Berliner Blätter 87/2024, 95–104

Urbanizing Soil: Berlin Teufelsberg as leaky archive

Laura Kemmer, Sandra Jasper

ABSTRACT: *In this contribution, we argue that the material process of urbanizing soil is not limited to the transformation of a "natural" into an "urban" element. Rather, soil is produced in and from cities. This is exemplified through the case of Teufelsberg, a rubble mound in the southwest of Berlin, created from 26 cubic metres of city rubble from the early 1950s onwards. We accompany soil scientists on an excursion to trace the scientific debates and troubles around classifying urban soil, studies about sulphate leaching from bricks, and recent ideas of resignifying the experimental rubble mound as a soil monument of both scientific and cultural significance. The Teufelsberg process of rubble pedogenesis confronts us with an imaginary of soils as leaky archives of human activity. Through their hybridity as both material and lively, organic and technogenic, rubble soils trouble imaginaries of elemental "purity".*

KEYWORDS: *urbaniziing soil, Berlin Teufelsberg as leaky archive*

HOW TO CITE: *Kemmer, L., Jasper, S. (2024): Urbanizing Soil: Berlin Teufelsberg as leaky archive. In: Berliner Blätter 87/2024, 95—104.*

Prelude: Cities from soil, soil from cities

What happens if an element that is associated with the "natural" realm outside cities becomes urbanized? In this contribution, we focus on the element earth, and, more specifically, on urban soil. While soils in general are largely defined as fertile, organic, lively, these qualities seem to get lost as soon as soil becomes urbanized. When soil leaves the "rural" and enters the "urban" realm, it is transformed from a "life-sustaining" element into a "raw material" for construction and landscaping or a "service provider" for storing carbon dioxide and filtering water. The material process of urbanizing soil, however, is not limited to the transformation of a "natural" element into an "urban" element. Soil is also produced *in* and *from* cities; it remains an earthly element that in turn shapes urbanization processes and urban metabolisms.

Berlin, the city we write about, offers a marvellous monument of "urbanizing soil". In the city's far west, a "deceptively pastoral" landmark protrudes over the large Grunewald Forest (Graham 2016). The Teufelsberg, or Devil's Mountain, has not formed out of natural processes of land (or ice) mass motion and weathering. The highest elevation of Berlin, with its 120 metres, has been piled up by human hands between 1950 and 1972. It is made of the tons of rubble that formed the soilscape of postwar Berlin. Within the topographical

DOI: https://doi.org/10.18452/28588

landscape of Berlin, it is one of the highest elevations, one of sixteen rubble mounds. A volumetric space containing traumatic pasts.

The Teufelsberg is a vivid example for how the very "earthen" materials that cities are made of, from bricks to concrete, become soils again. It is no coincidence then, that the rubble mound became one of the hot spots for Berlin's urban soil scientists to dig soil profiles and to build their scientific typologies. Teufelsberg in a way exemplifies the process that Science and Technology Studies (STS) scholar Germain Meulemans has termed "urban pedogeneses", following his walk-alongs with Paris soil scientists who saw soils-in-becoming through processes of sedimentation, decomposition, and erosion in every crack in the pavement (Meulemans 2020, 253). In Berlin, this process might as well be renamed as *rubble pedogenesis*.

Being confined to the destroyed landscapes of West Berlin, the pioneering work of soil scientists was carried out on the decidedly "non-natural" grounds of bombed lots, rubble fields, and backyards (Burghardt et al. 2022; like their colleagues in urban ecology, cf. Jasper 2018). As early as in 1978, scientists Hans-Peter Blume and Marlies Runge from Technische Universität Berlin published their study of the "Genese und Ökologie innerstädtischer Böden aus Bauschutt" (genesis and ecology of inner-city soils out of construction rubble). The work has by now become one of the foundational works of Berlin soil science, which until today takes the Teufelsberg as an experimental site, for instance for studying the impact of the high number of bricks in the ground on tree rooting processes (Nehls et al. 2013).

