Proximity and Permeability in Informal Settlements: Learning from Dharavi

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1 Introduction

Informal settlements, slums, favelas, gecekondus, barrios, townships or bastis have become a global phenomenon, offering shelter and support to people seeking housing, employment, and other basic human requirements (Boanada-Fuchs et al. 2024, Celhay & Gil 2020, Mueller-Wolfertshofer 2025a, Paul 2025, Sohane & Bhan 2023). One out of eight people in the world is estimated to live in 'slum-like conditions', and the number of informal dwellers has risen from an estimated 689 million to 880 million people between 1990 and 2014 (UN-Habitat 2016b, 2018). Urbanisation is expected to rise drastically and affect every aspect of human life in the coming years, according to UN-Habitat (2018), including health, socioeconomic opportunities and environmental factors. The provision of adequate housing to all citizens through strategies for sustainable urban development therefore remains a fundamental aspect for dealing with the polycrisis of the 21st century (Mueller-Wolfertshofer 2025a).

Governments worldwide are implementing 'slum redevelopment' projects to provide 'adequate' housing to their citizens (Agayi & Serdaroğlu Sağ 2020, Bhan 2024, Bhide 2023, Mueller-Wolfertshofer 2025a, UN-Habitat 2016a). These projects are often implemented by private investors within cities' neoliberal reforms on policy and governance (Indorewala 2018, Korkmaz & Balaban 2020, Mukhija 2017, Nainan 2008, Nuijten et al. 2012). Based on speculative markets

in a modernist mindset, such urban development projects are highly unsustainable, as demonstrated by researchers (Bhide 2023, Indorewala 2018, Mueller-Wolfertshofer 2025a, Patel 1996, Sanyal & Mukhija 2001). New approaches focused on inclusivity and sustainability must be explored to integrate the intrinsic requirements of inhabitants in such settlements into (re)development processes as well as to account for the growing scarcity of resources in the current climate emergency (Korkmaz & Balaban 2020, Mueller-Wolfertshofer 2025a, Schirnding de Almeida & Boucsein 2025).

This research addresses the gap between ethnographic approaches and urban spatial design in the context of Mumbai's informal settlements, where Dharavi is presented as a case study to understand its socioeconomic functioning. The research aims at identifying the spaces required by inhabitants for sustaining their livelihoods and how these can be integrated in (re)development initiatives (Mueller-Wolfertshofer 2025a). The architectural theory of hybridity (Fenton, 1985; Fernández Per et al., 2014) is used as a framework to accomplish this, by examining spaces in relation to use, proximity and permeability for facilitating sustainable urban transformations (Mueller-Wolfertshofer 2025a)).

2 Methods

The research followed a qualitative and explorative design, as illustrated in Figure 1. An empirical case study analysis of Dharavi in Mumbai, India, was used for data collection, which included photo documentation, spatial mapping, on-site observation, as well as interviews with inhabitants and NGOs active on-site. Design was also used as a research method, with graphical representations used to document hybridity in the settlement and formulate new ideas for (re)development with this architectural framework. Hybridity was studied in Dharavi at three scales: at the scale of a single unit, at the scale of a complex, and at the scale of the entire settlement. Each of these scales was also examined with a corresponding perspective of collaboration, identity and sustainability. Field research took place in Dharavi between January 2020 and January 2023.

Due to widespread mistrust of persons associated with redevelopment initiatives, considerable time was required for data collection. Interviews could only be conducted after getting acquainted and forming a basis of trust with the inhabitants. Collecting data as a female researcher led to unexpected advantages, however, as contact could be established with women and children, in addition to men living in Dharavi. This enabled data from exceptionally vulnerable groups – women and children in informal settlements – to be incorporated into the research. The data has been anonymised for the inhabitants' safety.

