Air Quality, Social Space and Urban Form: A case study of Mong Kok railway station

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Abstract

This paper will describe research in the urban morphology of Hong Kong and explain how it was translated into design guidelines and principles to be applied in developing the area around railway station in Mong Kok. The area of study is currently zoned largely GIC and is occupied by railway station, schools, government offices, transport interchange and a small area of commercial activity. Compared to areas immediately adjacent, it is underused, very inaccessible, contributes little to the community and forms a significant barrier to more effective rail transport. While Mong Kok is a vibrant and colourful sector of Hong Kong, there are significant problems in air quality, lack of public space, under provision of community facilities and a failure to support the demographic profile from youth to elderly. Mong Kok is also one of the densest places in the world. In such an over-constructed area, there are few opportunities of additional land to provide such essential facilities. The site has potential to contribute broadly to an improvement in the quality of life in Mong Kok but cannot be realised if the development proceeds under current prevailing practices. Studies have identified that pedestrian infrastructure is a crucial element for economic vitality of the area, quality of life and proper functioning of Mong Kok station; although pedestrian overcrowding exists within Mong Kok, there is limited pedestrian movement in the area around railway station. The paper will identify guideline's opportunities and illustrate what might be done.

1. BACKGROUND

In considering the nature of future rail transportation in Hong Kong and its connection to the city, we needed to examine alternatives to the status quo. Such exploration of alternatives can be conducted in several ways, using sociological, architectural, or regulatory frameworks. It is clear that established Western theories of architecture, such as towers in landscape (Le Corbusier and Etchells, 1971) legibility (Lynch, 1981), new urbanism (Duany et al., 2003) and figure ground (Ceen and Nolli, 1991) are ineffective in analyzing and guiding design strategies. This study proposed to initiate an examination of future relationships by examining future forms. The methodology that was employed was to embark on a morphological analysis of high density urban development, recognizing that Hong Kong is not only a three dimensional high density environment but one that works extensively in the fourth dimension, a dimension that relies on transportation networks.

1.1. Objectives

The aim of this research was to develop new morphologies supported by theoretical background, which were tested on specific site. It was assumed that existing railways development can contribute more to the community and to the urban structure of the city. Although very beneficial to the community, railway lines and stations consume valuable urban land and cause damage to the environment by disrupting connections and introducing pollutants such as noise, often leading to disruptive negative impacts on the city structure. As railways seek to become more economically attractive modes of transportation, stations are seen as means of generating income for the railways but the question of the lines and urban connectivity are not addressed. Our research tried to look for alternatives. In essence, we were asking the questions “Can we create space instead of consuming it? Can the railway station contribute more to the community than just being a transport node? Can we make railway station more profitable and more attractive?”

1.2. Methodology

Unlike engineering or medicine, architecture and urban design are best developed through action and projecting possible futures (Moudon, 1997). Such futures need to be evaluated, not only through subjective experience but also by way of rigorous analysis. Design, however, is such that quantitative criteria are inadequate for all aspects of evaluation. Thus, we proposed to combine rigorous systematic evaluation with prior experience and community discussion. In our

strategy, we had employed morphological studies to drive the rigorous analysis of urban form and as a tool to examine cause and effect in design.

Urban morphology, which started off as a branch of geography, is increasingly an interdisciplinary field since the urban experience is the result of many factors, such including economic, architectural, meteorological, cultural, political and sensorial. It was therefore crucial that our research involved academics and professionals from different fields. In a project of this scope and budget, it was impossible to examine all factors from first principles or experimental positions; we have therefore included members with a depth of experience in both research and in application in their own fields. One of the most important parts of morphological studies was to establish a solid database.

1.3. Site

The site under consideration was that on which the KCRC Mong Kok station is located, bounded on the north by Prince Edward Road, the west by Sai Yee Gai, to the south lies Argyll Street and to the east is Diocesan Boys School and Kadoorie Hill (see Fig. 1). The site is steeply sloped from a lower elevation to the west and higher on the east. The station is located well within the site boundaries.

Fig. 1. Site location

Mong Kok KCRC Station provides a third railway entry point on the curved and contour-generated KCRC line. This is separated from the main commercial and living area of Mong Kok by a large but relatively slender strip (500m x 60-80m) of land occupied mostly by schools and government buildings. It offers limited access to the public and is consequently a relatively quiet area and a barrier between the station and vibrant Mong Kok - crossed at only one point by

a route that is neither easily read nor particularly pleasant to use. KCRC Mong Kok is also a 'single-loaded' station in that there is direct public access to the west side only. The community potential for this site is not achieved; improving this and air quality was one of primary goals of the proposed changes.

1.4. The Sustainable City

While Hong Kong may not be sustainable today, its energy footprint per person is comparatively small for a substantial city. On many metrics, the city is already significantly more sustainable than any other "world city".

A sustainable city is usually characterised as one that has high densities, mixed uses and an efficient public transport system that encourages walking and cycling (Burton, 2002; Newman and Kenworthy, 1999; Breheny, 1997, Karakiewicz, 2005). In this regard, Hong Kong is well ahead of other cities, with densities that support a complex and richly layered transport system; however high density is often misunderstood. It is typically being understood as census profiles of residential occupancy. Such densities will not support viable transportation systems. Density is effective only when it is developed on the understanding of a four dimensional metric, reflecting not only habitation in a three dimensional space at one particular time but used to describe occupancy throughout the diurnal cycle (Karakiewicz, 2004).

