Visionary
Architecture Studies
VAS Scientific Journal

Arab City - Columbia University GSAPP - Spring 2026
Sub. 9/04, Rev. 13/05, Publication 14/05/2026
Vol.2, Issue 1, ISSN 3051-7478 by VAS-journal.org
pp.62-71 https://doi.org/10.48619/vas.v2i1.A1469
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Re-Reading Instant Urbanism: Ecological Infrastructure and the Production of Public Space in Dubai Marina and Masdar City

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Abstract
This paper aims to examine the implementation and application of infrastructure, urban spatial layout, and building systems within two urban models from the perspective of ecological strategies, with the goal of realizing the concept of "instant urbanism." The paper also aims to examine the feasibility and challenges of ecological design under extreme environmental conditions.
First, "instant urbanism" denotes the fast, often unofficial and temporary, construction of cities. It is known for cheap, malleable and adaptable interventions that break the traditional, slow process of urban planning. Known as "tactical urbanism" or "pop-up urbanism," the practice involves small-scale, fast, community-led interventions to bring life back to abandoned spaces and address immediate community needs.

Introduction

Like Ali said in <Beyond Oil: The Inevitability of Knowledge-Based Urbanism in Gulf Cities[1] >, "Gulf cities expanded rapidly rather than evolving incrementally, producing highly controlled urban environments." Dubai Marina is a prime example of "instant urbanism"; despite its quick growth, it has evolved into a tightly regulated urban ecology. The majority of current study, which focuses on topics like its urban design, real estate development, transportation systems, and artificial waterfronts, views Dubai Marina as the outcome of the combined effects of capital-driven pressures, master planning, and large-scale infrastructure. However, these conversations seldom go deeper into how these systems are really incorporated into architecture and how they influence building sections, facades, ground-level interfaces, and the feeling of public space; instead, they frequently stay limited to the scales of infrastructure or urban planning[2].

This paper seeks to shift the discussion of Dubai Marina and Masdar City from the planning scale to the architectural scale. Through the lens of "ecological infrastructure," this paper does not merely analyze systems such as cooling, water bodies, transportation, and public spaces in and of themselves, but rather examines whether they have been spatialized: do they exist as hidden mechanical infrastructure, or have they been transformed into spaces, interfaces, and climatic experiences? This paper compares Dubai Marina with Masdar City, pointing out that the difference between the two lies not in whether they rely on ecological systems, but in how those systems are organized: at Dubai Marina, environmental

1 - Ali Alraouf, "Beyond Oil: The Inevitability of Knowledge-Based Urbanism in Middle Eastern and Gulf Cities," 2020.

2 - Ali Alraouf, "Beyond Oil: The Inevitability of Knowledge-Based Urbanism in Middle Eastern and Gulf Cities," 2020.

Figure 1 Aerial Photos of Dubai Marina, https://science.nasa.gov/earth/earth-observatory/world-of-change/dubai/ accessed May 1st 2026

systems are largelyoutsourced to centralized infrastructure; whereas in Masdar City, climate regulation is more directly embedded within building forms, street profiles, and public spaces.

The district cooling system is Dubai Marina's main defense against harsh weather. In order to maintain a consistent interior temperature, this system generates chilled water at centralized cooling facilities and distributes it to individual buildings via an underground pipeline network, where air handling units perform heat exchange. The buildings themselves only act as heat exchange terminals in this process; they do not actively contribute to climate management. This cooling logic transforms environmental control entirely into a technical issue, separating it from the architectural space. Buildings no longer need to organize airflow through their sections or regulate sunlight and heat via their facades; instead, they rely on mechanical systems to stabilize the internal environment. As a result, building exteriors tend toward enclosed glass curtain wall systems, creating a clear thermal break between the interior and exterior environments, and the spatial experience exhibits highly homogenized characteristics. Consequently, in Dubai Marina, cooling is not translated into space or form but operates as an invisible infrastructure. This mechanically driven environmental strategy transforms architecture from a "regulator of climate" into a "container of climate."[3]

In addition to the cooling system, another key infrastructure component of Dubai Marina is its car-oriented ground-level and parking system. This system is typically implemented through multi-story podiums, which integrate parking, utility spaces, and commercial functions into the building's base. This spatial organization has a direct impact on the interface between architecture and the city. Ground-level spaces that could have served as a climate buffer are replaced by enclosed commercial volumes and parking structures, obstructing airflow

3 - Ali Alraouf, "Beyond Oil: The Inevitability of Knowledge-Based Urbanism in Middle Eastern and Gulf Cities," 2020.

and making it difficult to create shade and ventilation. At the same time, public activities are gradually shifting indoors, and ground-level spaces no longer fulfill the functions of climate regulation or public interaction, but rather serve primarily the purposes of transportation and consumption.

