
	Hochwert (UTM 33N): 5816090,9
Bohrbeginn: 10.12.1993	Bohrende: 13.12.1993
Bohrverfahren: Trockenbohrung	

Bohrung 412A-3617
Geländeoberkante
40,19 m NNH



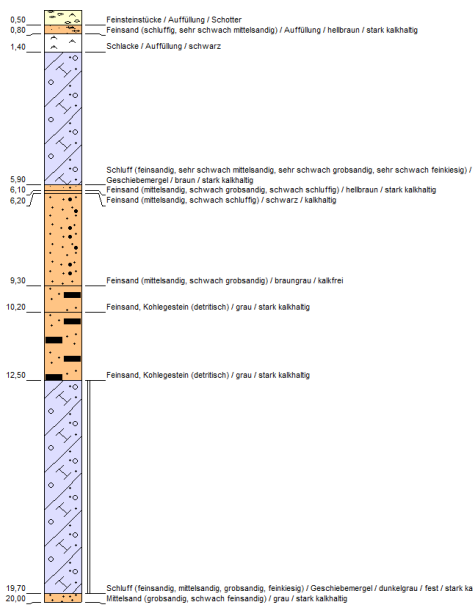
Bohrung 412A-3616
Geländeoberkante
40,14 m NNH



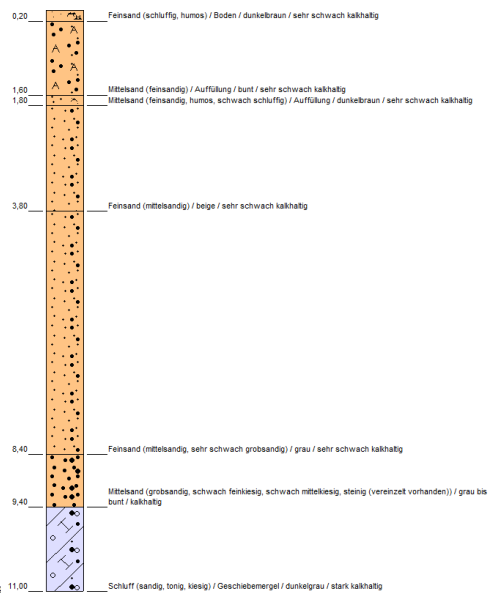
Bezirk: Treptow-Köpenick	
Ortsteil: Alt-Treptow	
Lage: S-Bahn / Kieflholzstraße	Rechtswert (UTM 33N): 395312,6 Hochwert (UTM 33N): 5815993,1
Bohrbeginn:	Bohrende: 17.12.1993
Bohrverfahren: Trockenbohrung	

Bezirk: Treptow-Köpenick	
Ortsteil: Alt-Treptow	
Lage: S-Bahn / Kieflholzstraße	Rechtswert (UTM 33N): 395319,6 Hochwert (UTM 33N): 5816044,9
Bohrbeginn: 14.12.1993	Bohrende: 16.12.1993
Bohrverfahren: Trockenbohrung	

Bohrung 412C-4023
Geländeoberkante
39,27 m NNH



Bohrung 412C-4180
Geländeoberkante
34,27 m NNH



Bezirk: Neukölln	
Ortsteil: Neukölln	
Lage: S-Bahnbrücke Kiehlufer	Rechtswert (UTM 33N): 395238,7 Hochwert (UTM 33N): 5815419,5
Bohrbeginn:	Bohrende: 13.05.1993
Bohrverfahren: Trockenbohrung	

Bezirk: Neukölln	
Ortsteil: Neukölln	
Lage: Mergenthaler Ring (Kolonie Kiehier Grund)	Rechtswert (UTM 33N): 395337,2 Hochwert (UTM 33N): 5815445,6
Bohrbeginn:	Bohrende: 27.11.1995
Bohrverfahren: unbekanntes Bohrverfahren	



**Fine silty topsoil
Southeast**



Medium-grained sand, high carbon content
South



**Pebbly fine-grained sand
East**



Technogenic substrate (asphalt)
East



Techno-technogenic substrate
Northeast



**Fine clay with high carbon content
North**



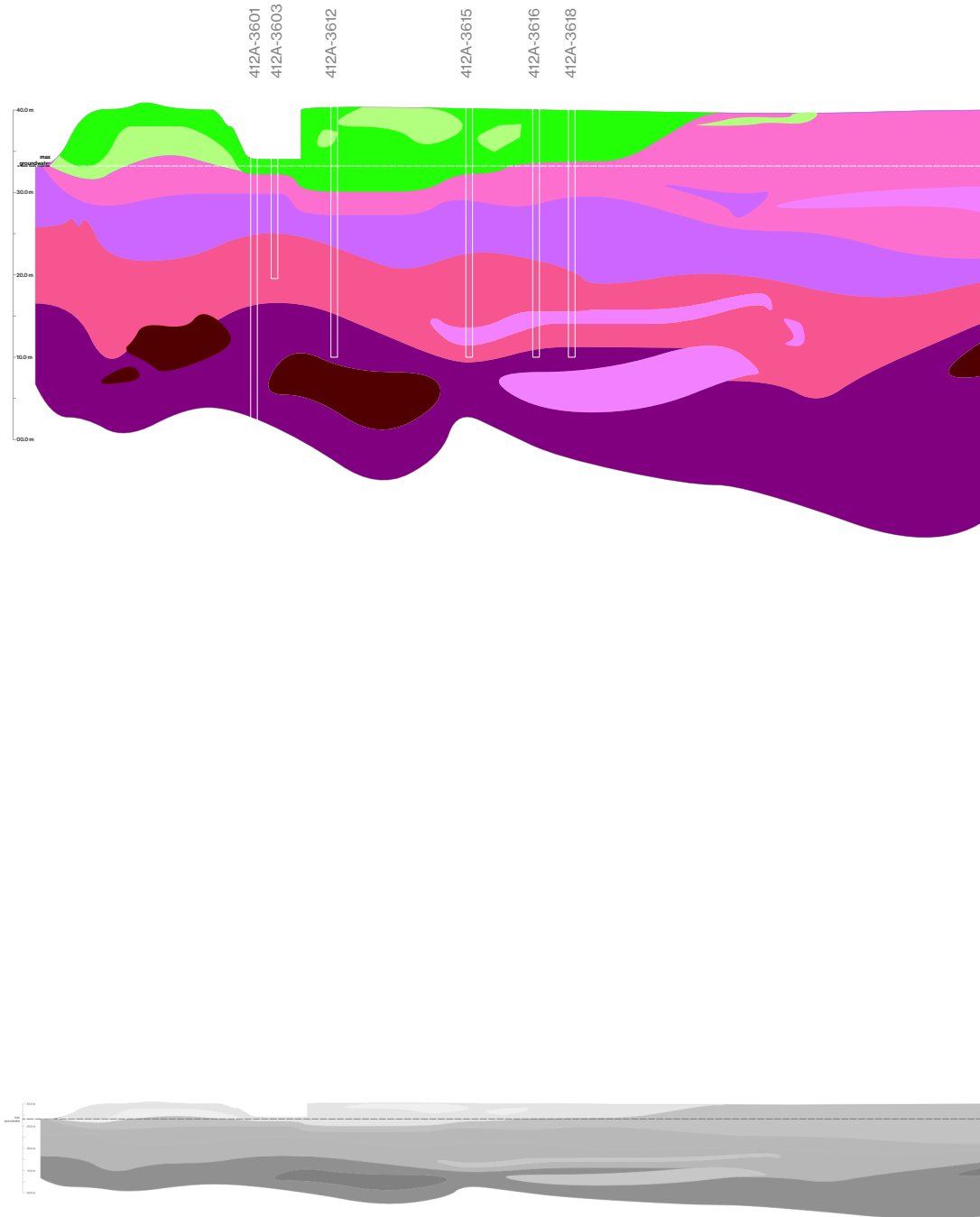
Anthropogenic residues becoming substrate
South



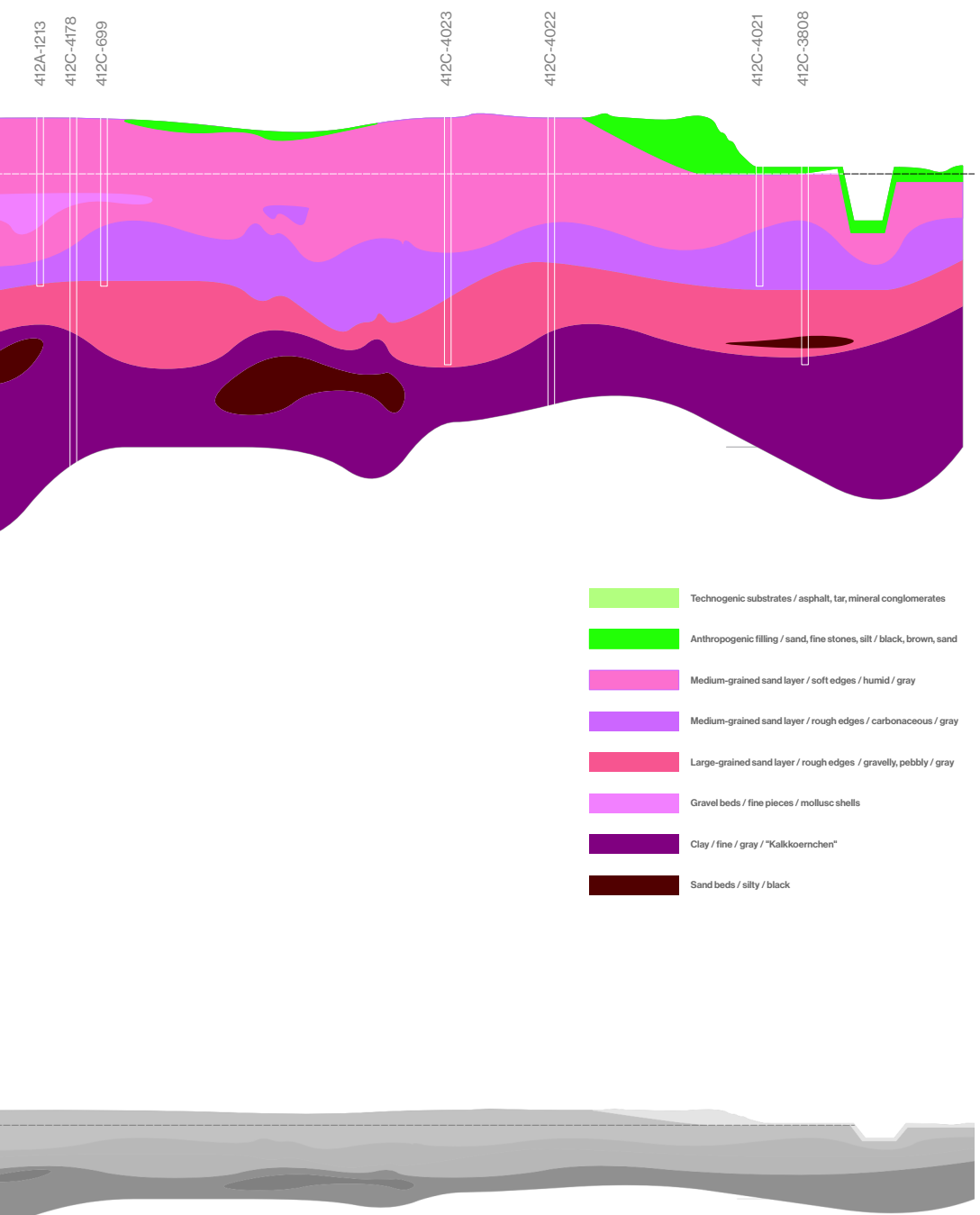
Anthropogenic residues becoming substrate
West

GEOLOGY

Site



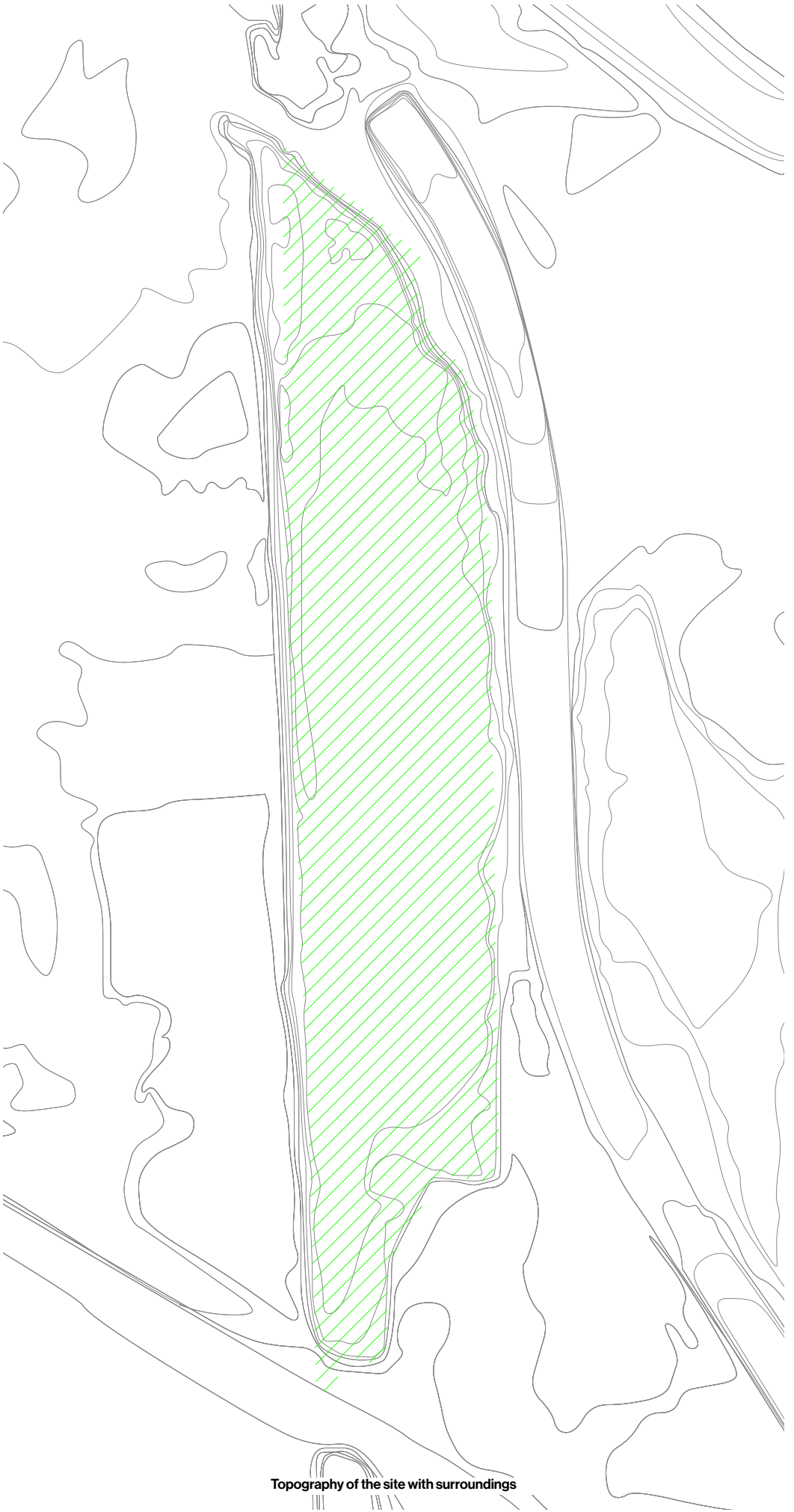
Height is quadrupled in top figure.
See monochromatic section for correct proportions.



