

BUILDING FOR THE FUTURE; A GLOBAL DILEMMA – REFURBISHING THE OLD, TRANSFORMING IT INTO HIPSTER

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ABSTRACT

If we look closely, innovations in construction technology nowadays are taking a diversion into promoting a more sustainable lifestyle. There is a developing trend of reusing and refurbishing the ‘old’ with a twist of technology advancement and turning it into hipster. For instance, it has been a worldwide trend of constructing buildings using used containers. Similar brilliant innovations are mushrooming worldwide and it is clear that the idea of building for the future must have the elements of sustainable development and green technology and most importantly must be future-proofed. Thus, the objective of this paper is to promote the idea of sustainable development emphasizing on construction of building using used containers. Two case studies based on actual examples in Malaysia will be presented which will accentuate their sustainable construction concept ideas without compromising on the aesthetic value, the construction technology, green innovation, and ultimately cost. This paper will also follow through one case study of project under construction to give a glimpse of process involved when constructing with used container. Through this paper, it is hope that the idea of sustainable development using refurbished used containers would curtail the dilemma of building for the future by incorporating nature and environmental aspect into consideration in the construction process and make the building future-proofed. Perhaps this idea is something that the Malaysian Government should be optimistic about for their future development plan of the country.

Keywords; Sustainable development, sustainable construction concept, building for the future, used containers

RESEARCH METHODOLOGY AND OBJECTIVES

According to Naoum (1998), “the data collected using the approaches of surveys, case studies and problem solving are called ‘primary data’ because they are obtained first hand. While the data collected using the desk study approach are called ‘secondary data’ because the data are obtained from other sources”. This study is a combination of both primary data and secondary data. Nevertheless, some of the primary data are freely available from the web sites and thus used to save time. The interview questions were emailed when the approached case study candidates replied to the earlier emails requesting to use their buildings as samples. Out of three emails sent, only one answered the interview questions. The data on another case study was obtained from secondary data resource that uses the sample building as their case study. Meanwhile, the data for an ongoing project sample was gathered through site visit and direct interview session where the progress is documented and analysed further to match the objective of this study.

The main objective of the analysis of the case studies is to prove that construction using used container is the next big thing in which if it is properly utilized and its criteria enhanced, it can serve as an alternative to Industrialized Building System (IBS). Taking the advantages of its modular design and strength, the construction using used containers can provide the better solution for building with limited resources or for post-disaster rebuilding plan. After all, its sustainability factors cannot be denied.

INTRODUCTION TO THE STUDY

In an era where building the tallest and grandest structure is the blueprint of a country’s development, many has forgotten the impact of this never ending race towards nature and our future generation specifically. While we are busy championing the so-called competition of the developed-nation, we have abandon the

need to preserve the natural resources for our children's generation. We admit that this technological advancement may have taken into consideration every aspect that would impact nature in the future, but when nature shows its true colours, none is spared and all is perished. What can we do for our construction industry today to safeguard our buildings and structures in the future? How can we ensure that our footprints today can sustain the global eco challenges? This is where the question lies. We are not able to compete with nature, but we can try to adapt and lessen the impact of global eco challenges to our buildings and structures for our future sake.

There are many research papers that describe sustainability as their main subject. Sustainability is a broad and complex concept with the idea that involves enhancing the quality of life, thus allowing people to live in a healthy environment, with improved social, economic and environmental conditions (Ortiz et al. 2009). A sustainable project on the other hand is designed, built, renovated, operated or reused in an ecological and resource efficient manner (Ortiz et al. 2010). In contrast with traditional construction approaches that emphasizes only on cost, schedule and quality performance of projects, sustainable construction expands performance goals to attributes such as low energy consumption, reduced air emission, and minimal waste generation (Vanegas et al. 1996). An ideal project should be inexpensive to build, last forever with modest maintenance, but returns completely to the earth when abandoned (Bainbridge, 2004).

According to J. Vijayalaxmi (2010), containers are an extremely flexible method of construction as they are modular in shape, extremely strong structurally and readily available. Although the units are simple, they are an effective way to cut costs, are naturally bug-resistant, do not rot and are hurricane proof, which is essential in a hot-humid climate. She also states in her journal titled 'Towards Sustainable Architecture- a case of Greentainer' that shipping containers are built to factory specifications and therefore have clear and unhidden specifications. Hence, construction using used shipping containers reduces the construction time for building crews. She added that the standard dimensions of a shipping container mean that it is an excellent modular unit; its inherent strength, weatherproof nature and availability makes it an ideal modular structural component or a whole standard accommodation unit. Nevertheless, since a large amount of energy is required to repurpose shipping containers, reusing shipping containers would save electrical energy, time and labour. Since steel is not a naturally compostable material, using shipping containers for construction provide an opportunity to reduce the negative impact on the environment. This is why construction using shipping container represents a very green building material and a form of recycling (Shipping Container Homes, 2009).

Construction using used container is indeed a good choice for alternative building system. Its ease of modification, flexibility in redesigning, economical possession cost, abundance, non-labour intensive and aesthetical value are attributes toward sustainability that will be proven from the case studies. Therefore, for the sake of our future generation, it is worth to seriously consider and adopt construction using used containers.