The podium is not merely an architectural typology but a spatial expression of infrastructure. While it concentrates multiple systems on a single level, it fails to transform them into architectural spaces with environmental performance, thereby further diminishing the building's role in climate regulation[4].

As the most iconic public space in Dubai Marina, the Marina Promenade embodies another contradiction in the area's integration of space and environment. On the one hand, the artificial water bodies offer the city the potential for microclimate regulation, such as cooling through evaporation and airflow; on the other hand, this potential has not been effectively realized through architectural or spatial design.

In practice, the waterfront interface often manifests as a narrow, continuous pedestrian strip flanked by hard revetments and high-density building facades. The lack of continuous shade, wind guidance, and spatial layering makes it difficult for the area to provide a comfortable outdoor environment during the day, with its use relying more on the natural drop in temperature at night[5].

Consequently, the Marina Promenade functions more as a visually and commercially oriented public space than as a genuine climate-regulating interface. Here, the water body exists primarily as a landscape feature rather than being translated into an environmental element that actively participates in the generation of architecture and space.

Based on the above analysis, it is evident that while the ecosystem in Dubai Marina is highly developed, it primarily exists in the form of infrastructure. Cooling, water, and transportation systems collectively constitute an efficient yet highly technical environmental control network; however, these systems are largely disconnected from the built environment and fail to establish perceptible spatial relationships.

The indoor public areas and the "containerization" of architecture are the direct outcomes. Public life has steadily moved to air-conditioned indoor spaces due to ineffective climate regulation in the external environment; at the same time, buildings have evolved into sealed shells intended to preserve a steady internal atmosphere rather than acting as climate mediators. As a result, Dubai Marina does not lack ecological strategies; rather, its ecosystem has been de-spatialized, which lessens the influence of architecture on public space creation and environmental management.

Like Yasser mentioned in <Real Estate Speculation and Transnational Development> in Dubai: "Dubai acts as showcase for the downside of turning urban environments into assets for generating rent."[6] Since Dubai Marina's canals are artificial waterfronts, its main objective is to improve the city's image, real estate values, and landscape. The building facades do not properly use the cooling and microclimate-creating capacity of the water bodies. The region functions as a consumer-oriented public space arranged by business facades rather than a free and diversified civic space in the conventional

4 - Yasser Elsheshtawy, "Real Estate Speculation and Transnational Development in Dubai," in *The New Arab Urban* (New York: New York University Press, 2019), 240, https://doi.org/10.18574/nyu/9781479880010.003.0011.

5 - Yasser Elsheshtawy, "Real Estate Speculation and Transnational Development in Dubai," in *The New Arab Urban* (New York: New York University Press, 2019), 250, https://doi.org/10.18574/nyu/9781479880010.003.0011.

6 - Yasser Elsheshtawy, "Real Estate Speculation and Transnational Development in Dubai," in *The New Arab Urban* (New York: New York University Press, 2019), 235–255, https://doi.org/10.18574/nyu/9781479880010.003.0011.

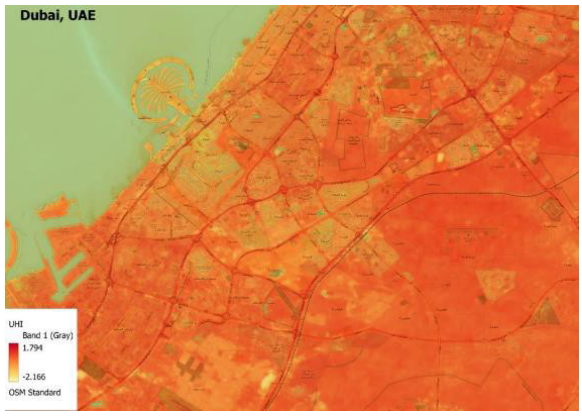

Figure 2 Dubai Marina Promenade, https://science.nasa.gov/earth/earth-observatory/world-of-change/dubai/ accessed May 1st 2026

sense since many activities center around dining, shopping, nightlife, and consumer-oriented areas. As a result, the majority of residents' use of the region is still restricted to interior spaces, with little chances to engage with the waterways.

