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Vitality Housing – A Total Solution to Service Transitional Social Housing in Hong Kong

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Abstract. In Hong Kong, about two percent of the population lives in squalid, overcrowded housing. Non-Government Organizations (NGOs) advocate that Transitional Social Housing (TSH), which broke the dichotomous housing supply (public vs. private) and can promote changes in Hong Kong's housing system, should be built to provide better quality shelters and supportive services to the underserved group. Scale of economy, efficiency, affordability and sustainability are all keys for success for the TSH program. In this regard, the paper proposes a beacon TSH service model called 'Vitality Housing' as a total solution to equip NGOs with the necessary knowledge to operate and deliver large scale of TSH in Hong Kong. The model suggests: (i) engaging NGOs in design processes to incorporate their needs, (ii) working with design, construction and housing management professionals to adopt cutting-edge technology to reduce life cycle costs, and expediting the TSH delivery, (iii) partnering with asset managers to develop a sustainable financing model for TSH development, and (iv) using a knowledge sharing platform to transfer property development and management knowledge to the NGOs. This model can help local NGOs to learn more efficient approaches to operating TSH based on their expertise in providing social services for the poor.

1. Introduction

Housing shortage coupled with the scarcity of developable land has long been a social problem in Hong Kong. The inadequately housed often fall outside the social welfare safety net and suffer from poor housing conditions. According to the latest figures published by the Hong Kong Government, a total of 450,000 housing units is required by 2029 to meet the current housing demand [1]. Of the 450,000 housing units, 116,000 units are expected to accommodate inadequately housed low-income families. Currently, some underprivileged families are paying as much as HK\$4500 per month (US\$577) for a unit of less than 70 sq. ft (6.5 sq. m) to live in temporary structures, non-residential buildings or poorly maintained subdivided units.

Transitional Social Housing (TSH) is a new type of social housing service operated by Non-Government Organizations (NGOs) in Hong Kong, aiming to provide decent, transitional shelter for these groups of people before they can secure more long-term housing. While the merits of TSH have



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increasingly been recognized in recent years, the NGOs' lack of professional knowledge and expertise in housing provision and management has, in fact, hindered prompt TSH supply. To empower the NGOs with the necessary knowledge to operate TSH, this paper proposes the 'Vitality Housing' model, an innovative total solution that aims to relieve NGOs from the technical burden of commissioning and delivering TSH. This will also ensure that NGOs can better focus on their forte in providing proper social services to the underprivileged group to maximize the social benefits of TSH as a form of social welfare. When the underprivileged groups are empowered with proper shelters and provided with the necessary guidance to tackle their life challenges, their well-being will gradually improve and, ultimately, help break the generational cycle of poverty. Our 'Vitality Housing' model concerns the engagement of the stakeholders, housing design and construction, financial feasibility, and sharing of operation and maintenance knowledge, which are elaborated in the subsequent sections. Furthermore, the model attends to the various United Nations Sustainable Development Goals (SDGs), including SDG 3 on Good Health and Well-being, SDG 9 on Industry, Innovation and Infrastructure, SDG 11 Sustainable Cities and Communities and SDG 13 on Climate Action, with an aim to partner with different stakeholders to create a more inclusive, safe, resilient and sustainable living environment.

2. Stakeholder engagement

The expansion of TSH delivery is premised on the engagement of a range of stakeholders. From August to September 2018, the Jockey Club Design Institute for Social Innovation (JCDISI) at The Hong Kong Polytechnic University organized cross-sectoral, multi-disciplinary TSH design workshops to deliberate challenges in TSH delivery in Hong Kong and to explore different options and possibilities to deliver a sizeable amount of TSH units in a relatively short period of time [2]. Three major issues were identified by the participants regarding the current TSH system.

First, there is no "one-scheme-fits-all" solution to TSH provision. The co-creation process, and the experience of design consultants in this detailed design scheme process, confirmed that TSH design and implementation is a highly complex process that requires trans-discipline, cross sector input. NGOs also advocated that they require significant input from experienced professionals from the building industry in designing, constructing, operating and maintaining TSH in order to execute projects and services in a sustainable manner.