In September 2022, the "urban soils" working group of the International Union of Soil Sciences convened for a fieldtrip to the Berlin Teufelsberg. On the occasion of their 11th conference, international scientists specialized on the Soils of Urban, Industrial, Traffic and Mining Areas (SUITMAs) climbed up the city's famous rubble mound (fig. 1). We have accompanied them on their way uphill to find out how soil scientific discussions might elucidate (or complicate) understandings of elemental urbanism.

Stumbling up: How urban soil transcends categories of "natural" and "artificial"

On a grey September morning, we meet at the Heerstraße S-Bahn station. French, Polish, Spanish and German languages mix as the scientists gather in a circle in the entrance hall of this history-charged building. Indeed, the station has witnessed a violent part of German military history, from the parading of the Imperial German Army under Prussia at the beginning of the 20th century, to the arrest of resistance fighter Adolf Reichwein inside this very station, which happened just a few days ahead of the famous 20 July plot against Hitler in 1944.

We begin to talk about rubble. As the urban soil scientists are aware of, rubble is a common soil substrate all over Europe. After the end of World War II, much of the continent was covered in debris from bombed-out buildings and industries. Germany alone was left with approximately 400 million cubic metres of debris. Today it is estimated that in Berlin about 60 percent of the urban soil is composed of rubble. The hand-out for the fieldtrip, authored by soil scientists Gerd Wessolek, states that the prevalent parent material of soil in the city is composed of fired bricks, gypsum, ash, and mortar (cf. Wessolek 2022, 2).

Someone makes a reference to Berlin's "war moraines" (cf. Forßbohm 2011). Indeed, we learn that the Teufelsberg is an unlikely mountain located in the glacial valley of an otherwise flat landscape. One third of the more than 75 million cubic metres of Berlin's war

debris has been deposited at this location after 1945. Teufelsberg is unique in its size, the largest of 37 major rubble deposition facilities in Berlin. But why did they pile it up here, in the middle of the Grunewald, the largest forested area of Berlin?

Our soil scientist tour guides present us with two reasons. First, the choice of the location of the Teufelsberg, we learn, has to do with the geopolitical division of Berlin after 1945. Unlike the USSR sector, which brought most of "their rubble" to locations further outside the city, the West Berlin city administration was constrained to dump more than half of the debris distributed on their part of the city within the urban frontiers, thus needing to recur to "rubble mountains" like the Teufelsberg. Secondly, this was exactly the place of the military faculty (Wehrtechnische Fakultät) of the Nazis, a large unfinished building made of concrete and extremely difficult to deconstruct or to destroy. Therefore, it was decided to bury the building under the rubble.

Our group sets into movement, climbing up a steep footpath in the midst of a densely forested area, slaloming around birches and oaks and blackberry bushes until we finally reach the top. As we stand on the hilltop ridge, which presents itself as a plateau with a scenic view over the city, soil scientist Kolja Thestorf shows us a series of historical photographs: trucks unloading at the steep edges of a gigantic debris dump, an aerial view of the brown and grey human-made terraces piled up in the middle of a forest, a group of women who separate bricks from wood and metal in the midst of a destroyed urban landscape.

For him, the Teufelsberg represents "one of Berlin's most impressive experiments in urban pedogenesis" (Fieldnote 08.09.2023). Thestorf, who works at the Geography Department of Humboldt-Universität zu Berlin where he studies the legacy of heavy metals in Berlin wasteland soils, explains to us the rubble pedogenesis at Teufelsberg:

> "It all began with sorting WWII debris, separating bricks, mortar and other reusable building materials from waste. They planned to "compost" textile material, leather and so on, which they left in holes in the ground for decomposition. Then the system changed again. In the final years, they started to bring in sewage sludge from a nearby treatment plant, but also topsoil from construction sites in the city centre. Basically, the soil here is a mix of everything now." (Fieldnote 08.09.2023)

The group gathers to have a closer look at the pictures that Thestorf has shown us to illustrate his story. Those who separated the rubble freshly unloaded from the trucks, those who roughened their hands and strained their backs were mostly female workers, the famous "rubble women" that reconstructed the city after WWII. When the Teufelsberg landfill was opened in 1950, the topsoil was first dug out and stored on the edges of the deposit. Then the rubble brought from the city was unloaded in circular lines, from the outside to the inside, piling up and compacting the new anthropogenic grounds with caterpillar levellers.

