Caring for Infrastructural Grounds. A Research Agenda

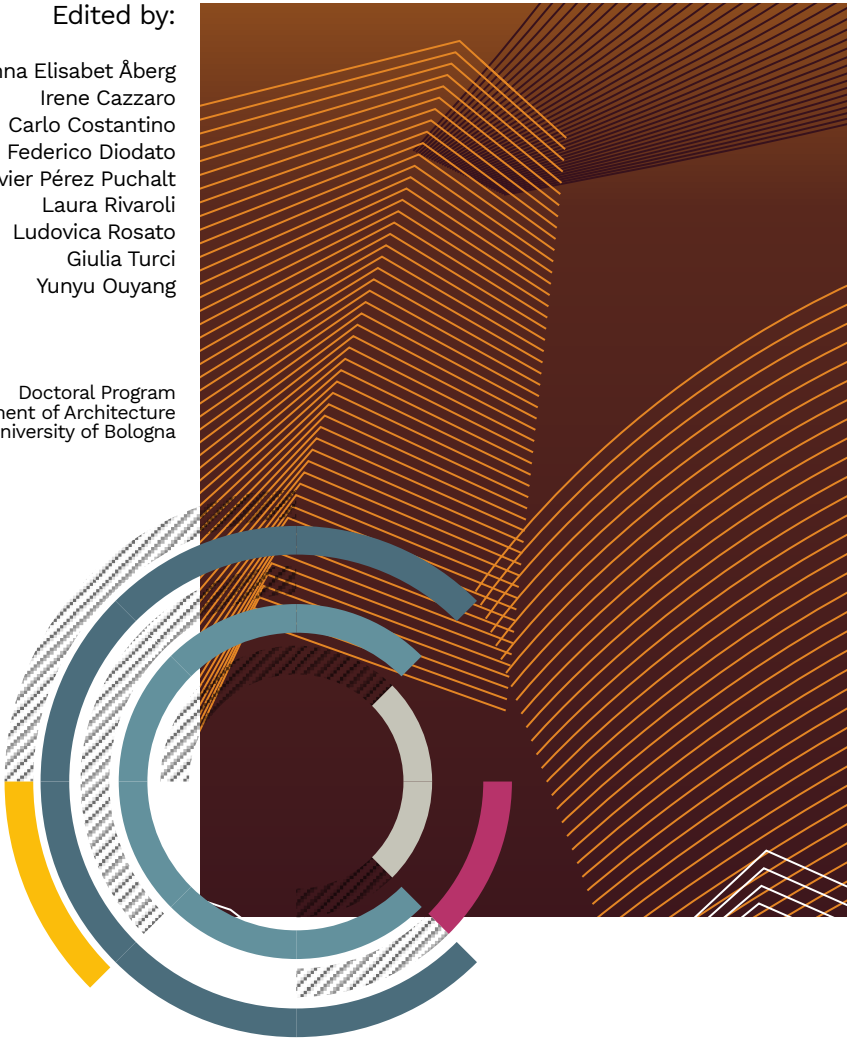
Ground(s)

Mapping, Designing and Caring: Towards a Convivial Society

Edited by:

Hanna Elisabet Åberg
Irene Cazzaro
Carlo Costantino
Federico Diodato
Javier Pérez Puchalt
Laura Rivaroli
Ludovica Rosato
Giulia Turci
Yunyu Ouyang

Doctoral Program
Department of Architecture
University of Bologna



CPCL SERIES PHD

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI ARCHITETTURA

CPCL SERIES PHD

Vol. 8 2024
ISBN/EAN: 978-90-834383-7-5

Doctoral Program
Department of Architecture
University of Bologna

GROUNDs

Margherita Ascari
Chiara Chioni
Fabrizio D'Angelo
Maria Giada Di Baldassarre
Sara Favargiotti
Alice Lewis
Marco Manfra
Margherita Pasquali
Chiara Pradel
Leonardo Ramondetti
Francesca Sabatini
Kevin Santus
Davide Turrini
Matteo Vianello
Virginia Vignali

ISBN/EAN: 978-90-834383-7-5

PUBLISHED BY

TU Delft Faculty of Architecture and the Built Environment
CPCL Journal
Department of Architecture, University of Bologna

(2024)
vol.8

S.04
CARING

Caring for Infrastructural Grounds. A Research Agenda.

Infrastructure; Logistics; Infrastructural turn; Urbanism; Exploitation.

Leonardo Ramondetti
Interuniversity Department of Regional and Urban Studies and Planning (DIST), China Room research group, Politecnico di Torino, Turin, Italy
leonardo.ramondetti@polito.it

Over the last 20 years, the infrastructural networks emerging from globalization have shaped new forms of urbanity, changed the fabric of the city, and revolutionized the spatial organization of ever-larger areas of the globe. These new infrastructural grounds merit greater attention and in-depth understanding through detailed descriptions. Hence, the following contribution illustrates three key categories of contemporary infrastructural grounds: grounds of storage, grounds of exploitation, and grounds of regulation. Each is explored by examining a representative space: Khorgas Gateway, on the border between China and Kazakhstan; Bayan Obo, in the Goby Desert; and the Sino-Singapore Tianjin Eco-City, in the Jing-Jin-Ji urban agglomeration. These become objects of study, as well as specific viewpoints that highlight the need to engage with contemporary infrastructural grounds through critical theory and design activities.