Second, given that TSH is classified as a temporary use always permitted under the Outline Zoning Plan if it is for a period of five years or less [3], building structures that can be erected and dismantled in a relatively short time is key. Modular integrated construction (MiC) as a construction method that enables freestanding integrated modules is ideal as MiCs can be manufactured and assembled in the factory and come complete with finishes, fixtures and fittings [4], allowing swift construction and maximizing the time tenants can live in the units. To justify TSH as a value for money investment for society the MiCs introduced should be cost-effective, adaptable, durable and highly re-locatable. Moreover, the design would need to consider climate-related risks and structural durability to ensure that the TSH structure could withstand extreme weather events, such as typhoon, extreme precipitation and heatwave. This is especially important as the tropical climate may greatly increase the wear and tear of the structure. These considerations would also help to extend the overall building life cycle.

Third, the Government has set aside HK\$5 billion (US\$0.6 billion) to support NGOs in providing 10,000 TSH units for the next three years [5]. While the majority of social service based NGOs are interested to operate TSH as an additional service for their target clients, they are deterred by the high commitment cost to enter the market. They are also worried about the lack of skilled staff and stable, sustainable funding to operate the service. It is of paramount importance to enhance the coordination between the built environment and property management professionals, NGOs, TSH tenants and relevant stakeholders to build the capacity of NGOs to empower them to enter the market to realize and maximize TSH's benefit to society to help the inadequately housed.

Acknowledging these gaps, the cross-sectoral participants proposed a few design and policy solutions during the workshops to facilitate the delivery of TSH in Hong Kong to serve the underprivileged. These have been concretized into a few prototypes in which the 'Housing-First' model has been consistently

considered: homeless are first moved into decent accommodation and are provided with additional support that are helpful for the reconstruction of their lives. In addition, a list of common design and operational requirements for TSH has also been developed. These include the provision of bathroom facility and kitchenette in each unit, at least one prescribed window for light and ventilation, designation of communal facilities within the buildings, including multi-functional rooms and training facilities, communal kitchen and launderette, consideration of on-site employment opportunities, adoption of efficient, cost effective and highly standardized construction methods, barrier free access, efficient estate management operation and the building capacity of NGOs to independently operate and maintain TSH. The design and operational requirements identified in this user-centric design process are likely to help increase the adaptability of the units to different households, reduce production cost and enhance the sustainability and re-usability of TSH units for different target groups and sites. Our ‘Vitality Housing’ model has been developed drawing on the discussions and prototypes generated from these workshops.

3. Design concept

While it is difficult to develop a “one-size-fits-all” solution for the construction of TSH, the design requirements identified during the prototyping process have enabled the design professionals to develop guiding principles for a user-centric TSH that is comfort for tenants and would be relatively easy for NGOs to operate and manage. Drawing on the on-going discussion of innovative design elements introduced by the Hong Kong Construction Industry Council, the aspiration for creating a design that meets SDG 3, 9, 11 and 13 and the cutting-edge building technologies available in the private sector, we have come up with a list of design concepts that are feasible and compatible with the TSH shown in figure 1. These options are believed to be able to contribute positively to increasing the buildability, adaptability and sustainability of TSH.



Figure 1. Design concept of TSH using MiC technology.

3.1. Modular integrated construction (MiC)

MiC as a construction method generally consists of five steps: designing, seeking approvals, producing the prefabricated building modules, transporting the building modules and installing the modules onto the site. Based on this innovative method, buildings can be installed offsite, transferred to the

construction site, and connected to the foundation and other structural components. This construction method allows for simultaneous work on the foundation and the building body [6] and shortens the overall project delivery cycle.

Apart from the shortened construction time, MiC also has other advantages over conventional construction methods, such as higher construction quality, more efficient construction site management and enhancement of production management [7]. These advantages are especially important to TSH, as they provide quality assurances to the delivery of TSH. Moreover, the Buildings Department of the HKSAR Government has been actively promoting the use of MiC in new constructions by introducing the pre-acceptance mechanism that grants in-principle acceptance to individual MiC system/components or prototypes that meet the prescribed performances [8]. This mechanism could potentially speed up the approval process of TSH.

