Fostering Sustainable Buildings in Indonesia by Foreign Developer for Resilience

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ABSTRACT

The built environment has been confronted by the global climate change and human created threats especially terrorism in today's world. The society has a strong desire in advancing the sustainable design to resilient building to cope with these vulnerabilities reactively and proactively. Resilience is the capability to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance. In the context of built environment, it is to incorporate into the design of a building, aspects and features that allow the building to carry out its intended functions, now and in the foreseeable future. Fostering resilient building is a challenge especially for a foreign developer in the Indonesian environment, where the stakeholders have inevitably different culture, technology savvy, body of project management knowledge, mindset and approach.

The paper aims at sharing with the sustainable community from a foreign developer's perspective the experience of developing a Grade A+ office development in Jakarta to put such ideas into action, the project management strategy adopted during the project life cycle, difficulties encountered, how they have been overcome from the project outset since its inception in 2012 and the sustainable technologies employed for resilience. The development acquired the LEED Pre-certification Platinum grade in 2014, the first of its kind in Indonesia, and the Greenship Design Recognition Platinum grade certification. Besides, the project was one of the finalists under the New Building Category (Building Projects under Design) of the HKBGC 2014 Green Building Award and was conferred the Winner of the Best Green Development and a highly commended Best Office Development in the 2015 Indonesia Property Awards. The project was also the highly commended Best Green Development in the 2015 South East Asia Property Awards. To recognize the contribution in promoting sustainability to local industry, the developer was also awarded the Winner of the Special Recognition in Sustainable Development in the 2016 Indonesian Property Awards. It is due to complete in 2nd quarter of 2017.

Keywords: *design process, sustainable building, resilience*

1. INTRODUCTION

Since the publication of the "Our Common Future" by the United Nations World Commissions on Environment and Development in 1987, the society has been pursuing sustainability for nearly three decades. There is increasing awareness and demand of community at large for a better place to live and work. Most of the corporations have incorporated in their Corporate Social Responsibility (CSR) policy sustainable development in which environmental responsibilities is an important part of the CSR. Sustainable buildings has proliferated in the property development sector partly due to the developer's own CSR and to a larger extent, the demand of the market especially those multi-national corporations which are looking for office premises that are greener for meeting the demand of the company's CSR and aspiration of their staff. To attract prestigious tenants who are willing to pay reasonable rent, the office building has to be of high quality and sustainable.

There was forecast in 2012 estimating that around 3.2 million m2 of extra office space would appear in the central business district of Jakarta over the next six years (RICS, 2012). The estimation had indicated the expected severe competition for reputable quality tenants in the office market. With such competitive market and against the backdrop of the economic uncertainty in Southeast Asia, developers have inevitably to transcend the norm in order to compete with others for filling up the space within a reasonable timeframe. Thus, the main driver for a better world is the community at large which controls the market force while the government, professionals or technology are catalysts of the process. The property developers have to follow suit to maintain a lucrative business.

For the abovementioned reasons, it was already decided at the inception stage that the office development be targeted to transcend Grade A+ quality.

2. FROM SUSTAINABILITY TO RESILENCE

2.1 Sustainability

The establishment of the World Green Building Council in 2001 has provided an international property focus for the global sustainability agenda, with significant representation of membership across Asia (APREA, 2012). A range of green building rating schemes have developed since then in different countries to rate the design of buildings in resources conservation and efficacy, biodiversity, enhancing the indoor environmental quality for the safety and health of occupants as well as overall community connectivity.

The United States Green Building Council LEED rating system, initially developed in 2000, is the most widely used green building rating system globally. It has been used as a building standard by multi-national tenants with a deep commitment to sustainability and has established the basic framework for many green building rating systems around the world including in Asia Pacific (APREA, 2012). While utilizing the basic framework of LEED, countries have developed the detailed requirements to accommodate their local differences and put different emphasis on the elements. For example, Green Mark (Singapore) has higher weighting on energy while that of water is higher in Greenship (Indonesia).

2.2 Resilience

The built environment has been confronted by the global climate change and human created threats especially terrorism in today's world. Sustainability is all about protecting nature and the environment from human endeavours. However, there is need to protect humans from both the Mother Nature and human threats. As a result, resilience is the next evolution of sustainability (Peng et al., 2012). Hence, the society has a strong desire in advancing the sustainable design to resilient building to cope with these vulnerabilities reactively and proactively.