Scholars Harsh and Simos cite Dubai Marina as a typical example of New Dubai. In contrast to traditional, densely populated neighborhoods, new developments like Dubai Marina struggle to provide a comfortable pedestrian environment during the summer heat, according to research on Dubai's microclimate that compares Old Dubai and Dubai Marina. Due to the spatial design's inability to adequately reduce daytime heat, public engagement along the promenade is restricted to specific times of day and increases at night[7].

In **<Urban Heat Island Effect Mitigation in Rapidly Developing Cities**: Case Study OF Dubai Marina>, Shariff said "The findings show that while the use of surface water, car-oriented transportation systems, and free-standing building layouts would increase the UHI effect in hot and humid climates, increasing the use of permanent shadow, natural ventilation, light, permeable materials, and vegetation can help mitigate the UHI effect."[8]. According to Sharifi's research on the urban heat island effect in Dubai Marina, water surfaces exposed to prolonged sunlight may make people feel more uncomfortable in public areas, forcing them inside air-conditioned buildings. At the same time, low vegetation, reliance on cars, and waste heat from air conditioning all contribute to the UHI issue in Dubai Marina.

Additionally, Shariff acknowledged that "the main contributors to the UHI effect have been cited as changing land surfaces, anthropogenic waste heat, and trapping sunlight heat in buildings' mass." Dubai Marina's hardscapes, overload AC waste heat, and glass towers all contribute to the heat island effects.

The main purpose of Dubai Marina's artificial waterways is to provide picturesque views for restaurants, promenades, and nightlife. Nevertheless, these water features have not yet been completely converted into true microclimatic infrastructure. To put it another way, they haven't been used as efficient climate-regulating interfaces through waterfront terraces, plant buffers, wind organization, humidity management, or continuous shade. Palm trees, planting beds, and landscaped strips are

7 - Harsh Thapar and Simos Yannas, "Microclimate and Urban Form in Dubai," in *PLEA 2008: 25th Conference on Passive and Low Energy Architecture*, Dublin, October 22–24, 2008, 5.

8 - Ehsan Sharifi and Steffen Lehmann, "Local Measures to Mitigate the Urban Heat Island Effect in Hot and Humid Climate: Comparative Case Study of Sana'a, Bushehr and Dubai Marina," *International Journal of Development and Sustainability* 3, no. 1 (2014): 38–54

Figure 3 Landscape Configuration, https://aqarlandscape.com/portfolio/dubai-marina/ accessed May 1st 2026

all included in Dubai Marina's landscape design; however, these features are usually ornamental rather than methodically arranged as ecological infrastructure. The plant density is inadequate, there is a lack of synergy with wind, water, and building profiles, and the paths are not continuously shaded. As a result, it is challenging to counteract the impacts of extensive hard asphalt, glass reflections, traffic heat, and air conditioning waste heat. Therefore, in harsh weather conditions, such a design may make the outside experience worse[9].

The ground floor's potential to act as a "climate interface" for shade, ventilation, and public activities is sacrificed because parking and retail spaces occupy these areas, despite the Podium's architectural form cleverly integrating a variety of functions, including housing, parking, retail, services, and mechanical systems. Additionally, the building has a closed glass curtain wall since it depends on district cooling and air conditioning. The building itself no longer reacts to the climate through its parts, facades, shading, and ventilation once temperature management is delegated to mechanical systems. This approach contrasts sharply with Masdar City's architectural strategy. I still think there are some useful points for comparison and reference because Hong Kong also has tower-and-podium constructions that are comparable to Dubai's, even though they were built to preserve land resources and in a different climate. Tow-

9 - Harsh Thapar and Simos Yannas, "Microclimate and Urban Form in Dubai," in *PLEA 2008: 25th Conference on Passive and Low Energy Architecture*, Dublin, October 22–24, 2008, 3