Section represents a layer estimation based on drill sample data by Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (1993-2010). Bohrpunktatlas accessed in April 2023 via <https://fbinter.stadt-berlin.de>

GEOLOGY

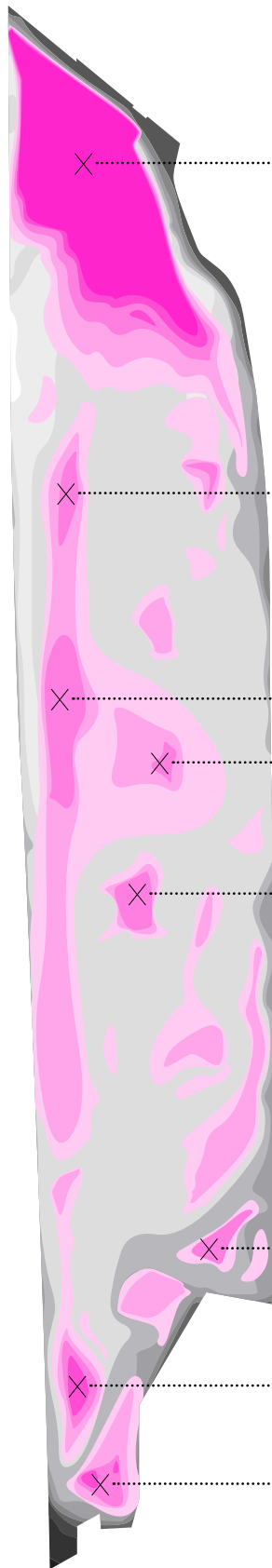
Site



Topography of the site with surroundings



Topography: Status Quo



Topography: Excavation proposal

Technogenic landfilling

Excavation up to -6.5m
see i.e. 412A-3612

Railway embankment

Excavation up to -2.5m
see i.e. 412A-3617

Railway embankment

Excavation up to -2.5m
see i.e. 412A-3617

Fuel spills etc.

Excavation up to -2.5m
see i.e. 412A-1213

Spills & Landfilling

Excavation up to -2.5m
see i.e. 412C-699

Fuel spills etc.

Excavation up to -2.5m

Technogenic landfilling

Excavation up to -5.5m
see i.e. 412C-4021

Technogenic landfilling

Excavation up to -4.0m
see i.e. 412A-4022

URBAN SITUATION

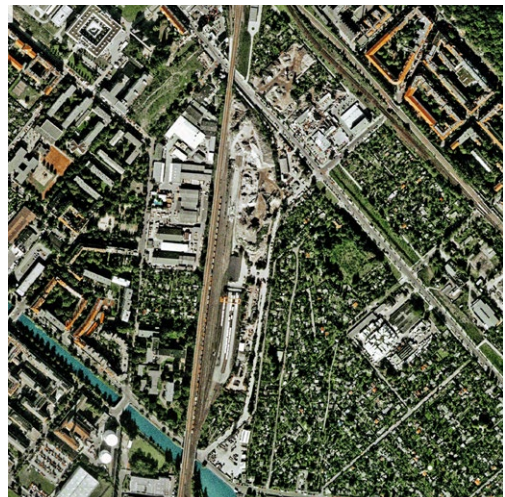
Site Analyses



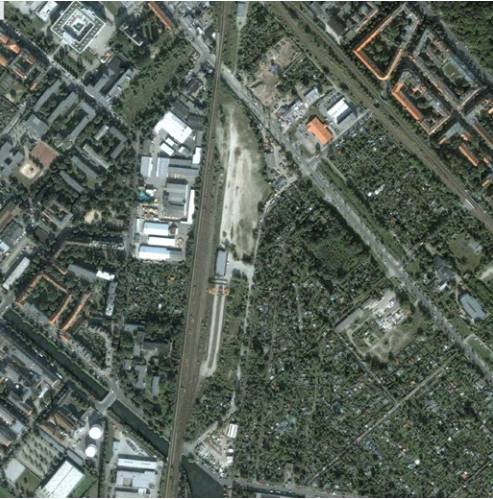
Winter 1961. Due to the proximity of the border wall, the station in West Berlin was almost unused during the separation of Berlin. It experienced a revival in the 1990s before being demolished to make space for the sand deposit.



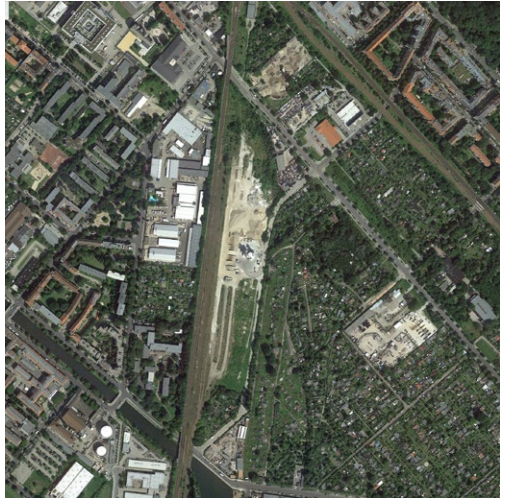
12/1953. Post-war destructions, early *Wirtschaftswunder*. Siemens' mobility section settles on Mergenthalerring. The wall will soon be erected close to it, right north of the site.



07/1993. After the reunification, the station is used and extended.



09/2005_ Industrial facilities and warehouses in vicinity gradually start to close down.



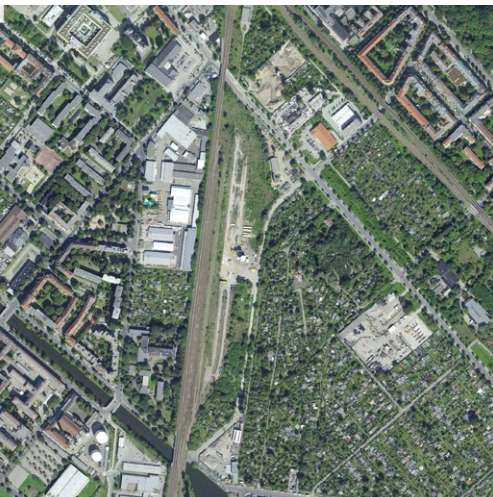
06/2012_ HeidelbergCement's plant is fully operational, including material storage. Last site-internal railway tracks are removed.



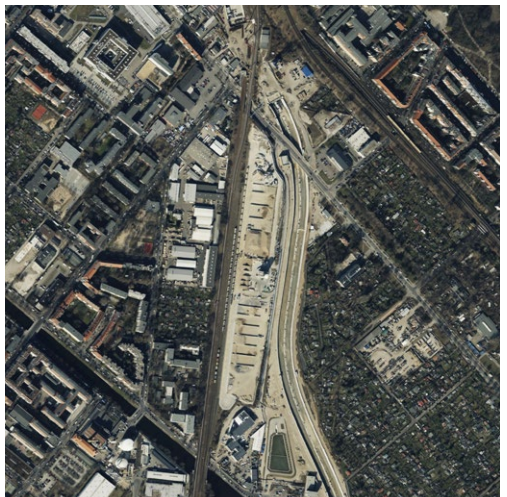
10/2009_ Demolition of station building and facilities begins.



06/2016_ Material deposit extends almost over the whole site. Autobahn A100 constructions reach the site. New accessway.



09/2010_ Demolition is finished, HeidelbergCement sets up a cement plant on the plinth of the former freight station building.



11/2022_ A100/BA16 is almost finished. Site perimeter is fully used by sand and cement firms. Pumps handle the high ground water levels for tunnel construction. Temporary railway bridge is in use.

URBAN SITUATION

Site Analyses



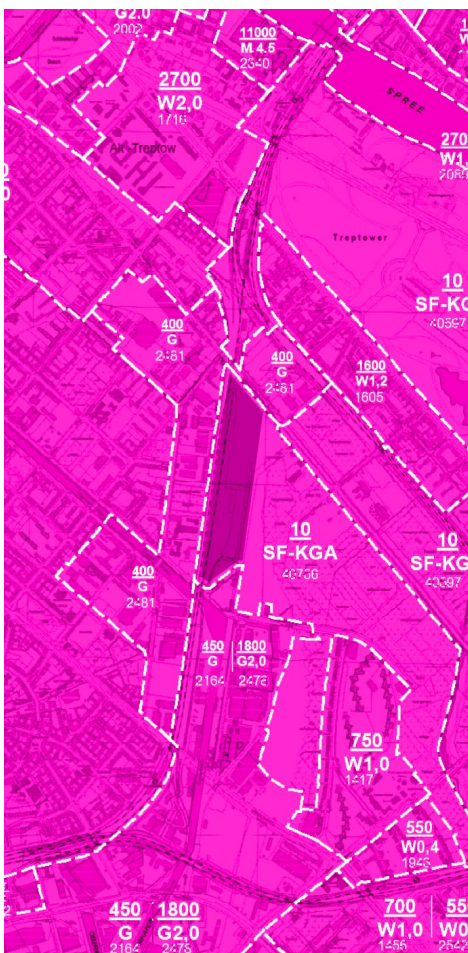


Map base data by Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (1993-2010), accessed in April 2023 via <https://fbinter.stadt-berlin.de>

Groundwater

The site is located in the valley belt of the Berlin-Warschau Urstromtal. Once a wide, swampy area, it has subsequently been drained to enable the metropolitan development of Berlin. A legacy of it however are high groundwater levels all along the former river valley. Due to landfilling and artificial terraforming on site, the ground surface's distance to the groundwater is up to 7.0 m (dark pink areas). The surroundings have significantly lower distances of down to 0.5 m (dark blue) for some of the allotment gardens.

The image on the left shows the construction site of the Autobahn A100, where groundwater needs to be actively extracted before sealing subterranean infrastructures and tunnels of the construction site. In terms of contamination, the longer vertical distance to the groundwater is favourable, as the leaching process prolongs according to the distance.



Map base data by Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (1993-2010), accessed in April 2023 via <https://fbinter.stadt-berlin.de>

Allotment Gardens

Berlin has a long history with allotment gardens. Once conceived to provide self-sustenance and promote healthier lifestyles for the city's residents, they are still prevalent all over the city. The site is located in close vicinity to several such "colonies" and is even regarded a Sonderfläche - Kleingartenanlage (special use area - allotment gardens) by the land evaluation map of Berlin's senate. Allotment gardens have several interesting characteristics in the context of Bodenschatz, as the land is for example usually city-owned and given out on long-term lease contracts. They are also hubs of biodiversity and have the second-lowest degree of ground sealing by the standards of Berlin's Umweltatlas (2018). Therefore, the gardens play an important role in a socio-ecologically inclusive city. For the recent A100 construction works, several colonies have however been expropriated and demolished, right next to the project site.

URBAN SITUATION

Site Analyses





Map base data by Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (1993-2010), accessed in April 2023 via <https://fbinter.stadt-berlin.de>

Access

Even though occupying a very large plot in the central area of Berlin, accessibility to the site is lacking. This has several reasons. The ongoing industrial use is well-protected and secured by high fences and a singular entrance road. But also the northern wall, a product of the freight station's landfilling, sets a harsh topographical boundary. Another challenge is posed by the public transport network, which creates a somewhat blind spot around the project site - the pink circles on the right approximately show 10 minute walks from the closest bus and S-Bahn stations. Ironically, upon finalisation of the A100, there will be two major infrastructure lines (Ringbahn S41/42 in the West and Stadtautobahn in the East) framing the area and having a visual connection or glimpse of the site, yet lacking direct physical contact and furthermore cutting off the respective other side of the site's infrastructural border.



Map base data by Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (1993-2010), accessed in April 2023 via <https://fbinter.stadt-berlin.de>

Landfilling

In order to create a level surface for the former freight station Güterbahnhof Treptow, sand, rocks, silt, clay and technogenic materials as building waste have been accumulated. Especially technogenic substrates (as mentioned before), have high values of contaminants (Hiller & Meuser, 1998). Therefore, the site as of now is used as a raw material deposit, ironically specialising on sand, gravel and cement. Berlin itself is - ironically - built on sand, which frequently causes issues with heavy projects like the Covivio tower on Alexanderplatz (Hasselmann, 2023). Sand at the same time is a valuable resource and indispensable for the building industry. Berlin's land is too expensive to mine it here, so the sand which is delivered to the site comes from all over Brandenburg. The simplified stratification of the site therefore reads something like: sand (natural origin, clean), sand (landfilling, contaminated) and sand (commodity, clean).

BIODIVERSITY

Impressions

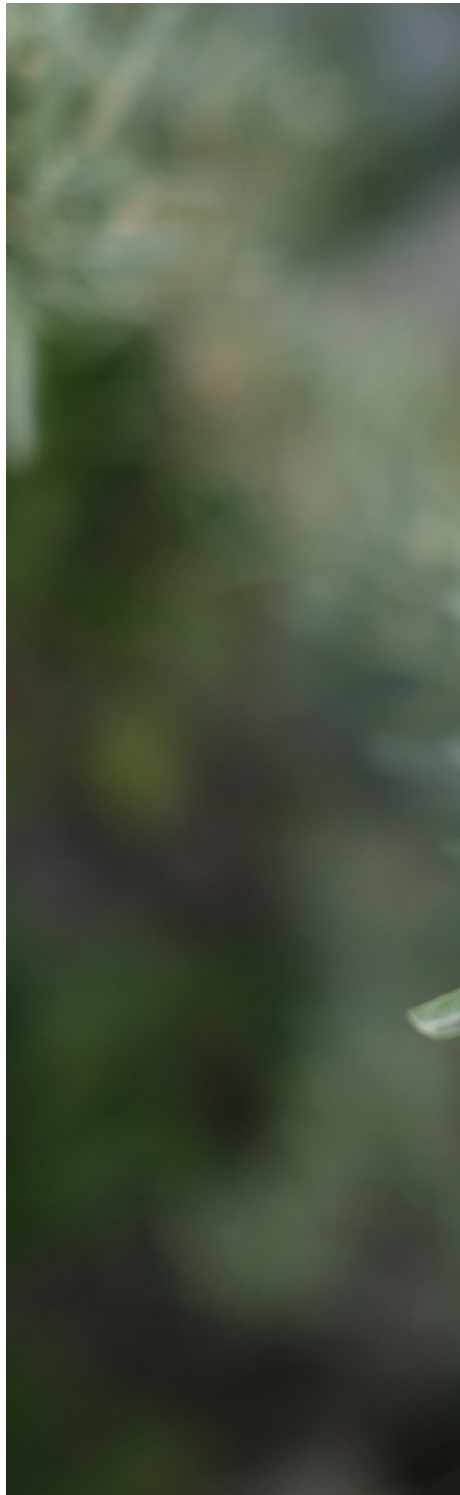
Despite the unfavourable local conditions, various ecological actors are appropriating the site. The design intervention is inspired by their relentless wrestling for urban space. Their presence, however, is worrying at the same time: By dwelling on contaminated ground, actors extract pollutants and become bearers of toxicity. Wandering around the site now is visiting a highly mysterious yet equally toxic garden.

The design is inspired by the enclosure, the mysterious entanglement and the force of life perceptible on site. At the same time, it is clearly manifesting that these actors deserve a pollution-free environment as much as the other inhabitants of Neukölln do.