Sustainability is only possible when density is predicated on economic robustness, and that in turn is based on a diversity of functions and cultural vibrancy. Density does not in itself directly imply or generate diversity. No concentration of residents is sufficient if diversity is suppressed or thwarted.

"Only open systems are capable of developing dissipative structures, therefore any complex systems are capable of complexification and differentiation, and hence diversification. Diversity is therefore the presence of open systems. Such systems thrive on the borderline between order and chaos. They are ordered complexity, and need constant interaction with their surroundings. If closed off, they just die (Arida, 2002).

Underlying sustainability must be systems of diversity, a diversity supported by a flexible environment; therefore flexibility is one of the conditions of urban life. In our analysis, and supported by empirical observation, older sectors of Hong Kong appear to work in very sustainable ways, yet newer sectors that have been carefully zoned and allocated are less vibrant.

Although Hong Kong could be still consider as a compact city, this situation may not last that long. The desire for lower densities results in the consumption

of large areas of land. A failure to integrate increasingly specialized planning ordinances lead to discretely single use zoned areas with conflicting intents conspire to make Hong Kong look like just another city, no longer the vibrant world city to which we aspire. The design of Hong Kong is undertaken increasingly by different specialists addressing their own particular issues. For example, the Road Ordinance addresses the provision of roads, the rail ordinance railways, the planning ordinance addresses built form; yet other ordinances focus on water, electricity, sewers and rubbish disposal. Each of these ordinances is optimised to its particular focus and each simplifying their own goals in a reductive and singular way. As the result a lot of opportunities are lost.

Current urban developments in Hong Kong rest upon a number of assumptions and within established constraints. New urban developments replicate these assumptions and the modus operandi of urban development in Hong Kong in such that the constraints continue. However cities are made up of possibilities and tendencies not physical certainties (Arida, 2002). Cities also function in a myriad of ways, many unpredictable and unplanned. What is necessary is to plan infrastructure to support the unplanned diversity of a successful city.

1.4.1. Computational support

In order to fully understand three and four dimensionality of Hong Kong our research used Digital Project software which is part of CATIA software developed by Gehry Technologies (see Fig. 2). Digital Project enabled us to develop bottom up approach, in which we specified the interactions and relationship between parts. Using these components and data, we were able to engage with parametric design methods to explore conceptualization of these relationships through unpredictable outcomes. Parametric design focuses on developing relations between data and artefacts, developing relationships between these components such that the resultant system adapts to changes. Therefore the initial part of the research, as mentioned before, was to establish a solid data base and understanding of the components and their relationships.

2. A NEW ROLE FOR THE STATION

Urban infrastructure, especially urban transport, has been added to cities over the time as a major element in promotion of urban efficiency and safety, facilitating exchange of goods, and therefore improved city economics. Today, however, urban transport is increasingly seen as threat to urban health, safety, economic efficiency and quality of life (Nadis and MacKenzie, 1993). Urban transport, in particular, has a great impact on community by its way of supporting accessibility and mobility. The effect can be both positive and negative; effective

transportation enables people to live in pleasant environments and commute to well pay jobs. Inversely, the alienation of low income urban communities and the threats of culture dependant on can result from inappropriate transport policies (Appleyard and Lintell, 1981). The direct relationship between transport systems and urban form has been the focus of substantial research (Newman and Kenworthy, 1996; Newman and Hogan 1987). It could be summarized that different transformation systems produce different types of the cities and therefore places and spaces within them. The forms of the modern cities are therefore subject to modes of movement and transportation, namely, walking, mass transit, and personal automobile. Since 89% of Hong Kong relies on public transport it follows that most of the population is a pedestrian a few times during each day. This relationship between pedestrian activity and public transport is one that must be maintained carefully.

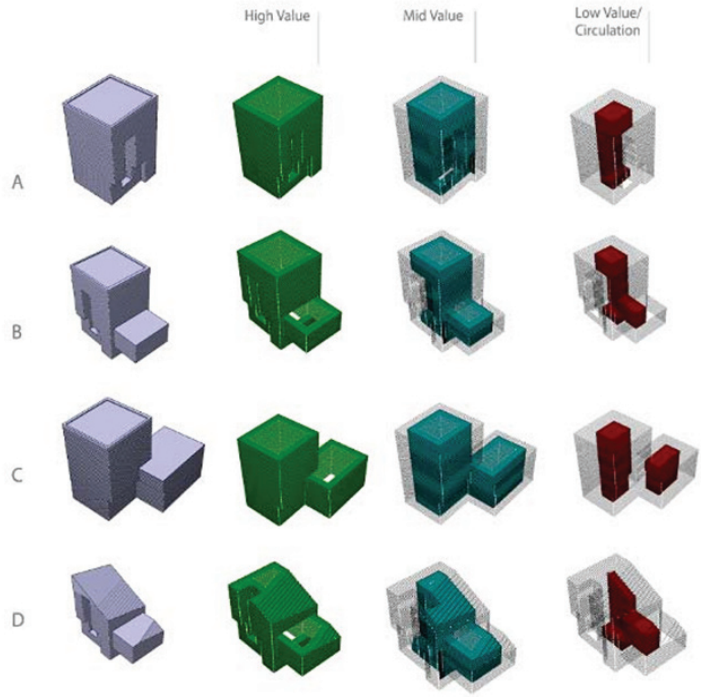

Fig. 2. Parametric modelling

2.1. A Framework for an "Interdependence Model"

This assignment requires an overall thought process that demands integration and resolution of these various and often conflicting considerations, and exhibits concern for the ***interdependence*** of the social, economic, physical, and institutional environments within which all urban development projects are planned and executed.