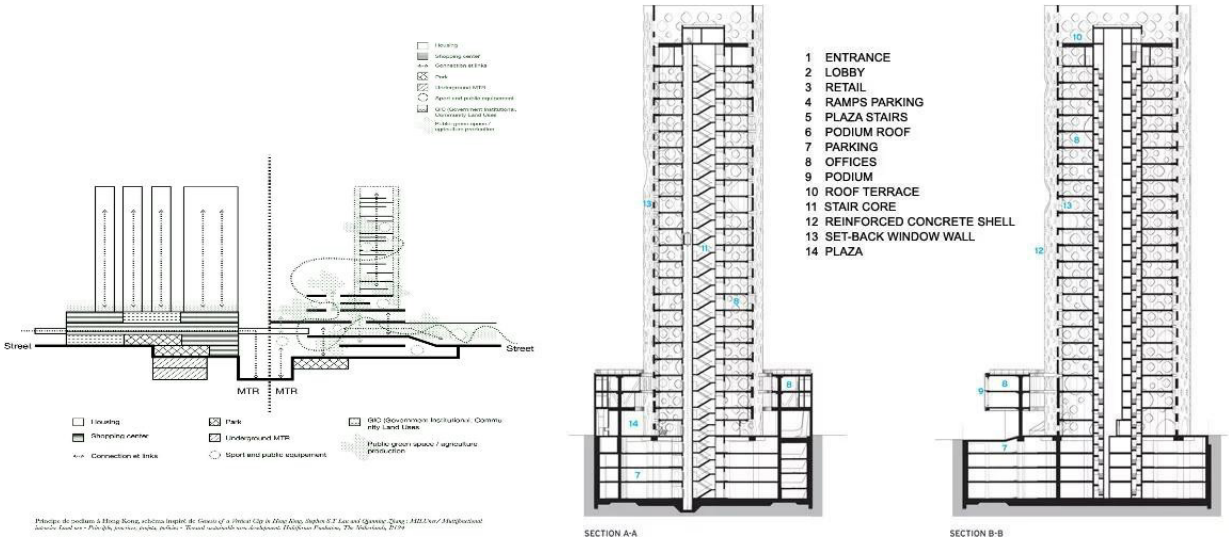

Figure 4 Podium Comparison, https://www.architecturalrecord.com/articles/7866-0-14-tower accessed May 1st 2026

ers in Dubai mostly rely on indoor air conditioning systems and hidden inner chambers. On the other hand, a natural passive ventilation system is created by the air corridors of Hong Kong's tower systems, which include substantial semi-outdoor pedestrian circulation networks.

To put it briefly, Dubai Marina is a capital-driven, master-planned waterfront that is developing quickly. This is in line with one of the hallmarks of "Instant Urbanism," which creates a "complete urban landscape" all at once as opposed to developing gradually through long-term social activity. As a result, the area feels less like an "organically evolved urban fabric" and more like a "packaged lifestyle." I think that rather than being a part of the actual constructed environment, Dubai Marina's ecosystem—which includes cooling systems, water bodies, transportation, utility networks, and podium service systems—is mostly hidden within the infrastructure[10]. Masdar City rethinks climate management as a spatial organization approach, in contrast to Dubai Marina's cooling techniques, which depend on centralized mechanical equipment. In this proposal, architectural characteristics and spatial linkages serve as guidelines for cooling instead of relying just on mechanical solutions.

For instance, courtyard areas further control temperature through airflow and evaporation; small street sizes and constant shading limit solar radiation; and wind towers catch high-altitude air currents and channel them into ground-level public spaces, generating localized cooling. This system's airflow routes, heat distribution, and spatial proportions all work together to create a noticeable climatic system[11].

As a result, cooling in Masdar City is now explicitly communicated via form and space rather than being a covert mechanical operation, making it an essential component of the architectural experience.

10 - Harsh Thapar and Simos Yannas, "Microclimate and Urban Form in Dubai," in *PLEA 2008: 25th Conference on Passive and Low Energy Architecture*, Dublin, October 22–24, 2008, 5

11 - Gabriel Tang, "Masdar—The Sustainable Desert City: A Theoretical Mirage or a Realistic Possibility?," in Sustainable Architecture and Urban Development (2010), 175.