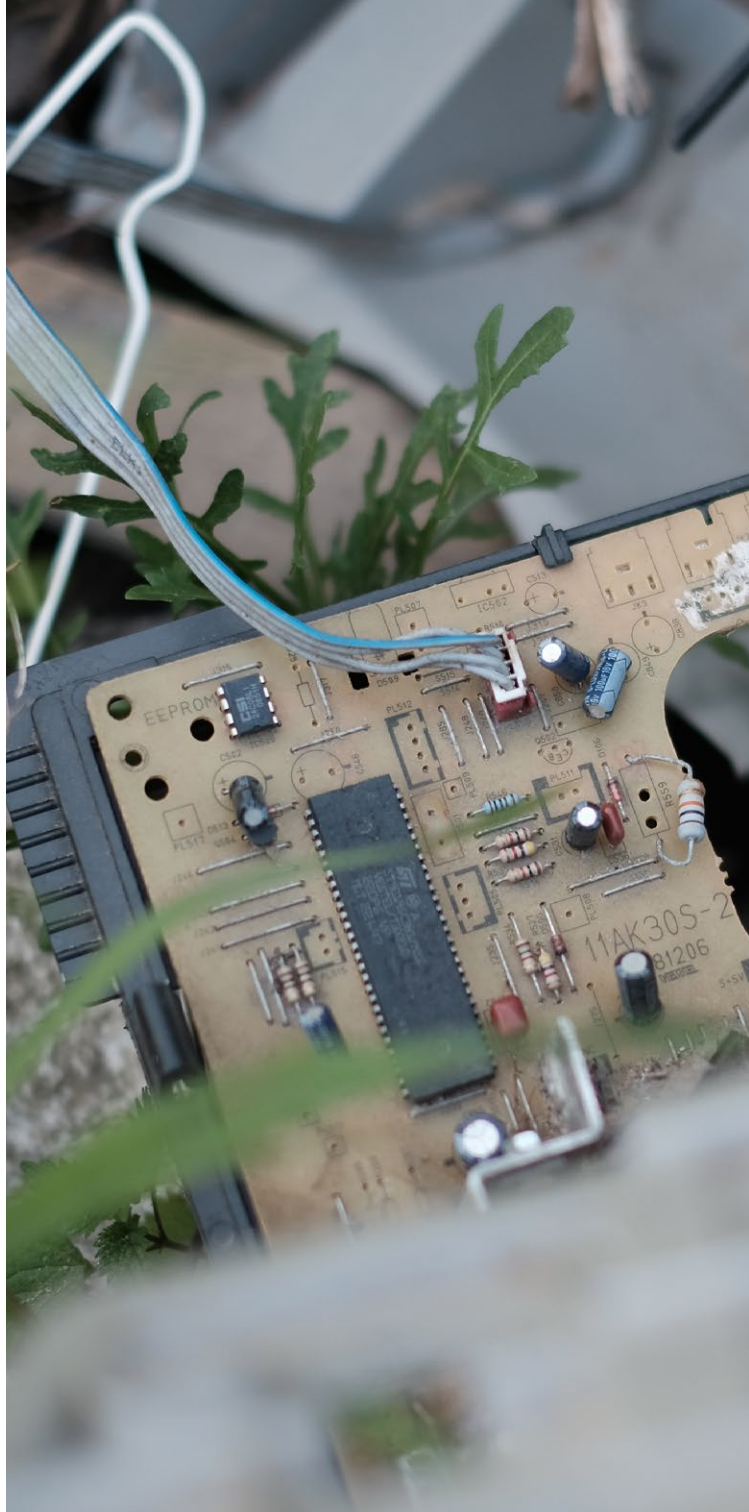








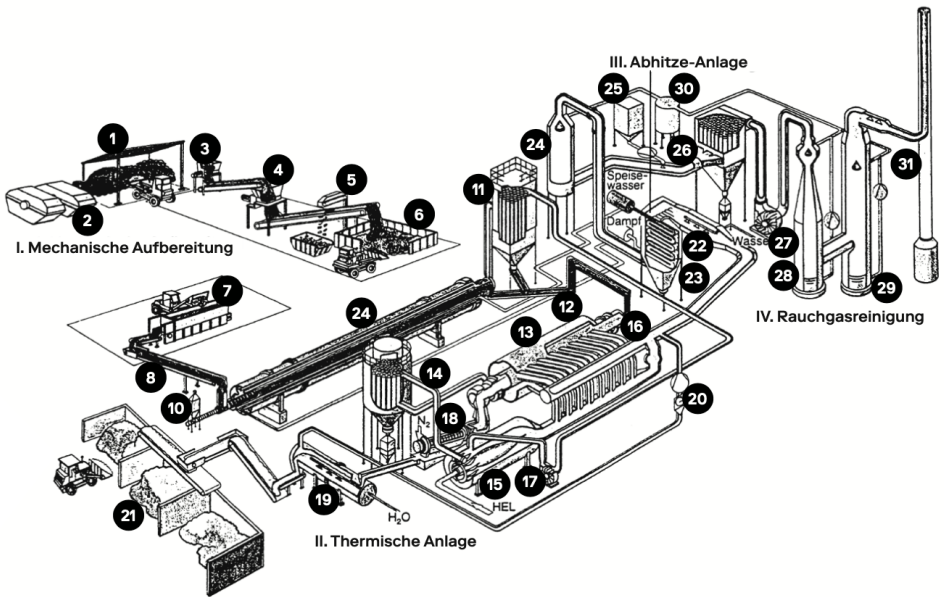


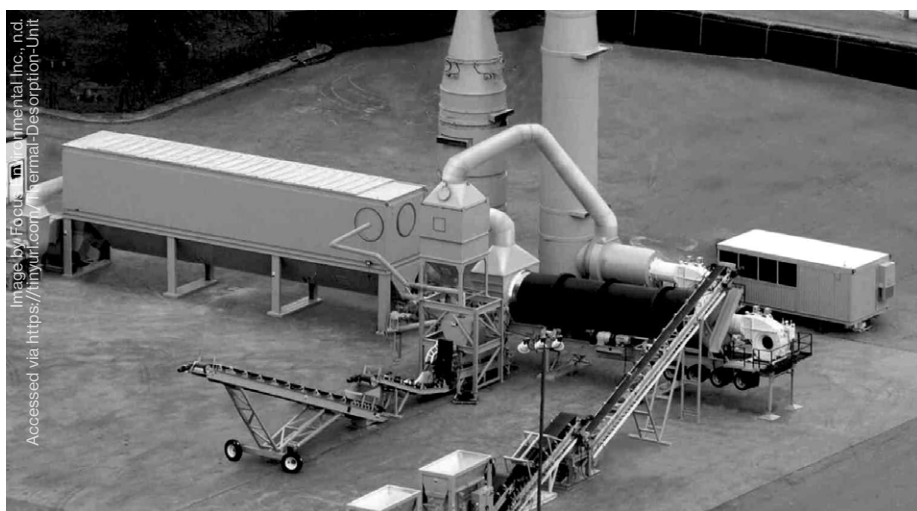




DECONTAMINATION

Technical Background



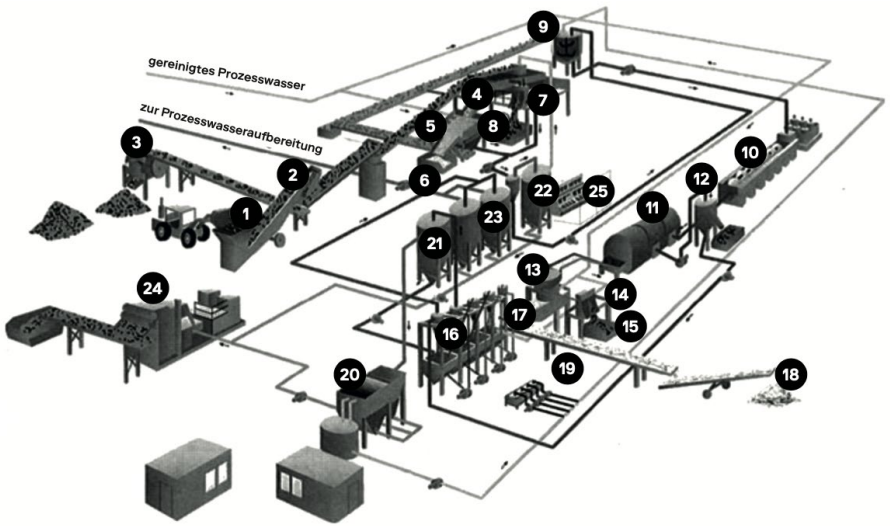


Thermal Desorption

Thermal desorption is a process used for the removal of volatile and semi-volatile organic compounds (VOCs and SVOCs) from contaminated soil. It involves heating the soil to a temperature that causes the contaminants to vaporise, and then capturing and treating the vapors to remove the contaminants. The thermal desorption process typically involves the following steps as described by Helmut Meuser (2013):

- 1. Soil Preparation:** The soil is screened to remove any large debris and is ground to a consistent particle size in a series of mechanical treatments (1-6).
- 2. Heating:** The prepared soil is placed on a conveyor belt or in a treatment vessel and is heated to a temperature ranging from 200 to 800°C. The heating process takes place in batches, with each batch treated for a specific period of time depending on the soil type and level of contamination (7-16).
- 3. Contaminant Vaporisation:** As the soil is heated, the contaminants vaporise and are released into the air. The vapors are then captured using a vapor collection system, which typically consists of a series of pipes or ducts that lead to a central collection point (17-24).
- 4. Contaminant Treatment:** Once the vapors are collected, they are treated using a variety of techniques to remove the contaminants. Common treatment methods include thermal oxidation, carbon adsorption, condensation, and scrubbing. The choice of treatment method depends on the type and concentration of contaminants present in the vapors.
- 5. Soil Recovery:** After the contaminants have been removed from the vapors, the treated air is released into the atmosphere. The treated soil is then cooled and is ready for reuse or disposal (21; 31).

Diagram on the left by J. Fortmann, P. Jahns (1996) via Meier (2020).



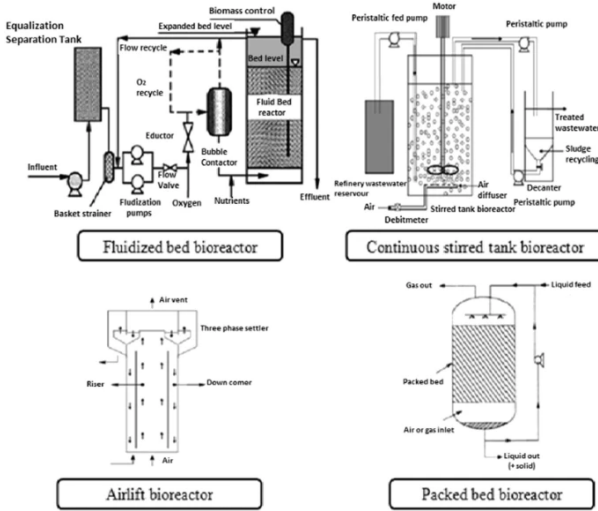


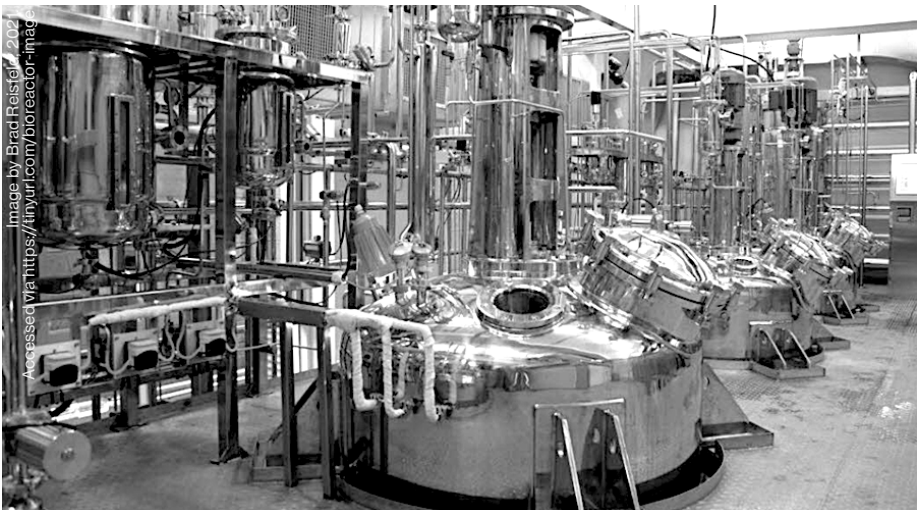
Soil Washing

Soil washing's main medium is water. The diagram on the left sums up the general rundown of the process based on the research and practice of German firm Harbauer. Diagram by H.J. Heimhard (1996) via Meier (2020).

The process works along:

- 1 Feed hopper with bar sizer
- 2 Top grain screening (≤ 60 mm)
- 3 Crusher
- 4 Sword washer
- 5 Oscillating screen w. fresh water spraying
- 6 Cleaned top grain (10-60 mm)
- 7 Curved screen
- 8 Separated light materials
- 9 Mixing tank
- 10 Extraction screw
- 11 Countercurrent grit trap (3-stage)
- 12 Flotation
- 13 Heavy turbidity screen
- 14 Curved screen
- 15 Separated light materials
- 16 Countercurrent hydrocyclone system
- 17 Dewatering screen
- 18 Cleaned soil
- 19 Dosing station for cleaning additives
- 20 Corrugated sheet separator
- 21 Round clarifier II
- 22 Round clarifier I
- 23 Thickener I, II
- 24 Belt press
- 25 Control room





Bioremediation

Bioremediation uses microorganisms in order to reach decontamination. In comparison to the other techniques presented here, bioremediation is the most passive process, as it is essentially utilising other organisms to mitigate the toxins of the medium. Thus, energy consumption and process complexity are minimalised. Thermal desorption has a mean energy consumption of 250-400 kWh/m³ soil while bioremediation consumes 0,3 kWh/m³, reducing the input by approximately 99,9% (DVWK, 1996 & Meuser, 2012). The downsides of the technique are however its slow process, higher costs of the initial facilities and a higher specificity on treatable contaminants and toxins.

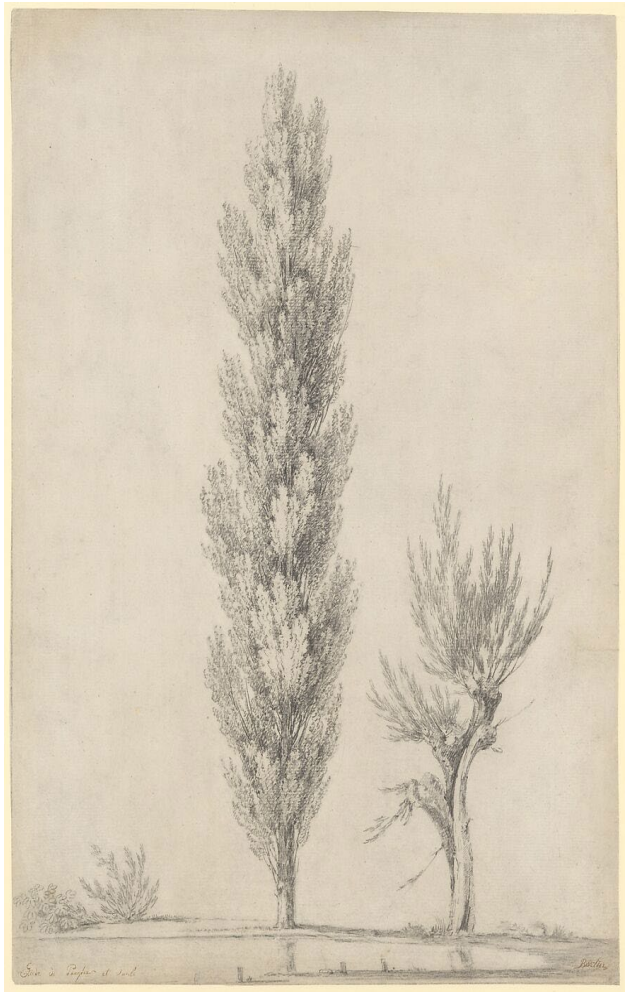
The diagram on the left introduces four different bioreactor types researched for this project. The thesis moves on with the continuous stirred tank bioreactor, which is thermally synergised by utilising waste heat from the other facilities.