The "system change" that Thestorf alludes to occurred after a few years, when the originally planned 12 million cubic metres of rubble had already been deposited. In 1954, the West Berlin administration decided to extend the Teufelsberg site, to make space for storing all the new debris generated by postwar communal construction projects, but also by private household waste and sewage sludge. The hill that we just climbed up, we learn, is the Drachenberg (dragon/kite mountain), a 99 metres hill without trees on top, which offers a good view to the field station at the neighbouring Teufelsberg (cf. fig. 1). When the landfill works ended in 1972, the planned 12 million cubic metres had more than doubled. Amounting now to approximately 26 cubic metres, the combination of Teufelsberg and

Fig. 1. "Members of the 'urban soils' working group on their way uphill (Drachenberg)"

Drachenberg stored more rubble than all other "artificial mountains" in Berlin taken together.

In a second story, our tour guides tell us about the actual form of the Teufelsberg. The original plans for a subterranean rubble deposit *below* the Grunewald, as proposed by famous Berlin architect Hans Scharoun during his one-year period as head of the municipal planning and building commission (1945-1946) were soon abandoned. That the rubble was piled up instead of grounded has to do with an "ironic twist of fate" in which, according to Gerd Wessolek, "soil plays an essential part" (cf. handout for the fieldtrip, authored by Wessolek 2022, 2).

Our second tour guide, Gerd Wessolek is professor emeritus from Technische Universität Berlin, a pioneer in *urban* soil science in the 1980s and a fierce advocate of combining scientific and artistic approaches to soil protection (Toland et al. 2019). With Wessolek, we get to know the Teufelsberg as quite a contradictory case of a "soil monument". The location for this new, major rubble deposit in the postwar years seems carefully chosen. It was far enough inside the Grunewald forest to avoid that the dust generated by the landfill would cover residential areas; and it allowed for potentially reforesting an area of the Grunewald where almost all trees had been cut between 1937 and 1940 to make space for the Nazi faculty of Military Technology.

In postwar Berlin, rubble became the material of choice for covering up architectonic remnants of Nazi Germany. And when the first tons of war debris had been spread throughout the city, Berlin planners speeded up to conceal the rubble again through a citywide greening and beautification program.

Again, the Teufelsberg became an important open-air laboratory for covering-over traumatic pasts. As the urban historian Dorothee Brantz writes, "the Teufelsberg is upside

down — stones inside, earth outside, buildings underneath and forest on top." (Brantz, forthcoming).

One year after West Berlin initiated a new tree planting scheme as part of the so-called "Green Emergency Program" (Grünes Notstandsprogramm) in 1953, a large area of the Teufelsberg was dedicated to experiments with technical solutions for water storage and adequate "pioneer" plants. The goal was to prove that "greening" the rubble was possible without needing to improve the soil quality (Forßbohm 2011, 63).

"The Teufelsberg is make-up", Wessolek explains to the group of soil scientists who now set into movement. Today, the hill is covered by a layer of topsoil that ranges from thirty centimetres to one metre. As Wessolek points out, not only the memories of Nazi Germany have been covered over at Teufelsberg. "The memory of the weight, feel, and smell of the burned bricks dies with the last of the 'Trümmerfrauen'", he states, referring to the invisibilization of the female labour of the "rubble women" who had separated the debris of the ruined city as first step of the human-induced process of decomposition to generate urban soil (cf. Toland/Wessolek 2017, 233).

We cross the small valley that separates Drachenberg from Teufelsberg, following a dusty footpath. Many of us stumble over stones on the ground. The thin topsoil reveals tile fragments: a metal door hinge, crumbles of mortar. Several scientists in our group point at the traces of human dwellings that have travelled here from far away areas of the city. Artifacts of the WWII era are readily brought to the surface here by the soil movements, weathering processes, but also by grazing deer, wild boars, and through human recreational activities, like mountain biking in the summer or sledging in the snow. It is not that easy to hide the past in these unruly grounds. In our stumbling, we experience how urban soil contests ideas of passivity and stasis ascribed to bricks, stones, or earth.