Other user-centric design considerations should be embedded in developing the MiCs to lower the customization cost at source. As the TSH will be inhabited mostly by those who require additional assistance, such as elderly or persons with disabilities, barrier free access requirements should be considered in the design of MiC units, and the TSH complex as a whole, to create a TSH that enables health living and well-being. This will facilitate greater independence of not only persons with disability and the elderly, but also people with other forms of physical infirmities or limitations, such as pregnant women or families with young children [9]. Prefabricated communal kitchen and launderette facilities can be installed on alternate levels to reduce the operation cost of the NGOs and promote social co-existence amongst tenants. Nonetheless, in order to create a sense of community among future TSH tenants, a dedicated multi-purpose community facility is proposed. The multi-purpose community facility enables the NGOs to host different health and wellness activities that could enhance the well-being of future tenants and build the social bond of tenants. Supporting amenities (e.g. community kitchen and health clinic) could be installed in the multi-purpose community facility and generate local employment opportunities.

3.2. Climate Resilient Design

Extreme weather events, such as typhoon, extreme precipitation and heatwave occur frequently in Hong Kong. Extreme weather events affect the durability of buildings and interrupt the supply of electricity [10]. TSH design without the consideration of climate resiliency are prone to a higher chance of structural degradation and service disruption when the building comes into full operation. As a result, it minimizes the comfort level of the residents and could create anxiety when building services are disrupted in extreme weather events.

Although climate resiliency was not identified as one of the key design and operational requirement in JCDISI's prototyping process, climate resilient features are embedded in the 'Vitality Housing' model in view of its importance in modern day building design and providing a durable, sustainable, functional and reliable residences for tenants. Climate resilient features that are proposed in the design include panelized envelope system for the building façade and stand-alone power system consisting of photovoltaic panels and battery storage system.

The panelized envelope system and stand-alone power system are proposed over other features because of their reliability, cost-effectiveness and adaptability to the local's condition. Assuming in a likely scenario in Hong Kong where typhoon knocks down the power grid and damages part of the TSH facade, the two features would then be able to serve their functions when the stand-alone power provides limited supply of electricity for the residences to sustain their living before the power grid is fixed. On the other hand, as opposed to replacing a large extent of the façade, only the damaged portion of the façade would be replaced when the panel system is in place. As a result, reduction of cost, time and resources on maintenance can be expected for both the NGOs and the residents of the TSH.

3.3. Smart building management system

One of the more important operational requirements identified during the JCDISI's prototyping process is the need for efficient estate management operation to reduce the NGO's burden in managing the TSH

complex. A smart building management system is proposed to serve that purpose. From an operational management point of view the smart building management system helps maintenance staff to control, monitor and manage different building service installations installed within the premise under a single control. Moreover, the system adds significant value to the tenants as the system doubles up as an information portal and could increase their standard of living. Notably, utilities costs will be transparent compared to subdivided flats and they could monitor their use more effectively. Additional services such as paying rent and utility charges via the portal, checking the availability of launderette facilities, booking the communal rooms and requesting for household repair services can also be set up on the platform.

4. Construction database

One of the requirements identified during JCDISI's prototyping process is that the TSH construction methods need to be highly standardized to increase cost effectiveness and shorten the project delivery cycle. Construction methods that meet this requirement could effectively enhance the building quality and delivery schedule of the TSH, thereby allowing the TSH to be supplied to the market at a sustainable pace.

To complement with the requirement for standardized construction method, a centralized construction database could be introduced to allow different stakeholders to collaborate, configure and adopt TSH configurations based on several standardized design scheme approved by designers. Since the TSH layout and material options on the database are highly standardized, contractors would be able to make more accurate estimations on the material quantities, labors and resources needed to construct the TSH no matter how the NGOs configure the TSH design. This increases predictability in the construction process and enables the TSH to be delivered more efficiently and effectively. As for the NGOs, they could utilize the standardized construction data to make more informed decisions on the configuration, project delivery timeline and costing of the TSH before the design is finalized for construction. By empowering the NGOs with the necessary construction data to make informed decisions prior to construction commencement, the possibilities of disputes, variations and delays during TSH construction are expected to reduce, enabling a more predictable project delivery cycle.

When the market has more demand for the TSH and its construction data, the functionalities of the centralized construction database could be expanded to include technology such as Building Information Modeling (BIM) and blockchain. These additional functionalities allow designers and contractors to make continuous improvement on the standardized TSH design based on experience acquired from preceding projects and new building technologies made available in the market. It also enables for more comprehensive construction data to be presented into the standardized TSH design and thereby allowing NGOs and contractors to better optimize the delivery schedule and costing of the TSH.