Introduction

On March 23rd, 2021, a 400-meter long and 46-meter-wide cargo ship blocked the Suez Canal. Within a few hours, a major global trading route had turned into a planetary bottleneck: more than 300 cargo ships halted, and shipping companies had to hurriedly rearrange their routes, provoking an 8% bump in crude oil prices. With the media emphasizing the fragility of global supply chains, few paid much attention to the ground where this accident occurred. Despite its image, the Suez Canal is not just a water corridor, but one of "the new world capitals:"[2] 12% of global trade passes through here; and even though the entire area is inhabited by only 750,000 people, the establishment of the Suez Canal Economic Zone in 2002 foresaw the development of 461 square kilometers as home to two industrial and logistics sites, two new towns and four ports[3]. Hence, what, until the mid-19th century, was barren desert is now turning into an urbanized infrastructure: a mix of human-generated technologies, housing developments, domesticated landscapes, and

Fig. 01

Suez Canal Traffic Jam. Credit: ESA, Copernicus Sentinel data

1. Julian Lee, "What a Long Suez Canal Closure Means for the Oil Price," *Bloomberg*, 25 March 2021, https://www.bloomberg.com/opinion/articles/2021-03-25/suez-canal-blocked-what-a-lengthy-closure-will-mean-for-the-oil-price.
2. Kagkuo Renia and Nikos Katsikis, "The New World Capitals," *Domus* 1037 (August 2019): 752.
3. General Authority for Suez Canal Economic Zone, *The Suez Canal Economic Zone* (Suez: General Authority for Suez Canal Economic Zone, September 2016).

ecological reserves.
While the same might be true for most of the Earth's surface, the radical effects of such transformations are most evident in new infrastructural grounds such as the Suez Canal. Thus, these spaces have drawn the attention of many scholars in the field of urban studies. The majority regard infrastructural grounds as the result of global capitalism and neoliberal policies: theatres of environmental violence, labor exploitation, and stark inequalities[4]. This would be more than enough to spark a debate on the reconceptualization and redesign of these spaces, but there is a further key point to consider: infrastructural grounds demand constant care. Owing to rapid technological obsolescence, economic disruption, catastrophic climate changes, and other external shocks, these places need continual readaptation to meet ever more demanding ecological, financial, and socio-political requirements[5]. Again, the Suez Canal is emblematic in this sense, and this does not only refer to the constant maintenance required to keep global trade flowing, but the ongoing construction of new grounds to accommodate free economic zones, spaces for production and logistics, and a new heterogeneous population made up of a low-paid labor force, rich businesspeople, and wealthy tourists. This need for constant care, while problematic to some extent, can also be considered as a stimulus for envisioning new design approaches. For instance, could infrastructural grounds be remodeled as inclusive spaces? Could they be envisioned as sites for new socio-environmental relations? And are there ways to care for infrastructural grounds, while avoiding a merely techno-managerial restructuring "aimed at reinforcing

---

4. For instance: Nikhil Anand, Akhil Gupta, and Hannah Appel, *The Promise of Infrastructure* (Durham: Duke University Press, 2018); Keller Easterling, *Medium Design: Knowing How to Work on the World* (London: Verso Books, 2021); Erik Swyngedouw, "More-than-Human Constellations as Immuno-Biopolitical Fantasy in the Urbicene," *New Geographies* 9 (2017): 20-27.
5. Christopher R. Henke and Benjamin Sims, *Repairing Infrastructures. The Maintenance of Materiality and Power* (Cambridge, Massachusetts: MIT Press, 2020); Jérôme Denis and Daniel Florentin, "Urban Infrastructures' Maturity and the Age of Maintenance," in *Handbook on Infrastructures and Cities* eds. Olivier Coutard and Daniel Florentin (Camberley and Northampton: Edward Elgar Publishing, forthcoming), n.d.
6. Swyngedouw, "More-than-Human Constellations as Immuno-Biopolitical Fantasy in the Urbicene," 20.