Fig. 2. "Stumbling down the way to Teufelsberg (Drachenberg-Teufelsberg valley)"

The rubble itself continues to move and re-appear on the surface. It serves as a reminder of the social and political histories buried underneath the surface, contesting the renaturalization of rubble soils into a "deceptively pastoral" landscape or urban forest. "The water and the erosion processes are transporting stones and bigger parts up here through a kind of migration process through the soil" (Fieldnote 08.09.2023), conference organizer Björn Kluge, an ecohydrologist from Technische Universität Berlin, explains. As we learn, the Teufelsberg has served as exemplary case for an agenda-setting article about the "Technosphere", published by an interdisciplinary group of mainly geologists, but also archaeologists, environmental historians, and urbanists, who argue that the material resistance of technical artifacts in soils, such as construction debris, pipes, power lines, tools and machines, but also, the very "human-modified soils" themselves will become important evidence for human-made planetary transformations (Waters et al. 2016, 4).

Digging down: Leaky grounds, sulphate, and soil protection

During our walk with the soil scientists, they highlight how recognizing human activities in cities as integral to soil formation has spurred conceptual debates about "urbanizing soils". West Berlin soil scientists, from their particular fascination for rubble soils, have pioneered the advocacy for recognizing "anthropogenic soils" as part of international soil classification systems. Amongst the first urban soil surveys produced between the 1950s and 1970s, three out of five cities mapped by international soil scientists were German cities: Bottrop, Halle, and West Berlin (Burghardt et al. 2022, 463).

Already in 1986, the 13th World Congress of Soil Science of the International Union of Soil Sciences (IUSS) held in Hamburg, featured an excursion to the "Soilscapes of Berlin (West)" (Tietz/Wessolek 1986). One year later, in 1987, the German Working Group Urban Soils was founded, which in 1998 became a nucleus of the SUITMA (Soils of Urban, Industrial, Traffic and Mining Areas) working group of the IUSS. Our excursion to the Teufelsberg is part of the 11th SUITMA conference, being held in Berlin between 5th and 9th of September 2022.

The participants of our walk up the Teufelsberg hill, urban soil scientists from all over the world, are concerned with themes ranging from ongoing questions of soil pollution and soil health in cities, to more recent engagements with soils' "ecosystem services", i.e., their capacity to store water or carbon dioxide (cf. book of abstracts, SUITMA 11). One central and recurrent topic of the SUITMA conferences, however, is the discussion of new classificatory categories for urban soils. The first group of urban soils that has entered international classification schemes as late as in 2006 was the group of urban "Technosol", that is, human-modified soils. Only later, this group was joined new categories for soils originating from sewage sludge ("Garbic" Technosols), soils that are sealed under concrete ("Ekranic" Technosols), or soils that are generated through the decomposition of organic matter on top of green roofs or inside a gutter ("Isolatic" Technosols) (cf. Meulemans 2020, 251). Echoing the Anthropocene arguments by their geology colleagues, soil scientists frame the urbanization of soils as an ignored challenge (cf. ibid; EEA 2006), which needs to be tackled through a more differentiated study of the development of Technosols.

As German soil scientists Lutz Makowsky and Bernd Steinweg argue in their paper for the SUITMA 11 conference, the most recent (2022) publication of the German Guidelines for Soil Mapping in urban, commercial, industrial, and mining areas very well represents the history of conceptual adaptations and revisions in the classification of Technosols. What

it offers is a detailed description of *anthropogenic* components such as "bricks" or the more precise term "construction rubble" as crucial for urban soil classification (Markowsky/ Steinweg 2022). When we gather around a soil profile, we learn that the soil type developing at rubble mountains is usually called "Pararendzina", developing from materials such as metals, ceramics, glass, bitumen, leather, slate, marble, limestone fragments, organic and inorganic carbon (figure 3, cf. handout for the fieldtrip, authored by Wessolek 2022, 5).