We sought inspiration from systems philosophy, an abstract, yet not unknown

philosophy to facilitate integrated consideration of all these prioritized concerns. Systems philosophy underpins systems thinking, which in turn informs the systems approach to design and planning of facilities, products, processes, organizations, and institutions. In essence two fundamental principles underpin systems philosophy, and hence are critical in *systems design*:

The first fundamental principle is that of the "***emergent property***":

'A system is a set of interrelated entities, of which no subset is not related to any other subset'. This means that a system as a whole displays properties which none of its parts or subsystems has. (Kramer & DeSmit 1997)

In much popular literature and common vocabulary this is also known as "synergy", an overused and often misunderstood concept.

The second fundamental principle is ***subsystem interaction and systematic behaviour:***

"A systems approach is the application of synthetic (i.e. "integrative") thought to systems problems.

This way of thinking is based on the observation that when each part of a system performs as well as possible, the system as a whole will seldom perform as well as possible.

This follows from the fact that the sum of the functioning parts is seldom equal to the functioning of the whole." (Ackoff 1974)

When each part of the system is optimized, or each subsystem is designed to be as efficient as it can be, it is likely that the system will under perform. This is known as ***"reductionism"*** in system design and planning. It is clear that reductionism can undermine the system's emergent property. Optimising road design, transport interchanges, or any other individual urban system is likely to result in underperforming urban area.

To be sure, there is a great deal more to systems philosophy, systems thinking and design, not least the difference between hard systems (mostly physical systems with predictable functional behaviour), and soft systems (mostly organizations where people form subsystems, and thus often with less predictable behaviour), and the phenomenon of complexity. It is clear that Mong Kok station may be viewed as an integration of hard and soft subsystems with a complex overall emergent property that transcends both. Systems design aims to achieve that emergent property to which all stakeholders subscribe. This demanded that we did not approach (re)design and (re)development of the station by an attempt to co-locate optimised parts (subsystems) such as

transport interchanges, development income, pedestrian movement, and all the other individual subsystems – this would have been reductionist thinking and would undermine the whole. Instead a vision was required of what it was that we wanted to emerge from the (re)design/ (re)development of Mong Kok station.

The implication of this philosophy for the assignment was clear: our objective was to propose a strategic approach to urban and station design that aimed to facilitate emergence of that interpretation of a redeveloped Mong Kok station that would satisfy the agreed and reasonable functional objectives of all legitimate stakeholders. This required that no one particular aspect of the redeveloped station was optimized at the expense of achieving a facility that was more than the sum of its parts.

2.2. Framing the Interdependence Design Model

From the prior research, we could identify a number of concepts that clearly demand attention in an "Integrated Model" design for any urban commuter railway station in an urban context. These were:

- density (social, physical)
- porosity (accessibility)
- connectivity (functional objectives)
- social and political (facilitates access for all to the locality and the city)
- transport functions (pedestrian/vehicular/railway and their interchanges)
- physical and social environment (sustainability)
- economic feasibility

The aim of the IDM (Interdependence Design Model) was to refine and restate all these concerns as functional objectives to be achieved in the strategic framework for Mong Kok's redevelopment plan.

Bringing the findings from the earlier research together with the principles of emergent properties and attempting to avoid reductionism, we concluded that the Interdependence Model must consist of performance-based goals, not prescriptive rules.

2.3. Potential Urban Design Problems in Mong Kok

An initial analysis of Mong Kok identified the following issues:

- air pollution

- overcrowding and congestion
- lack of accessibility
- lack of recreational space
- lack of services for elderly
- lack of the services for community

Clearly, each of these can be addressed yet the solution lies not in solving individual problems. When asked to come out with design for an area, designers (architects, urban planners) often try to correct the problems they found on site with an applied and direct remedy. Congested streets are turned into pedestrian zones; lack of connectivity is dealt with elevated pedestrian bridges; traffic congestions result in construction of new roads; overcrowding on the street level results in new policies recommending lower plot ratio. What we observe later, however, is that all the strategies adopted to solve the problems instead aggravate the issue rather than producing a solution; the response induces a negative feedback loop.

Cities, however, are not simple systems and direct solutions for individual issues fail. Complex systems have a multiplicity of interacting feedback loops and therefore cannot be treated the same way as a simple system. In order not to treat symptoms but to find out causes of the problem, we have carried out intensive research and data collection, which allowed us to have clearer picture about how Mong Kok works and what could be done to make it work better.

Mong Kok is a vibrant and vital part of Hong Kong, yet the KCRC station is isolated from the community, hidden on a parcel of land that, through its government functions, fails to engage with the surrounding area. With the isolation, the use of trains is reduced, a significant area of land is wasted and the continuity of the city is broken.

Popular perception of Mong Kok is that of pollution, crowds and few enjoyable spaces. The community is greatly under-provisioned in recreational space and facilities that enhance a quality of life. A world city is not supported by such an environment. There is a well established need to provide a healthy environment for children to study, exercise, socialized, and play; for elderly to participate in society; for residents and workers to enjoy the environment.

It is also important to provide environment for changes to occur and not just provide carefully designed spaces where carefully prescribe things can take place. What is needed today probably will not be needed in a year time. What was needed was a framework for a society to claim as its own. Within this framework we were able to address the issues of quality of life and density of habitation.