5. Financing model

Sustainable investing and green financing have been gaining momentum in recent years. From 2016 to 2018, the global growth of sustainable investing has increased by 34% [11]. At the same time, it is the intention of the HKSAR Government to make Hong Kong a fund-raising hub for green projects [12]. In view of the vast amount of funds dedicated to sustainable investment and the HKSAR Government's keen support for green financing, this paper advocates that TSH be financed through sustainable investing with participations from both the public and private sector to provide a steady funding source for TSH developments. This is particularly important as it is anticipated that TSH will be an indispensable social good in the long run to help the inadequately housed and those on the Public Housing Rental queue. More resources should be made available to NGOs to enable them to operate and scale up TSH operation as a social measure to improve the quality of life of the inadequately housed and reduce intergenerational poverty.

A public-private partnership financing model is shown in figure 2, with an aim to tackle the issue of scalability identified during JCDISI's prototyping process. Under this financing model, investors could set up a pool of investment fund to match the total amount of the Government grant dedicated to the

NGOs for TSH construction. NGOs would make use of the additional investment funds to scale up TSH provision.

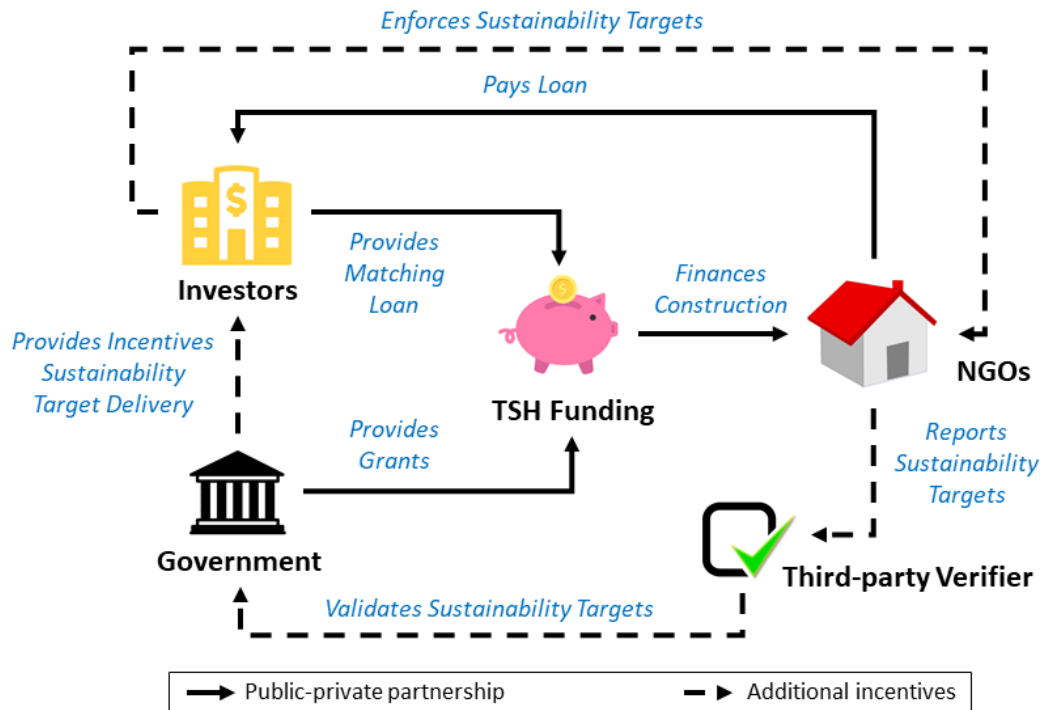


Figure 2. Financing model of TSH.

Under this financing model, the investors are expected to bare relatively low risk because the Government grant would serve as a guarantee in case the TSH loan defaults. Moreover, with the current TSH module being designed to have a life cycle of 60 years and TSH generally being given the right to occupy land loaned by private developers for a period of not less than 7 years with possibility of extension [13] [14] [15] [16], it is possible for the loan to be paid off through a stable stream of fixed income generated from the rental of the housing units and associated community facility.