Helianthus annuus
Common sunflower



Brassica juncea L.
Indian mustard



Populus
Poplar tree

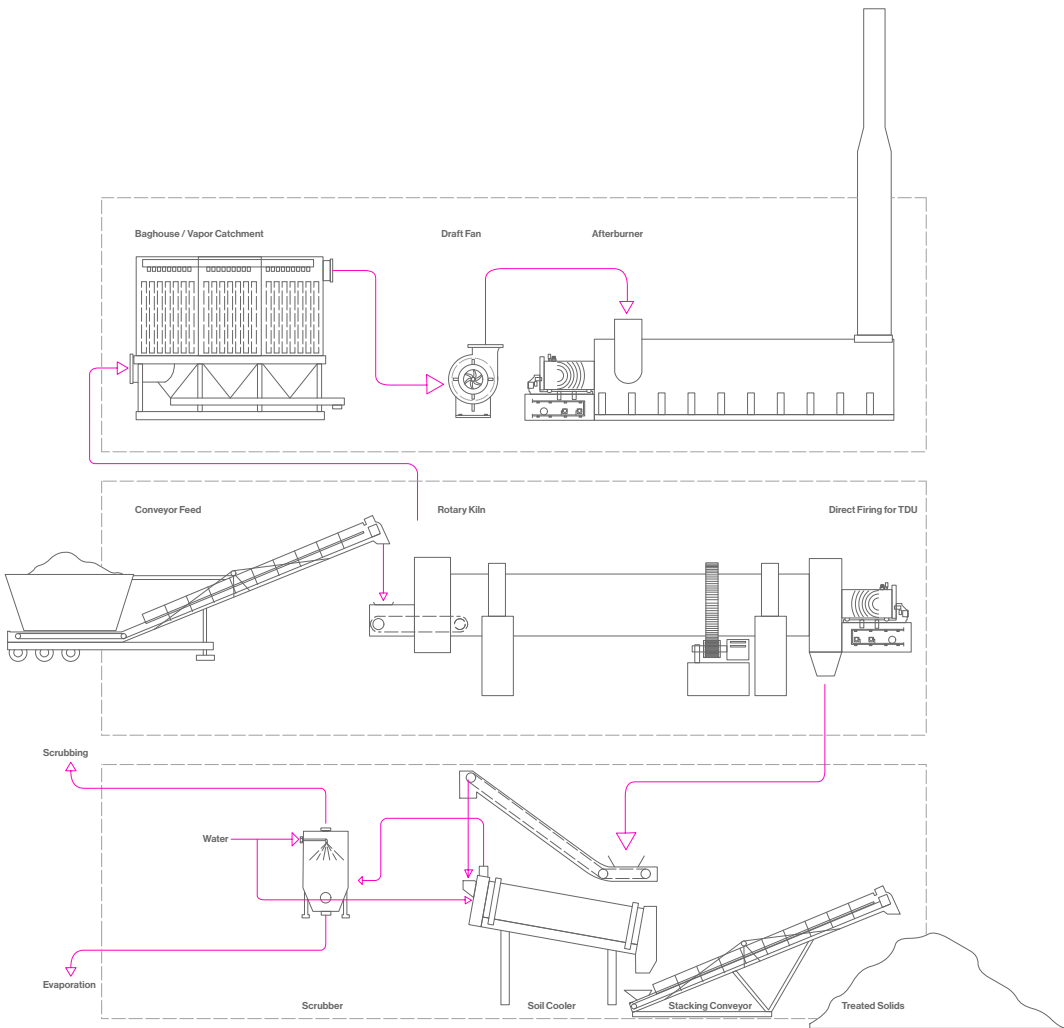
Salix
Willow tree

Phytoremediation

For less grave contamination degrees, phytoremediation is a viable alternative to the former more technical methods. Heavy metals like lead and cadmium can be extracted by different plants like sunflowers or mustard strains. Phytoremediation is mostly prevalent in low-tier in-situ remediation efforts, but is also becoming a more established technique in ex-situ pre- and post-treatment.

By planting the organisms right into the medium, their roots begin to extract pollutants from the ground. Phytoremediation is slow-paced and typically has to be conducted in multiple plant cycles per patch. At the end of each cycle, the plants are collected and burned under special circumstances to extract the contaminants. The waste heat can be used for other purposes. Even though being extremely low in maintenance and energy consumption, the relatively long process and low effectivity pose use limitations to phytoremediation.

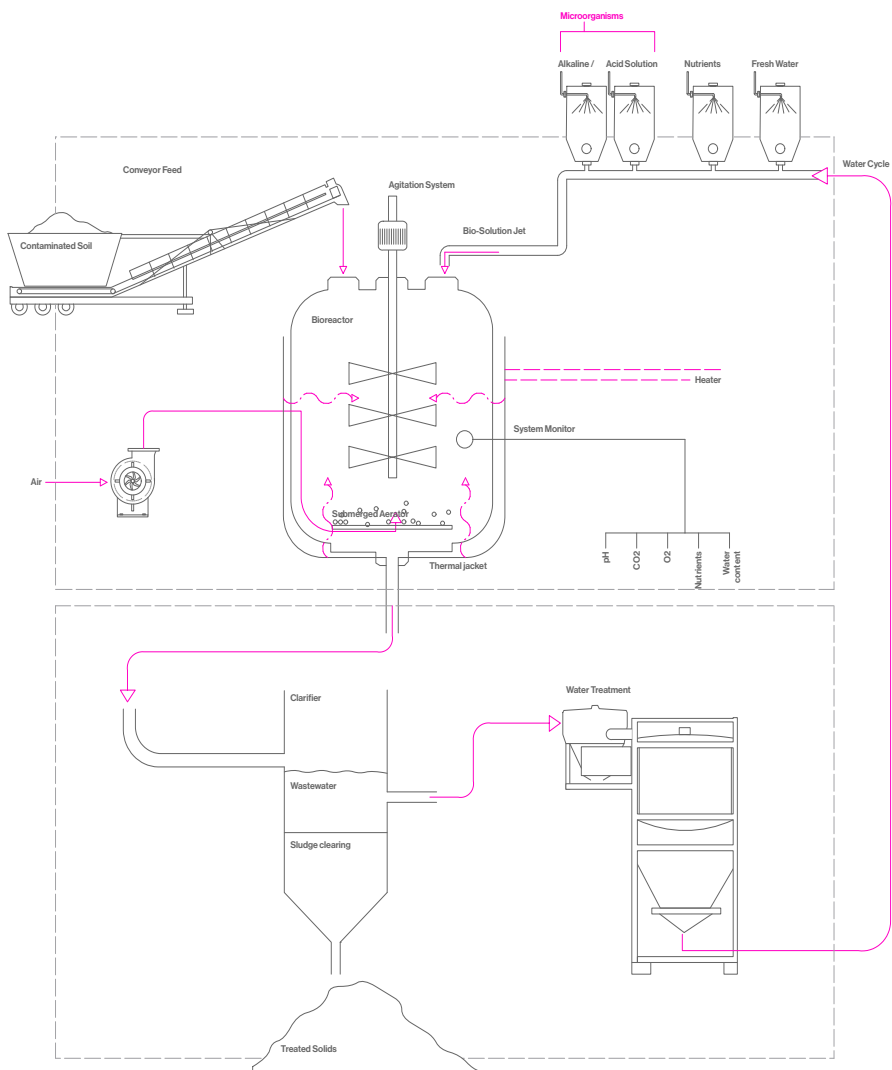
DECONTAMINATION Spatialities



Thermal Desorption

Spatial Approach

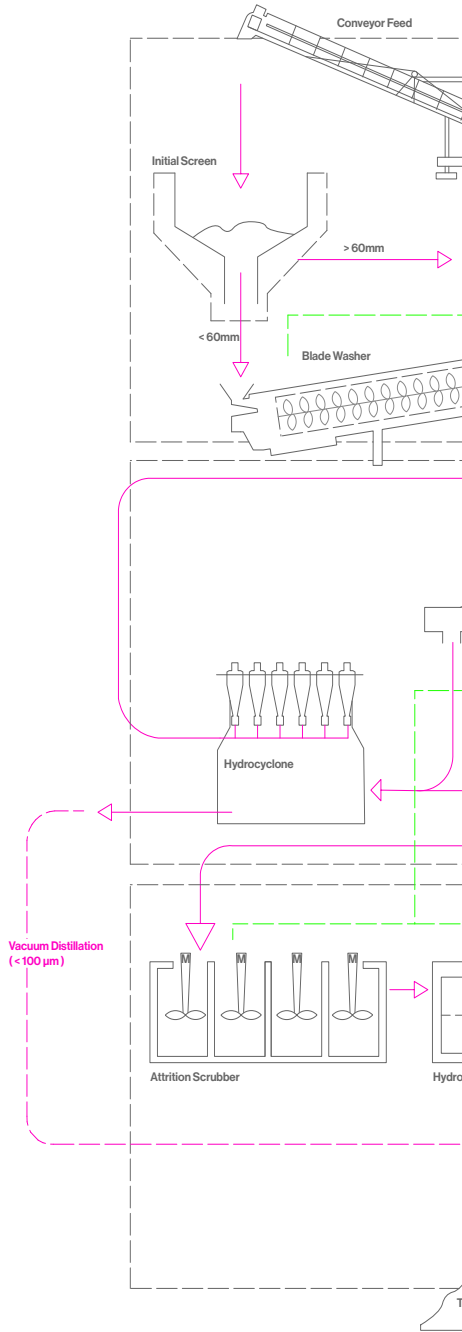
In order to plan a building which is informed by the existing technologies of soil remediation, their processes were analysed in detail. As part of that, spatial needs could be defined, including clearances, requirements and installations. The according schemes base upon descriptions by Helmut Meuser (2013) and Ullrich Förstner (2014). Drawings by author.



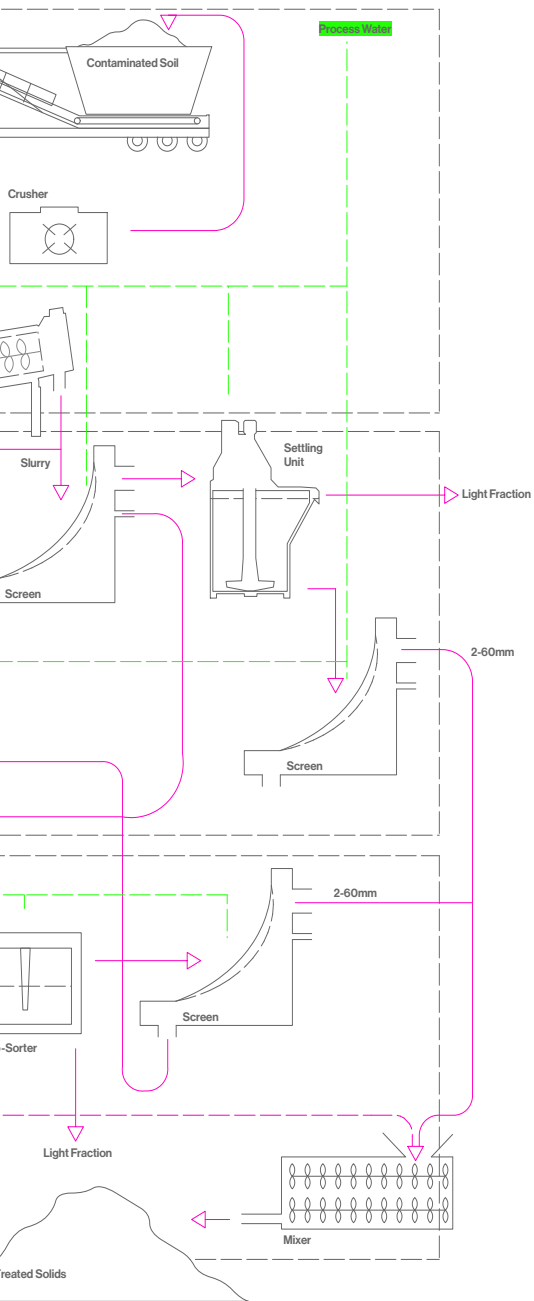
Bioremediation

DECONTAMINATION

Spatialities

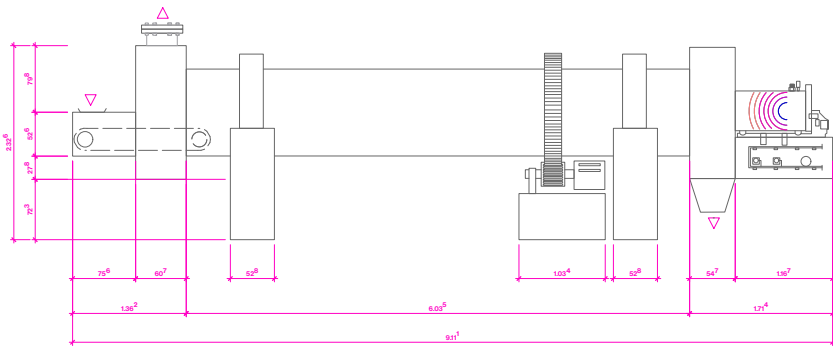
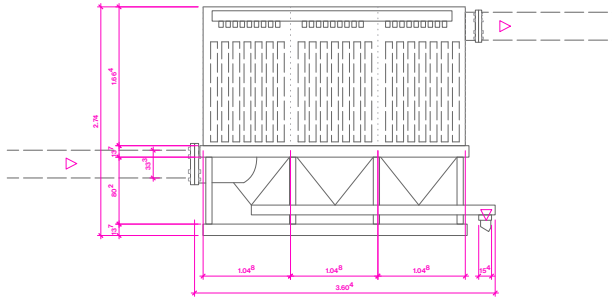
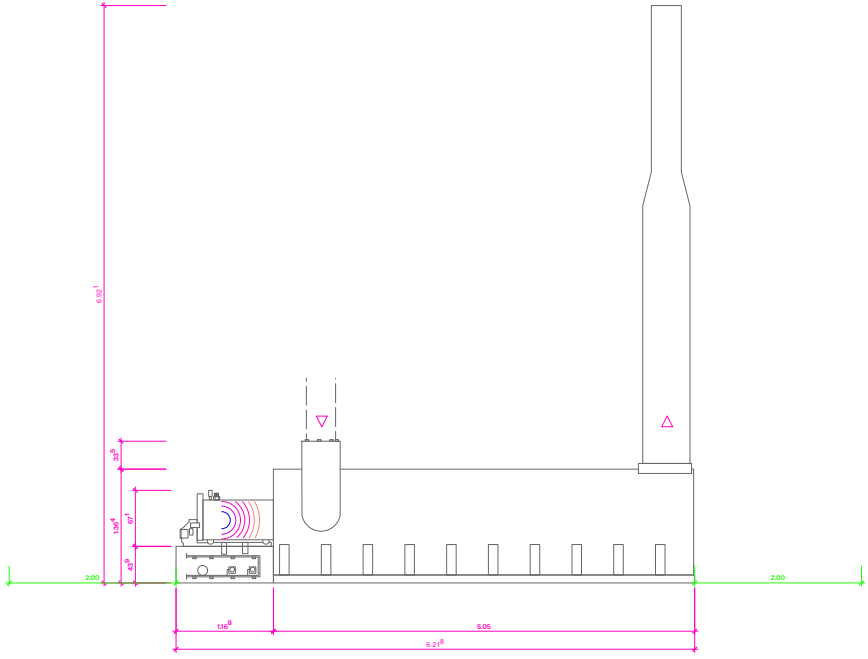


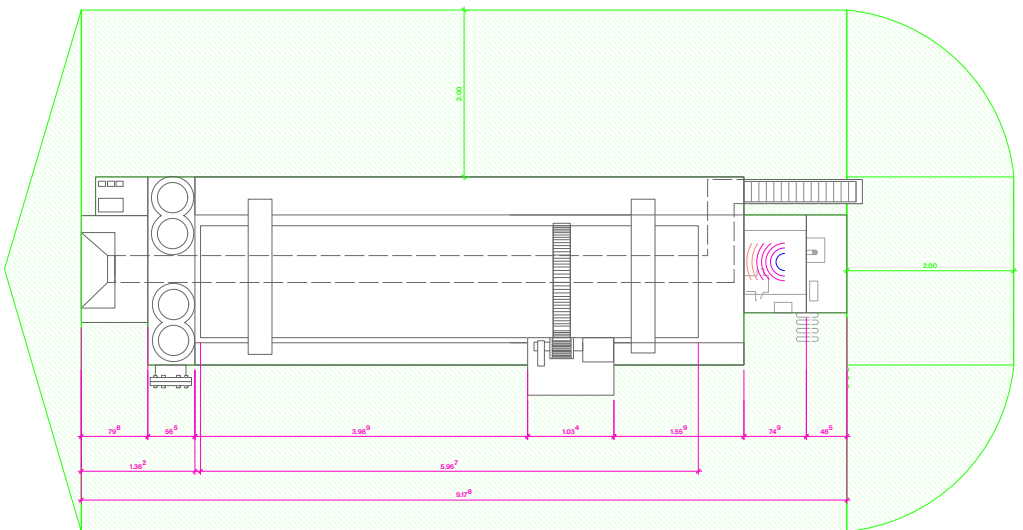
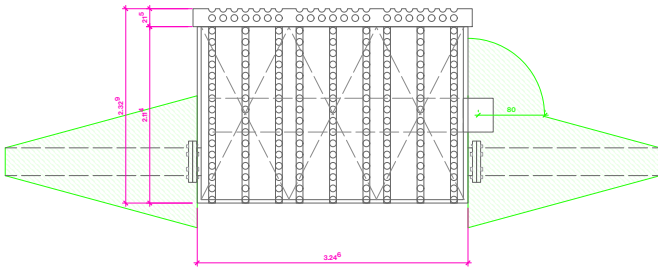
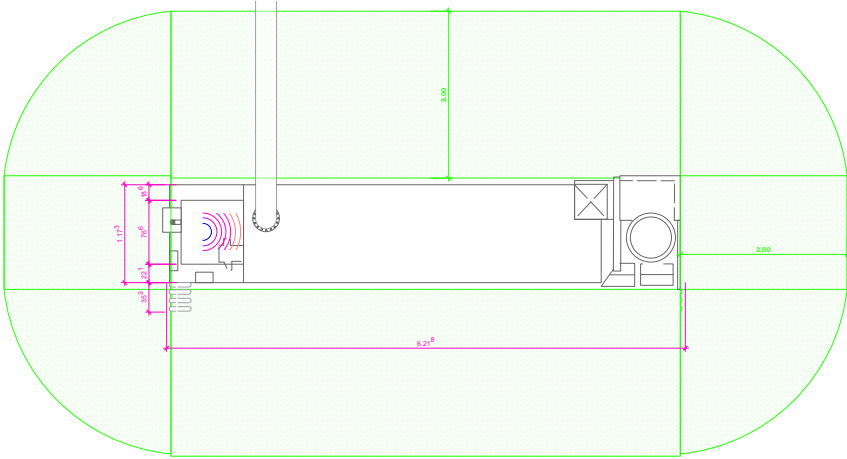
Soil Washing