Figure 5 Terracotta façade of student dormitories designed by Foster & Partner, https://www.architecturalrecord.com/articles/7866-0-14-tower accessed May 1st 2026

The ground-level spaces of Masdar City reflect a reconsideration of the relationship between climate and public life. By restricting automobile traffic and prioritizing pedestrian systems, the ground has been liberated as a continuous public area in addition to serving as an essential interface for climate control. Therefore, rather than being only a means of transportation or functional distribution, the ground in Masdar City is an actively planned climatic device that integrates public spaces with environmental performance.

As Gabriel noted in < Masdar—The Sustainable Desert City >, an eddy effect is created when the direction of the street changes, causing turbulent air flow. The air is pumped out and sent out of the street, giving you this cooling effect. Masdar views airflow as a product of street layout rather than an abstract environmental condition. These areas usually mix wind-oriented layouts, narrow streets, and shade structures to produce pedestrian environments with microclimatic characteristics. These outdoor areas are made to react instantly to extreme temperatures, allowing public activities to continue outside, in contrast to public areas that depend on internal air conditioning. Masdar arranges urban shape as a shade mechanism, in contrast to Dubai Marina's exposed coastal promenade. The urban grain is bent to maximize shading in the streetscape and reduce midday warmth on street level in order to create cool

public spaces for people to use. Instead of relying on discrete mechanical systems, Masdar's environmental performance is based on architectural linkages[12].

Masdar City uses facade solutions with environmental regulating capabilities at the building envelope level, like sunshades with perforated patterns (like mashrabiya). These facades establish a transitional climatic layer between the inside and external by limiting heat gain, regulating sunshine, and permitting some ventilation.

This interface is now a "thick interface" with filtering features that can create a progressive transition between various environmental situations rather than just a basic separating line. This method enables buildings to control their interior environment without totally depending on mechanical systems, in contrast to fully sealed glass curtain walls. As a result, Masdar City's facades participate in the distribution and arrangement of the climate in addition to acting as building envelopes[13].

The ecology in Masdar City is integrated into the architecture and urban areas rather than existing as a distinct infrastructure, as demonstrated by the spatial strategies mentioned above. Through sections, interfaces, and spatial proportions, environmental factors like heat, moisture, shade, and airflow are transformed into physical architectural forms.

Masdar City also has a very sophisticated water treatment system. The desalinated water must be used as many times as feasible in order to build irrigation, etc. In order to desalinate seawater and make it fit for human consumption, Masdar City will use solar energy. To conserve water, grey and black water will be separated, recycled, and utilized for irrigation.

As a result, public spaces continue to be outdoor settings under controlled temperature conditions rather than being indoors, and buildings function as active mediators that regulate the climate rather than merely being confined containers. In other words, rather than being an external force that design ignores, climate now plays a significant role in the formation of space. Therefore, rather of relying just on technological optimization, Masdar City provides a kind of ecological spatial order achieved through architectural means[14].

These two urban shapes are representative of the construction of cities in harsh surroundings. Critics contend that Masdar City, which aims to achieve ecological goals of sustainability and carbon neutrality, would require a lot of outside resources, such as water and energy, and that the desert is not a suitable area for people to live. Energy is needed for the transportation of these materials alone, which may go against the concept of sustainability. Additionally, the oil economy is a major source of funding for Masdar City[15].

The nation's energy structure is still largely reliant on oil, which raises the obvious question of whether a low-carbon urban model is being constructed on top of a high-carbon economic system. Compared to the entire population of the United Arab Emirates, Masdar City's permanent population of about 50,000 is quite small. With minimal effect on the nation's carbon emissions, its function is more akin to an ecological exhibition. Masdar, on the other hand, is an exclusive community that serves primarily upper-class locals and scholars and is cut off from the outside world. "Eco-city development projects often turn into 'high-end enclaves' rather than inclusive urban environments," according to Arthur Lau's article "Masdar City: A Model of Urban Environmental

12 - Gabriel Tang, "Masdar—The Sustainable Desert City: A Theoretical Mirage or a Realistic Possibility?," in Sustainable Architecture and Urban Development (2010), 172.

13 - Gabriel Tang, "Masdar—The Sustainable Desert City: A Theoretical Mirage or a Realistic Possibility?," in Sustainable Architecture and Urban Development (2010), 175.