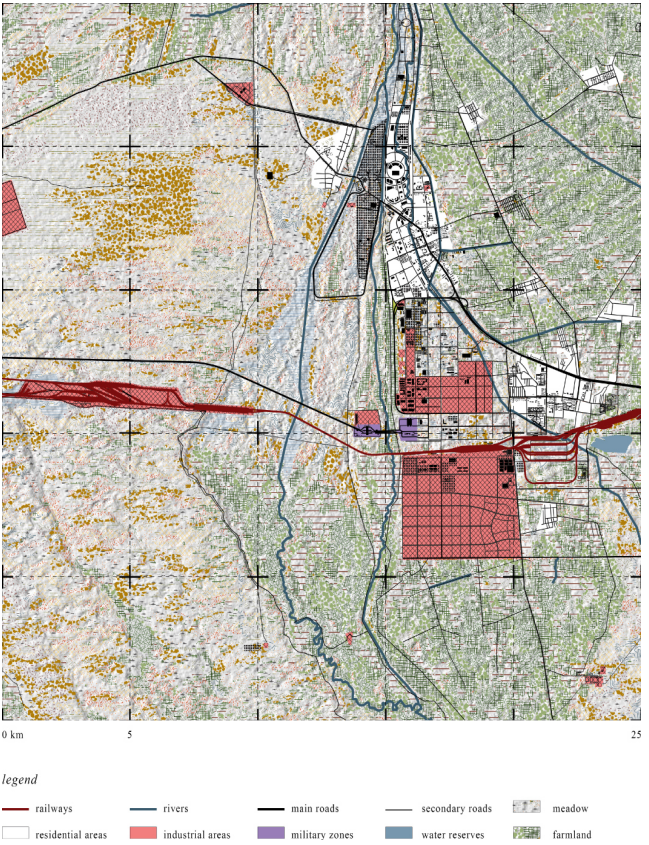
the body politic against threatening outsiders ... so that life as we know it can go on?"[6]
To address these questions, the first step is to depict the new infrastructural grounds. These are still lumped together regardless of their specificities; instead, their exploration and description are vitally important. Consequently, this contribution highlights the heterogeneity of such spaces, sited in extremely variegated contexts as a response to diverse needs. It focuses on three types of infrastructural grounds: grounds of storage, grounds of exploitation, and grounds of regulation. These become objects of study as well as specific viewpoints from which to discuss the issues, needs and possibilities of contemporary infrastructural grounds.

Grounds of storage

Similar to the Suez Canal Economic Zone, in 2014 a cooperation agreement between China and Kazakhstan was sealed to build a new Dubai: Khorgas Gateway[7]. This has turned a stretch of the Taklamakan desert, 2,500 kilometers from the nearest sea, into the largest dry port in the world. Huge terminals handling up to 18,000 containers a day have appeared on each side of the border, with gigantic cranes for conveying containers onto two national rail systems operating on different track gauges. In addition, an area of 10,000 square meters is dedicated to container storage. Khorgas Gateway is, however, intended to be more than just a ground for the movement of goods. Next to the container area is the Khorgas International Center for Border Cooperation, that is, a Special Economic Zone (SEZ) consisting of 608.56 hectares cleared to host large-scale factories, massive malls, universities, amusement parks, golf clubs, and business centers. Moreover, the overall plan for Khorgas encompasses

7. Marcelo Duhalde, Adolfo Arranz, and Marco Hernandez, "Belt and Road Initiative," *South China Morning Post*, June, 18 2019, http://multimedia.scmp.com/news/china/article/One-Belt-One-Road/khorgos.html; Ben Mauk and Andrea Frazzetta, "Can China Turn the Middle of Nowhere into the Center of the World Economy?," *The New York Times*, January 29, 2019, https://www.nytimes.com/interactive/2019/01/29/magazine/china-globalization-kazakhstan.html.

Fig. 02
Khorgas Gateway.
Credits: Leonardo
Ramondetti



Nurkent: a new town offering housing, schools, kindergartens, shops, and all the facilities required to make the dry port work properly. As declared by the CEO of Khorgas Gateway, this 'middle of nowhere' will soon become the main oasis of global trade[8]. Like logistics zones worldwide, Khorgas Gateway reveals

8. Wade Shepard, "Khorgos: The New Silk Road's Central Station Comes to Life," *Forbes*, February 20, 2017, https://www.forbes.com/sites/wadeshepard/2017/02/20/khorgos-the-new-silk-roads-central-station-comes-to-life/; Andrew Higgins, "China's Ambitious New 'Port': Landlocked Kazakhstan," *The New York Times*, January 1, 2018, https://www.nytimes.com/2018/01/01/world/asia/china-kazakhstan-silk-road.html; Khorgos ICBC Authority, *Investing in Khorgos. International Center for Border Cooperation*, (Khorgos: Khorgos ICBC, 2018).