Fig. 3. "Mapping rubble soils (soil profile at Teufelsberg)"

The rubble at Teufelsberg produces new soil through the decomposition of its organic and inorganic components, the bricks, the mortar, the clothes. However, there is something specific about rubble soil that troubles the process of breakdown and soil formation. There are elements that do not break down. The "elemental legacy" of rubble soil is produced by sulphate, a chemical that is leaching from gypsum, slag, coal-ashes, and bricks into the groundwater. In Berlin, sulphate levels in inner-city aquifers already exceed the threshold level of the Federal Drinking Water Act (handout, 8). Not directly affecting human health, high sulphate concentration does pose a challenge to urban ecologies, to environmental planning and mitigation schemes.

According to Wessolek, "an incalculable risk of groundwater contamination is developing for several catchment areas in Berlin in the medium term" (handout, 8). He shows us a diagram from a state-commissioned study that he has carried out with colleagues at

the Teufelsberg and the (secondary) Berlin rubble mound "Fritz-Schloss-Park" to provide porjections about the temporalities of sulphate leaching (fig. 4; cf. Abel et al. 2015).

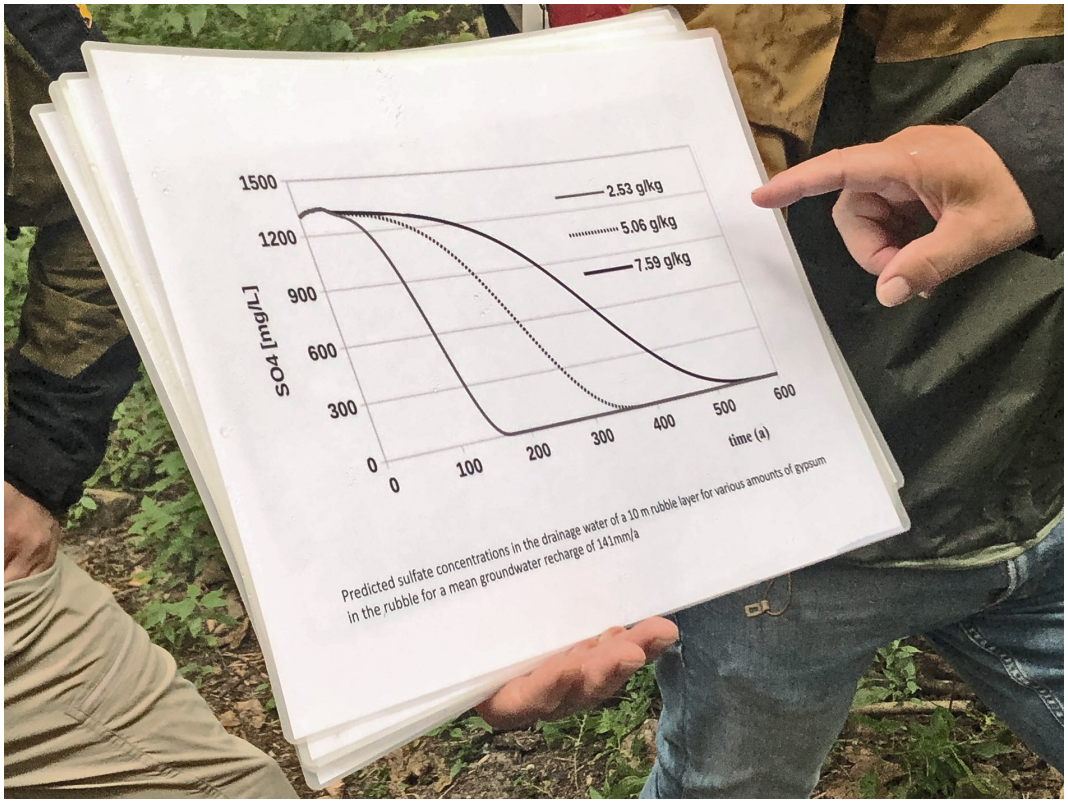

Fig. 4. The 'leaching experiment' (SUITMA handout)"

According to Wessolek, the soil scientists' "leaching experiment" (fig. 4) suggests that it will take over 3000 years until all sulphate from the war debris at Teufelsberg finds its way into the groundwater. For the Berlin Senate, he explains, the study presented a "problem solved", because there is no realistic way to avoid long-term sulphate leaching for protecting the groundwater reserves of the nearby lakes, which are part of the drinking water reservoir of the city of Berlin. The alternative for soil remediation would be to dig up the complete Teufelsberg, but this would imply the destruction of the forest ecosystem all over. Again, the question would occur: where to put the rubble?