14 - Arthur Lau, "Masdar City: A Model of Urban Environmental Sustainability," *Social Sciences* 9 (2012): 77.

15 - Arthur Lau, "Masdar City: A Model of Urban Environmental Sustainability," *Social Sciences* 9 (2012): 80

Sustainability."[16] Masdar City is being isolated from the wider society prevents more citizens from participating in the city's decarbonization process.

An analysis of Dubai Marina and Masdar City reveals that both rely on a series of environmental systems to maintain habitability amid extreme climatic conditions. However, the difference between them lies not in whether these systems are used, but in how they are organized and integrated into the built environment.

First, in terms of cooling mechanisms, Dubai Marina primarily relies on a centralized district cooling system, transforming environmental regulation into a technical process driven by piping networks and equipment. Within this system, buildings function merely as heat-exchange terminals, with their spaces and forms playing almost no role in climate regulation. In contrast, Masdar City integrates airflow, temperature differentials, and spatial proportions through wind towers, shaded streets, and courtyard spaces, transforming the cooling process into a perceptible spatial experience. Thus, the difference between the two lies not in whether cooling is employed, but in whether it operates as a "mechanical process" or as "spatial organization."

Second, regarding the role of water bodies, the artificial canals in Dubai Marina primarily serve landscape and real estate functions; their potential microclimatic effects are not effectively harnessed through architectural or spatial interfaces. While the water visually reinforces the urban image, it fails to function as an architectural element participating in environmental regulation. In contrast, in Masdar City, water integrates with space, contributing to the generation of local climate through evaporation and shading, thereby becoming an integral part of the environmental system. In this sense, the roles of water in the two projects are respectively that of an "object to be viewed" and a "medium participating in climate regulation."

Third, regarding the organization of ground level and public space, the ground level in Dubai Marina is dominated by traffic and podium structures, with public activities largely shifting to air-conditioned indoor spaces, creating a trend toward the indoor public space. In contrast, Masdar City transforms the ground into a continuous climate-regulated interface by restricting cars and strengthening the pedestrian system, allowing public spaces to persist in the outdoor environment. Consequently, public spaces in the two models present themselves as enclosed interior environments and regulated exterior environments, respectively.

From an architectural perspective, these differences ultimately manifest in spatial organization and interface strategies. In Dubai Marina, buildings tend to employ enclosed curtain wall systems, creating clear boundaries between internal and external environments, with the building functioning as a container for maintaining constant internal conditions; whereas in Masdar City, buildings establish gradual relationships through multi-layered interfaces, shading elements, and spatial transitions, allowing the climate to be progressively regulated across different spatial levels.

In summary, the core difference between the two lies not in their technical approaches, but in whether the environmental system is translated into architectural space. In Dubai Marina, the ecological system primarily exists as infrastructure, with its operational mechanisms relatively separated from the architectural space; whereas in Masdar City, the ecological system is embedded within sections, interfaces, and spatial organization, thereby becoming the intrinsic logic of architectural generation.

Therefore, this difference does not lie in technical superiority or inferiority, but rather in a difference in architectural philosophy: whether the environment is viewed as an external condition to be controlled, or as an internal driving force for the generation of space.

From a broader perspective, this contrast demonstrates that "instant urbanism" does not inherently lead to a

16 - Arthur Lau, "Masdar City: A Model of Urban Environmental Sustainability," *Social Sciences* 9 (2012): 77–82.

rupture between space and ecology. The real issue lies in the fact that when urban development relies entirely on the logic of infrastructure, environmental systems tend to become centralized and invisible, thereby undermining architecture's role in climate regulation. However, when these systems are re-embedded within architecture, radically different spatial outcomes can emerge even under similar climatic and technological conditions.

Masdar City and Dubai Marina are both examples of the challenges of environmental and sustainable design in extreme climatic conditions. Each project deploys a variety of ecological and technological strategies, but often these methods have difficulty in achieving precise control over carbon emissions or a fully accountable calculation of energy consumption. Also, they are limited by their regional and spatial boundaries.

Their environmental strategies are difficult to scale beyond the boundaries of the project itself, whether considered through urban planning, architectural form, or internal mechanical systems. Both cases thus exemplify a wider problem: sustainability can be localized, exclusionary, and even elitist, rather than a genuinely replicable model for the wider city.

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