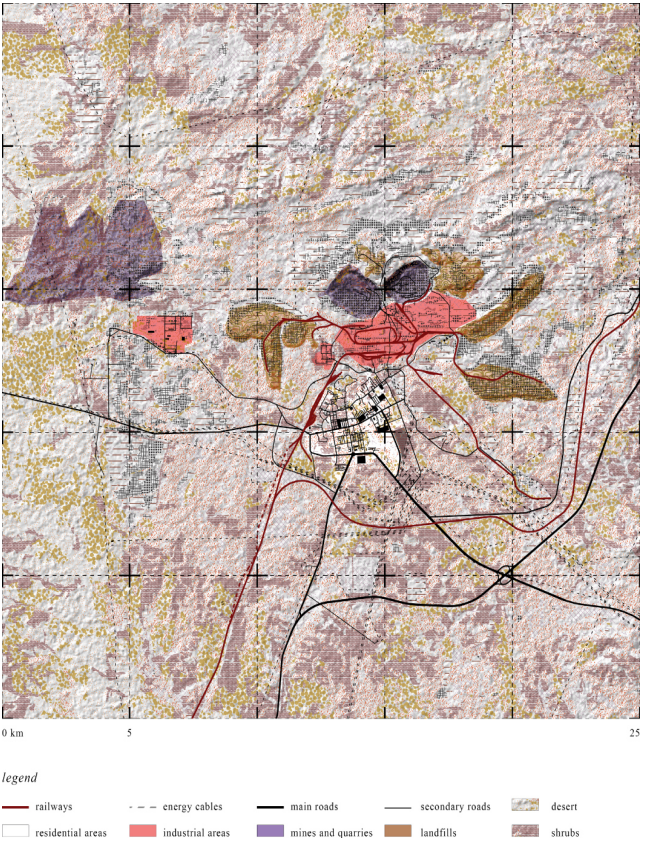
how infrastructural spaces are redefining their status. Even in the late 1990s, these were merely technical enclaves all over the world to integrate the global economy[9]. On the contrary, today, they are fully-fledged cities that include an ever-wider range of activities and can accommodate a myriad of uses. A 3D virtual tour of Khorgas Gateway reveals this new condition[10]. The plots of land range from 300x300 to 500x500 meters, have access to roads and come ready-equipped with utilities such as, electricity, water, sewerage, fiber optic network, internet connection, and 24-hour security. Inside, each area is completely customizable, and it can be freely used as an industrial zone, a warehouse, for tertiary activities, or even residential purposes. However, despite their new status, these grounds of storage are still designed to be nothing more than "backup space[s] available to be used when necessary:"[11] they are enclosed areas, within which a standardized infrastructural grid acts as a motherboard, storing and supporting the correct functioning of different programs which rarely interface with one another. This simplified blueprint is now applied everywhere: from the Murmansk Economic Zone above the Arctic Circle to the Tierra del Fuego Free Trade Zone in southern Argentina. Engaging critically with these grounds of storage means envisaging these spaces differently, reorganizing such an urbanism-on-demand, and ensuring these zones do not become decoupled from their surroundings.

Grounds of exploitation

1,500 kilometers south-west of Khorgas is Kabul. Here, the withdrawal of NATO forces and the return of the Taliban raised widespread concern in the West. While the main issue is the social, humanitarian, and

9. Neil Brenner, "Between Fixity and Motion: Accumulation, Territorial Organization and the Historical Geography of Spatial Scales," *Environment and Planning D: Society and Space* 16, no. 4 (1998): 459-81.
10. Khorgos ICBC Authority, "Khorgos 3D-Tour," Khorgos ICBC Authority, accessed September 10, 2021. https://khorgos.kz/3-d-tour/?lang=en.
11. Angelo Sampieri, "The City is Available. Chinese New Towns as a Backup sSpace," in *The City after Chinese New Towns. Spaces and imaginaries from contemporary urban China*, ed. Michele Bonino et al. (Basel and Boston: Birkhäuser, 2019), 210-11.

Fig. 03
Bayan Obo.
Credits: Leonardo
Ramondetti



democratic future of the country, there is also the question of the at-least-one-trillion dollars' worth of unexploited mineral deposits, particularly lithium, copper and, above all, rare-earths. For the last, China is eager to retain its near monopoly thanks to Bayan Obo: the largest mine in the world. Located in Inner Mongolia, this highly developed mining industry has turned 200 square kilometers of the Gobi Desert into a production site replete with roads and railways as

12. Pui-Kwan Tse, "China's Rare-Earth Industry," *U.S. Geological Survey*, 2011, https://pubs.usgs.gov/of/2011/1042; Marc Humphries, *Rare Earth Elements: The Global Supply Chain*, (Darby: Diane Publishing, 2010); Yasuo Kanazawa and Masaharu Kamitani, "Rare Earth Minerals and Resources in the World," *Journal of Alloys and Compounds* 408 (2006): 1339-43.

well as towns that house about 30,000 inhabitants. In other words, a branch of the ever-widening circuit of commodity exchange[12].

Bayan Obo is only one of the many remote areas of the world which have recently been integrated into the global supply chain. The deserts and forests of Latin America are exploited to the point that raw materials and energy exceed 60% of total exports in Chile, Colombia, and Peru[13]. It is not just mining and power production, but also the Plantationocene[14]: extensive cultivations of soy and corn farms in the American Midwest, massive palm oil plantations in Malaysia, expanses of tomato greenhouses in Almeria, and many others all over the planet[15].

These are all grounds of exploitation resulting from trade liberalization and new infrastructural networks that ensure cost-effective access to every market. Such conditions turn the landscape into a fungible asset, allowing the segmentation of production and its horizontal spread to exploit every location on the basis of the best performance it can offer[16].