Resilience was defined by the United Nations Development Programme as the tendency to maintain integrity when subject to disturbance (Levina & Tirpak, 2006). RDI (n.d.a) described resilience is the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance. It is the capacity to bounce back after a disturbance or interruption. Through resilience livable conditions in the event of natural disasters, loss of power, or other interruptions in normally available services can be maintained. In the context of built environment, resilience means incorporating into the design of a building, aspects and features that allow the building to carry out its intended functions, now and in the foreseeable future (Alfraidi & Boussabaine, 2015).

Resilient design is the intentional design of buildings, landscapes, communities, and regions in response to vulnerabilities caused by climate change and power outages. RDI, n.d.a). Resilient Design Institute (n.d.b) listed out the design principles in a more macro scale. ResilientCity (n.d.) proposed building design principles for designing and constructing buildings in a post-carbon climate responsive building environment. Alfraidi and Boussabaine (2015) more specifically addressed building resilience design in the face of climate change under the categories of site, layout, structure, envelope, system and operation. Champagne and Aktas (2016) surveyed different literatures the principles for resilience to withstand external stressors that may arise over the buildings' lifetime for it to be truly sustainable. Based on the above sources, the principles of resilient building design are listed below:

- Meeting basic human needs including potable water, sanitation, energy, livable conditions, lighting, safe air and occupant health;
- Anticipation of interruptions and a dynamic future – adaptation to changing climate such as higher temperatures, flooding, earthquakes, solar flares and anthropogenic actions like terrorism and cyberterrorism;
- Diverse and redundant systems;
- Use low carbon-input materials systems;
- Maximising the use of day-lighting;
- Design for future flexibility of use e.g. modularity and standardization;
- Durability and robustness including strong building envelope;
- Systems that can be serviced/maintained with local material/parts and labours;
- Low energy inputs for constructability and ongoing building operations;

- Renewable energy for less reliability on grid power; and
- Water capture and storage, and usage reduction.

2.3 Assessment of resilience

The existing sustainability or green rating tools, such as LEED, BREEAM, Green Star and CASBEE can be used to assess whether new developments address both the adaptation and mitigation demands of climate change (Stubbs & Beckmann, 2013). Champagne and Aktas (2016) analysed the overlaps between resilient design principles and the LEED certification system and concluded that some of the principles identified have already been incorporated by the existing LEED rating system. To address the gaps, it was recommended to use future climate projections instead of historical data for Site Assessment and Rainwater Management credits, and to revise the Regional Priority credits with regard to flood, drought, water, pest, fire, storm and air to achieve regional resilience based on regional climate projections.

Therefore, it is necessary to integrate resilience into the sustainable building certification system and consider the gaps in light of the local environment to incorporate the necessary resilient features in the development project cycle.

3. LOCAL CONTEXT

A developer constructing building in a foreign country will inevitably encounter issues such as differences in culture, technology savvy, body of project management knowledge, mindset and approach. Strenuous effort is required to foster sustainable building in environment like Indonesia. It will be even more challenging if the target is to transcend sustainability to resilience. In Jakarta, public and sustainable transportation is almost non-existence making the selection of suitable site not been easy.

According to the local professions, Greenship was first launched in June 2010. There was lack of local experience in sustainable design and knowledge on resilience at the time of the project inception in 2012. There were only few developments that had been built with sustainable features and rated by LEED or even Greenship. It was not easy to find professional consultants and contractors who are environmentally responsible and knowledgeable on the requirements of sustainable building technology and the rating tools. For examples, knowledge of recycled contents in materials, concept of using regionally manufactured materials and construction environmental management plan and waste recycling appeared to be new to the contractors and material suppliers. Chillers optimisation control for energy consumption reduction and integrated building management system are not common in Jakarta. Materials that are environmentally friendly may need to be imported and can be costly because of taxation issue besides the transportation cost.

Knowledge on local authority approval process, technological practice on design, quality control and construction methodology as well as language barrier are also challenges which foreign developers have to face.

4. APPROACH TO SUSTAINABILTY AND RESILENCE

The ten Knowledge Areas of PMBOK® (PMI, 2013) were applied to manage the project and in particular to formulate the strategies as described in the ensuing paragraphs to overcome the hurdles. Figure 1 depicts the approach.

