Social and Institutional Innovation in Self-Organising Cities

edited by
CAMILLA PERRONE
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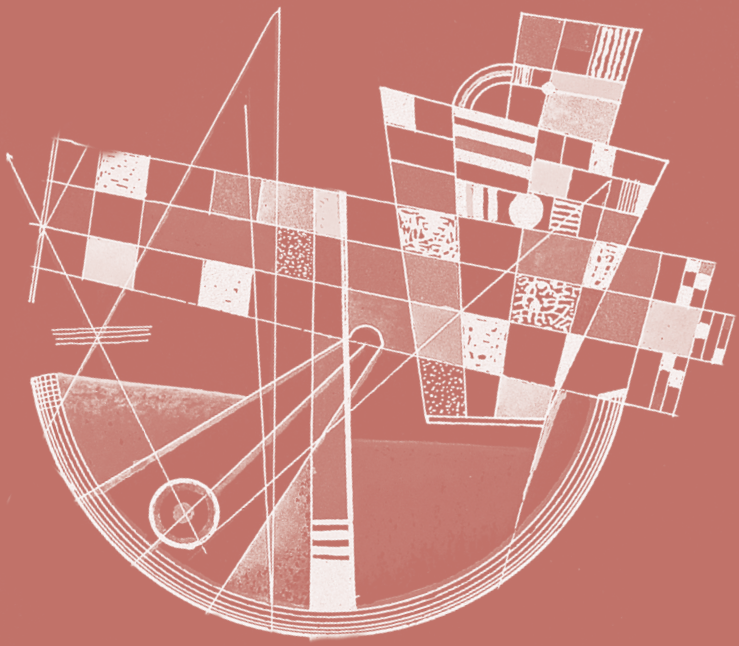

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Introduction

This essay shows a series of strategies and thoughts for design of human settlements built on water surface. The described project is a 10'000 people temporary •oating settlement, designed as alternative answer to the constant increase of housing demand in Hong Kong. The work was developed as Master degree thesis (tutor: Prof. Arch. Aldo Aymonino) and defended at Iuav Università di Venezia, in 2017. The strategy is set by two considerations: the first it deals with the main implications related to the floating settlements, the second it reflects on the opportunity given by the water's surface as a new new territory. Furthermore, it re•ects on the necessity of establishing a theoretical/physical dialogue between sea and land surfaces. The research underlined several contradictions and a lack of clear strategies that belongs to contemporary case studies, giving the project the opportunity to enrich the contemporary architectural debate with alternative strategy and operative tools. The project deals with different urban topics: from temporality and permanence, to infrastructure and public spaces. The result is a complex urban infrastructure, where the public spaces become the planning and regulation tool of the whole settlement, while different steps of temporality are assigned to each element of the structure, giving the possibility to be adaptable to different demographic scenarios. The strategy embodies all the project's scale, even describing some different atmospheres and domestic scenarios inside the housing modules, the basic element of the whole settlement.

HONG KONG'S NEW NEW TERRITORIES, AN ARCHITECTURAL DIALOGUE BETWEEN LAND AND SEA ENVIRONMENTS FOR FURTHER FLOATING CITIES ON WATER

Matteo Vianello
Università IUAV di Venezia
Italy

Introduction. Water is the new land.

Projects, strategies and scenarios for villages and cities which use water as a new surface recently came back as an urgent topic in the architectural debate on the future of the human settlement's expansions, figuring as a solution able to face the climatic displacements of the *Anthropocene* (Dobraszczyk 2017).

Beyond their operative value in emergency contexts, contemporary cases of cities on water demonstrates ambiguous approaches. In cases of cities' territorial expansion, it has been preferred to fill water surfaces with earth, funding artificial islands for hosting some functions of the city (e.g. airports, terminals, touristic resorts). Nonetheless, in several projects proposed by private investors, a single floating platform resets all the surface's differences between earth and water, giving the builder the freedom to settle on it its earth archetypes. Even among the consolidated tradition of Dutch houseboats (Kloos, de Korte, 2007) come up ambiguities in juridical definitions (is it a boat or a house?), space regulations, architecture and urban language for floating houses.

There is a fundamental choice to be made in designing a village on the water: we can think about a floating settlement, a fleet of small boats or a massive ocean liner that everything includes, or we can try to transport the primitive certainties of the mainland stability in a context that endlessly denies them. As the first option implicates both a physical and ideal drift towards fragmentation and informal aggregation, the second one escapes from finding a specific solution to the main question.

These premises act as the starting point of the project. Is it possible to adopt design strategies able to establish a clearer dialogue between land and sea territories? Understanding the limits and potentialities of each own surface made the project aware of a fundamental consideration: water is the new land (Schmitt [1942] 2015).

But If water becomes an unknown land, a 'New' New Territory (to recall the history of Hong Kong development) fated to be colonized, the reflection switches to a different issue, parallel to the primary one. How can a hostile place be domesticated? What foundations must be laid

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Fig.1
Hong Kong seen from the ferry to Lamma Island (photo by the author)

for a new settlement? Which development to image? Which complexity? What realistic scenario can we give for the future development of Hong Kong? (see Fig.1)

To settle on water

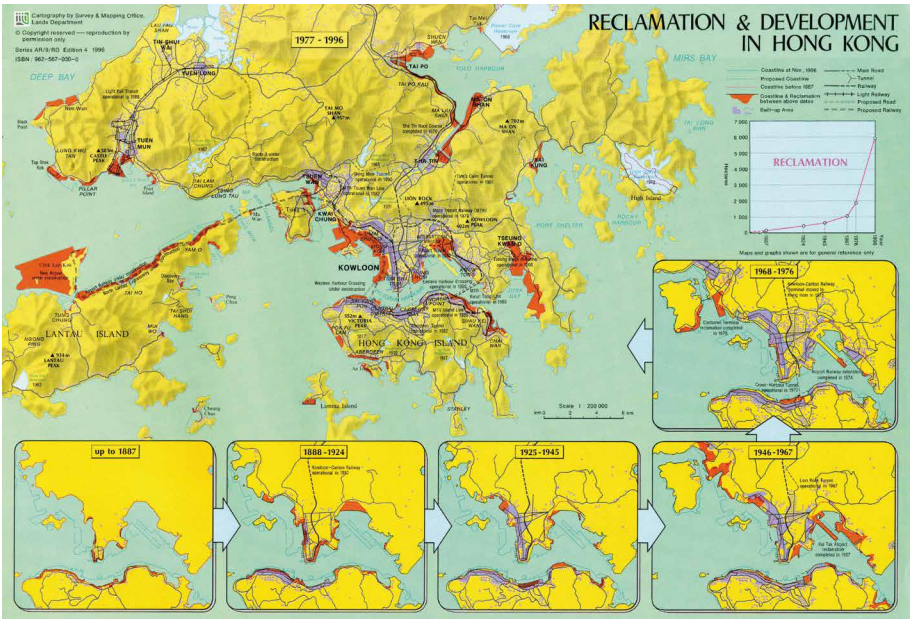
Humans are not suited for inhabiting seas. As Carl Schmitt wrote, "Man is a terrestrial, an earthling. He lives, moves and walks on the firmly grounded Earth. It is his stand point and his base. He derives his points of view from it, which is also to say that his impressions are determined by it and his world outlook is conditioned by it" (Schmitt, [1942] 2015: 5).

Although this, a vast series of case studies accepted the challenge to settle on water surface, accomplishing one of the strongest architecture's desire: overcoming environmental constraints for inhabiting hostile territories.

Beyond heterogenous necessities, most of the projects were pushed by critical issues happening on land. Water surface was chosen as a place of expansion of the city (in cases of land scarcity), as a place of political/urban exploitation, as a place of food production or energetic source.

Hong Kong, one of the most dense city in the world (in 2011, almost 400'000 inhabitants located in less than 1100 Km2), has faced with land scarcity since its born.

Fig.2
History of Hong Kong's land reclamations (from the Survey & Mapping Office, Lands Dept., Hong Kong)



The city's economic-political history, the dramatic topographic conditions and a rapid demographic demand in the 70's (Yeh 2011), pushed the city to reclaim portions of land from the sea, expanding its waterfront (see Fig.2). Beyond this continuous coastal reshape, other urban interactions with the water coexist in the bay. Since the XIX century, Aberdeen harbour (located in the Southern district) hosts a 6000 fishermen's floating village; while other fishermen's floating villages are settled in other points in the Pearl bay. Among them, the village of Lamma Island was chosen as site for the project (see Fig.3).

Other case studies come from many informal fishermen villages settled in Far east bays, between China, Vietnam, Cambodia. Among them, the villages of Xiapu (Nindge Region, China), Ha Long (Vietnam), Ko Panyi (Thailand). In these case studies (adopting both piling foundation and floating strategies) the inhabitants established a site for cultivation and fishing, saturating harbours and bays surfaces for food production (see Fig.4).

The project chose to give an alternative answer to the city's space reclamation, finding in the floating (rather than in the land filling) strategy an opportunity to develop an alternative urban structure. Parallel to this first case studies typology, other Eastern architecture projects had been chosen as design precedents. In 1960, the World Design Conference in Tokyo raised several questions for the future of urbanism, thanks to the contribution of architects

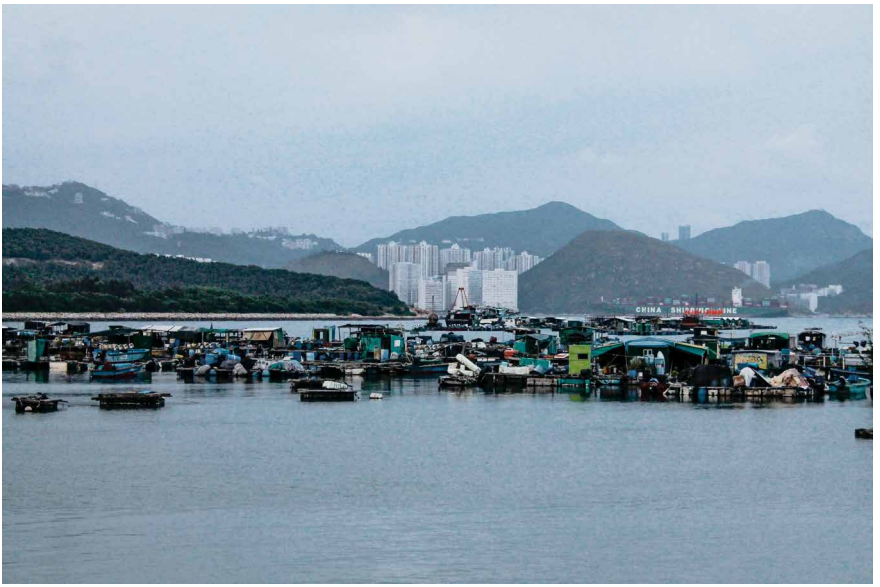


Fig.3
Project site, Lamma Island bay with the fishermen's floating village (photo by the author)

Fig.4
Beach, Shoals, Fujian, Xiapu (anonymous author, https://www.maxpixel.net/Beach-Xiapu-Fujian-Shoals-1833569)

who later joined together under the name of Metabolists (Koolhaas et Al. 2011). The projects developed by the group offered alternative scenarios for the rapid urban expansion of Japanese cities during the 50-60's, formulating innovative strategies for replacing the inadequacy of existing urban design and planning tools (Pernice 2004).
Fumihiko Maki's (1964) innovative researches on urban collective forms, Kikutake Kionori (Oshima 2016) and Kenzo Tange's project for Tokyo bay (Tange and Kultermann 1970) focused on floating cities for millions of inhabitants. Addressed by the international architectural debate as utopias, they rather were planned as prototypes for an urban expansion on water surface (Kaji-O'Grady and Raisbeck 2005). Reconsidering its role in the architectural contemporary context (Pernice 2004) these unbuilt projects offered innovative spatial hierarchies and relations.

To found, or to float? Dealing with temporality and permanence

Building a new settlement on the water gives the possibility to deal with current issues related to the life in the urban settings (temporary nature, flexibility, limited space), but at the same time, the water gives less constraints in the elaboration of new strategies. Considering the radical differences between land and water surfaces, to find an architecture on the seabed appears clearly as a paradox, since marine objects adopt and follow the basic hydrodynamic constraints. Their shape is totally devoted to satisfy Archimedes' law: rather than founding themselves as land objects, they float onto a fluid surface.
Kikutake's marine cities projects (Oshima 2016), furnished a vast catalogue of floating typologies, mainly derived as inspiration from organic shapes (Nyilas 2016). In these precedents, the potentiality behind the floating strategy allowed to deal with temporality and flexibility on urban structure. The design of urban elements which adopt different founding technologies, allowed to design with different degree of temporality. Thus, the hierarchy which orders all the project's elements is regulated by a balance between permanence and temporary nature of the structures.
The breakwater dam that protects the bay, is the element with the lower degree of temporality. It is founded with an embankment that produces energy, a massive drinkable water concrete tank and a surface that offers welfare services and public spaces for the community. Designed as a generating element of the settlement system, the embankment is designed with reference to the construction principle of vertical-walled dams. Usually used as mouths in the main maritime ports, it works both as foundations and renewable energy storage (see Fig.5).

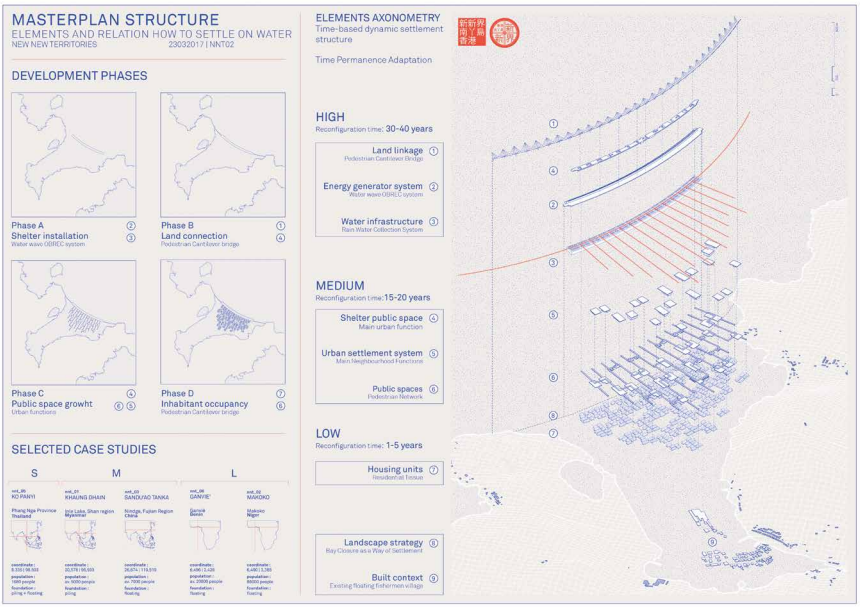


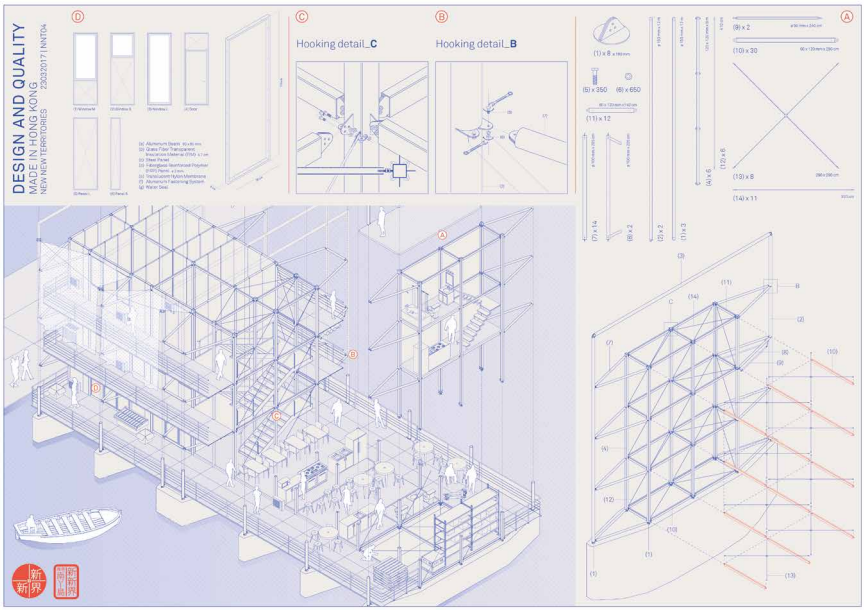
Fig.5
Masterplan structure, project elements and hierarchies. Exploded axonometric projection

Fig.6
Housing units, construction strategy, Exploded axonometric projection

Above this complex element, the arch of the pedestrian bridge keeps a light, but comforting link with the mainland, creating a new dialogue with the context. The dam is planned to remain the only permanent element of the project, to which a more flexible structure is connected.

From this element, a series of radiant piers are founded to the seabed with removable pillars. Conceived as mediation elements between the dam and the housing units, they have a middle degree of temporality. Built with a modular prefab framework, they could be expanded or reduced in length, adjusting to the expansions or the contractions of urban tissue.

The floating residential units are the most ephemeral and dual elements of the system: the modular structure allows a great flexibility in term of space and function. The necessity of an easy and fast building process, eventually reversible, determines the choices about materials and detail solutions. Thanks to their floating nature, they could adapt to tides, move from one point to another, expand or reduce their dimensions, adapting to the settlement's housing demand. Refusing the concept of a platform, they are built starting from an array of parallel vertical buoys, hinged together by a prefab framework.



Those vertical cores act as fixed logistic spaces able to assure domestic facilities (toilets, kitchen, stairs). The other space of the units is shaped by inhabitants' desires and necessities (see Fig.6).

Energy & Public spaces as design tool

Adapting the strategies shown in Maki's *Investigation in collective form* (Maki 1964) and taking inspiration from megastructure' concept (Banham, 1976), the settlement is designed as an energetic machine, managing with different flows (people, energy, sources, waste). Acting as main design tool, public spaces are conceived in synergy with the energy infrastructures.

Energetic independence from land could be considered as the most present aim for the recent (not only) floating cities' projects, being sustainability a central topic in the contemporary architecture debate.

The project takes distances from these precedents, refusing the idea of a complete sustainability. Different systems of renewal energy (taken mainly from solar and waves sources) contributes to Hong Kong's energetic network, which still remains the main source of energy for the settlement. This dependence wants to establish a closer relation between city and

settlement: rather than an independent entity, it works more like a piece of the main city, implementing the whole network with the production of renewable energy.
Other flows, like drinkable water and waste are completely managed by the settlement's structure.
The breakwater dam acts as main 'mother' element. The side of the dam facing the outside of the bay hosts a water and energy storage system called OBREC: this technology uses the breaking of waves against the dam walls for storing water inside tanks, and extract electricity with a forced passage through a series of hydroelectric turbines.
The reinforced concrete tanks that make up the dam's structure act as water tanks, divided into different storage functions: from the first storage, to the treatment up to the conservation of drinking water for human consumption. The water comes from two collection systems. The first collects the rainwater from the housing unit's roofs, then sending it to a centralized purification system, which redistributes purified drinking water to the entire network. The second water resource, the marine one, is captured by OBREC system: after having obtained energy through the turbines, the water used is stored and desalinated, for non-potable use, both domestic and non-domestic.
This flow is centralised as well in the embankment and distributed to the entire network (see Fig.7).
Over this water storage system, settlement's main public services take place: these are primary services, such as high schools, medical centres, commercial, entertainment. Their composition is developed along a central axis, accessible from the main connecting bridge. From the height level of the central axis, the piers branch off, delivering energy and flows.
Urban piers are the founding matrix of settlement's public space, composing the entire urban/energetic village's infrastructure. The piers structure is assembled in correspondence with energy and water network, which always remains continuous and undifferentiated throughout the pier's length. All the variable modular components of the bridge and services are designed to connect to it.
The pedestrian walkway spaces have been designed to offer heterogeneous functions and practices, as well as direct connection between the parts of the village. Different configurations can be assembled and made possible, thanks to the pier's modular structure, which provides as well moorings for floating housing units.
Secondary public services, different in scale and function from the primary ones, take place alongside the piers. These units, with heterogeneous public functions (from the market, to the primary school, up to the sports centres) act as aggregation spaces. Their

position alongside the piers organize the settlement in different portions, managing housing density.

These secondary services are designed as urban piers' expansions, sharing with them composition and construction strategy.

Furthermore, these nodes are connected with the transverse pedestrian bridges. Intersections serve as well as infrastructural junction between the two levels of the piers, thus providing further opportunities for spontaneous aggregation, in correspondence with the public functions. Different piers heights give the possibility to navigate underneath them and to go across the settlement, while the transverse bridges allows the same freedom for pedestrians flows (see Fig.8).

The path from secondary service cores to the housing units is planned as a gradient from a public to a private space, with hybrid spaces which act as mediator. From the piers, short movable bridges connect to the housing units, conceived as a living frame capable of accommodating both the living function, and small work/business activities. Housing unit's balconies act as hybrid space, bring the plot of public spaces to increasingly smaller dimensions, blurring the rigid boundary between public and private (see Fig.9).

Imaginary

Building land city's expansions on water surfaces implies a selection of concepts, spatial relations, materials and atmospheres to be transcribed and placed in new territories: a migration of imaginaries and urban narratives, displaced from the land to the sea.

This ontological operation could be found in several precedents: from European colonies settled in the Americas, to the most ancient religious myths regarding the great flood. Especially the myth of Noah's Ark could become a key reference for tracing this approach.

The millenary Noah's Ark iconography, witnesses how Ark's architecture took shape from different land archetypes through the centuries: churches, tents, palaces, etc.

The drawings made by Athanasius Kircher (1675) gave scientific dimensions and proportions to Noah's Ark. Kircher's designed an encyclopaedic architecture, which works as taxonomy for all the animal species to be saved from the flood. Pushed by the imminent divine climate disaster, this architecture operates as archive which selects and collects a precise portion of the known world. (Breidbach and Ghiselin 2006)

Taking inspiration from this myth interpretation, the project is a framework which supports a displaced imaginary brought from Hong Kong (see Fig.10). All the elements hosts narratives brought by the city, in the attempt to establish a conceptual dialogue with Hong Kong. The mix of work and housing spaces, the imaginary of living in extreme levels of

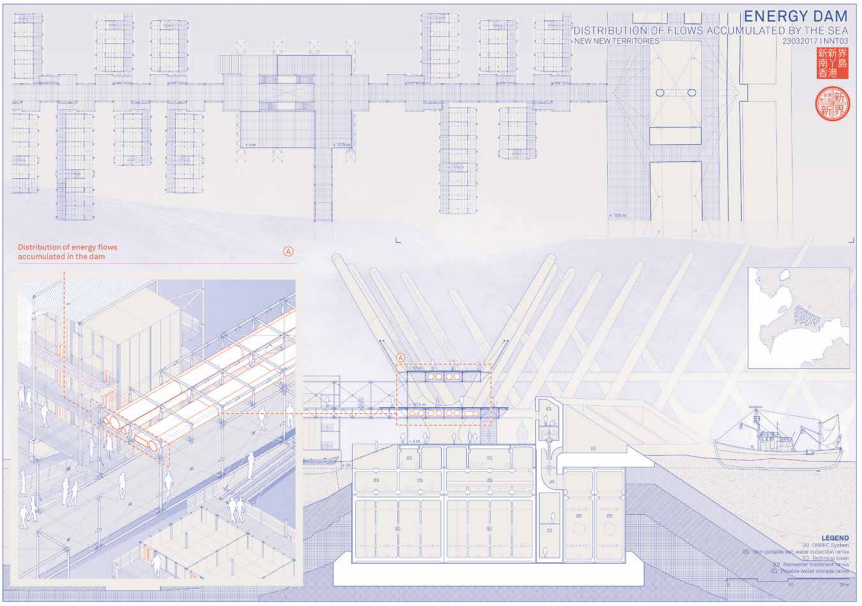
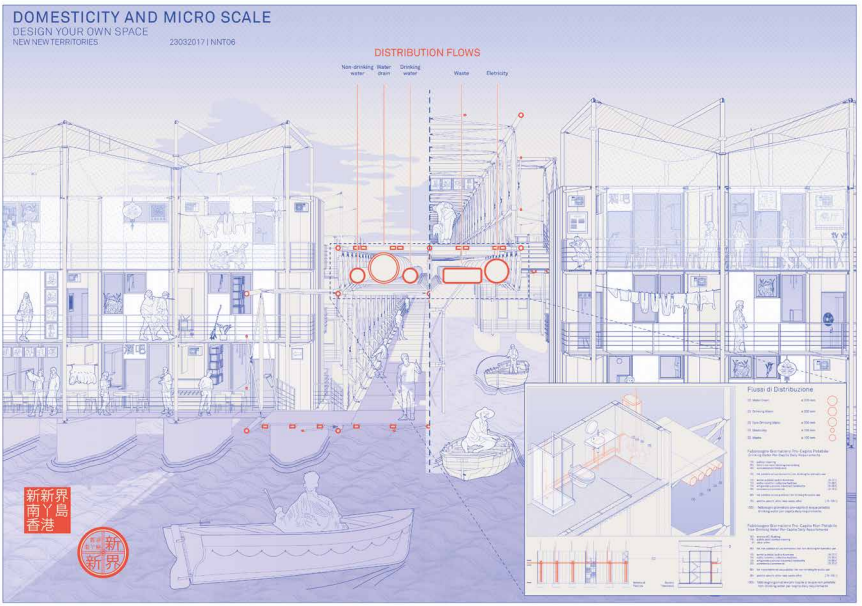


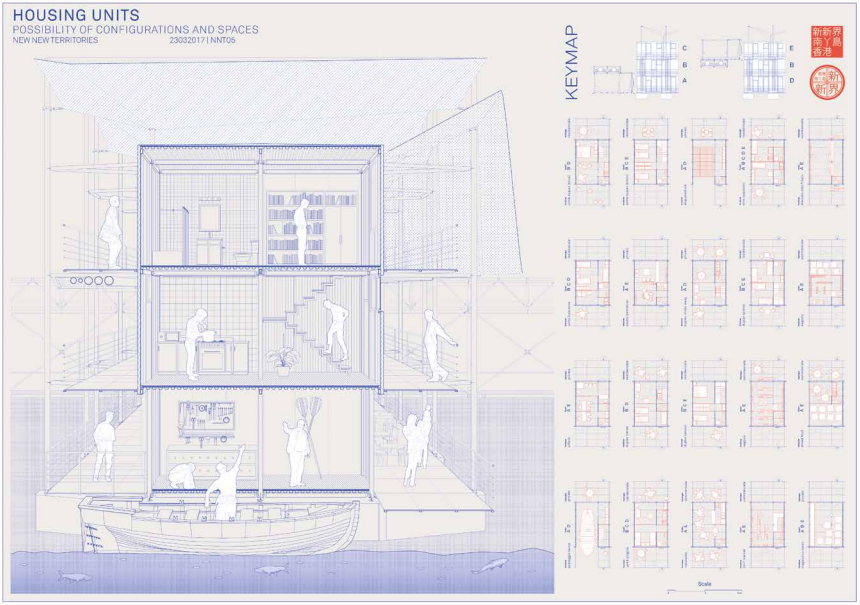
Fig.7
Energetic network, Breakwater dam, Section

Fig.8
The urban pier and its relation with the housing units and the energetic network, Section

Fig.9
Housing unit and its potentialities in spatial configuration, Section and plan

Fig.10
Displaced imaginaries, Hong Kong's elements translated into the project, Axonometric projection

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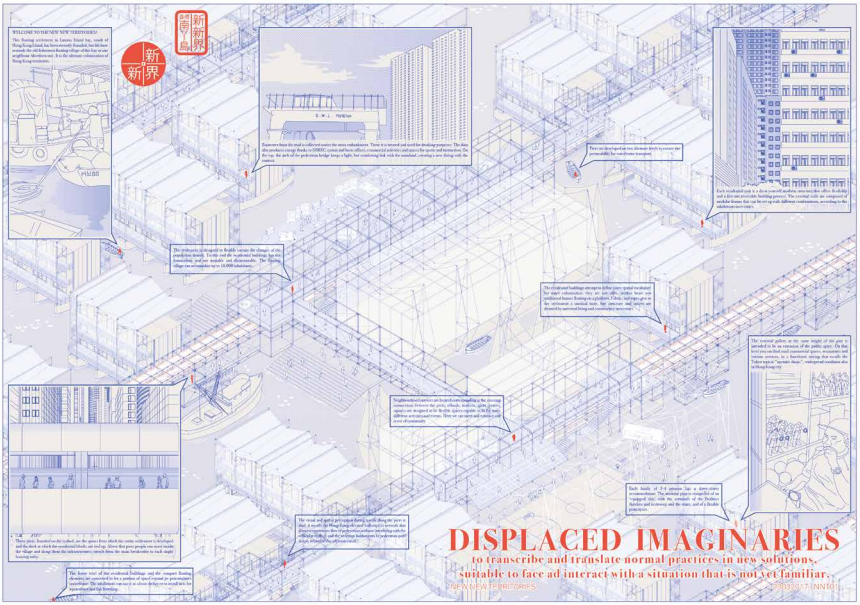
DISPLACED IMAGINARIES
to transcribe and translate normal practices in new solutions,
suitable to face ad interact with a situation that is not yet familiar.
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Fig.11
West Kowloon, Hong Kong (photo by the author, Kodacolor 200 film)

Fig.12
Hong Kong's pathways, Tsim Sha Tsui, Hong Kong (photo by the author, Kodacolor 200 film)

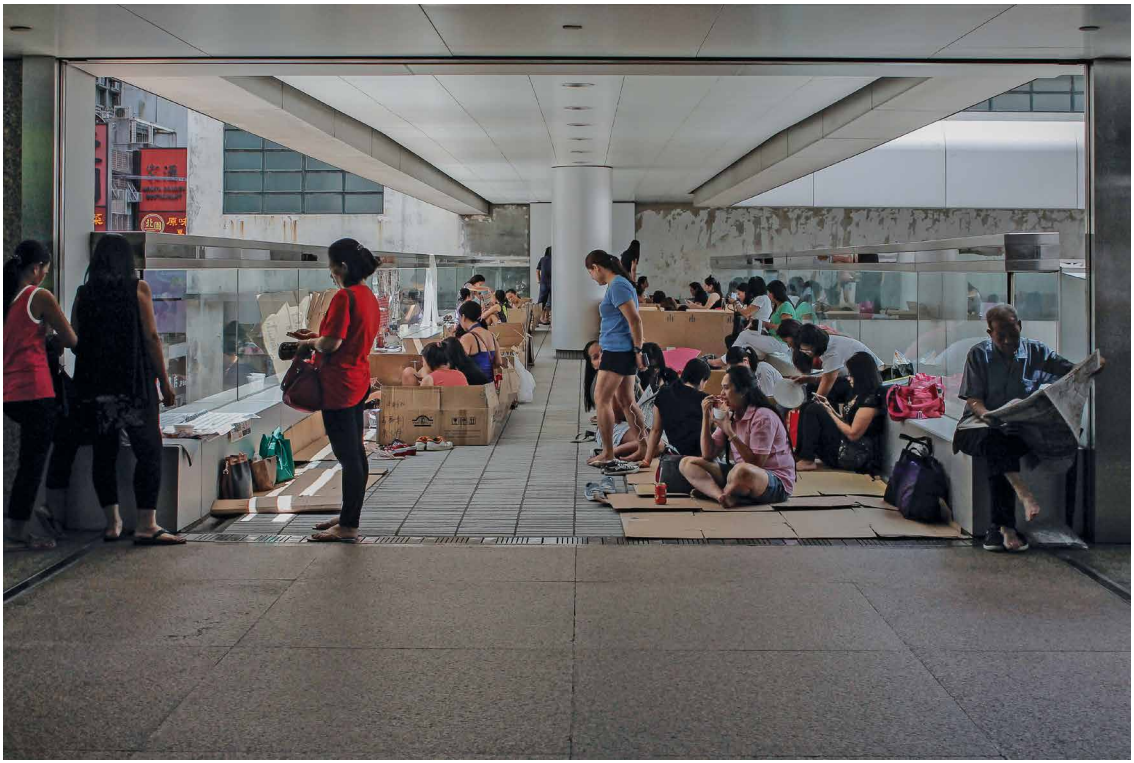
congestion and population densities: even the cladding material of project's volume tries to recall to the foggy atmospheric conditions of the Pearl bay. Even the density has been source of imagery. Rather than a matter of numbers, the project had interpreted it as opportunity to develop new design experiences, focused on the rewriting of the spontaneous practises that the density itself generates (see Fig.11).

Project's infrastructure and public spaces design are mainly inspired by Hong Kong's pathways (see Fig.12). They compose inside the city a complete autonomous pedestrian infrastructure, set above the ground and separated from car traffic. Because of this, on a cultural and physical point of view, "Hong Kong is a city without ground" (Frampton et al. 2012). The complex pedestrian network is shaped by city's density, atmospheric and environmental constraints (air conditioning). It crosses and joins heterogeneous fragments of the city: shopping mall's halls, public parks, transport stations, housing lobbies (see Figg.13, 14).

Conclusion

Fig.13
Hong Kong's pathways as space of aggregation, Central, Hong Kong (photo by the author)

The project acted as an index of theoretical questions related to the design of floating settlements on water surface. Taking origins from two main topic, Hong Kong's demographic demand pressure and the strategy to build on water, the project tries a dialogue between the necessities of the land and the opportunities given by water territories. The lack of strategy and ambiguities in contemporary case studies has been the starting point for this argument, with the purpose to enrich the architectural debate of a renewed perspective.



The approach to the design of a settlement on water territory brings to the image of a new frontier: it is an effort in transcribing and translating normal practices into new solutions from land to the sea, suitable to face and interact with a situation that is not yet familiar.
Because of this, building on water surface is a matter of an ontological and spatial dialogue between two environmental surfaces: land and sea. The design strategies within this project are intended as a possible, alternative relationships for these two contexts.
The potentiality of this operation is the development of an alternative, innovative urban strategy.

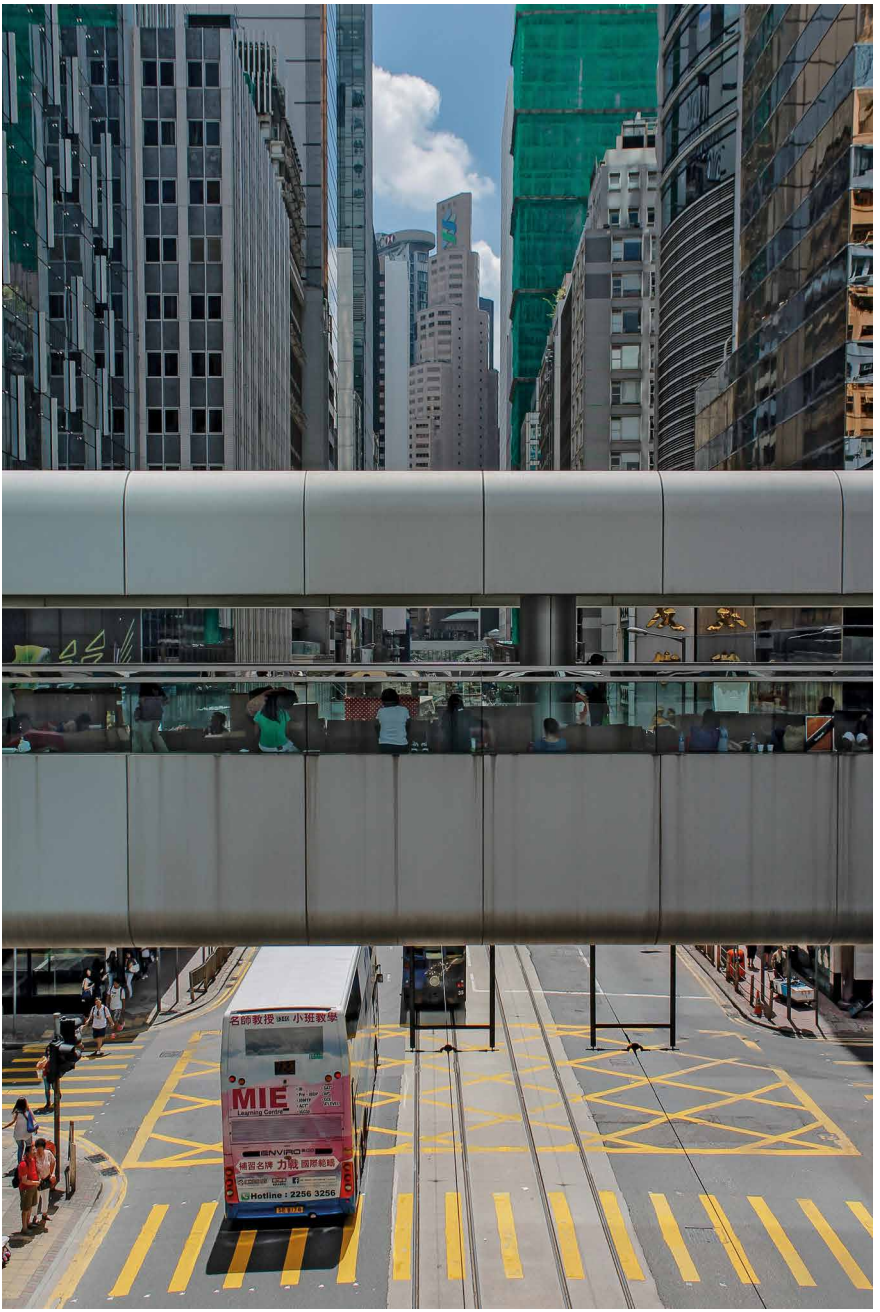


Fig.14
Elevated pathway crossing the street, Central, Hong Kong (photo by the author)

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