DECONTAMINATION

Thermal Desorption





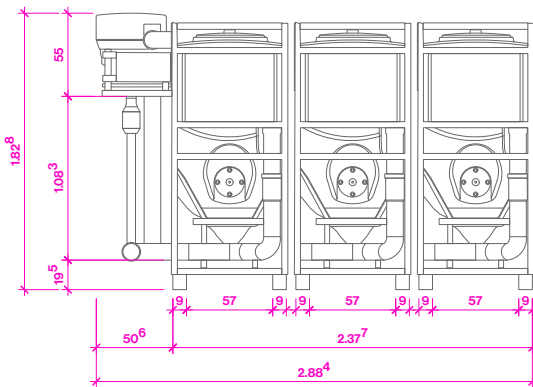
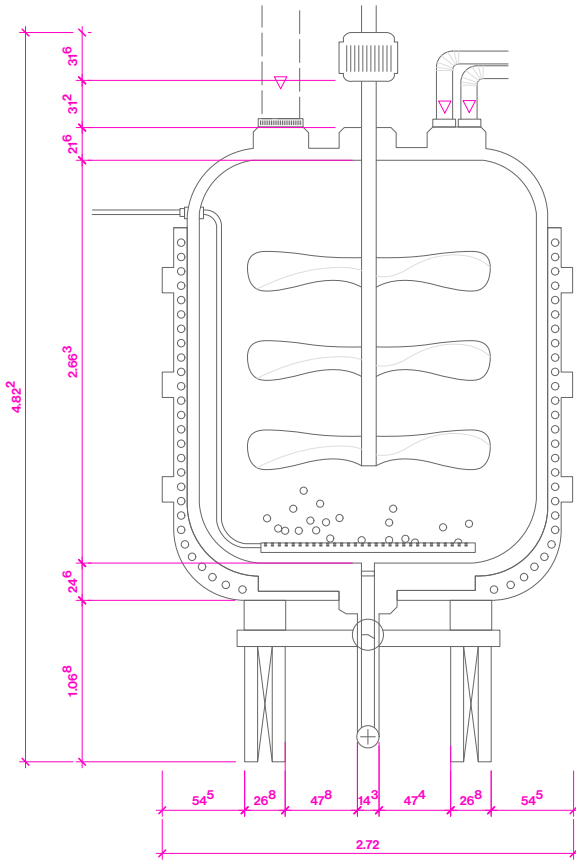
Afterburner, Baghouse, Rotary Thermal Desorption Unit (TDU)

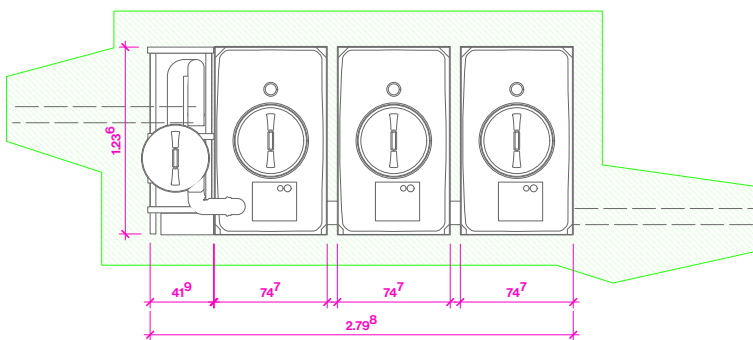
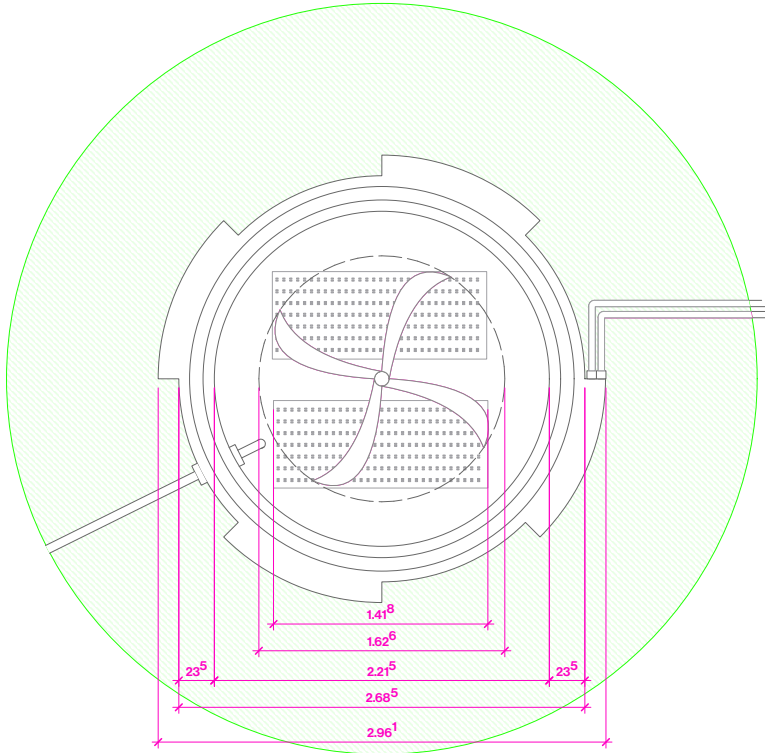
1:100

Clearances and spatial needs of the three elementary units of thermal desorption based on descriptions by Meuser (2012; 2013) and Förstner (2004). Drawings by author.

DECONTAMINATION

Bioremediation



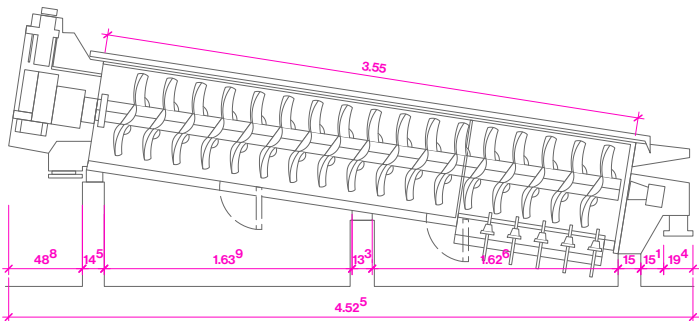
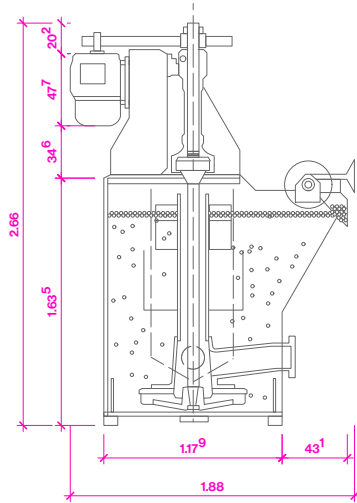
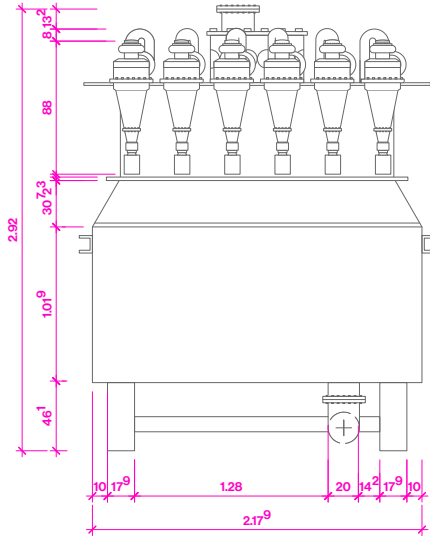


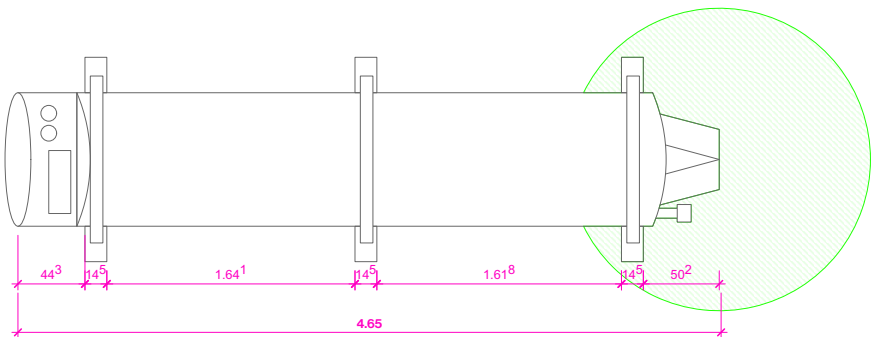
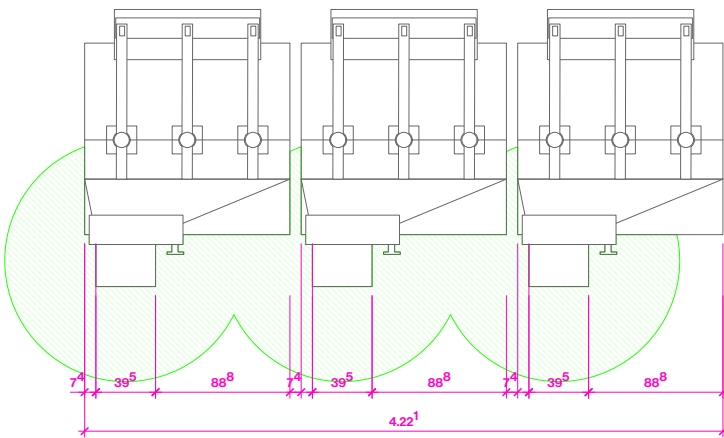
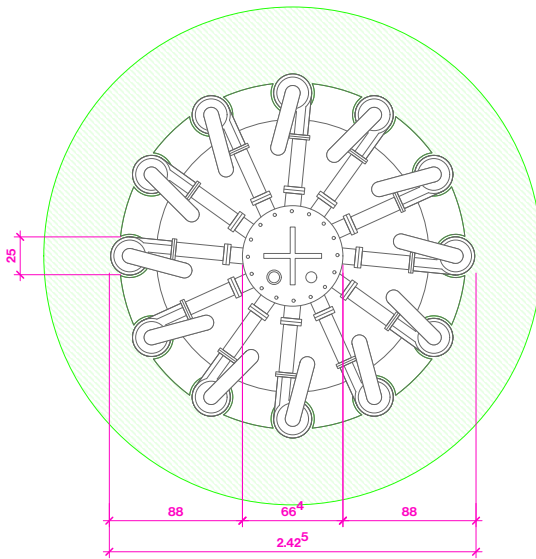
Bioreactor Unit, Wastewater Treatment Facility
 1:50

Clearances and spatial needs of two elementary units of the Bioremediation process based on descriptions by Helmut Meuser (2013) and the hansgrohe Pontos AquaCycle 2500. Drawings by author.

DECONTAMINATION

Soil Washing





Hydrocyclone, Settling Unit, Blade Washer

1:50

Clearances and spatial needs of three elementary units of the soil washing process based on descriptions by Förstner (2004) of the Harbauer soil washing approach.

Drawings by author.

DECONTAMINATION

Precedents

Sondermülldeponie Kölliken (SMDK), Switzerland

Kölliken represents a major effort of remediating decades of heavy contamination in close vicinity to residential and ecological areas. Once a hailed solution to toxic waste disposal in Switzerland, the former landfill became an international symbol of the issues deriving from finding and maintaining such disposals and had to be fully remediated for decades.

The landfill was established in 1978 to prevent illegal disposal of hazardous waste materials. Over the years, the landfill had undergone several upgrades and expansions, but was from the beginning located within the perimeters of the village of Kölliken. The local community from the beginning voiced concerns about groundwater safety and air pollution deriving from the clay-bed of the landfill. Scientific measurements finally confirmed the worries, resulting in the plant's shut down in 1985 (Cossu & Stegmann, 1991). Efforts from 1985 to 2003 focused on maintaining the pit with special regard to groundwater and surface runoff. The cantone of Aargau in 2003 however ruled in favour of a complete dismantling and deconstruction of the former landfill, a total area of 70000m² (Rickenbacher & Wittmer, 2015).

Several structures were erected to facilitate the security of the decontamination process. 28 arches of up to 169m width formed the free-standing decontamination hall, the most prominent part of the conglomerate (see third figure on the right). From 2007 until 2015, the site was fully decontaminated in an unprecedented financial and technological effort. A total of 569230 t of material was excavated, the total cost to this day accumulates to over CHF 900000000 (SMDK, n.d.). Upon the disassembly of the free-standing megastructure in 2016, SMDK opened its doors to the public, marking the end of an era of explosion-proof vehicles roaming and cleaning a hall locked by a complete air-tight seal. Today, the 7ha site lays fallow again and is to be converted into an ecological reserve.



ATM Moerdijk, Netherlands

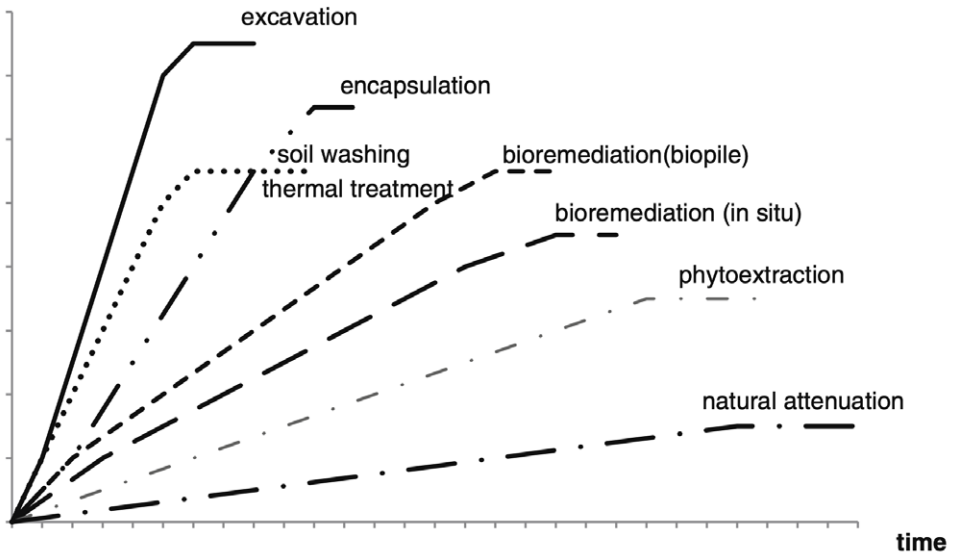
Afvalstoffen Terminal Moerdijk (ATM) is a waste management company that operates in Moerdijk, a municipality in the province of North Brabant in the Netherlands. The company was established in 1984 with the aim of providing a range of waste management services, including recycling, incineration, and landfilling (ATM, n.d.). In its early years, ATM focused primarily on incinerating waste materials, but later expanded its operations to include a wide range of waste management services, including soil remediation through techniques such as thermal desorption. (van der Voet et al., 2005). Over the years, ATM has continued to expand its operations in response to changing regulatory and market conditions, becoming one of the largest facilities of ex-situ waste management in Western Europe.