Engaging with grounds of exploitation means being aware that, in bringing about economic optimization, such development also raises environmental and social concerns. The ecological footprint of the grounds of exploitation is gigantic. For instance, as documented by Martín Arboleda[17], large scale mining sites require between 460 and 1,060 liters of water per gram of mineral and produce between 50 and 140 million tons of solid waste per year. Their total

13. Martín Arboleda, "Spaces of Extraction, Metropolitan Explosions: Planetary Urbanization and the Commodity Boom in Latin America," *International Journal of Urban and Regional Research* 40, no. 1 (2016): 96-112.

14. The term was collectively coined by the participants to a seminar for *Ethnos* at the University of Aarhus in October 2014. See Donna Haraway, "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin," *Environmental Humanities* 6, no. 1 (May 2015): 159–65.

15. See respectively: Neil Brenner and Nikos Katsikis, "Operational Landscapes: Hinterlands of the Capitalocene," *Architectural Design* 90, no. 1 (2020): 22-31; Géraud Bablon et al., "Stop this," *Domus* 1038 (September 2019): 856-61; Keller Easterling, "Tomato World," *PRAXIS: Journal of Writing + Building*, no. 4 (2002): 116-23.

16. Ronald W. Jones and Henryk Kierzkowski, "Horizontal Aspects of Vertical Fragmentation," in *Global Production and Trade in East Asia*, eds. Leonard Kwok-Hon Cheng and Henryk Kierzkowski (Basel: Springer, 2001), 33-51; Kieran P. Donaghy, "Urban Environmental Imprints after Globalization," *Regional Environmental Change* 12, no. 2 (2012): 395-405.

17. Martin Arboleda, *Planetary Mine: Territories of Extraction Under Late Capitalism* (Brooklyn: Verso Books, 2020).

emissions are, on average, 40% greater than any megacity in the global South. Moreover, the impact of mining and monoculture farming on these lands makes their reclamation nearly impossible. Finally, most of these activities rely on low-paid migrant workers, leading to local communities' displacement. Within this picture, design activities cannot be confined to remedial actions or reclamation, but must rethink the organization of these spaces and consider them as more than just sites to be plundered.

Grounds of regulation

Raw materials, such as rare-earth minerals, lithium, and copper, have gained increasing importance because of the global green-energy transition. However, just as critical are the rules for regulating the new infrastructural realm, which increasingly affects how the space is modelled and lived. A case in point is the Sino-Singapore Tianjin Eco-City (SSTEC): a model for the sustainable metropolis of the 21st century. The plan, drafted in 2009, envisages the urbanization of 30 square kilometers over the next 15 years to be home to 350,000 inhabitants. Here, green spaces account for more than 50% of the total surface, solar panels should provide 60% of the energy, and a huge 150,000-ton treatment plant can purify blackwater and clean up to 50% of graywater[18]. Aside from the technical devices to be adopted, the success of this pilot project relies on the rules and the standards outlined in the Eco-City Assessment and Best Practices Program established by the Ministry of Housing and Urban-Rural Development[19]. This includes the 61 performance indicators on the basis of which the China Academy of Urban Planning and Design designed the ‘eco-cell’: a precise urban

18. Wade Shepard, *Ghost Cities of China: The Story of Cities without People in the World’s Most Populated Country* (London: Zed Books, 2015).
19. Axel Baeumler, Ede Ijjasz-Vasquez, and Shomik Mehndiratta, *Sustainable Low-Carbon City Development in China* (Washington: World Bank Publications, 2012).
20. Wu Deng and Ali Cheshmehzangi, *Eco-development in China: Cities, Communities and Buildings*, (London: Palgrave Macmillan, 2019); Austin Williams, *China’s Urban Revolution: Understanding Chinese Eco-Cities* (New York: Bloomsbury Academic, 2017).

layout that establishes functional, dimensional and density criteria for building eco-cities anywhere[20]. Today, standards, rules, and indicators such as those set out for the SSTEC are influential grounds of regulation. These sets of rules (i.e., SEED, LEED and ISO 37120) are anything but ephemeral: they define each and every infrastructure, establishing "an extensive yet mundane and, to now, rather silent force of social rationalization across the globe."[21] To make this possible, the space and its components are reduced to a set of measurable, reproducible, and manageable variables. Perfect examples of such datafication are the recent techniques of space

