

How can socio-technical infrastructures heal the fractures in contemporary territories where for years development policies have exacerbated segregation and socio-spatial inequalities?

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Infrastructure and services for a socio-ecological transition

One of the most relevant factors in global spatial dynamics is the rapid, and often uncontrolled, shift in urban living. Today, urban dwellers comprise a 54% of the world population and are expected to exceed 60% within the next 10 years (UN DESA 2018). Much of this urban growth will take place in countries within developing regions, particularly in Africa and Asia,

Access to land, particularly serviced land, is critical for a sustainable world urban development. The availability of land, and with it, of natural resources sustaining livelihood, will determine how our cities and neighbourhoods will grow and expand; whether they will be able to absorb the population growth currently estimated at 1.1% with 82 million new inhabitants in 2019 on this planet (UN DESA 2018); and how they will respond to the consumption pressures posed by global markets and the growing demand for services.

At a time when inequalities have become more acute, also in light of the recent global pandemic and the environmental and ecological crises exacerbated by climate change, a transition toward sustainable approaches to land use management and distribution of planetary resources demands urgent attention and collective efforts.

The destruction of the natural basis of human life in contemporary society is the consequent result of contemporary forms of dwelling that swallow ever larger quantities of energy and raw materials, to spit out goods and services that pollute the environment in its vital resources (water, earth and air) in their production, distribution, consumption and disposal. Urban planning schemes have for long increased the rural-urban divide, providing services and infrastructure to the urban cores, while expanding their reach to secure sufficient water supply and land for real estate development, food production and waste disposal in peri-urban areas (Allen 2017).

The contingent ecological crisis which is tightly coupled with urbanization spreads worldwide, but mostly in the poorest yet largest part of the world's population living in the global South, where uncontrolled urban growth goes along with increasing poverty, socio-spatial inequality, environmental degradation and exclusionary service provision (Allen et al. 2017; Marshall and Dolley 2019).

In these urban horizons, injustice is very often exacerbated by infrastructural development schemes.

Research has advanced theorization on the role played by infrastructure networks on the social, spatial and environmental materiality of territories and on the variable-geometry boundaries of what can be described as an "ecology of exclusion". Starting from Graham and Marvin's thesis on splintering urbanism, a number of scholars explored the multiple ways through which the implementation of large-scale technical networks, supported by neo-liberal reforms, instead of having an integrating character, has contributed to fragmentation of the social and material fabric of the city. This generally occurs through "by-pass" strategies which offer connection to most valuable places and users, disregarding those with less value (2001).

In this perspective, the development of urban infrastructures, accelerated by the rise of deregulation and privatization reforms which affected key economic sectors, -energy, gas, water, sewer and telecommunication-, can be described as a “self-reinforcing trajectory of exclusionary urbanization” (Marshall and Dolley 2019).

Faced with these contradictions and challenges that emerge from the observation of contemporary environments, some questions arise on the role of infrastructures in promoting a socio-ecological transition.

How can socio-technical infrastructures heal the fractures in contemporary territories where for years development policies have exacerbated segregation and socio-spatial inequalities? What possibilities do serviced infrastructures offer to fuel the necessary socio-ecological transition? What governance models and politics of infrastructures are desirable to foster socio-spatial and environmental justice?

A reconceptualization of infrastructures as socio-technical landscapes capable of producing common goods and collective imaginaries is essential in order to tackle the following challenges.

New ecological imperatives addressing socio-spatial inequalities

Global sustainability agendas consider cities as key players for broader societal transformations toward more low-carbon, sustainable and resilient futures. On a global scale, urban settlements are not only energy-intensive, as they consume around 80% of all resources (Baccini 1997), but their socio-ecological footprint has become global, namely coupled in a global network (Swyngedouw and Kaika 2014). This means that unless urban settlements will turn sustainable and the interconnected processes that tightly link built and natural environments across scales and geographies will be addressed, global targets will hardly be met.

The pandemic crisis and its economic fallout has contributed to create new inequalities while exacerbating existing ones: restrictions of mobility within cities have highlighted the need to rethink neighbor-

hoods' proximity services and overcome the rigid spatial organization of single-function neighborhoods that dominate the urban landscape. Government strategies addressing urban transition need to increasingly focus on infrastructure systems, with policies and actions directed toward the implementation of more sustainable and localized approaches to energy supply, water and waste management and transportation systems.

Nature-based solutions and novel ecosystems, as urban green infrastructures, can represent opportunities to redevelop neglected urban spaces, thus improving the quality of life and at the same time providing a concrete response to the environmental crisis. It is precisely in the interstices, in the margins, that policies must direct resources and interventions if the goal is to build more accessible and just cities.

If small interventions are appropriately scaled up, their effectiveness for climate change mitigation can be much greater on a spatial and temporal perspective.

Technical, social and spatial re-configurations beyond digitalization

Digital advances offer new opportunities for both research and practice to support the transition to more sustainable, resource-efficient society. The use of new technologies, tools and methods can substantially help improving the design and maintenance of infrastructures, services and neighborhoods, while providing opportunities for home schooling and telework.

However, the longer-term impacts of digitalization on territories and infrastructures deserve to be further inquired.

With the cessation of activities during the pandemic, and the possibilities of teleworking, new emergent mobilities have been reported, "particularly those that resemble 'ex-urbanisation,' or urban-rural migration" (Ramachandran 2021).