Despite its growth over the years, ATM has faced several challenges. In 2011, a fire broke out at the company's incineration facility, causing significant damage and releasing toxic smoke into the surrounding area (van der Voet et al., 2014). The incident raised concerns about the safety of waste management facilities in the Netherlands and prompted calls for stricter regulations and oversight. Also its soil remediation policies were questioned and discussed. One of these controversies took place in 2009, when the company was fined for violating environmental regulations related to soil remediation (van der Voet et al., 2014). Another incident occurred in 2016, when ATM delivered thermally remediated sand to a dike construction site near Spakenburg. The material, however, started leaching different heavy metals into the ditches. After a neighbouring farmer reported sudden deaths in several grazing calves, ATM was investigated after and fined for delivering toxic material (BN DeStem, 2017). The follow-up public discussion shed light on the potential for negligence and conflicts of interest in the soil remediation process within such large-scale, intransparent monopolists in the waste management business. Questions about the impartiality and transparency of ATM's efforts were for example raised about companies responsible for contaminating soil being involved in the remediation process (van der Voet et al., 2005). Restrictive entrance policies and a lack of communication further obstruct public control over ATM's operations in Moerdijk.



DECONTAMINATION Process

remediation effectiveness



Schematic relationship between remediation time and gained remediation objective
 Diagram by Meuser, H. (2013), p. 374

	Time				
	Weeks to a few months	More than 4 months to 2 years	3–10 years	Decades	Long-term monitoring
Excavation, transportation and landfilling	X	(X)			
Surface cover (geotextile-based and bentonite-based)	(X)	X			(X)
Sealing	X	(X)			(X)
Barriers installation at the sides		X			X
Encapsulation		X			X
Solidification (cement-based, <i>in situ</i>)		X			X
Asphalt batching	X				(X)
Vitrification	X				X
Stabilisation (liming)	X				X
Stabilisation (organic matter addition)	X				X
Soil washing	X	(X)			
Soil extraction (acids, detergents)	X	(X)			
Bioremediation (<i>in situ</i>)		(X)	X		X
Bioremediation (landfarming)		X			
Bioremediation (regeneration pile)		X	(X)		
Bioremediation (bioreactor)	X	(X)			
Phytoremediation (extraction)				X	X
Phytoremediation (degradation/volatilisation)				X	X
Thermal treatment	X	(X)			
Electroremediation (<i>in situ</i>)	X				
Natural attenuation				X	X
Soil vapour extraction (SVE)		(X)	X	(X)	X
Bioventing		X			X
Steam enhanced extraction (SEE)	X				(X)

X usual treatment time
 (X) treatment time exceptionally necessary

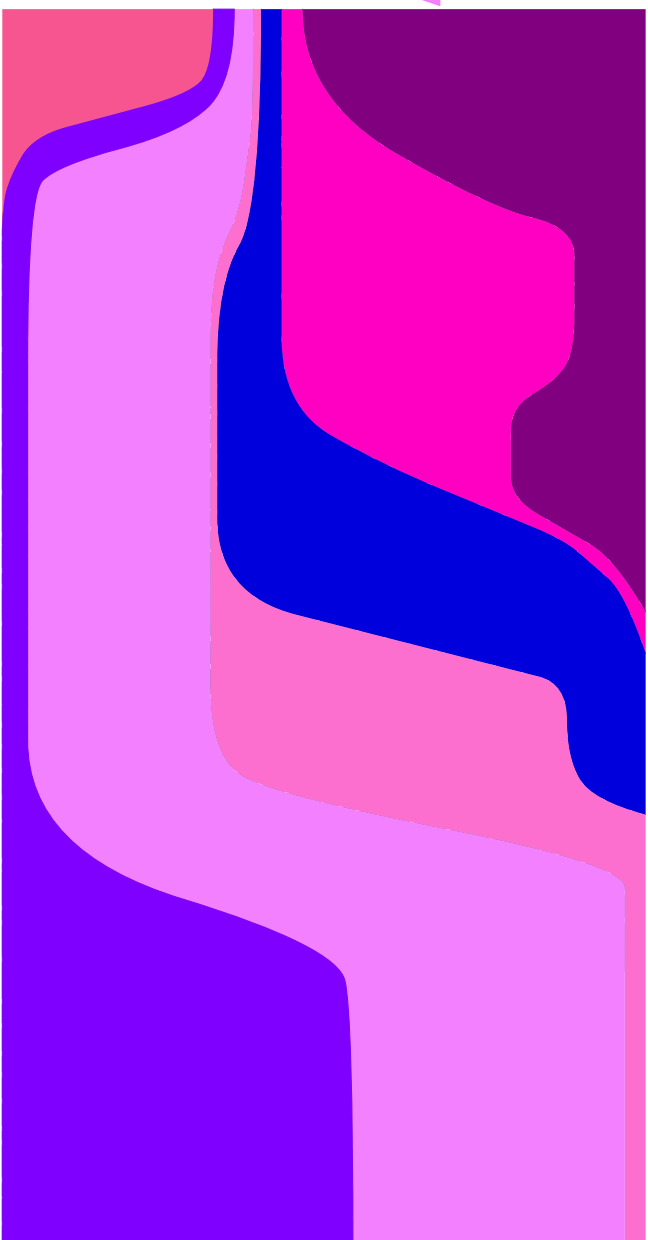
Calculated remediation time for soil and soil vapour based on a contaminated area of approx. 3 ha
 Diagram by Meuser, H. (2013), p. 375

Site Factors

Based on data available for this research, the estimated amount of excavated material for the site in Berlin-Neukölln sums up to 99'266.75 m³. With an estimated mean density of sandy topsoils of 1.6t/m³, the cumulated amount equals to 158'826,8 t of contaminated material. Based on data and diagrams by Meuser (2012), the choice of methods is a triad of a large-scale bioreactor, a medium-sized soil washing facility and a small thermal desorption unit. Their respective capacities add up to 12,2 TPH (tons/hour).

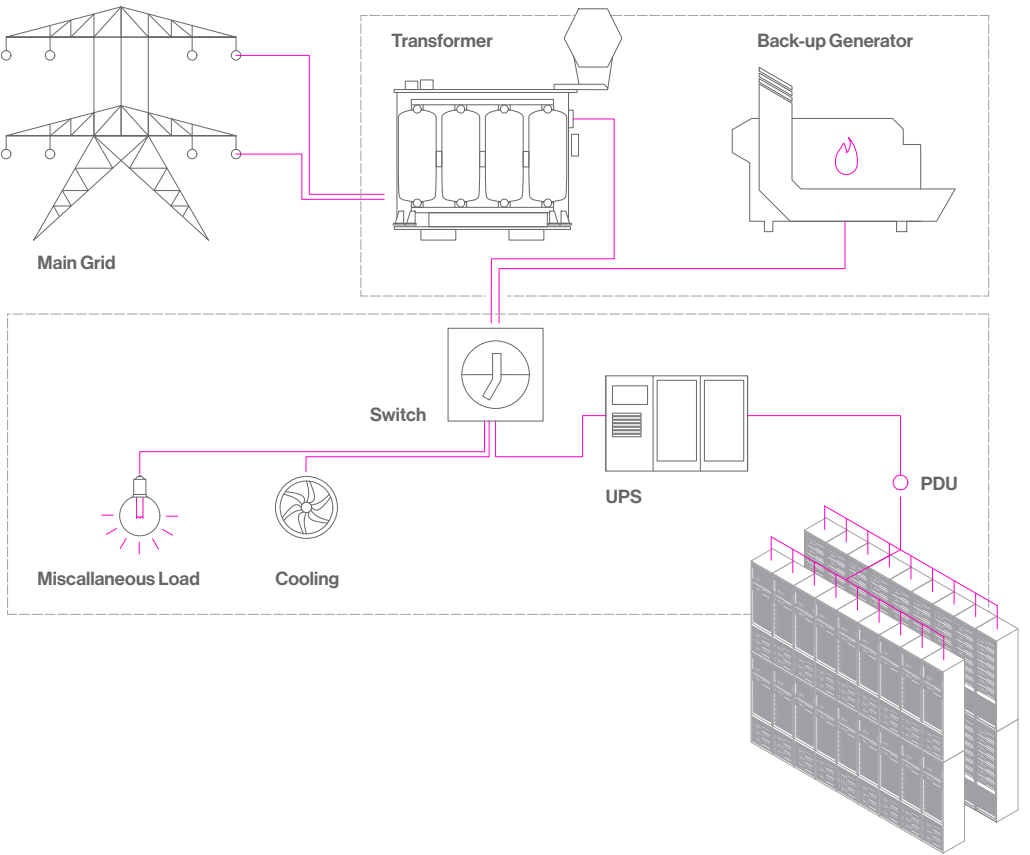
The remediation time under best conditions therefore is 13'018 h or 542 days. After this, the decontamination machines' capacity comes free for decontaminating the material of other sites in Berlin.

Excavation on site
Granary construction
Radarmovement
Greenhouse set-up
Decontamination granary
Data centre operation
Site scanning



Time

DATA CENTRE Technology



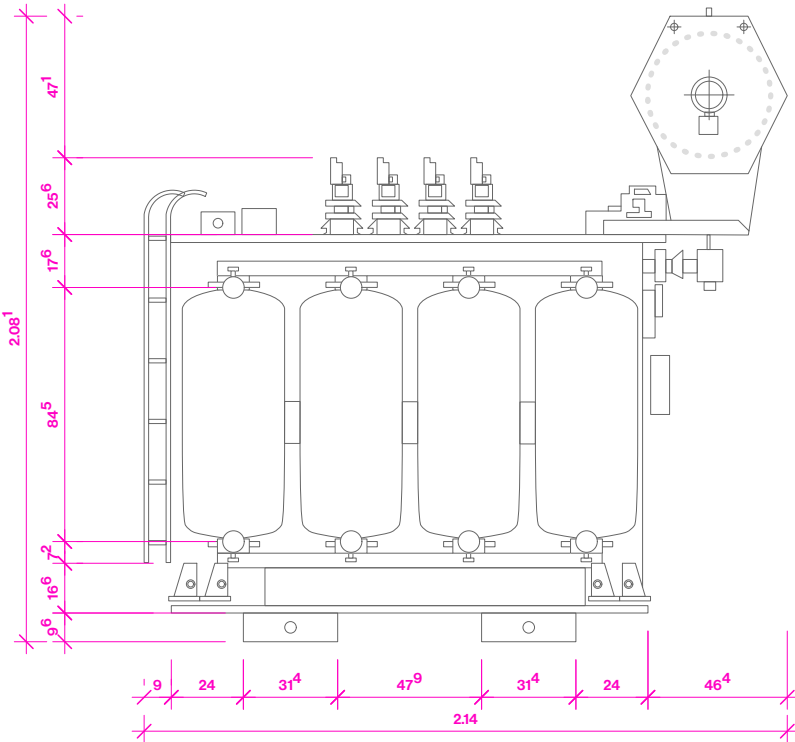
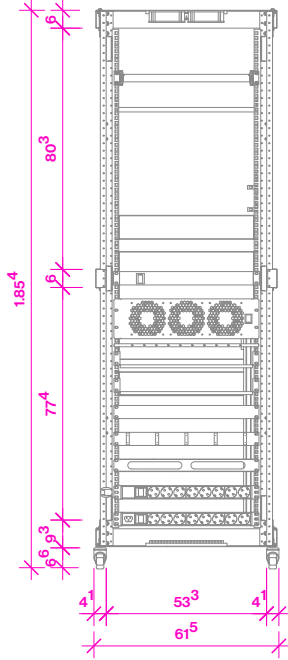


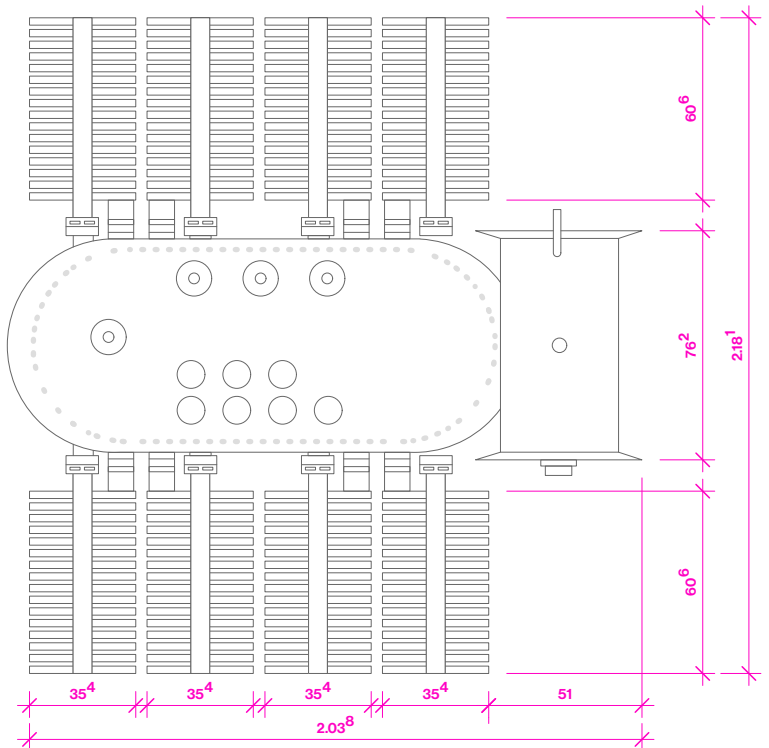
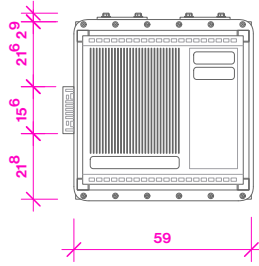
Data Centre

The main spatial requirements of data centres revolve around their services and installations as well as appropriate cooling facilities. As the energy consumption is high, data centres oftentimes are directly connected to the main grid and possess their own transformers to cover high loads at peak capacities. Back-up generators ensure of a seamless processing of critical computing operations even during blackouts. An uninterruptible power supply (UPS) and a power distribution unit (PDU) direct and steer the distribution and consumption of power. While cooling is a technical question, it is also a spatial challenge: clearances can enable lower cooling loads due to natural ventilation. In general, air cooling is increasingly replaced by liquid cooling, however most data centres these days still operate with ventilation-based cooling systems. This project is also moving forward with air-cooling, but tries to create a spatially favourable situation and synergetically use the waste heat.

DATA CENTRE

Spatialities





Server Rack, Electrical Transformer

1:50

Clearances and spatial needs of two elementary units of data centre processes. Transformer drawing based on precedent by Hitachi Energy (2022).

Drawings by author.