3. Design Proposal

The possible influence of the site development in the wider context of Mong Kok or even Hong Kong was of particular interest of our studies. However even though we have established problems associated with the site and surrounding areas, it was not our intention to solve these problems or provide missing facilities. We did not intend to cure symptoms but to find causes of the existing problem first. The main goal of our proposal was to create an environment where these and unforeseen future problems can solve themselves by constantly adapting to for ever changing condition of the site.

3.1. Air pollution

Usually when new development is proposed in Mong Kok a prominent issue is environmental impact. The problem is not trivial. As discussed previously one of the most significant problems in Mong Kok is air pollution. In Chapter 18 of Metroplan Strategic Planning Policies we read:

"... anticipated increases in RSP concentration are major concerns in Mong Kok. It should be noted that these findings relate to ambient air quality and not air quality at the road side location, which will be worse. Roadside air quality is influenced by surrounding buildings, which form...street canyons and limit the dispersion of pollutants omitted by traffic".

Previously, the reaction to such this problem has been the isolation of traffic to major feeder road surrounding large podium developments in which pedestrian activity is internalised. In Planning Department Guidelines, Chapter 10, *Development Parameters,* (10.1.6), we read that:

"... the Hong Kong 2030 Study Stage 3 Public Consultation was conducted in December 2003- March 2004. On the issue of plot ratio reduction, there have been recommendations to sub-divide large land lots into small lots, which will have the advantages of reducing overall building density, promoting design variation and avoiding large and standard podium structure. Similar recommendation is also proposed under the Feasibility Study for Establishment of Air Ventilation Assessment [3] with a view to enhancing air ventilation for health and comfort so important in a quality city."

From the above description it is clear that Government is now aware of the negative aspects of large developments, like the podium structures to the ventilation of the urban environment. However the government response it is simple close negative feedback system which does not take into account all the

other factors which may influence the air movement.

With help from Geography Department of Chinese University of Hong Kong, we carried out studies of air movement in six different parts of Hong Kong in order to identify other potential causes of the problems of air pollution in Mong Kok (see Fig. 3). The studies included path line studies from prevailing wind direction at pedestrian level, and velocity contours at different sections. We observed that another part of Kowloon, Tsim Sha Tsui, has a very similar urban form and grid orientation to Mong Kok. The air quality in Tsim Sha Tsui, however, is better than in Mong Kok. The density of bus stops and slow moving traffic exist in both places and in Tsim Sha Tsui the situation is often worse. So why pollution levels register on daily bases is always so much higher in Mong Kok?

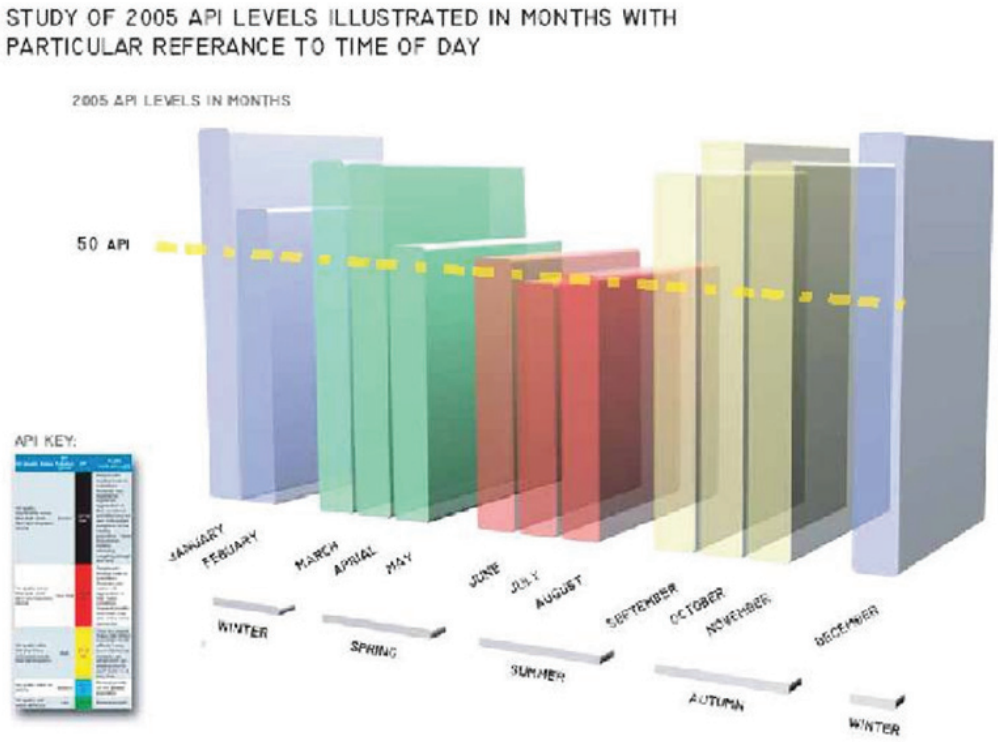

Fig. 3. Pollution in Mong Kok

Further analysis suggested that the reason behind was due to the barrier created by the station and government buildings around the station which prevented the prevailing wind from penetrating the urban structure of Mong Kok. Since the barrier created by the station and the government building contributes greatly to the air condition in Mong Kok design opportunities were identified. Breaking podium structure into smaller bits may improve air quality in some areas by providing wind corridors but only if the corridors are aligned towards prevailing wind direction. Also the same, if not better, conditions can be achieved by simply providing more porous structure. Having bigger development site could

be an advantage, since opportunity to develop more comprehensive form to stimulate the air movement is much higher. Bigger size developments also have opportunity of providing better recreational facilities and open space. Smaller grain at the street level is very important to be maintained, but this can be achieved in variety of ways not only by breaking bigger sites into smaller lots. With appropriate attention, the design of the KCRC station together with surrounding buildings can contribute to increasing air movement in the area to the west.

Typically, the tool used to control development is the plot ratio; it is thought that any new development will contribute to increase in traffic levels and therefore pollution, hence the restriction on plot ratio. In this site, however, conditions were different. Being next to the railway station and well connected by pedestrian walking infrastructure, it was possible to mitigate the impact of development in other ways. More importantly, the morphology of development on this site, even with increased plot ratio, can dramatically improve the air quality in the area. The question here was not to what plot ratio this site could be developed but what plot ratio could have the most dramatic effect on improvement of air quality in the area. Some flexibility in controlling plot ratio was therefore desirable.

The Kowloon Density Study recommends a two tier system:

"… by which the domestic plot ratio permitted as of right is 6, while large sites of 400 m square or greater this could be increase to 7.5, provided that development includes provision of car parking and loading and unloading facilities sufficient to satisfy HKPSG standards."

This clearly has a negative impact on keeping the smaller grain of the existing urban structure. The aim of the developers is to maximise site potential. Gaining additional 1.5 of plot ratio is enough of the reason to agglomerate small sites into one bigger development and as the result destroys the existing urban structure. Hong Kong 2030 Study promotes development of smaller lots but there are no incentives to make them attractive to developers.

Our proposal suggested breaking up the barrier and allowing the air to penetrate through the site and enter Mong Kok, therefore improving the air quality in the area. We have conducted various studies to develop the suitable form, allowing for high and low pressure zone which would stimulate air movement through air corridors. Our proposal also recommended that some tall buildings should be located in strategic positions on the site to further enhance the air movement.

Our design had to come up with the form that helps to promote air movement and dissipate it throughout the urban structure and a mix use that supports evenly spread traffic throughout the day. Provision of extensively developed pedestrian

walking system would also result in reduction in vehicular movement. Provision of great amount of greenery would contribute substantially to the reduction of pollution within the area (see Fig. 4).

However that would require significant area of the site to be designated to the green open space. Instead we proposed a "Green Wall" as a three-dimensional filter. The users of the "Green Wall" would benefit from a pleasant breeze. The temperature within "Green Wall" should be lower than other parts of Mong Kok through transpiration, but also due to water features. Cooler temperatures and breeze may encourage more sport activities to take place within the wall (see Fig. 5).

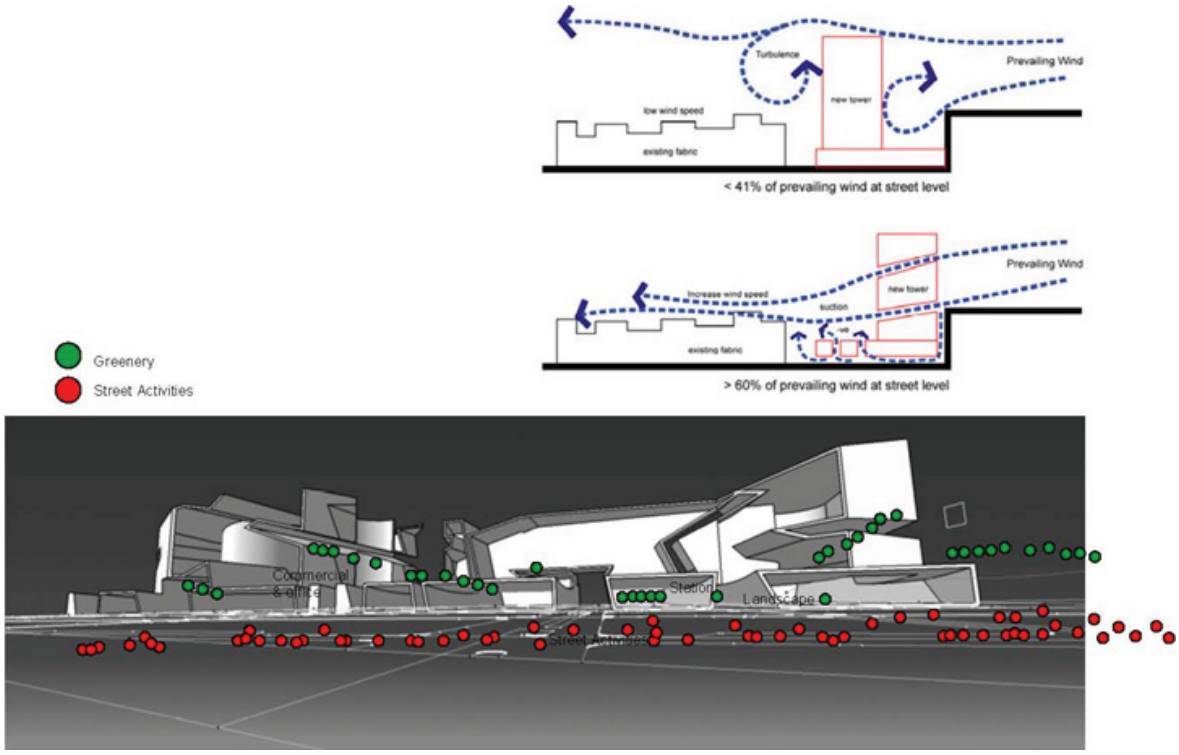

Fig.4. Possible form (Angus Ngai)

3.2. People as an infrastructure

The data which we collected during our research, made us to believe that porosity of the elevation could influence greatly the density of pedestrian movement, the speed, variety of activity and variety of interaction. We found out the residential density have very little influence on pedestrian density and pedestrian interaction. We also noted negative effects of overcrowding in some parts of Mong Kok.

Since our aim was to promote people as an infrastructure, we analyzed existing interaction on the site and how through addition of certain function and changes in porosity or form the level and type of interaction could change. Using bottom up approach, a specified lower variable, the speed of the pedestrian movement, was chosen to see how the effect reaches the top level and changes the whole

interaction system at the end of the process.

The area chosen for investigation was a circle with its central point at the Mong Kok KCRC station and radius of 500 meters. At first the area was divided according to the land use and streets into types of human interactions. What we were trying to observe was how different uses influence interactions. The next thing was to establish categories of human interaction and interaction index (see Fig. 6).

Fig. 5. Green Wall (Justyna Karakiewicz)

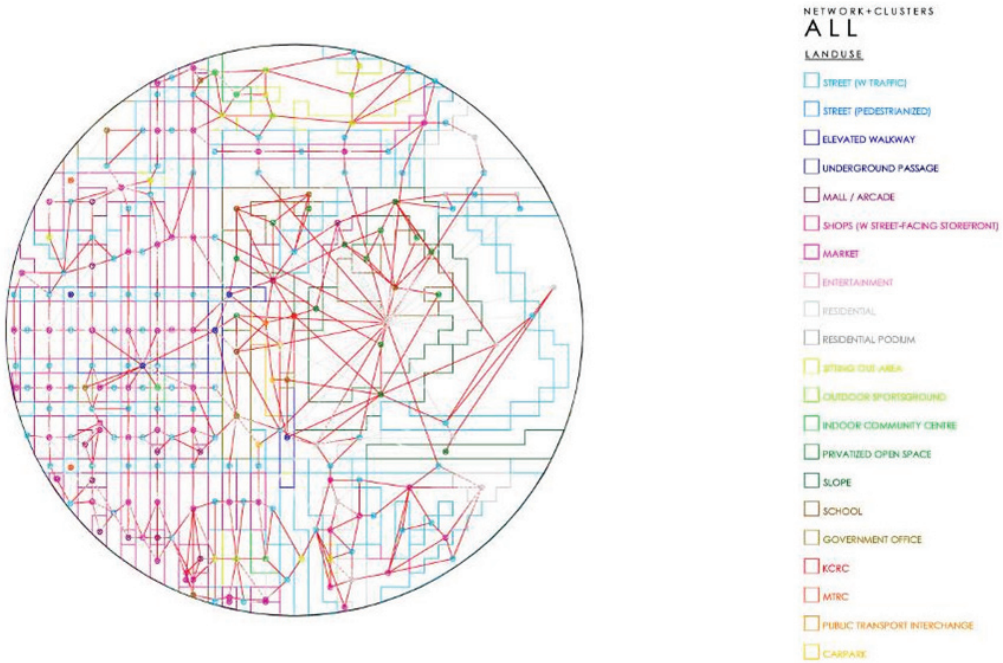

Fig. 6. Human interaction diagram (Becky Luk)

The results are illustrated below.

Pattern identification

A. Successful Satellite Linkages numerous activities present and successfully linked up by a street among them to form thick and busy linkage.

B. Unsuccessful Satellite Linkages fail to produce thick and busy linkage due to the small variety of activities

C. Linear Linkages activities are able to be carried out from one point to adjacent point by providing a large variety of conditions that allow activities to take place

D. Triangular Linkages different activities connect to at least 5 points to create heavy linkage. People can access different activities in different ways

E. Rectangular Linkages the rigid linkages only allow the activities to be connected to less than 4 points forming weaker linkages

F. Disconnected Linkages linkages are broken inaccessible private space or no further support for already occurred activities to carry on to the next point (see Fig. 7)

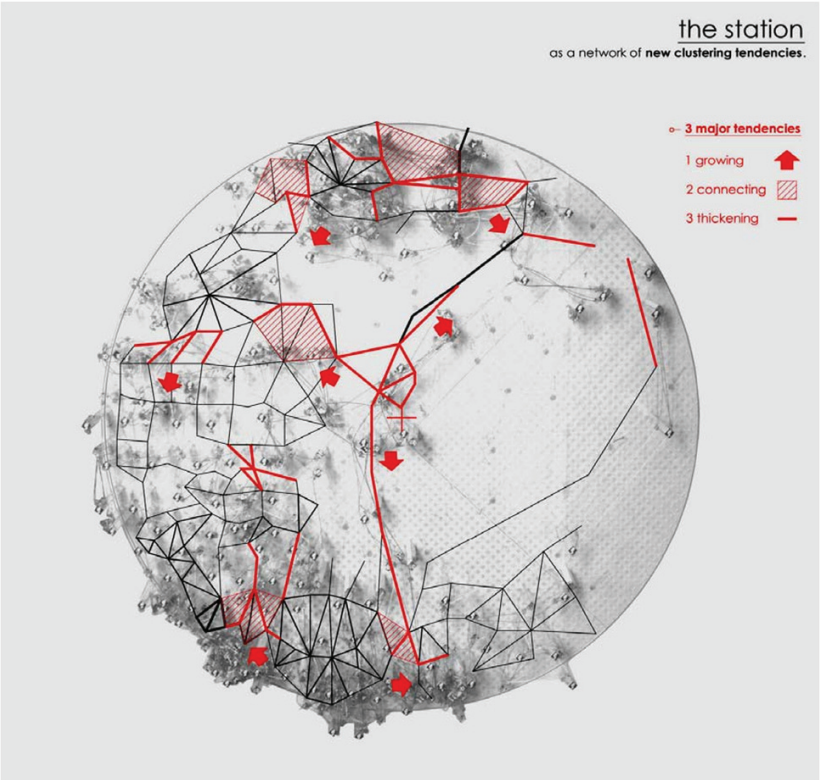

Fig. 7. Connectivity diagram (Becky Luk)

3.2.1. Dealing with Overcrowding

Mong Kok suffers from overcrowding of pedestrians in some areas, lack of pedestrians in other areas, and associated with it lack of connectivity between various parts. The situation in overcrowded areas is often dangerous for

pedestrians and pedestrian experience can be unpleasant.

The Metroplan Strategic Planning Policy, UF4, states that "…traffic-free pedestrian areas should be created or extended in major commercial areas containing shopping and offices". According to Metro Plan Mong Kok is a key candidate for pedestrianization scheme. Pedestrianization of some parts of Mong Kok may contribute to better pedestrian experience. Unfortunately this experience will be only limited to the small isolated islands and without proper connections to the other parts of Mong Kok. Neighbouring areas may not be able to cope with increase number of pedestrian on non-pedestrianized roads. Also the ever increasing traffic will be pushed to other areas and most likely will result in more congestion and increased air pollution. This is typical way of treating symptoms not causes.

In our research we sought an approach based on empirical evidence in Hong Kong. In this, we tried to identify interactions and processes that take place between parts at the lowest level and processes that allows the movement from low-level rules to higher sophistication. From the data on interactions, porosity and its correlations with pedestrian movement and activity, diversity in use, speed of movement; social mix, we tested different configurations that lead us to the "Green Wall" concept (see Fig. 5). The intention here was to provide a green wall as a pedestrian movement system that additionally introduces an idea of a "high-rise" park with community and sport activity 'within' rather than 'upon'. Thus the wall facilitates movement of people yet, if they desire, allows people to escape from over-congested and polluted areas and relax in a peaceful green environment. We established points within the existing structure which will benefit from increase porosity. Next we establish the strategic points at which to place the attractors and decided on possible connections. This in turn led us to accessibility problems.

3.2.2. Dealing with Accessibility

Although Hong Kong people can choose from a wide range of transportation modes, the pedestrian experience is limited and largely unpleasant when compared with other world cities. Hong Kong offers a hostile, unhealthy and often unsafe pedestrian environment. The answer to this problem is often to create elevated pedestrian bridges. Unfortunately the primary purpose of these bridges is simply to move people and to move them fast. Mong Kok has a good example of this kind of connectivity, the elevated pedestrian bridge that connects the active area of Mong Kok structure with the otherwise isolated station. This bridge accentuates the isolation of the station. The city structure

away from the station is one of the most vibrant and most densely populated in the world. However the closer you move to the station the less lively the streets become. Sai Yi Street, the first street running parallel to the station is nearly completely deserted. The GIC zone contributes greatly to this situation. Our research showed that the density of pedestrian movement can be correlated to porosity, mix-use, and the size of city block, but not to residential density. A larger number of pedestrians are found where the street edges are porous. The eastern edge of Sai Yi Street is not porous; not unsurprisingly we observe that there is little pedestrian movement on that side. This suggests that an extension of the existing city grain towards the station and an increase in porosity could drastically change and improve pedestrian movement, fundamentally linking the station to the city at several levels.

The bridge idea most likely came about from an analysis of the question of pedestrian access to the station and represents an optimised – *reductionist* - solution. The solution is uni-dimensional; the problem of enabling a pair of legs to walk unheeded from station to Nathan Road is addressed, but the needs of a city and a city dweller are not. A bridge can never achieve the weaving of the station back into Mong Kok. Our analysis identified a nested hierarchy of hard and soft subsystem functional requirements in which we can encompass the prioritized requirements of legitimate stakeholders. If the project comes to fruition, legitimate stakeholder consultation will be essential to identify concerns. These are best achieved by establishing a performance-based approach to urban development.

Without ensuring exciting and comfortable experience it will be very difficult to encourage people to walk or use trains as a mode of transport, since taxis, mini buses and buses provide a more extensive network and therefore become preferable mode of transport. This, in turn, will lead to more congestion, deteriorating air quality and, logically, the building of more roads to solve congestion problems. Our idea of "Green Wall" was used again, this time to illustrate how it can contribute to accessibility. We hoped that "Green Wall" will not only facilitate access to the station but also to accessibility within the wider area of Mong Kok.

It was our intention to create a strategy for pedestrian infrastructure which will take place above the railway line from the sea front all the way to Kowloon Tong (see Fig. 8). Provision of green pedestrian infrastructure, extension of the "Green Wall", would have dramatic impact on vehicle traffic. The green infrastructure was meant to connect divided communities across the railway tracks and provide communities with badly need facilities without consuming any land. It was proposed that the development would be developed in stages as opportunities arrive.

4. Performance-oriented Urban Design

Is there an alternative to the current KCRC railway/property development model? Narrowly interpreted, in principle this represents a mechanism to finance railway development. Broadly interpreted, the question raises the possibility of changing the relationship of a station to the city and hence the role of rail transport as a primary mode of transportation. To achieve this, however, we clearly need to move away from a prescriptive approach of legislating permitted solutions and move toward a goal oriented performance approach. In our research we found out that all the problem listed by us at the beginning (pollution, overcrowding, accessibility, lack of recreational space, facilities for the elderly and the community) are all interrelated and could be solved better if treated together than separately one by one. The question we posed when dealing with these problems was how station can improve the quality of life in Mong Kok, instead of giving an answer (solution) to each specific problem. We hope that our proposal moves beyond sustainability development towards positive impact development.

Fig.8. Green Infrastructure (Linear City Project)

The current development of the station and surrounding areas creates barriers to wind flow and contributes negatively to the air movement. Our research illustrated how different urban form and configuration can enhance air movement. It acknowledged prevailing wind direction and engages these to enhance the air quality in Mong Kok. Breaking out the barrier of existing development allowed prevailing winds to enter the urban structure and get rid of stagnating pollution. Further modelling of urban mass allowed us to control the speed of wind in different time of the year; allowing for more wind and

stronger breeze during the summer and more moderate breeze during winter.

The introduction of the "Green Wall" in front of the development, not only contributed to improved air quality entering the urban structure, but also managed to provide much needed recreational place within Mong Kok. Mong Kok has an identified shortage of some 19 ha of recreational land. Currently there is no opportunity to address this deficit as a result of high land values and a shortage of open ground in the neighbourhood. At the moment the policies and guidelines in place do not ensure the quality of recreational spaces. Open recreational spaces are designed according to strictly prescribed rules, which specify functions and activities, percentage of greenery to hard services, etc. As the result they all look very similar and the standard furniture and equipment installed in them make situation even worst. Even with clearly evident lack of recreational spaces, the spaces which already exist often remain deserted and not used for the purposes which were designed for. From our research we concluded that air quality in most of the playgrounds and recreational spaces provided by government is extremely poor. Accessibility is often difficult. Over-design and over-prescription make these spaces not user friendly.

Accommodating, more than required green recreational space, above the railway tracks will help to connect two separate parts of the city, increase the land value next to the railway tracks, provide people with extensive and continuous open space for relations and pedestrian connection to other parts of the city, and most of all will not required any land area (Fig. 9).

All these ideas can only be realised, however, if the planning approach is fundamentally reviewed and a process established that enables the integration of different goals, provides flexibility to support evolution in the city and facilitates diversity. This approach is one that recognises the interdependence of component systems in the city.

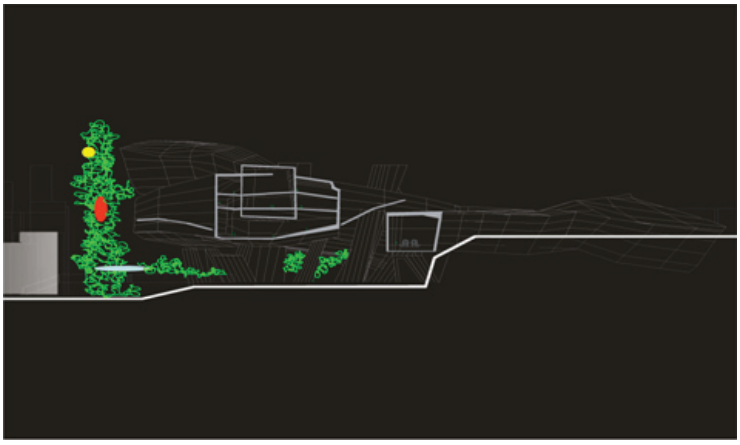

Fig.9. Possible form of station development (Kai Wah)

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نوعية الهواء والفراغ الاجتماعي والهيئة العمرانية: حالة دراسية لمحطة قطارات مونغ كوك

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الملخص:

يقدم هذا البحث وصفا لدراسة من التشكيل الحضري (urban morphology) لمدينة هونج كونغ وتوضيح كيفية ترجمتها الى مبادئ ومنهجية تستخدم لتطوير المنطقة المحيطة بمحطة قطارات مونغ كوك. تصنف المنطقة حاليا (GIC)، وتشمل اشغالات الاراضي لمحطة قطارات، مدارس، مكاتب حكومية، تقاطعات وسائل مواصلات ومنطقة صغيرة للنشاطات التجارية. وبالمقارنة للمناطق لها مباشرة، نجدها غير مستغلة بالكامل، صعبة الوصول وقليلة النفع للمجتمع وتشكل عائق لكفاءة حركة النقل بالقطارات. وبالرغم من ان مونغ كوك تعتبر منطقة حيوية وجذابة من هونج كونغ، الا انها تعاني من مشاكل نوعية الهواء، قلة الفراغ الحضري العام، ندرة الخدمات المجتمعية وعدم قدرتها لجذب كافة الشرائح العمرية للمجتمع من الشباب وكبار السن. كما انها من اكثر المناطق كثافة في العالم، وفي مثل هذا الوضع لا توجد فرص لاراضي اضافية لتوفير الخدمات اللازمة. والموقع محل الدراسة له امكانية لتحسين الوضع المعيشي بمونغ كوك الا ان ذلك لن يتحقق اذا استمر التطوير على اساس الانظمة السائدة حاليا. وتشير الدراسات الى ان البنية التحتية لحركة المشاة من العوامل الحيوية الاقتصادية ومستوى المعيشة والاداء الجيد لمحطة مونغ كوك، فالبرغم من ازدحام حركة المشاة في مونغ كوك نجد حركة مشاة محدودة حول المحطة. سيتناول البحث تحديد الفرص المتاحة لمنهجية العمل وتوضيح ما يمكن تحقيقه.