These trends, which have already had an initial impact on real estate markets, should be properly analysed as they not only represent

an opportunity to rethink the consolidated fabric of cities and re-organize mobility patterns on a local scale, but also to tackle the existing broader territorial relationships.

Yet, the digital inequality in access to technology and services is still acute and visible even within well-connected cities and mega-cities, as well as in the rural-urban divide.

To achieve digital inclusion, cities must first understand and identify where digital discrepancies persist (Boza-Kiss et al. 2021). New spaces in which to incorporate the lessons of digitalization will be needed, with the increasing possibility to move services and workspaces, to integrate recreation and necessities within a new territorial scale, that of neighborhoods. In order to make this possible, new stakeholders configurations and participatory arenas have to be designed and tested, favoring horizontal relationships and knowledge exchange among users, policy-makers, and researchers to inquiry into the opportunities opened up by digitization to rework territories and infrastructures.

New governance models and politics of infrastructures

The shift from a technocratic approach to a socio-technical perspective on infrastructures challenges the current engineering of the urban production, while emphasising the centrality of the social dimension.

Greater attention to different user-provider arrangements and the role of users in producing services and managing infrastructures has recently increased in international and scientific communities (Joshi & Moore 2004; Mitlin 2008; Moretto et al. 2018).

The interest toward community participation in the delivery of public services is underpinned by the view that the engagement of users may improve service efficiency and accountability (Ostrom 1996; Watson 2014), while favouring the reconfiguration of state-society relationships through the rise of new democratic institutions (Mitlin 2008).

Governance capacity to accelerate urban transition should be strengthened and new policies tested capable of integrating bottom-up

knowledge and everyday practices in the planning instruments, drawing on Crosta's conception of policies as practices of common good (1998).

Promoting participation in service production and delivery has indeed the potential to make room for different roles and responsibilities to the citizenry, fostering the emergence of democratic platforms around the management common resources, such as water, energy and green, and infrastructures.

Increasing awareness of the interdependency of infrastructure systems has raised questions related to governance systems, scales, organizations, resources flows, users and ecosystems. The aim of the two days seminar conducted with the group – Infrastructure and Services for a Socio-ecological Transition-, was to critically identify and explore potential urban infrastructure solutions to tackle sustainability challenges.

By foregrounding socio-technical pathways that claim to improve urban sustainability as a starting point, we sought to reflect the urgency of the need for change, and to investigate the extent to which wider lessons for research and practice can be drawn from concrete examples of potentially transformative approaches to urban infrastructures.

In this sense, to address the three challenges identified above through the experimentation of more participatory governance schemes and user-friendly socio-technical solutions, can represent an opportunity to rethink our cities, to co-create greener, more cohesive and sustainable neighborhoods; to formulate models of land and infrastructure governance that consider user participation in urban transformation processes, promoting community empowerment through new forms of co-management of infrastructure, resources and spaces.

References

Allen, A., Hofmann, P., Mukherjee, J. & Walnycki, A. (2017). *Water trajectories through non-networked infrastructure: Insights from peri-ur-*

- ban Dar es Salaam*, Cochabamba and Kolkata. *Urban Research & Practice*, 10(1), 22–42.
- Boza-Kiss B, Pachauri S and Zimm C (2021) *Deprivations and Inequities in Cities Viewed Through a Pandemic Lens*. *Front. Sustain. Cities* 3:645914. doi: 10.3389/frsc.2021.645914
- Ramachandran, Vidya. 2021. *Urban-rural mobility during COVID-19: the growth of ‘cottagecore’ in Australia and Aotearoa-New Zealand*. MoLab Inventory of Mobilities and Socioeconomic Changes. Department ‘Anthropology of Economic Experimentation’. Halle/Saale: Max Planck Institute for Social Anthropology. doi: <https://doi.org/10.48509/molab.5434>
- United Nations, Department of Economic and Social Affairs, Population Division (2018). *World Urbanization Prospects: The 2018 Revision*, Online Edition.
- Crosta, P.L. (1998). *Politiche. Quale conoscenza per l’azione territoriale*. Franco Angeli: Milano
- Mitlin, D. 2008 *With and beyond the state – co-production as a route to political influence, power and transformation for grassroots organizations*. *Environment and Urbanization*, 20/02:339-360
- Graham, S. & Marvin, S. (2001). *Splintering urbanism: Networked infrastructures, technological mobilities and the urban condition*. London: Routledge.
- Joshi, A. & Moore, M. (2004). *Institutionalised co-production: unorthodox public service delivery in challenging environments*. *Journal of Development Studies*, 40(4), 31–49.
- Monstadt, J. (2009). *Conceptualizing the political ecology of urban infrastructures*. *Environment and Planning, A* 41(1924–1942).
- Ostrom, E. (1996). *Crossing the great divide: Coproduction, synergy, and development*. *World Development*, 24(6), 1073–1087.
- Watson V. 2014. *Co-production and collaboration in planning – the difference*. *Plann Theor Pract*. 15(1): 62–76.
- Peter Baccini (1997) *A city’s metabolism: Towards the sustainable development of urban systems*, *Journal of Urban Technology*, 4:2, 27-39, DOI: 10.1080/10630739708724555

Swyngedouw, E., & Kaika, M. (2014). *Radical Urban Political-Ecological Imaginaries: Planetary Urbanization and Politicizing Nature*. *Derive*, 55, 15-20.

Marshall, F., & Dolley, J. (2019). *Transformative innovation in peri-urban Asia*. *Research Policy*.