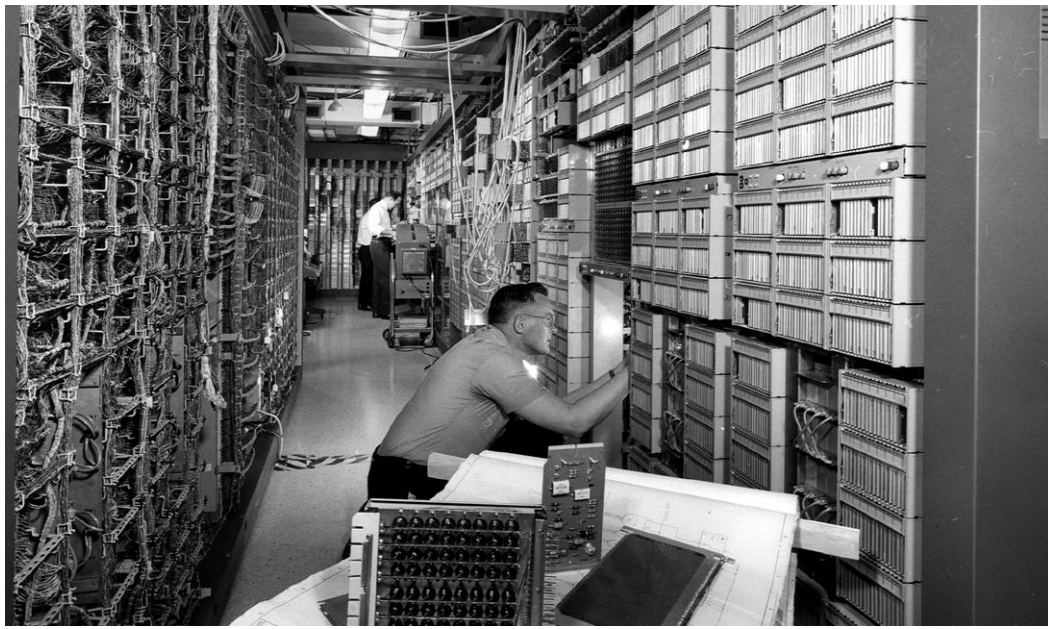
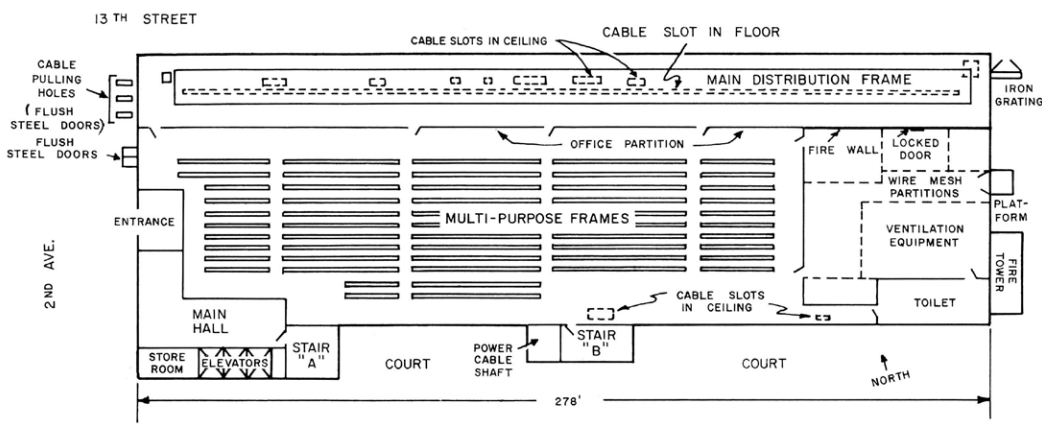
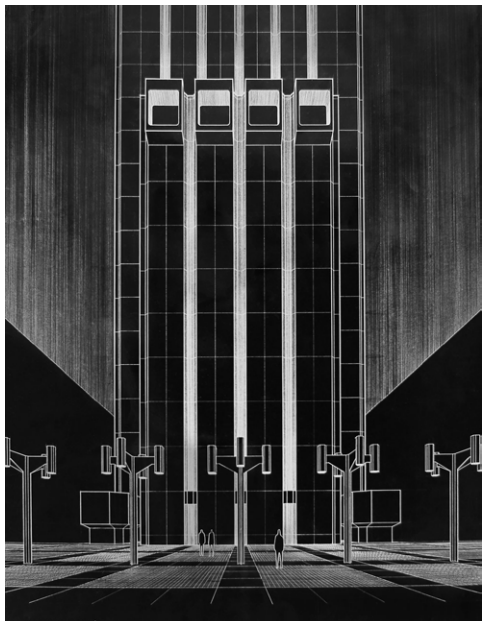
DATA CENTRE

Precedents

AT&T Long Lines Building, New York City
John Carl Warnecke (1971–1974)

A “20th century fortress, with spears and arrows replaced by protons and neutrons laying quiet siege to an army of machines within“ (Warnecke, 1970), the AT&T tower in Manhattan has long become an iconic brutalist representation of data in a metropolis. Warnecke’s office designed New York’s headquarters of AT&T in the most contextual typology they could imagine: a skyscraper. The monumental gesture of conceiving it without notable windows however renders the tower a gigantic, mysterious black box. Reaching a height of 161 metres, the stone-clad building was originally designed for processing long-line telephone calls before being repurposed to a sole data centre. Its infrastructural use and physical representation of data in the urban context are as unique as they are extreme. Utilitarian as it is, the architecture does not assimilate to its surrounding glass towers in any other form than its shape and volume.

Long Lines for this project serves as a reference on public interaction with the physical condition of the internet and data. The building is a valuable case study of a highly urban site and a dense data centre that caters for infrastructural needs from within the city instead of decoupling them to rural areas. And even though being designed in a highly inaccessible manner, the ominous facade is evocative: It has inspired the public for various speculations and pop-cultural adaptations. One of the rumors for instance involves the National Surveillance Agency (NSA), which is said to have taken over the building from AT&T to launch their national and international operations from there. The obscurity of Warnecke’s “fortress“, maybe unwillingly, has certainly fostered and physicalised a critical discussion about data.



DATA CENTRE

Precedents

Data Centre 260 Goswell Road, London

Scott Brownrigg (1990)

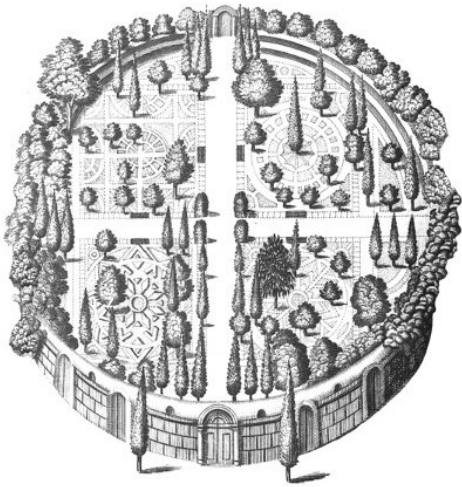
The brick facade of 260-266 Goswell Road in Angel, London spans almost 150 metres in length. Originally conceived as a Gordon's gin distillery, the building was since repurposed into a data centre used by the companies CenturyLink and Lumen. The street facade, as in its original use for Gordon's, is referencing size, brickwork, and facade layout of a residential London block. The true nature of the building, then and now, becomes apparent when walking around the building: Where there used to be distilling facilities and boilers on the back facade, there now is a layer of ventilation and cooling systems as well as other necessary service installations. Embedded in silverish plates and large, milky windows, this spaceship-side of the building is revealing its purpose rather easily. Yet, ventilation shafts and glass brick infills in former entranceways (like in the top right image) also give clues on the street facade.

260-266 Goswell Road embarks on a different strategy than Long Lines: Its nearly complete camouflage in the original building makes the data centre hard to spot. This is following the somewhat prevalent out of sight, out of mind paradigm around data, which this project is trying to undermine and contradict. If data plays such an important role in urban processes, why hide it?



ARCHITECTURAL CONCEPTS

Decontamination: Enclosure



Hortus Conclusus Padova

Contemporary representation of the paradise-resembling garden typology from 1632

Image via <http://www.padovamedievale.it/info/botanische-garten/de>



Sondermüldeponie Kölliken

Photo of the explosion-proof vehicle used in the site's decontamination efforts, 2007-2015

Image via <https://www.aargauerzeitung.ch/aargau/kanton-aargau/verseuchter-fels-wir-sind-vom-messergebnis-eher-angenehm-uberrascht-id.1288818>



Post-nuclear landscape in Fukushima

Photo of containing efforts in the large-scale reactor catastrophe, March 2011

Image via <https://news.cnr.fr/decontamination>

Interaction: Inhabited filters

Multi-layer filtering

6 Standing Panes

Gerhard Richter, 2002/2011

Image via <https://www.mariangoodman.com/artists/59-gerhard-richter/works/28878/>



Il filtro monumentale

Monumento Continuo (a Positano)

Superstudio, 1969-70

Image via <https://www.theradicalproject.com/continuous-monument-1969/>



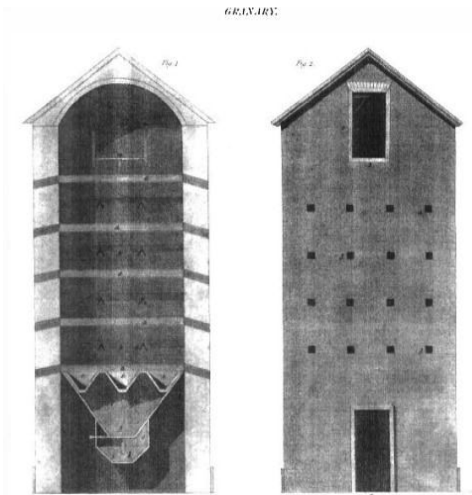
Excitement at Sondermülldeponie Kölliken

Swiss media interviews as part of the open day after the finalisation of decontamination efforts, 2016

Image screenshot from <https://www.tagblatt.ch/bildergalerien/zurcher-stadtrat-genehmigt-5-23-mio-franken-fur-sondermulldeponie-kolliken-id.1285623>



Volume: Verticality

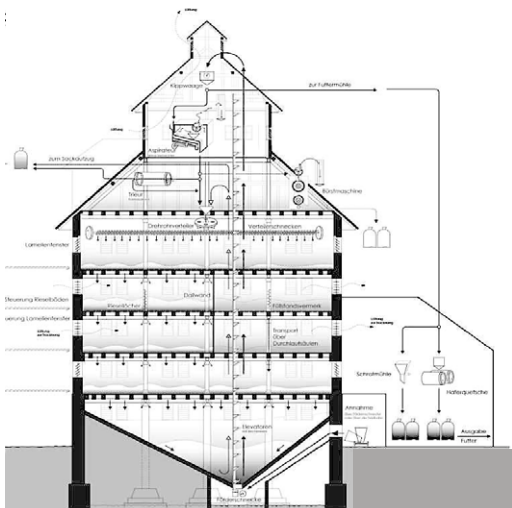


Granary Archetype

Rees, 1810

An overlooked machine typology

Image via Rees, A. (1810). A New Cyclopaedia: Example of Granary.

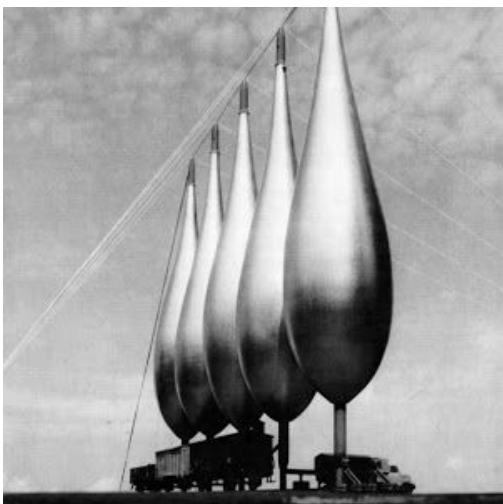


Granary Berlin-Hobrechtsfelde

James Hobrecht, 1889-1906

The local version

Image via https://landschaften-in-deutschland.de/themen/80_b_150_guttspeicher-hobrechtsfelde/



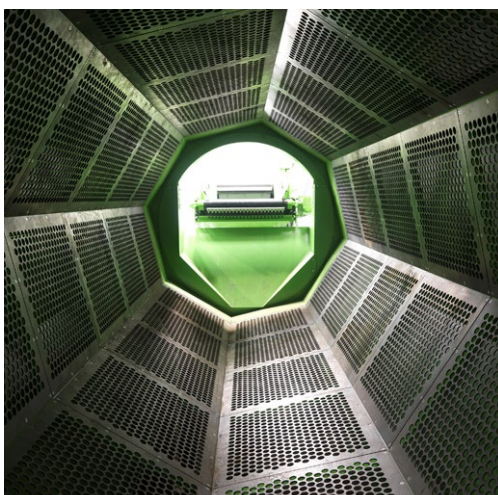
Conceptual silos for grain (or cement)

Frei Otto, 1959

A visionary adaptation

Image by MoMA / L. Glaeser via https://www.moma.org/documents/moma_catalogue_2662_300299029.pdf

Facade: Screens



Trommel screen

Mining (and deconta-mining) screening tool
Screens as necessity

Image via <https://www.bezner.com/de/products/siebmaschinen/>

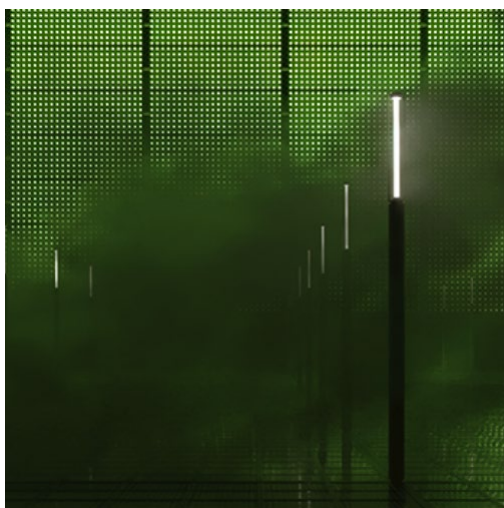


Girl with Leica

Alexander Rodchenko, 1934

Screens as atmospheric element

Image via Yale University Art Gallery
<https://artgallery.yale.edu/collections/objects/276457>



LCD Screen Installation (unbuilt)

Studio David Klemmer / Artefactorylab, 2020

Screens as scenography

Image via <https://www.artefactorylab.com/david-klemmer/>

Open space: Machine garden



Contained environments: Ecotron in Belgium

Hasselt University, Maasmechelen

noAarchitecten, 2016

Image via noAarchitecten, <https://noaarchitecten.net/projects/29/071-ecotron-hasselt-university-maasmechelen>



Still from the (actually) toxic garden in Stalker

Andrei Tarkovsky, 1979

Film still via Tarkovsky, A. (1979), Stalker.



Post-coal age in Gräfenheinen

Campsite Ferropolis under dredger ruins

Image via <https://www.gocamping.de/camping/2362/Ferropolis.html>

Process: Dynamism

Dragging I: Dress with train

Wedding of Prince Harry and Meghan Markle, 2018

Image via <https://www.rnd.de/panorama/so-schon-ist-meghans-hochzeitskleid-NB5VSHKGLSROFAF6ZNCTYFRB6l.html>



Dragging II: Tractor drag

Giants Software: Farming Simulator 19

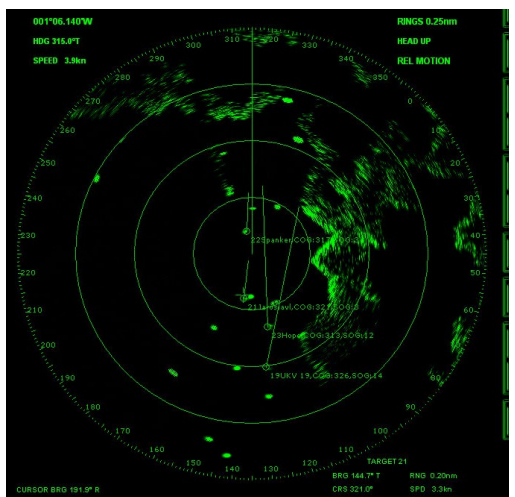
Image via <https://forbidden-mods.de/filebase/file/8898-wiesenschleppe/>



Dragging III: Radar Scanner

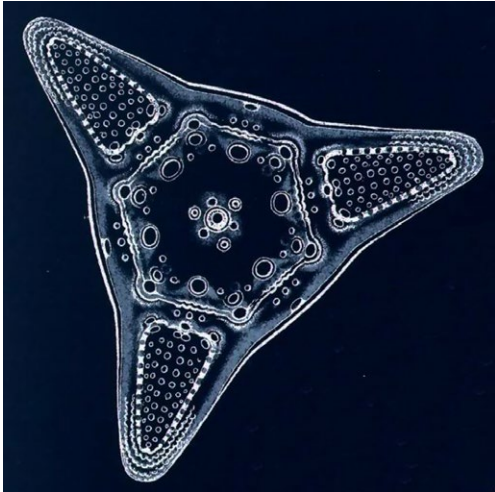
Echolotic scanning on a container ship

Image via <https://www.nauticexpo.de/prod/mi-simulators/product-26918-429207.html>



STRUCTURAL THOUGHTS

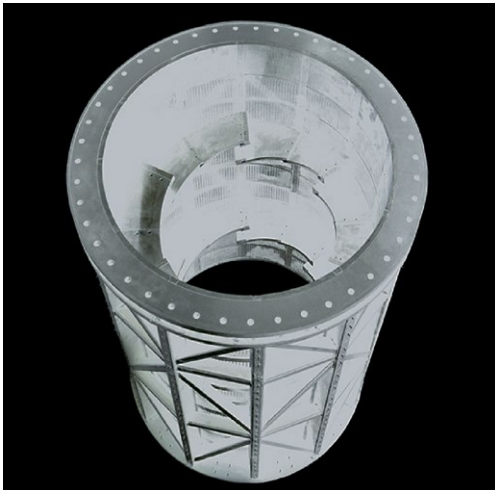
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Biomimicry: structural and installational core

Algae drawing by Ernst Haeckel
Kunstformen der Natur, 1909

Image via Haeckel, E. (1909) Kunstformen der Natur. Wien: Bibliographisches I.