As Wessolek explains to our group, "the toxicants in the rubble still contained by the soil might become a severe problem in the future, but since this cannot be solved within one generation, nothing has been done". Beyond the limits of human agency, however, there is something else in the ground of Teufelsberg that shapes the elemental relation between soils and chemicals. Thomas Nehls, a participant soil scientist from Technische Universität Berlin, points out that the rubble components of the soil are slowing down the sulphate leaching: "The reason for the delayed leaching into the groundwater is that the sulphate is stored in this physical storage system, so it comes through much later than expected".

Based on this observation, Nehls proposes a new soil category: "brick soil". The mixture of rubble, bricks, and stones that compose the Teufelsberg soils act as a water-repository, he explains. While the Teufelsberg ecosystem is threatened, like many forests around Berlin, by lack of rainfall and increasing dryness, underneath the sandy topsoil of the hill, the roots of Teufelsberg trees encounter a layer of rubble soil full of water.

Rubble pedogenesis is an ambiguous process. It may have positive effects on the water storage capacities of soils, and in providing nutrients for plants. At the same time, however, rubble soils can negatively affect the health of an ecosystem, as much as the technical infrastructure buried in the grounds (pipe corrosion) through sulphate leaching.

Conclusion: Urban soil as cultural and material archive

What we learn from Teufelsberg is how 'rubble soils' bring about locally specific understandings of soils-as-archives, bearing traumatic memories but also toxic traces of human activity. Through considering the socio-cultural and historical context of rubble pedogenesis in Berlin, we can interrogate the logics of passivation, stabilization, scalability and standardization of "earth" as generated by human-made urbanization processes. While the very movement of the land masses at Teufelsberg brings to the surface bricks and stones from WWII times, it also contests local government plans to renaturalize urban soils into "pastoral landscapes", parks and forests. Through tracing the material legacies of rubble and sulphate in Berlin's postwar soils, we can question imaginaries of "earth" as a natural or fertile resource that is rediscovered as active agent of sustainable urbanism. How does the *process* of urban pedogenesis, and in particular rubble pedogenesis, fit into this elemental imaginary?

In our fieldnote-collage we took a journey alongside an international group of urban soil scientists, who, from Berlin's particular kind of rubble pedogenesis, have allowed us to unpack the "elemental" in "urbanizing elements". Rubble pedogenesis, here, designates a process where not only organic matter, but also all kinds of technogenic and abiotic matters decompose into soil — a process through which chemical elements cannot be decomposed.

At Teufelsberg, two kinds of "material legacies" become evident through rubble pedogenesis. The first is the rubble itself, that resurges from the ground as stones and bricks appear on the surface and make us stumble across the hill. So, in one way, this rubble cannot be covered up, it always reappears and reminds of past wars and destruction. Yet at the same time, the rubble soils of Berlin (and elsewhere?) also mark spaces of oblivion and attempts to hide the evidence of historical rupture, war and destruction through greening and landscaping.

A second material legacy of the rubble soil at Teufelsberg appears through the sulphate. Through their hybridity as both material and lively, organic and technogenic, rubble soils trouble imaginaries of "earths" elemental "purity". The Teufelsberg — through its unruly rubble that moves up to the surface and the sulphate that slowly filters through the soil into the groundwater — confronts us with an imaginary of soils as both "living" and "leaky archives" of human activity.