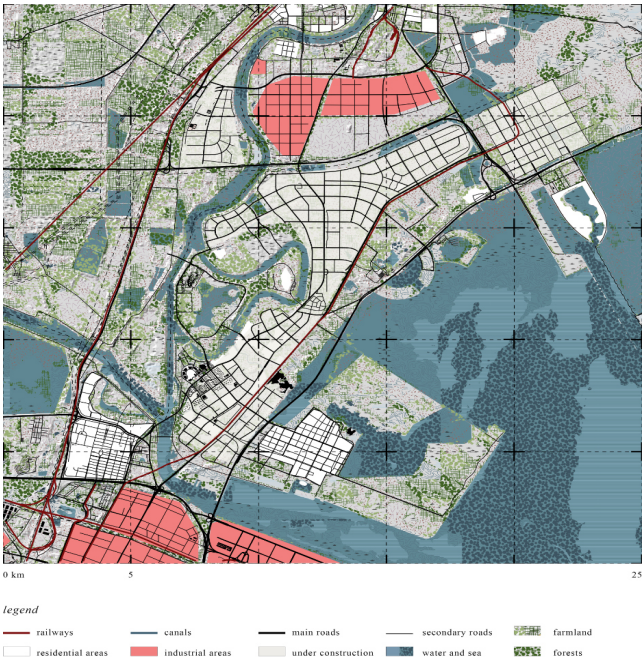


Fig. 04
Sino-Singapore Tianjin Eco-City. Credits: Leonardo Ramondetti

21. Peter Mendel, "The Making and Expansion of International Management Standards: The Global Diffusion of ISO 9000 Quality Management Certificates," in *Globalization and Organization: World Society and Organizational Change*, eds. Gili S. Drori, John W. Meyer and Hokyu Hwang (Oxford: OUP Oxford, 2006), 162-63.
22. Bradley E. Cantrell and Justine Holzman, *Responsive Landscapes: Strategies for Responsive Technologies in Landscape Architecture*, (London: Routledge, 2017); Antoine Picon and Carlo Ratti, "Everything Becomes Data," *Domus* 1039 (October 2019): 1000-1005; Eran Ben-Joseph, *The Code of the City: Standards and the Hidden Language of Place Making* (Cambridge, Mass: Mit Press, 2005).

matrix, mixed-use index, and space syntax, as well as, the extensive usage of responsive technologies, and the establishment of global city indicators to perform computational analyses of city performance.[22]
The resulting dissolution of material forms into information flows, not only reduces urban complexity, but "make[s] ownership of the city available to those who can pay for the data."[23] In a contemporary neo-liberal context, where public infrastructural systems are splintered into 'premium networked spaces' customized to the needs of the most powerful users, this turns standards into a means of enclosing spaces, reinforcing discrimination and restricting practices[24]. Thus, engaging with grounds of regulation signifies regarding design activities and everyday practices as an opportunity to constantly challenge and negotiate the status of the infrastructural grounds and the established body of rules.

Concluding remarks: infrastructural grounds as complex spaces to care for

The cases presented in the previous sections highlight how contemporary infrastructural grounds are disputed terrains, subjected to constant negotiations and appropriations. While these conditions are widely discussed in contemporary urban studies[25], there is still the need to address these issues through design. Urbanists and architects

23. Easterling, *Medium Design: Knowing How to Work on the World*, 71.
24. Stephen Graham and Simon Marvin, *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition* (London: Routledge, 2001); Olivier Coutard and Jonathan Rutherford, *Beyond the Networked City: Infrastructure Reconfigurations and Urban Change in the North and South* (London and New York: Routledge, 2015).
25. Anand, Gupta, and Appel, *The Promise of Infrastructure*; Stephen Graham and Colin McFarlane, *Infrastructural Lives: Urban Infrastructure in Context* (Routledge, 2014); Colin McFarlane and Jonathan Rutherford, "Political Infrastructures: Governing and Experiencing the Fabric of the City," *International Journal of Urban and Regional Research* 32, no. 2 (2008): 363-74; Jago Dodson, "The Global Infrastructure Turn and Urban Practice," *Urban Policy and Research* 35, no. 1 (2017): 87-92.
26. Hélène Frichot et al., *Infrastructural Love: Caring for our Architectural Support Systems* (Basel: Birkhäuser, 2022); Jesse LeCavalier, *The Rule of Logistics: Walmart and the Architecture of Fulfillment*, (Minneapolis and London: University of Minnesota Press, 2016); Clare Lyster, *Learning from Logistics. How Networks Change Our Cities* (Basel and Berlin: Birkhäuser, 2016); Easterling, *Medium Design*.

are crucial for engaging the materiality of the space of flows and challenging the controversial spatial connotations of the infrastructural grounds. Recent works by Hélène Frichot et al., Jesse LeCavalier, Clare Lister, and Keller Easterling turn the spotlight on this issue[26]. This body of studies has superseded the previous landscape urbanism approach to infrastructure[27], although it still lacks urban design practices. Not only is this caused by the complexity of contemporary infrastructural realms, which require the engagement of multiple disciplines and expertise; but also by the prevalence of a technocentric perspective that considers infrastructure primarily as belonging to the engineering domain. This perspective still regards each network in se, since its primary objectives are: optimizing resources, improving efficiency, and eventually establishing universal standards. Conversely, in pursuing a deeper engagement with the infrastructures, their externalities, and the spatialities they generate, what emerges is their role in the production of complex urbanities. With respect to this relational understanding, the importance of design as a speculative practice cannot be neglected. New infrastructural grounds have to be approached as an opportunity to challenge consolidated norms, question contemporary ways of production, and address today's socio-economic challenges. This requires what Hélène Frichot et al. term 'poetic