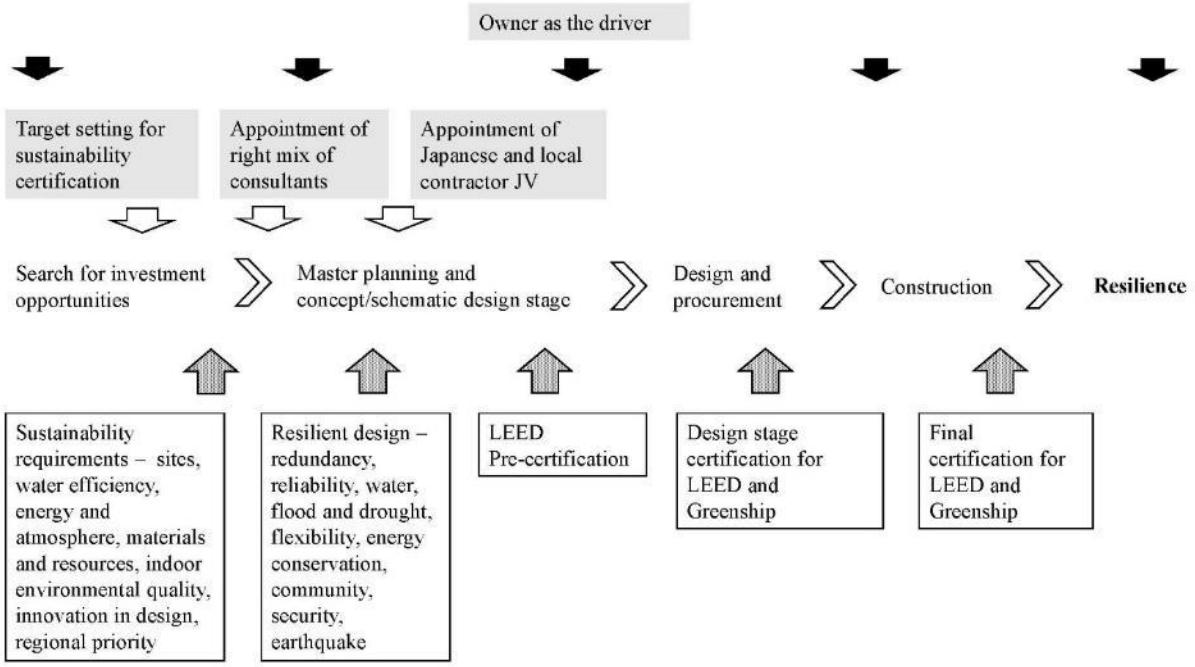

Figure 1: Approach to sustainability and resilience

Appointment of professional consultants with the appropriate mix of specialty – To complement the knowledge base of the local team on both local practice and authority approval process, and to top up the deficiency in knowledge base of sustainability in Jakarta, besides employing experienced local professionals, specialists were drawn from different regions for example, architect from Japan, sustainability consultant and independent commissioning authority from Singapore, wind tunnel laboratory from the State, façade consultant from Hong Kong and security experts from Dubai/London for design beyond the local standards.

Early appointment of the key professional team members – During the searching for investment opportunities, the local architect who is also the founder of the Green Building Council in Indonesia was appointed to assess the viability of each targeted piece of land and selection of suitable sustainable site which was located nearby the future mass transit station. The consultants were appointed at the very early stage and some even before the formalisation of the land deal. They included those for architectural (both local and overseas), quantity surveying, sustainability, mechanical/electrical, structural/civil, façade and property management. This has ensured the early incorporation of the design elements and the integration of the design for sustainability and resilience.

Ride on Japanese culture in construction – Japanese contractors are often giving the industry the impression of attentive to construction details, quality control and timely delivery. A joint operation between a Japanese contractor and the largest local contractor was appointed to construct the building to complement each other in delivering the project to meet the developer's expectation on time, cost and quality.

Early involvement of the main contractor – The main contractor was involved in the project as early as at the time of land plot searching to give advice on buildability, cost and time factors with due consideration to the locally available skill, materials and methodology and to familiar with the resilience building requirements.

Project management team of the developer as the driver of the process - The usual problem with professionals is that each member will only focus on their own specialty. This problem will be exacerbated for a multi-cultural team with different mother languages. However, sustainability and resilience need integration. The approach to circumvent is to have the project management team of the developer to reinforce the advice from the sustainability consultant and coordinate with team to ensure design integration in particular with the local context and the compatibility with local construction practice and methodology.

Setting target at project outset – The target of highest grade for LEED and Greenship rating was set at the outset of the project to ensure that the appointed team members were working towards the same common goals starting from day one.

Step by step approach for certification process – Since the local team has not much experience in the green rating tools, a step by step approach was adopted i.e. undergoing pre-certification, design stage certification and construction stage certification. This was purposely done for the team to get familiar with the process and the requirements as well as to ensure that the sustainability initiatives were incorporated in the various stages of the project development – design, tendering, construction, sales and operation.