Our tour guide Gerd Wessolek, together with the artist and designer Alex Toland, has mobilized cultural elemental imaginaries of "soil memories", for the mountain to become an earthen monument, one that is not merely used for leisure but as a site where the violent history of war is remembered (Toland and Wessolek 2017, 238). Indeed, these claims can be grounded in German soil protection law, which is unique in comparison to European or international regulations for its reference to soils' function as "archive of natural and cultural history" (BBodSchG, §2, 2). In this way, by activating a search for evidence and discussions around a "soil monument", rubble soil can serve as another kind of "disruptive archive".

Bibliography

Abel, Stefan, et al. (2015): "Pools of sulfur in urban rubble soils." In: *Journal of Soils and Sediments* 15, 532 – 540. https://doi.org/10.1007/s11368-014-1014-1

Blume, Hans-Peter/ Marlies Runge (1978): "Genese und Ökologie innerstädtischer Böden aus Bauschutt." In: *Zeitschrift für Pflanzenernährung und Bodenkunde*, 141, 727 – 740.

Brantz, Dorothee (forthcoming): "Upside Down Ecologies: Berlin and the Teufelsberg in the 20th Century." In: T. Moss (Ed.): *Ecologies of the Technopolis: Contested Environments and Infrastructures of Berlin*, 1871 – 2020 (History of the Urban Environment).

Burghardt, Wolfgang et al. (2022): *Soil science within German cities. In: Journal of Plant Nutrition and Soil Science*, 185/4, 462 – 474.

European Environment Agency (EEA) (2006): *Urban Sprawl in Europe: The Ignored Challenge*. www.eea.europa.eu/publications/eea_report_2006_10, accessed on 31.10.2023.

Forßbohm, Ulrike (2011): "Kriegs-End-Moränen. Zum Denkmalwert der Trümmerberge in Berlin." In: *Forum Stadt- und Regionalplanung e.V.: Graue Reihe des Instituts für Stadt- und Regionalplanung*, Technische Universität Berlin, Heft 34.

Graham, Steven (2016): "City Ground." In: *Places Journal*. https://doi.org/10.22269/161107, accessed 30.10.2023.

Jasper, Sandra (2018): "Sonic refugia: nature, noise abatement and landscape design in West Berlin." In: *The Journal of Architecture*, 23/6, 936 – 960.

Markowsky, Lutz/Bernd Steinweg (2022): *Description of Anthropogenic Components for Soil Mapping – A Glance to the German Guidelines for Soil Mapping, version 2022 (KA6), in proceedings SUITMA 11*. https://www.dbges.de/de/system/files/AG_Bodensystematik/suitma-2022_makowsky-steinweg_221011.pdf, accessed on 31.10.2023.

Meulemans, Germain (2020): "Urban Pedogeneses: The making of city soils from hard surfacing to the urban soil sciences." In: *Environmental Humanities*, 12/1, 250 – 266.

Nehls, Thomas et al. (2013): "Contribution of bricks to urban soil properties." In: *Journal of Soils and Sediments*, 13, 575 – 584.

SUITMA 11 (2022): *Book of abstracts*. https://suitma11.org/conference-program/, accessed on 31.10.2023.

Tietz, B./Wessolek, G. (1986): "Soilscapes of Berlin (West)." In: Alaily, F. et al. (eds.): *Mitteilungen Deutsche Bodenkundliche Gesellschaft, Band 50, XIII Congress of International Society of Soil Science, Guidebook Tour G*, Hamburg, 1 – 204.

Toland, Alexandra/Gerd Wessolek (2017): "Devil in the Sand – The Case of Teufelsberg Berlin and Cultural Ecosystem Services." In: Kim and Levin (Eds.): *Urban Soils and Culture*.

Toland, Alexandra et al. (eds.)(2019): *Field to Palette: Dialogues on Soil and Art in the Anthropocene*.

Wessoleck, Gerd (2022): *SUITMA 11 Handout "Devils Mountain"*. Handout received 08.09.2022.

Waters, Colin N. et al. (2016): "The Anthropocene is functionally and stratigraphically distinct from the Holocene." In: *Science*, 351/6269, aad2622. doi:10.1126/science.aad2622

List of figures