27. I refer to studies developed in the field of landscape urbanism such as: Alan Berger, *Drosscape: Wasting Land in Urban America* (New York: Princeton Architectural Press, 2007); Pierre Belanger, *Landscape as Infrastructure: A Base Primer* (Abingdon; New York: Routledge, 2016); James Corner, *Recovering Landscape: Essays in Contemporary Landscape Architecture* (Princeton Architectural Press, 1999); Margaret Birney Vickery, *Landscape and Infrastructure: Reimagining the Pastoral Paradigm for the Twenty-First Century* (London; New York: Bloomsbury Academic, 2021); Charles Waldheim, *Landscape as Urbanism: A General Theory* (New York: Princeton University Press, 2016); Charles Waldheim and Alan Berger, "Logistics Landscape," *Landscape Journal* 27, no. 2 (2008): 219-46.
28. Frichot et al., *Infrastructural Love*.

pragmatics,'[28] that is, the need to give free rein to our imagination, while remaining firmly anchored to the ground. A change in strategy is increasingly urgent since caring for infrastructural grounds is, in the end, caring for our contemporary city.

Bibliography

Anand, Nikhil, Akhil, Gupta, and Hannah, Appel. *The Promise of Infrastructure*. Durham: Duke University Press, 2018.

Arboleda, Martin. *Planetary Mine: Territories of Extraction Under Late Capitalism*. Brooklyn: Verso Books, 2020.

Arboleda, MartÌn. "Spaces of Extraction, Metropolitan Explosions: Planetary Urbanization and the Commodity Boom in Latin America." *International Journal of Urban and Regional Research* 40, 1 (2016): 96-112. https://doi.org/10.1111/1468-2427.12290.

Bablon, Gèraud, Timotihy, Ravis, Benjamin, Notkin, and Rui, Su. "Stop this." *Domus* 1038 (September 2019): 856-61.

Baeumler, Axel, Ede, Ijjasz-Vasquez, and Shomik, Mehndiratta. *Sustainable Low-Carbon City Development in China*. Washington: World Bank Publications, 2012.

Ben-Joseph, Eran. *The Code of the City: Standards and the Hidden Language of Place Making*. Cambridge: Mit Press, 2005.

Berger, Alan. *Drosscape: Wasting Land in Urban America*. New York: Princeton Architectural Press, 2007.

Belanger, Pierre. *Landscape as Infrastructure: A Base Primer*. Abingdon and New York: Routledge, 2016.

Brenner, Neil. "Between Fixity and Motion: Accumulation, Territorial Organization and the Historical Geography of Spatial Scales." *Environment and Planning D: Society and Space* 16, no. 4 (1998): 459-81.

Brenner, Neil, and Nikos, Katsikis. “Operational Landscapes: Hinterlands of the Capitalocene.” *Architectural Design* 90, 1 (2020): 22-31.

Cantrell, Bradley E., and Justine, Holzman. *Responsive Landscapes: Strategies for Responsive Technologies in Landscape Architecture*. London: Routledge, 2017.

Corner, James. *Recovering Landscape: Essays in Contemporary Landscape Architecture*. Princeton: Princeton Architectural Press, 1999.

Coutard, Olivier, and Jonathan, Rutherford. *Beyond the Networked City: Infrastructure Reconfigurations and Urban Change in the North and South*. London and New York: Routledge, 2015.

Deng, Wu, and Ali, Cheshmehzangi. *Eco-development in China: Cities, Communities and Buildings*. London: Palgrave Macmillan, 2019.

Denis, Jérôme, and Daniel, Florentin. “Urban Infrastructures’ Maturity and the Age of Maintenance.” In *Handbook on Infrastructures and Cities*, edited by Olivier Coutard and Daniel Florentin, n.d. Camberley and Northampton: Edward Elgar Publishing, forthcoming.

Dodson, Jago. “The Global Infrastructure Turn and Urban Practice.” *Urban Policy and Research* 35, 1 (2017): 87-92. https://doi.org/10.1080/08111146.2017.1284036.

Donaghy, Kieran P. “Urban Environmental Imprints after Globalization.” *Regional Environmental Change* 12, 2 (2012): 395-405. https://doi.org/10.1007/s10113-011-0265-2.

Duhalde, Marcelo, Adolfo, Arranz, and Marco, Hernandez. “Belt and Road Initiative.” *South China Morning Post*, June 18, 2019. http://multimedia.scmp.com/news/china/article/One-Belt-One-Road/khorgos.html.

Easterling, Keller. *Medium Design: Knowing How to Work on the World*. London: Verso Books, 2021.

Easterling, Keller. “Tomato World.” *PRAXIS: Journal of Writing + Building*, 4 (2002): 116-23.

Frichot, Hélène, Adrià, Carbonell, Hannes, Frykholm, and Sepideh, Karami. *Infrastructural Love: Caring for*

our Architectural Support Systems. Basel: Birkhauser, 2022.

General Authority for Suez Canal Economic Zone. *The Suez Canal Economic Zone*. (Suez: General Authority for Suez Canal Economic Zone, September 2016).