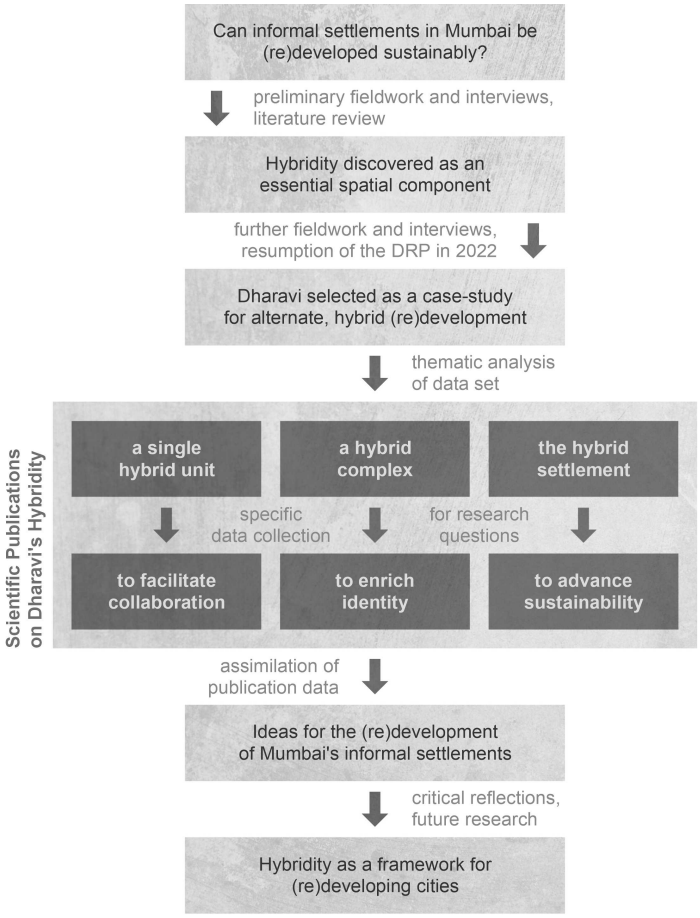

Figure 1: The qualitative and explorative research design (Mueller-Wolfertshofer 2025a)

3 Results

The results display the complexity of hybridity in Dharavi at three scales. The first was a hybrid unit consisting of a pottery production-cum-household to understand processes of collaboration. The second was a hybrid leather manufacturing complex to understand the implications of identity, especially within the informal urban context. The third was the entire hybrid settlement of Dharavi, where a variety of socioeconomic systems, or microecologies (Mueller-Wolfertshofer & Boucsein 2023), were analysed on the basis of sustainability.

The pottery unit, covering around 60 sq m of ground area and consisting of two floors, encompassed the potter family's economic as well as domestic activities, as illustrated in Figure 2. Six people lived in this unit: the grandmother, her two sons, her daughter-in-law, her grandchild and a worker who mixed clay for the family (Mueller-Wolfertshofer & Boucsein 2023). The daughter-in-law assisted her husband and his brother in their economic processes, as well as the grandmother with domestic chores. The daughter-in-law also cared for her son when he came home from school. The proximity of uses within this hybrid unit enabled the family to maintain their socioeconomic stability by enabling domestic and care-work to be carried out flexibly, while simultaneously upholding production cycles for income. The daughter-in-law also had a central role in the family's functioning, as she collaborated with members on various tasks in the hybrid unit.

Collaboration was also an important aspect in the neighbourhood, as the household was part of a community of predominantly Hindu potters in Dharavi called 'Kumbharwada'. Production processes in this community were carried out in staggered rotations, enabling cost-effective systems of production (Mueller-Wolfertshofer & Boucsein 2023). The worker who lived with the family, for example, also worked for other families in the neighbourhood when his services were not required by the family he lived with, enabling continuous employment and income. The family's kiln was also rented by other families in the neighbourhood when it was not in use. One of the family members additionally worked for a larger pottery unit in the vicinity for additional income. Furthermore, the processes of transporting raw materials to the potters' community and finished artefacts for sale are also more cost-effective and sustainable when used collectively. These collaborative processes, facilitated by hybridity and permeability in the built environment, also imply that calamities like flooding severely affect the economic stability of all the businesses in the community or microecology (Mueller-Wolfertshofer & Boucsein 2023).