As an additional incentive to enforce the private sectors' participation in TSH development, the Government could consider providing incentives, either in the form of providing additional coupon rate for the matching loan or tax reduction for the investors who make the effort to ensure TSH is delivering its social and environmental targets. A comprehensive impact assessment on the achievement of sustainability-focused targets, such as TSH delivery time, improvement in TSH tenants' household income, the reduction in utility consumption and the number of tenants with better education attainment, can be implemented throughout the financing cycle to evaluate whether the TSH is creating added value socially and environmentally as a benchmark for good NGOs' performance. A third-party verifier could also be hired in the process to provide a fair assessment of the achievement of targets. Upon verifying the result, the Government would then pay incentives to the investors based on the number of targets the TSH project is able to achieve to increase the sustainability of the TSH scheme in the long run. This will create a sustainable ecosystem where TSH, as a form of supportive housing that would be required in Hong Kong in the long run, will have a stable, diversified funding stream to continuously support NGOs to operate the service to serve the underprivileged. This would also reduce the financial pressure on the Government and allow them to re-focus their resources to scale up the production of Public Renting Housing.

6. Knowledge sharing

NGOs specialize in relief work and social welfare services and, thus, do not usually possess adequate knowledge to maintain the overall operational quality of TSH. Moreover, NGOs would likely have insufficient resources to hire external contractors to manage the operation and maintenance of the TSH complex. To equip the NGOs with the skills to servicing of the TSH, a web-based collaboration platform should be established to build the social capital of NGOs and interested parties in the operation and maintenance knowledge of the TSH.

The web-based collaboration platform should be freely access by property developers, professional facility managers, NGOs and any other TSH tenants who are interested in acquiring knowledge on property management. The different parties would utilize the platform to collaborate on operation and maintenance elements such as project management framework, house rules and allocation of manpower and resources to maintain the operation of the TSH. To provide good user experience and to allow the web-based collaboration platform to become a bazaar for knowledge exchange, modules on communication, learning and knowledge database should be included.

First, the communication module would enable the NGOs and TSH tenants with the capability to interact with property developers and professional facility managers and seek solutions on complicated operation and maintenance issues that requires the knowledge of a professional. Second, the learning module allows the property developers and professional facility managers to provide interactive trainings and workshops on the essential knowledge to operate, maintain and service the TSH, so that the NGOs and TSH tenants could learn the essentials to operate and maintain the TSH independently. Third, the knowledge database module would supply NGOs with different operational manuals and case studies to empower the NGOs and the TSH tenants with the know-how to manage the daily operations of the TSH facility.

With this web-based collaboration platform, it enables direct interactions and transfer of operation and maintenance knowledge from property developers and professional facility managers to the NGOs. On one hand, it allows the developers and the professional facility managers to fulfill their own corporate social responsibility by promoting and enhancing the disciplines and professions of facility management for the betterment of the society. On the other hand, the NGOs and the tenants could also benefit in this collaboration process, when the NGOs and tenants could acquire the operation and maintenance knowledge in this platform and self-manage the TSH. The self-managing of the TSH generates local employment and allows the tenants to learn the fundamental skills in operation and maintenance. All in all, the partnership between the professionals with the intellectual capital, the NGOs and the tenants with the human capital, coupled with the aid of technology, could certainly help to operate and maintain the TSH in a more resilient, sustainable and durable manner.

7. Conclusion

This paper has provided an overview of how the ‘Vitality Housing’ model is a total solution in the delivery of TSH. This housing model has been drawn from interactions with different stakeholders of JCDISI’s TSH workshop and has identified opportunities and constraints concerning the design, construction, operation and management of TSH. Based on the information provided by different stakeholders, sustainable design measures and construction methodology suitable for TSH have been proposed with the objective of enhancing the durability, adaptability and sustainability of the TSH complex. To further scale up the development of the TSH with existing resources, an innovative financing model based on sustainability-themed investment has been proposed to incentivize public-private partnerships in the development of TSH. Knowledge transfer through the use of a web-based collaboration platform has also been introduced to enable the NGOs and the tenants to acquire the necessary knowledge to self-operate and maintain their TSH complex.

The ‘Vitality Housing’ model has demonstrated that the collaborative engagement of different stakeholders in the early stage of the design process and collaborations between public and private sectors are key to facilitation of the sustainable delivery of TSH. With this collaborative process, the project team is able to devise a total TSH solution that is user-centric while meeting the objective of the

SDGs on ensuring the occupants' health and well-being, building a sustainable cities and communities and tackling climate change.

The Project Team is currently discussing with an NGO to pilot 'Vitality Housing' as a test case to finetune the total solution model. Users' perceptions, project management experience and costing may vary and could affect the compatibility of the model. The team is hopeful that the test would provide insightful lessons to develop a feasible solution to expediting the delivery of the TSH and contribute to a sustainable housing solution for Hong Kong and beyond.

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