Graham, Stephen, and Simon, Marvin. *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. London: Routledge, 2001.

Graham, Stephen, and Colin, McFarlane. *Infrastructural Lives: Urban Infrastructure in Context*. London: Routledge, 2014.

Haraway, Donna. "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin." *Environmental Humanities* 6, 1 (May 2015): 159–65.

Henke, Christopher R., and Benjamin, Sims. *Repairing Infrastructures: The Maintenance of Materiality and Power*. Cambridge, Mass.: MIT Press, 2020.

Higgins, Andrew. "China's Ambitious New "Port": Landlocked Kazakhstan." *The New York Times*, January 1, 2018. https://www.nytimes.com/2018/01/01/world/asia/china-kazakhstan-silk-road.html.

Humphries, Marc. "Rare Earth Elements: The Global Supply Chain". Darby: Diane Publishing, 2010.

Jones, Ronald W., and Henryk, Kierzkowski. "Horizontal Aspects of Vertical Fragmentation." In *Global Production and Trade in East Asia*, edited by Leonard Kwok-Hon Cheng and Henryk Kierzkowski (Basel: Springer, 2001), 33-51.

Julian, Lee. "What a Long Suez Canal Closure Means for the Oil Price." *Bloomberg*, March 25, 2021. https://www.bloomberg.com/opinion/articles/2021-03-25/suez-canal-blocked-what-a-lengthy-closure-will-mean-for-the-oil-price.

Kanazawa, Yasuo, and Masaharu, Kamitani. "Rare Earth Minerals and Resources in the World." *Journal of Alloys and Compounds* 408 (2006): 1339-43.

Khorgos ICBC Authority. *Investing in Khorgos: International Center for Border Cooperation*, 2018.

Khorgos ICBC Authority. *Khorgos 3D-Tour*. Accessed September 10, 2021. https://khorgos.kz/3-d-tour/?lang=en.

LeCavalier, Jesse. *The Rule of Logistics: Walmart and the Architecture of Fulfillment*. Minneapolis and London: University of Minnesota Press, 2016.

Lyster, Clare. *Learning from Logistics. How Networks Change Our Cities*. Basel and Berlin: Birkhäuser, 2016.

Mauk, Ben, and Andrea, Frazzetta. "Can China Turn the Middle of Nowhere into the Center of the World Economy?," *The New York Times*, January 29, 2019. https://www.nytimes.com/interactive/2019/01/29/magazine/china-globalization-kazakhstan.html.

McFarlane, Colin, and Jonathan, Rutherford. "Political Infrastructures: Governing and Experiencing the Fabric of the City." *International Journal of Urban and Regional Research* 32, 2 (2008): 363-74. https://doi.org/10.1111/j.1468-2427.2008.00792.x.

Mendel, Peter. "The Making and Expansion of International Management Standards: The Global Diffusion of ISO 9000 Quality Management Certificates." In *Globalization and Organization: World Society and Organizational Change*, edited by Gili S. Drori, John W. Meyer and Hokyu Hwang, 137-66. Oxford: OUP Oxford, 2006.

Monstadt, Jochen. "Conceptualizing the Political Ecology of Urban Infrastructures: Insights from Technology and Urban Studies." *Environment and Planning A: Economy and Space* 41, 8 (August 2009): 1924–42.

Picon, Antoine, and Carlo, Ratti. "Everything Becomes Data." *Domus* 1039 (October 2019): 1000-1005.

Renia, Kagkuo, and Nikos, Katsikis. "The New World Capitals." *Domus* 1037 (August 2019): 752-65.

Sampieri, Angelo. "The City is Available. Chinese New Towns as a Backup Space." In *The City after Chinese New Towns: Spaces and Imaginaries from Contemporary Urban China*, edited by Michele Bonino et al., 204-14. Basel and Boston: Birkhäuser, 2019.

Shepard, Wade. *Ghost Cities of China: The Story of Cities without People in the World's Most Populated Country*. London: Zed Books, 2015.

Shepard, Wade. "Khorgos: The New Silk Road's Central Station Comes to Life." *Forbes*, February 20, 2017.

Swyngedouw, Erik. "More-than-Human Constellations as Immuno-biopolitical Fantasy in the Urbicene." *New Geographies* 9 (2017): 20-27.

Tse, Pui-Kwan. "China's Rare-Earth Industry." *U.S. Geological Survey*, 2011.

Vickery, Margaret Birney. *Landscape and Infrastructure: Reimagining the Pastoral Paradigm for the Twenty-First Century*. London and New York: Bloomsbury Academic, 2021.

Waldheim, Charles. *Landscape as Urbanism: A General Theory*. Princeton University Press, 2016.

Waldheim, Charles, and Alan, Berger. "Logistics Landscape." *Landscape Journal* 27, 2 (2008): 219-46. https://doi.org/10.3368/lj.27.2.219.

Williams, Austin. *China's Urban Revolution: Understanding Chinese Eco-Cities*. New York: