

Reimagining Dubai's Car-centric Infrastructure

TU Delft

City of The Future

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Research Plan

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Problem Statement

Dubai's rapid urbanization, economic growth, and evolving demographics have fostered an extensive, car-centric infrastructure, designed primarily to accommodate private vehicles through wide roads, multi-lane highways, and vast parking areas (Kanna, 2011). The concept of car-centric is one that approaches urban planning emphasizing on private vehicle use over public transport or pedestrian-friendly infrastructure (Kay, 1997). Dubai's urban planning model prioritizes economic growth which has contributed to the city's rapid growth, but several of its policies have resulted in infrastructure that have since rendered the city to remain heavily car dependent (Kanna, 2011). Additionally, the proliferation of transnational infrastructure in Dubai has affected the city's traditional governance structures and urban planning (Esterling, 2014) . Situated in a desert climate, facing extreme heat throughout the year, the city's single-use zoning, dispersed public spaces and public transport gaps leave very little room for environmentally sustainable transport options (Kanna, 2011). Since expanding the city in the late 2000s, Dubai's metro has two main lines, however they fall short in coverage and have inadequate last-mile connectivity, especially for the lower working class migrants who live further out away from the central (Kanna, 2011). The public transport network is limited in comparison to the city's sprawl, and last-mile connectivity issues discourage its use. This limited access particularly impacts lower-income residents who may not be able to afford cars, creating a transportation gap and social inequity (Alawadi, 2017). The limitations and consequences of car dependency are becoming increasingly apparent. In many global cities, especially in the US, car-centric planning poses challenges in sustainability, mobility efficiency, and urban liveability. With the new 2040 Master Plan, Dubai has been aiming to reduce carbon emissions and enhance its global image as a sustainable, forward-thinking city (Alawadi, 2017). In order to begin shifting away from car-centric planning, Dubai needs to reimagine parts of its urban design to support more public transit, walkability, and mixed-use development. The ongoing challenge will be

integrating these sustainable changes while managing the demands of a rapidly growing and internationalized city that is in a unique environmental, social, economic and political context as compared to the rest of the world (Alawadi, 2017). The early roots of Dubai's car-centric urban planning model has fueled urban sprawl and have resulted in intensive—both in size and cost of roads and transport infrastructure (Kanna, 2011). While shifting towards better pedestrian mobility and public transport use seems the most ideal for a sustainable future, many car-lite city planning strategies are being criticized for underestimating the social and economic structures and in Dubai's case the climate issue that embed cars deeply in daily life (Sheller & Urry, 2000). The car in this case becomes part of a larger system of auto-mobility that is tied to individual freedom, economic activity, social status and infrastructure (Sheller & Urry, 2000). This problematizes the car-lite city planning model and its actual feasibility in a place like Dubai. At where the city stands in current day, taking its socioeconomic and environmental contexts in account, it looks far more realistic to adopt an alternate approach to a sustainable future. The research seeks to rethink the blanket car-lite city planning model and to challenge the purpose of Dubai's extensive infrastructure in its rapidly growing city.

Research Question

How can Dubai's existing car-centric infrastructure be repurposed to support alternate hybrid mobility options, public spaces, and green infrastructure?

Argument

Globally-driven Rapid Urbanism in Dubai

Dubai's model of development has become a template for other cities seeking rapid growth and economic diversification, particularly in the Global South (Menoret, 2014). The city's *success* in creating enclave economies through SEZs and its focus on attracting global capital has made it a model for similar projects in places like China, Africa, and other parts of the Middle East (Easterling, 2014). Dubai's model is replicated and exported globally, often without regard for local conditions or governance structures. These formulaic urban templates shape global urbanism by focusing on profit-driven development that often marginalizes local needs, while prioritizing infrastructure that serves global capital flows (Easterling, 2014). Dubai showcases how infrastructure space can be leveraged to shape a city's identity and role on the global stage, while also revealing the risks associated with unaccountable, opaque governance structures that prioritize global economic interests over local civic or environmental concerns (Easterling, 2014).

Alienated Streets of Neighbourhoods in Dubai

Urban design author, Roger Trancik argues that modern architectural trends, including high-rise buildings and highways, disrupt traditional urban patterns and degrade the quality of city life (Trancik, 1986). He uses the term "lost space" to describe areas rendered unusable by residents, often found along highway borders or around multi-story buildings (Trancik, 1986). These spaces, such as vacant land at the base of high-rises or isolated plazas, lack structure and are disconnected from pedestrian activity, leading to disuse (Trancik, 1986). Trancik also points to surface parking lots surrounding city centers and areas along freeways as examples of "lost space" that fragment the connection between commercial and residential zones (Trancik, 1986). In cities like Dubai, where vertical

architecture dominates, the gaps between high-rises can be so large and impractical that they distort people's sense of scale. These spaces, as noted by Le Corbusier and echoed by Trancik, are designed without considering the daily needs or experiences of city dwellers, making them "lost" to urban life (Trancik, 1986).

Streets of Al Nada 2 (neighbourhood in Dubai)

The city's focus on grand architecture often comes at the expense of human-scale urban design that prioritizes walkability, community spaces, and street-level interaction. As a result, the spaces between buildings are often overlooked, making them poorly planned for daily use (Abdelfattah, Bazzoni & Choubassi, 2021). Dubai's public transport system, including the metro and buses, has made significant improvements in recent years, but it still does not cover the entire city comprehensively. Certain areas, particularly the more suburban and car-dependent neighborhoods, remain poorly served by public transit (Abdelfattah, Bazzoni & Choubassi, 2021). Most of the higher-income residents have become accustomed to a car-centric lifestyle, partly due to the prestige associated with car ownership and the convenience it offers in a city designed for vehicles. Shifting cultural attitudes toward walking, cycling, and using public transport is not an easy task, it requires public awareness campaigns, incentives, and changes in policies. While this might pose as a near to impossible task, the Dubai 2040 Urban Master Plan shows intentions to create more pedestrian-friendly spaces, improve public transportation, and enhance connectivity between different parts of the city (Abdelfattah, Bazzoni & Choubassi, 2021). These plans demonstrate a commitment to reducing car dependency, though realizing them will take time and consistent investment. While the concept of a car-lite city is not inherently Eurocentric, it is often associated with European cities due to their historical urban planning and current sustainability initiatives (Alawadi, 2017). Although the concept is seen to have been adapted in different global contexts, it still raises the question if the concept could truly be

implemented given Dubai's unique local climate, cultural norms, urban planning legacies, and socioeconomic conditions.

In a summary, this research probes the potentials of a car-reduced planning of Dubai's neighborhoods. In contrast to conventional urban developments with heavy reliance on public transportation, it expects a shift from car-oriented to car-reduced planning practices that strongly relates to the divergent perspectives of the relevant actors.

Research Methodology

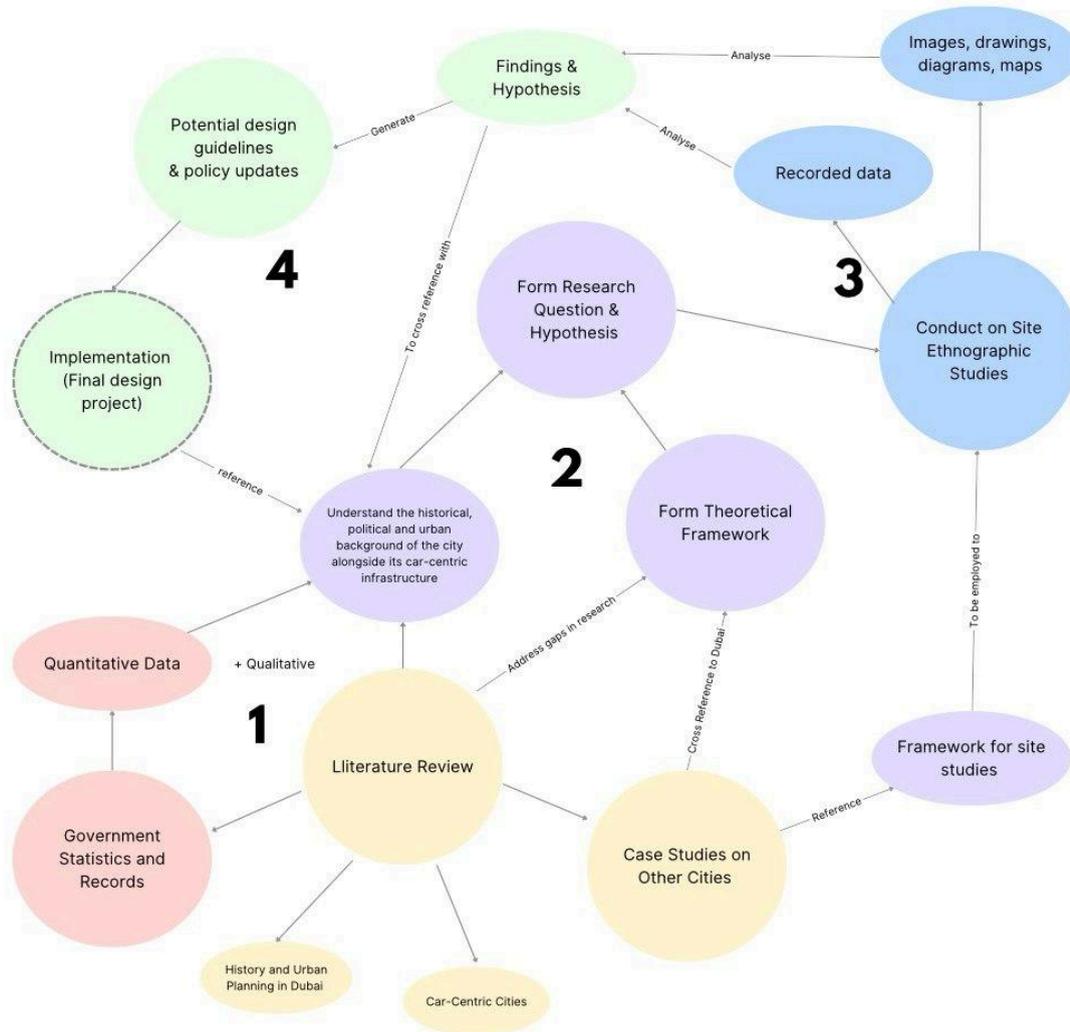


Fig. 1. Research Methodology Diagram (Author)

The research will likely employ a mixed-method approach, combination of qualitative and quantitative research methods to understand the historical, political and urban background of the city alongside its under-utilised infrastructure. The methods include a literature review of existing scholarship and research, the use of case studies and comparative analysis, the use of Google Earth and GIS systems (for imagery), ethnographic fieldwork and 3D modeling.

Jan Gehl, the Danish architect and urban designer known for his human-centered approach to city planning offer a detailed set of methods for conducting site ethnographies of roads, streets, and public spaces. Gehl's approach focuses on understanding how people use and experience public spaces, particularly streets and sidewalks, and includes methods for both observing and measuring human activity in urban environments (Gehl, 2010). The methods he has used will be employed as follows:

1. People Counting

A basic method of observing how many people pass by or linger in specific parts of the street at different times (Gehl, 2010).

2. Mapping Activities

Mapping of various types of human activities (e.g., walking, sitting, playing, conversing) helps the observer understand how people use different parts of the street (Gehl, 2010).

3. Behavioural Observation and Timing

By timing how long people spend in a particular spot (sitting on benches, standing, interacting), it provides insights into how comfortable and appealing a space is (Gehl, 2010).

4. Path Mapping

This method involves tracking the paths people take through an area to see the natural flow of pedestrian movement (Gehl, 2010).

5. Counting Stationary Activities

Observing and counting where people stop, either to rest, converse, or engage with street vendors or shop windows, helps assess where public spaces succeed or fail in attracting people to linger (Gehl, 2010).

6. Photographic Documentation

Taking photographs at different times of day helps to visually document the changes in use, crowd density, and interactions (Gehl, 2010). This is useful for comparing usage patterns over time.

7. Environmental Conditions Analysis

This consists of factors such as sunlight, wind, noise, and temperatures, as these can influence people's comfort and willingness to use a street or public space (Gehl, 2010).

His list of methods come with some form of limitation as the scale of the space affects how meticulous the data collection needs to be. Gehl's methodology mainly covers human street life but it does not take into account the road usability and traffic networks. Another tool is thus being employed to record traffic data.

Scholars use ArcGIS for tasks like traffic congestion mapping, shortest path analysis, accessibility analysis, and vehicle routing optimisation (Flacke, Martinez & van Maarseveen, 2018). It is primarily used by urban planners and researchers to assess urban road networks' accessibility and efficiency in supporting transit systems by integrating land use and demographic data (Flacke, Martinez & van Maarseveen, 2018). These findings are visually presented in maps, 3D models and diagrams.

Theoretical Framework
(highlighted in brown)

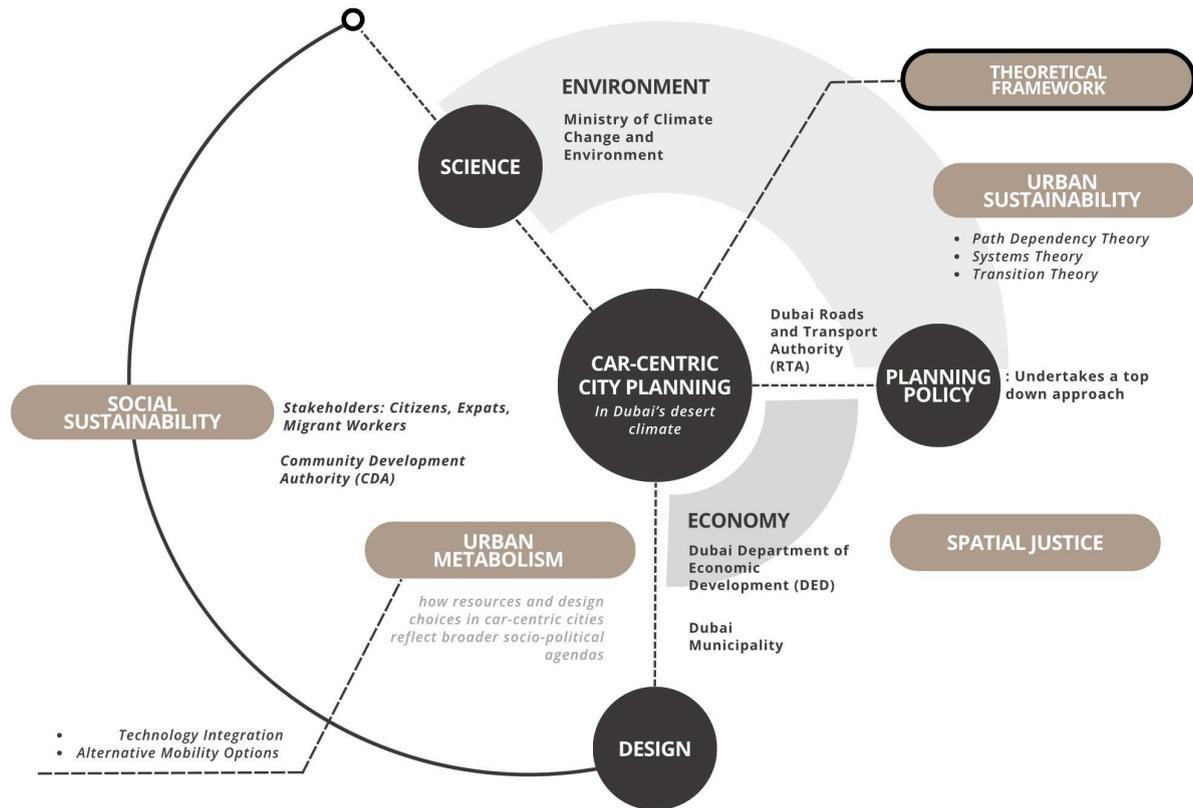


Fig. 2. Research Diagram with Theoretical Framework (Author)

This theoretical framework enables a comprehensive approach to examining how infrastructure in Dubai can be investigated not just to address immediate environmental concerns but also to re-address historical and systemic social inequalities.

Urban Sustainability

Urban sustainability focuses on balancing economic, social, and environmental dimensions in city development. It looks at how cities can reduce their ecological footprints while enhancing quality of life. The discovery of oil transformed the Middle East's economic and political landscape, particularly in the Gulf States (Kanna, 2011). The oil boom financed the development of modern, globalized cities like Dubai, Abu Dhabi, and Doha, with futuristic skylines, luxury real estate, and world-class infrastructure (Kanna, 2011). These cities are marked by stark contrasts between wealthy, expatriate-dominated neighborhoods and areas

housing lower-income migrant workers, often from South Asia. This rapid urbanization has led to unsustainable development, environmental degradation, and growing social inequality (Easterling, 2014).

Spatial Justice

In *The Right to the City* by Henri Lefebvre, his concept argues that all inhabitants, including marginalized groups like the vulnerable working class in Dubai, have the right to participate in and shape the urban environment (Butler, 2012). This theory challenges the exclusion of certain populations from the benefits of urbanization and encourages the repurposing of infrastructure to promote inclusion and equity (Butler, 2012).

Urban Metabolism

Dubai's rapid urban transformation into a global city is driven by the strategic branding of its infrastructure. The city showcases extravagant architectural projects, such as the Burj Khalifa and artificial islands like The Palm Jumeirah, which are designed to attract global attention, tourism, and investment (Easterling, 2014). Author Keller Easterling uses Dubai as a key example of extra statecraft in her book, "*Extrastatecraft: The Power of Infrastructure Space*," to illustrate how infrastructure and urban development in the city operate beyond traditional state mechanisms, driven largely by global economic forces and corporate interests (Easterling, 2014). Easterling views Dubai's urbanism as part of an infrastructure space that extends beyond its physical borders, shaping global perceptions through its spectacular architecture and branded environments (Easterling, 2014). The goal would be to explore how this infrastructure (streets and transport infrastructure) can be repurposed to support not only economic activity but also social welfare and environmental goals.

Social Sustainability

Dubai's urban and economic development is often characterized by its top-down, corporate-driven approach, which sometimes bypasses traditional forms of governance (Kanna, 2011). Decisions about infrastructure projects, urban planning, and economic strategy are often made through private-public partnerships or directly by multinational corporations, with limited public participation or transparency (Easterling, 2014). Its hyper-commercialized development model reflects this reality, where economic and financial protocols often drive urban planning more than social or civic concerns. This rapid development has also created social divides, with wealthy expatriates and tourists living in luxurious areas, while migrant laborers, primarily from South Asia, live in more modest, often overcrowded conditions on the city's outskirts (Kanna, 2011). These divisions are a direct consequence of the city's Western-oriented development model, which prioritizes the needs of global businesses and affluent residents over the broader population (Easterling, 2014).

Limitations

In Dubai, a significant portion of the working class is made up of migrant workers, many of whom live in labor camps far from the urban center and are excluded from certain public spaces due to socio-economic and legal structures (Kanna, 2011). Migrant workers' limited mobility and restricted access to public spaces complicate the notion of enhancing living conditions through urban design alone (Kanna, 2011). Many of the working class, particularly in construction and service industries, may not live in the neighborhoods.

While Dubai's top-down urban planning model is unique, future cities in similar climates may have different governance structures. The policies and frameworks needed to repurpose infrastructure and promote social cohesion may vary greatly depending on political regimes, making the results less transferable without considering broader governance contexts.

Overall, enforcing meaningful change in Dubai's urban planning and public spaces remains difficult because of the city's economic priorities, centralized decision-making, car-centric infrastructure, and socio-political dynamics that marginalize certain populations (Kanna, 2011). A fundamental rethinking of urban policy, with a focus on inclusivity, sustainability, and public engagement, is needed to overcome these limitations. The entrenched interests and systems that prioritize rapid economic growth and real estate development over social and environmental concerns present significant obstacles to such reforms (Easterling, 2014). However, investigating car-centric cities is vital because they embody many of the most pressing issues in modern urbanization—sustainability, social inequality, mobility, public health, and climate adaptation. With these cities shaping the future of global urban development, their research provides insights into creating more equitable, livable, and environmentally responsible urban environments. These lessons are critical not only for today's cities but also for planning future ones.

References

Abdelfattah, L., Bazzoni, F., & Choubassi, R. (2021). The Redemptive Potential of the Street.

A Multi-angular Analysis of Dubai's Pedestrian Infrastructure. *The Journal of Public Space*, Vol. 6 n. 1, 67–94. <https://doi.org/10.32891/jps.v6i1.1326>

Notes: The article revolves around a collection of mobility studies focused on the conditions of the street. In full, the research traces the functional structure of 36 streets within the city of Dubai and Abu Dhabi, offering various insights into their potential to deliver better walkable environments.

Alawadi, K. (2017). Rethinking Dubai's urbanism: Generating sustainable form-based urban design strategies for an integrated neighborhood,

Cities. Annual International Conference on Architecture and Civil Engineering. Vol. 60, Part A. <https://doi.org/10.1016/j.cities.2016.10.012>.

Notes: The article recommends that Dubai's urban planners aim for a balanced approach to social, economic, and environmental sustainability to ensure practical solutions that support the city's long-term resilience and goals.

Butler, C. (2012). *Henri Lefebvre: Spatial Politics, Everyday Life and the Right to the City*. Routledge.

Notes: Lefebvre argues that space is socially produced and reflects power dynamics. His concept of the "right to the city" advocates for all urban residents, especially marginalized groups, to have a role in shaping their cities, promoting inclusivity and democracy in urban planning.

Easterling, K. (2014). *Extrastatecraft : the power of infrastructure space*. Verso.

Notes: Easterling uses Dubai as a key example of extra statecraft to illustrate how infrastructure and urban development in the city operate beyond traditional state mechanisms, driven largely by global economic forces and corporate interests.

Flacke, J., Martinez, J. A., & van Maarseveen. (2018). GIS in Sustainable Urban Planning and Management. [10.1201/9781315146638-1](https://doi.org/10.1201/9781315146638-1)

Notes: ARC GIS tool

Gehl, J. (2013). *How to study public life*. Island Press. <http://ci.nii.ac.jp/ncid/BB15519072>

Notes: Reference for methodology

Kanna, A. (2011). *Dubai, the City as Corporation*. U of Minnesota Press.

Notes: This book offers a more critical view of Dubai's urban development, focusing on the city's pursuit of corporate interests and global prestige at the expense of social equity and cultural authenticity. It challenges the celebratory narratives around Dubai's rapid modernization, offering insights into the social costs of its corporate urbanism and its implications for global cities following similar paths.

Menoret, P. S. (2014). The Superlative City: Dubai and the Urban Condition in the Early Twenty-First Century ed. by Ahmed Kanna, and: Dubai Amplified: The Engineering of a Port Geography by Stephen J. Ramos, and: Demystifying Doha: On Architecture and Urbanism in an Emerging City by Ashraf M. Salama, Florian Wiedmann (review). *The Middle East Journal*, 68(4), 642–645.

<https://dialnet.unirioja.es/servlet/articulo?codigo=4873918>

Notes: This book analyzes Dubai's urbanism beyond its gentrified architecture, exploring planning strategies and overlooked areas like worker camps, offering a holistic view of the city.

Trancik, R. (1986). *Finding Lost Space: Theories of Urban Design*.

<http://ci.nii.ac.jp/ncid/BA03906744>

Notes: Trancik's theories offer valuable insight into how these spaces can be repurposed to improve urban life, enhance social cohesion, and foster a stronger sense of community. It is especially applicable to cities like Dubai, where large-scale, car-centric developments and high-rise buildings have created many isolated and underutilized spaces.

Sheller, M., & Urry, J. (2006). The New Mobilities Paradigm. *Environment and Planning a Economy and Space*, 38(2), 207–226. <https://doi.org/10.1068/a37268>

Notes: This paradigm highlighted by Sheller and Urry challenges static views of social structures, emphasizing the importance of mobility in shaping economic, social, and political life.