5. HIGHTLIGHTS OF FEATURES

The development was pre-certified with platinum grade by LEED in 2014, the first of its kind in Indonesia and has undergone the design stage certification. It also acquired the Greenship Design Recognition Platinum grade certification. Besides, it was one of the finalists under the New Building Category (Building Under Design) of the HKGBC 2014 Green Building Award and was conferred the Winner of the Best Green Development and a highly commended Best Office Development in the 2015 Indonesia Property Award and the highly commended Best Green Development in 2015 South East Asia Property Awards. To recognize the contribution in promoting sustainability to local industry, the developer was also awarded the Winner of the Special Recognition in Sustainable Development in the 2016 Indonesian Property Awards. These certifications and awards have illustrated that applicable features of sustainability and resilience such as site connectivity, heat island mitigation, landscaping and biodiversity, recycled materials, regionally manufactured materials, daylighting application, energy conservation, low emitting materials, heat recovery, increased ventilation etc. were incorporated. So, instead of going through the features in details, the more salient ones with consideration are summarised in Table 1 below.

Resilience principle	**Features**
Redundancy and reliability	100% backup power by diesel generator; Dual electrical risers; Dual telecommunication lead in and risers; Spare chiller cooling capacity for future increase in cooling load; 100% WiFi coverage in common area for connectivity; 100% mobile network coverage for connectivity;
Water	Reduction in water use by using efficient water devices and sanitary fitments; Deep wells as backup water supply;
Flood and drought	Zero run-off design; Ground floor level at 1 m above the flood plain; Installation water gates to prevent backflow; Critical equipment on Level 6; Long soak pond to control the site run-off; Greywater and black water recycling; Rainwater harvesting; Reducing landscape water use using drip irrigation system and indigenous plants;
Flexibility	Modular and standardized design; Raised flooring; High floor to floor (4.5m) and high false ceiling (3.05m from the raised flooring); Variable air volume air-conditioning system integrated with lighting system; Coordinated ceiling and flooring grids, column spacing and façade modular size; Spare electricity and chilled water supply in each tenancy floor for future expansion;
Energy conservation	Waste heat recovery from the toilet exhaust; Chillers optimization control; LED lighting with daylight sensors in perimeter zone and motion sensors in staircase and toilets;

	VVVF lift system with destination control and regenerative braking; 25%, 30% and 33% saving as compared to baselines of LEED, Green Mark and Greenship respectively;
Community	Clear goals for sustainability parameters in tenancy lease, tenancy fit out guidelines and tenancy manual; Post occupancy evaluation; Measurement and verification plan to mitigate deviation of building performance;

Table 1: Summary of resilience features

Besides, earthquake and security are important issues for designing resilience in Jakarta. In 2012, Indonesia government introduced the new Indonesian Earthquake Regulation (SNI 1726:2012) which requires high-rise building to sustain standard seismic load to 'Life Safety' performance for withstanding earthquake occurrence equals to 8.5 Richter Scale. The building was designed to have the 'immediate occupancy' performance during Maximum Considered Earthquake (once in approximately 2475 years return period i.e. 2% probability of being exceeded in 50 years) with the Importance Factor of 1.25 which means that the building has been designed to withstand 25% more seismic forces compared to other buildings designed in accordance with the regulation. Instead of using seismic isolation or passive damping such as diagonal viscous damper or friction pad which are less appropriate for high rise buildings and reinforced concrete cast-in-place, composite structure with concrete-filled steel tube column and shear wall system was used.

A security risk assessment in accordance with ISO 31000 Standard for Risk Management and the associated Security Management Handbook and blast assessment were conducted to identify security hazards, threats and vulnerabilities facing the project in Indonesia. Protection objectives were determined against the identified medium and higher risk scenarios following the strategy of detecting threats before they can affect an asset, delaying the threats from accessing an asset, and allow enough time for a coordinated response to be deployed. Measures were incorporated to ensure critical assets have defences that will limit potential for prolonged outage of operations. It is not intended to reveal the details of measures in this paper because of sensitivity. Generally, the measures include physical protection, automatic access control, CCTV, automotive number plate recognition, intrusion detection, vehicle and personnel screening systems to mitigate high risk scenarios caused by bomb blast, petty/opportunistic theft, office theft, trespass, sabotage.

6. ONCLUSION

With the application of the PMBOK© Knowledge Areas on crafting the project management strategies by appointing the right mix of professionals and Japanese/local joint reputable partnership builder, setting the target at the outset of the project, developer' s project management team as the process driver and adopting the step by step approach for certification process, a foreign developer to develop sustainable building for resilience in environment like Indonesia could be made possible to meet the demand of the customer and market, expectation of the developer and aspiration of the sustainable community. The building was at the final stage of construction at the time of writing this paper. The challenge yet to face was to ensure that the contractor(s) would follow diligently the sustainability and resilience design intents for achieving the targets.

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