Rotational screen exo-structure

Round industrial trommel screen

Image via a product page of Naipu Mining, naipumining.com



Service core and suspended cylinders

Aerial of Munich BMW tower's interval construction
Karl Schwanzer, 1968-1972

Image by M. Patucca (1970) via <https://www.youtube.com/watch?v=E8DJOrZ->

Walkway within structural level

Airship hangar "Cargolifter"

SIAT GmbH, 1997-1999

Image via <https://atlasofplaces.com/architecture/cargolifter/>**Hanging canopy**

Braga Municipal Football Stadium

Eduardo Souto de Mora, 2000-2003

Image via <https://www.atlasofplaces.com/architecture/braga-municipal-stadium/>**External wall-like structure with suspensions**

Extension of Royal Botanic Garden Edinburgh

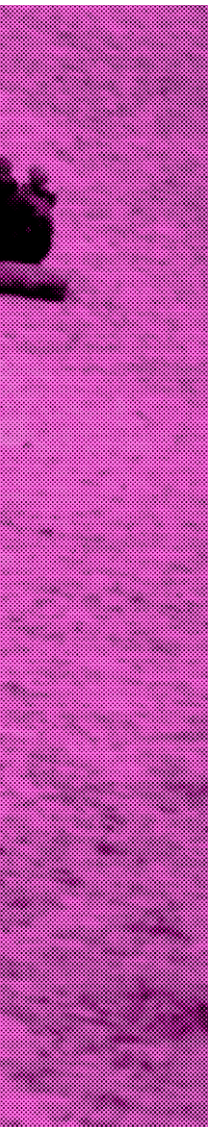
Property Services Agency - PSA, 1967

Image via <https://www.haakon.co.uk/explore-blog/royal-botanic-garden-edinburgh-scotland>



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Translating

Languages

This thesis departed from the German *Boden* as an agglomerate of meanings. The term has served as an intuitive entrance point that led me into a stratified volume converging concepts like land, soil, ground, space and habitat. By dissecting definitions, exploring explanations and acting accordingly, my process in hindsight was from the beginning an attempt to translate this multi-definitional concept. Its lingual thickness has originally intrigued me for its inherent sociocultural significance yet equally evocative vagueness. As my research has showed, *Boden* in Berlin is however narrowing down to its meaning as land, especially related to land ownership in an incrementally financialising and speculative city. My approach has therefore shifted from an exclusive attempt to translate the German *Boden* to its multiple meanings in another language like English. Rather, this translative process in the end also took over as a new access to the conceptual layers comprised in *Boden*: By translating them, their multitude got narrated and their richness was able to surface again: The treasure in the *Boden*, the literal *Bodenschatz*, was mined¹.

My thesis understood this inherent richness as a potential solution towards the issues each of its dimensions faces. I started with the land ownership question, which is a pressing concern for human and non-human inhabitants of Berlin, who are subjected to scarcity of space due to its increasing commodification. For mitigating this socio-ecological urgency, my language-based understanding of translating (as a widening of meanings) has made me consult options in all the other definitions and layers of *Boden*. Like this, my approach has ultimately resulted in a scheme that enables new land ownership models by changing the physical condition of the ground and a metaphysical subversion with digital technology, which all reflects in a single piece of architecture. Spatial design in this was not the conclusion but rather a continuous testing ground tool of bringing the various facets of the research part together to cross-pollinate the research with its hypothetical implementation.

Processes

Upon the realisation of translating as the motivation of the thesis, I began to encounter my research and design outcomes in a different way, too. All of the proposal's operative processes share translating as their conceptual vector.

The research's main outcome is a counter-speculation of undermining the current regime of land tenure financialisation and speculative market processes. My main research proposal, the Decentralised Autonomous Organisation *Bodenschatz DAO*, translates the current *modus operandi* towards land in order to achieve its decommodification. In this speculative business scheme, land is withdrawn from the market to enable eco-inclusive cohabitation between human and non-human actors in Berlin, who fulfil important roles in the process. Blockchain technology and digital governance schemes lay the foundation of making land an autonomous actor, loosely based on existing Community Land Trust models. Land therefore is translated: from a profit-oriented market good to a self-governed cohabitation ground.

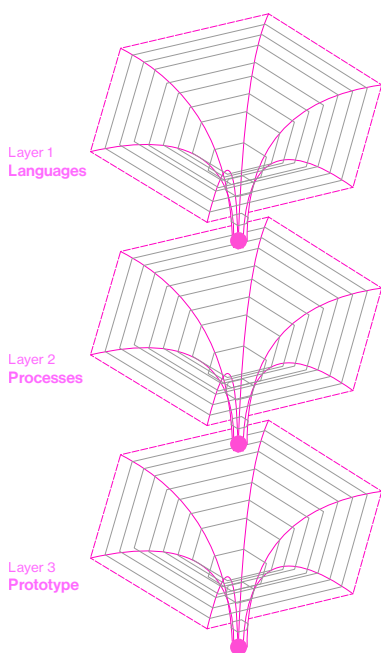
This is achieved by yet another translation, the physical remediation of the ground itself. By decontamination, value in the form of biodiversity on site can be generated, which in turn is tokenised, sold and used to buy back ownership over the very land that has just been cleaned up. The thesis has engaged with and proposes several strategies such as thermal desorption, bioremediation and soil washing. Their translative and transformative potential is bundled in the architectural intervention proposed by *Bodenschatz*, and is spatially synchronised with the data centre required for the DAO's digital processes. Soil is physically translated here; it is stripped off its hazardous technogenic burdens like heavy metals or chemicals.

Another translation process is present in the science fiction enveloping the whole project. The ancient myth of a deity whose songs guided Berlin's first settlers to make peace with a seemingly hostile environment is translated into a contemporary version, which explains the project's technophilic approach towards an socio-eco-inclusive city along land automation and soil decontamination in narrative terms. This science fiction approach is a vehicle to reach societal understanding of the project, as it translates it into simpler terms by forming a myth around it. This is introducing translation as a method of communicating academic outcomes to the public and vice versa. The science fiction approach is seen as an advocative role model for researchers to enable more public agency in scientific, economic and especially architectural proposals.

Prototyping

Architecture to me has always been associated with transforming the status quo. The quality of a design goes beyond structural soundness, spatial qualities or technical feasibility. It has to change something. This change might be related to these points of structure, space or technology, but it can also be achieved by other means or solely be rooted in the impact it has on its environment of any scale – from the individual to global systems.

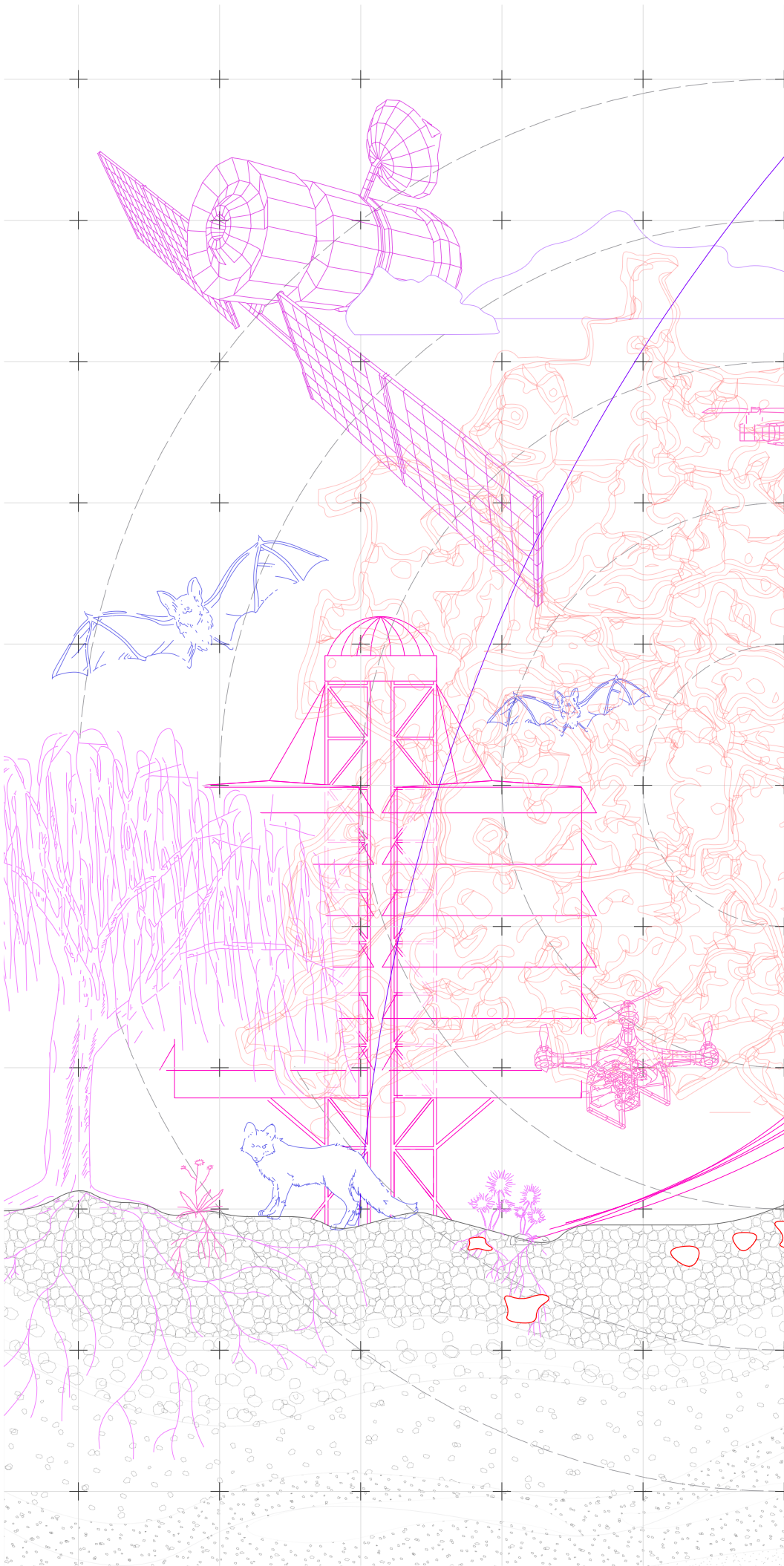
The architectural process itself is a series of changes: I have always understood design assignments as a translative process. Receiving an abstract and sometimes fairly vague brief and taking it to a spatialised, quantifiable solution through design thinking makes every architect a translator. My thesis, *Bodenschatz*, comes up with its own brief which rethinks urgencies in Berlin as a call to action. This call translates former intangible processes like soil decontamination and data management first into an action plan and then further into a synergetic prototype of a publicly accessible urban typology. The impact of my proposal roots in architecturally integrating digital processes like Decentralised Autonomous Organisation models or blockchain technology with grounded, physical soil remediation techniques such as thermal desorption. By using available means (science), a possible story with a holistic positive outcome is told (fiction) through an architectural proposal and design. The main impact is created by narrating and therefore translating these complex programs. Abstract topics are visualised and urbanised for the public to take positions and agency in the necessary processes on the way to a socio-ecologically inclusive city. As the ground is cleared of contamination for a thriving urban biodiversity and land is getting more accessible for community inhabitation, *Bodenschatz* also provides a transparent layer of inclusive spatial narration. Lebbeus Woods once famously stated: “The only thing that is radical is space we don’t know how to inhabit. This means space where we have to invent the ways to act and to live”². *Bodenschatz* sees itself as a provider of this space, yet understands space itself as a translative element.

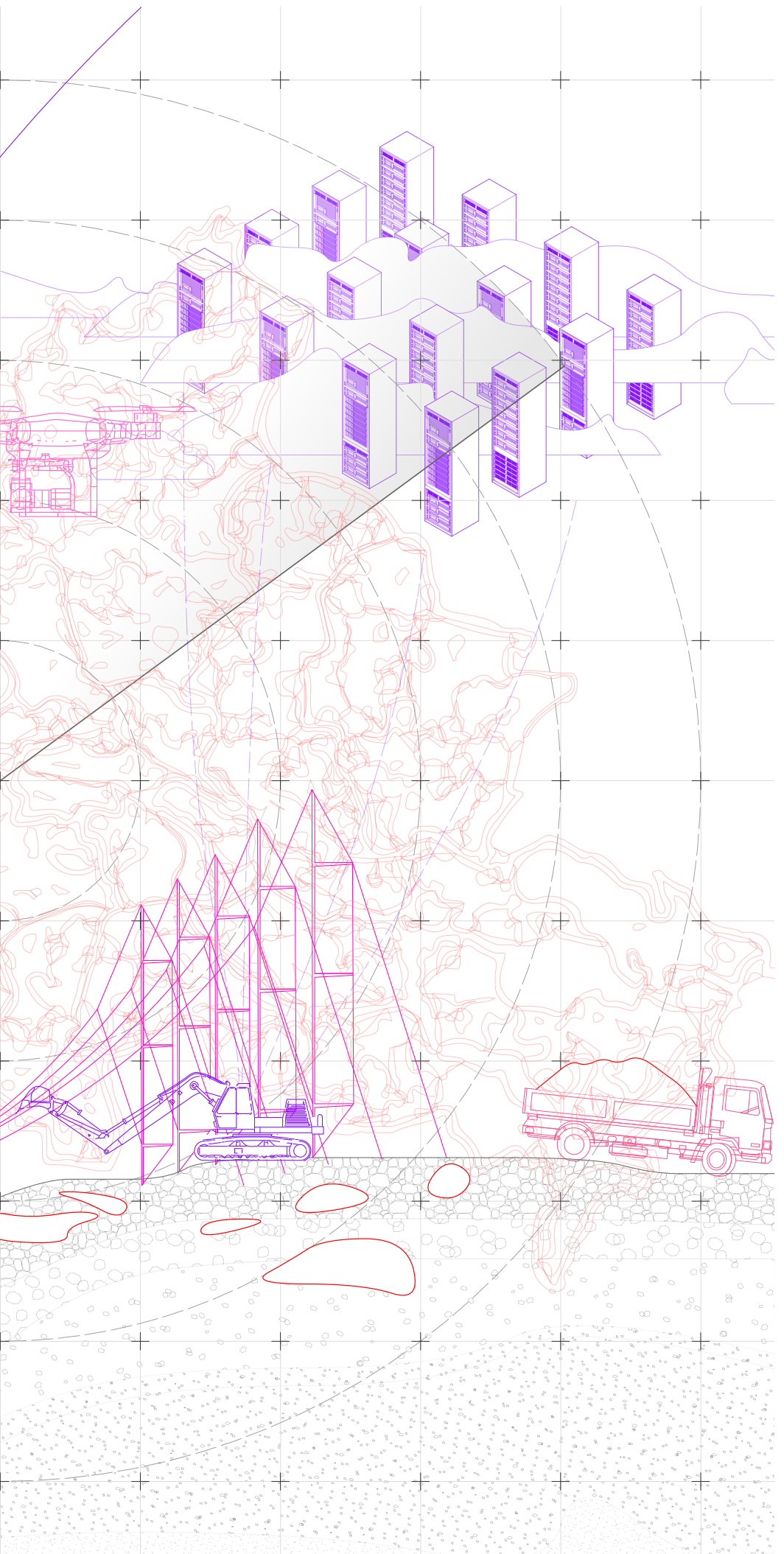


In summary, the conceptualised process of this thesis is a series of translations: from language translations as a point of departure to process translations as methodology and program to a translation of abstract ideas into a physical prototype as the architectural outcome. The beauty of translations is their ambiguity. Two translators can pick up a text and the outcome will never be the same. Wars have been fought about the sole concern of correctly translating (or not translating) holy books, and even machine learning software like DeepL never commits itself to singular answers. My thesis is a dynamic, speculative point of departure to be picked up and discussed by a diverse audience – planners, scientists and laypeople. It is told and visualised in a way to engage with and relate to this audience by using science and fiction. The recipients’ way of translating ideas, concepts and designs into subjective positions will equally stratify upon and excavate the thesis’ ground. The main objective is critical engagement with the ideas presented, positive or negative. No matter how many substrate layers archivally set upon the bedrock, the process has to be initiated somewhere. My thesis is to be buried under diverse ideas, iterations and interventions. Translation in the form of interaction, whether proaction or counteraction, is the main purpose of a science fiction prototype – *Bodenschatz*.

¹ German *Bodenschatz* [literally “soil-treasure”] translates to natural resources

² Woods, L. (1977). *Radical Reconstruction*. Hudson: Princeton Architectural Press [p.27]





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Technische Universiteit Delft, Explore Lab Studio XXXV

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