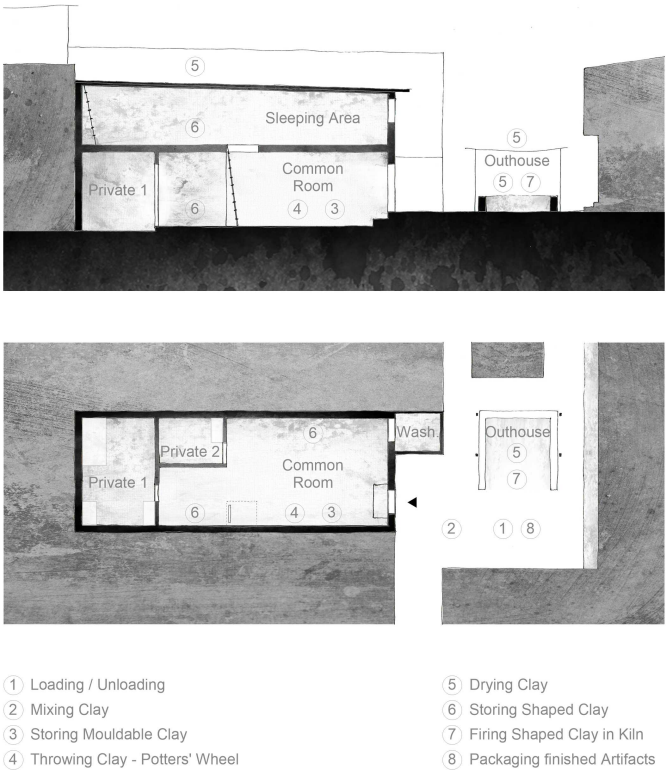

Figure 2: Hybridity in the potters' unit (Mueller-Wolfertshofer & Boucsein 2023)

The next scale of hybridity studied was that of the manufacturing complex, which accommodated multiple economic, domestic, and religious uses. It encompassed three buildings with a ground coverage of approximately 150 sq m, with three floors as seen in Figure 3. The complex consisted of zones for production, a warehouse for storing finished products and a shop for sale. The spaces for production were also used for domestic activities by the workers who lived there, pulling out their mats to sleep at night or using kerosene stoves for cooking. All the employees observed on site were Muslim men from northern India, who shared the same ethnicity as the owner. They conducted daily prayers together on the upper floors and bathed outside the building with buckets of water. According to Saglio-Yatzimirsky (2013: p. 182), business owners often employ members of the same caste or community because it has advantages in the same spoken language, shared practices and fixing holidays for religious events. Once

again, the proximity of uses in the hybrid complex and the buildings' permeability enable cost-effective systems of production and employment.

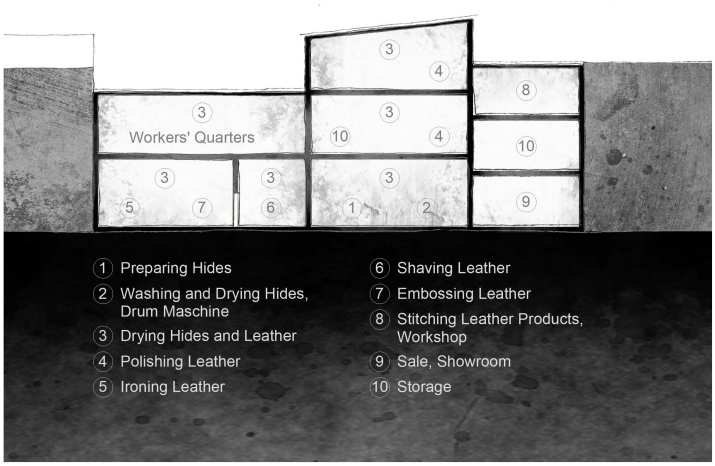

Figure 3: Hybridity in the leather manufacturing complex (Mueller-Wolfertshofer 2025)

Leather production plays an important role as a source of income and identity in the Indian context, as confirmed by the manufacturing complex studied in this research. It is only carried out by the lowest Hindu casts and Muslims because the work involves animal carcasses (Mueller-Wolfertshofer 2025, Saglio-Yatzimirsky 2013, Weinstein 2014). Hindus of higher casts are predominantly vegetarian and do not condone the slaughter of animals in their neighbourhoods. This is an important aspect in understanding the functioning of informal settlements like Dharavi, as the settlement consists of separate communities, each with its own identity based on aspects like religion, caste, occupation, language, ethnicity and corresponding hybrid spatial configuration.

Sustainability also plays an important role in Dharavi at the settlement scale, whether explicitly or implicitly (Mueller-Wolfertshofer 2025b). This hybrid settlement covers about 2,4 sq km in area and accommodates over 10,000 small-scale industries ranging from pottery to recycling to the production of food and medical supplies, which are sold in the country and abroad (Mueller-Wolfertshofer 2025b, Patel & Paul 2010, Sharma 2000). Of these, the recycling industry is internationally reputed for its circular processes and is the largest in India, as it employs about 5000 people (Patel & Paul 2010, Weinstein 2014). The proximity and permeability of domestic, economic, religious, educational and

other uses in the hybrid settlement enable sustainability in terms of mobility. In comparison with most of Mumbai, where people often commute for five or six hours on a daily basis, residents of Dharavi rely on micro-mobility, as their daily needs can be met within walking distance. The use of private cars is an exception, as inhabitants use public transportation to travel to other parts of the city (Mueller-Wolfertshofer 2025b). Other aspects of sustainability in Dharavi include economic stability, sociability, adaptability and a low carbon footprint in the steelement (Mueller-Wolfertshofer 2025b).

Despite the inherently sustainable hybrid layout of Dharavi, data also reveal that inhabitants are vulnerable to pollution, precarious working or living conditions, and the environmental impacts of climate change. The greatest risk posed to them, however, is that of the investor-led redevelopment projects, which threaten to eliminate the complex socioeconomic systems they have built over the decades. The loss of socioeconomic spaces within settlements like Dharavi (Saglio-Yatzimirsky 2013: pp. 261–263) would reduce the proximity and permeability of current hybrid configurations, requiring inhabitants to use additional resources to commute and resulting in the loss of their livelihoods and socioeconomic flexibility. The badly designed and poorly constructed structures that replace these settlements would waste resources and enhance existing inequalities by worsening the conditions of inhabitants on-site through new constructions instead of improving them (Bhide 2023, Indorewala 2018, Sharma 2000: p. 185). Inhabitants' requirements must be integrated into (re)development processes, and the data in this research lay a foundation for future work by documenting the complex socioeconomic systems, or microecologies (Mueller-Wolfertshofer & Boucsein 2023), that exist and must be promoted in informal settlements.

4 Discussion and Conclusion

Hybridity is fundamental to the socioeconomic functioning of informal settlements like Dharavi, through the proximity of uses and permeability of the built environment. An alternate process of (re)development, which implements hybridity as a mode of architectural practice through perspectives of collaboration, identity and sustainability should be attempted. Communities must be empowered to lead (re)development processes, as they can transform the built environment around them based on intrinsic requirements through collaboration with architects and planners (Mueller-Wolfertshofer & Boucsein 2023). The study of non-speculative collaborative housing projects is an avenue for future research in this regard, as these projects are led by communities and demonstrate traits

of hybridity within them (Mueller-Wolfertshofer 2025a, Mueller-Wolfertshofer & Glogar 2025).

This research goes beyond the redevelopment of informal settlements like Dharavi, however, as the hybrid mode of architecture can be used to (re)develop urban space irrespective of labels like 'formal' or 'informal'. Facilitating proximity and permeability of vital uses in the urban fabric is essential for inclusive and sustainable urban transformation. Such inclusive approaches can help counter spatial segregation and mitigate socioeconomic inequalities in cities. Settlements like Dharavi, which are currently perceived as pejorative, already embody these hybrid principles and should become international beacons of sustainable urban (re)development.

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