1. Sustainable Development

Development of a nation is not represented merely by having more concrete cities, tall sky scrapers or even having world record sizes of building or monuments. The real development of a nation is about co-existing with nature and the earth while sustaining the natural ecosystem. By doing so, it should be able to improve the quality of life for both man and nature as a whole (Buurps.com). This is the basic concept of sustainable development.

Environmental issues have become critical to the sustenance of our planet. Brundtland Commission, formerly known as the World Commission on Environment and Development (WCED) defines sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Wikipedia). This is important because our future is greatly dependent on our decision today. By adopting sustainable development concept, it means inculcating the process of maintaining human needs while preserving the environment for future generations (MPC 2010). It also means that humans must use the available resources efficiently so that they would not become extinct and will exist for many years to come.

The issue of sustainability has been duly highlighted in the Malaysian Construction Industry Master Plan (2005-2015) and is of significant importance to the Malaysian construction industry. On 24th July 2009, the

National Green Technology Policy was launched by the Prime Minister of Malaysia. Green technology is defined as the development and application of products, equipment and systems used to conserve the natural environment and resources which minimizes and reduces the negative impact of human activities (MPC 2010). Therefore, sustainable development is the development that uses green technology or gives priority to it. Sustainable development is pursued to enable humans to have a preferable future that includes cleaner environment, sustained level of economic development without excessive waste and pollution, and the protection of natural resources and biodiversity” (MPC 2010).

2. Sustainable Construction Concept

The practice of sustainable development must evolve from the earlier stage of conceptual idea. While the historical method positions nature as the last aspect in the overall construction process, there is now a need to make it as priority. In other words, the environmental concerns will be the centrepiece of the whole sustainable construction concept. Building sustainably has many merits but applying the concept is not easy as it requires changes to the old ways (Nazirah Zainul Abidin & Aini Jaapar, 2008).

The success of implementing this overall concept will require active participation of all parties in the construction development process from the inception until the handing over and ultimately the operation of the building. Atkins (2001) states that, delivering sustainable construction requires action from all of those engaged in the construction and maintaining of the structure or building including those providing design, consulting and construction services. Changing of mindset into one that can inculcate sustainable concept would require mega transformation in the overall perception and acceptance of all practitioners towards new products, ideas and practices.

Although sustainable construction has long been dubbed as green construction, the whole idea of it is not confined to the industry. The concept of sustainable construction is the enhancement of the green construction with the quality of life and ultimately the environment and nature at large. Sustainable construction on the one hand is about maintaining a balance between the human needs for buildings building as shelter and business operations, and infrastructure for a higher quality of well-being, and on the other hand, is about preserving natural resources and ecosystems on which future generation and we depend on. (Nazirah Zainul Abidin & Aini Jaapar, 2008).

Kibert (1994) at the First International Conference on Sustainable Construction held in Tampa, Florida, USA defines sustainable construction as, “creating a healthy built environment using resource-efficient, ecologically-based principles”. He further explains in his preface that sustainable construction involves commitments as follows:

- i) Economic sustainability – increasing profitability by making more efficient use of resources, including labour, materials, water and energy.
- ii) Environmental sustainability – preventing harmful and potential irreversible effects on the environment by careful use of natural resources, minimizing waste, protecting and where possible enhancing the environment.
- iii) Social sustainability – responding to the needs of people at whatever stage of involvement in the construction process (from commissioning to demolition), providing high customer satisfaction and working closely with clients, suppliers, employees and local communities.

Sustainability is a dynamic concept which requires decision makers to be flexible and willing to modify their approaches. To achieve sustainable construction, it is very important to balance collectively the basic principles of sustainability i.e. environment, economic and social aspects (Jamilus Md Hussin et al., 2013).

3. Building for the Future

To enable our present-day buildings withstand the ecological challenges of the future, it must have one important criterion that is to be future-proofed. What does future-proof means? According to Maria-Christina Georgiadou in her research titled “When Building for the Future Means What It Says”, future proof is the ability of the building or structure to respond to upcoming changes. Nowadays, too little attention is being paid to the long-term sustainability of a new building in a changing climate and the ever

unpredictable ecological challenges. She therefore believes that there is a need for a best practice of equipping present day building and structure with future-proofing element.

As an engineer, Maria-Christina explains that there is a need for a significant shift of the current industry philosophy of “build-it-now and fix-it-later”, into one that rather anticipate future trends in the earlier design development and construction process. In Malaysia, there has been an increase in the awareness of building sustainably. For instance, all government projects must incorporate a provision which requires 70% of the design factors to comprise industrialized building system or IBS. Nevertheless, focusing only on one sustainable element does not prepare the building or structure as future-proof. Nowadays, too many building or structures contain sustainable elements but for it to be future-proof, the whole concept of sustainability has to be considered. She concludes that many have underestimated or even overlooked the social and economic aspects of sustainability. Her statement is clearly in agreement with Kibert’s (1994) idea of what a sustainable construction should be.

All in all, it can be summarized that building for the future is when the overall construction concept or ideas are sustainably coordinated from every angle, be it from the design, economic, environmental or the social angle. Only then can we claim that what we build today is future-proof.

4. Used Containers

One alternative of sustainable construction concept is by reusing and recycling. Reusing means refurbishing old or disused materials for a new purpose that includes upgrading of, repurposing and bringing a new function to unwanted materials. For this particular study, I would like to promote the idea of sustainable construction and development through reusing and refurbishing of old and used freight containers. The idea of using shipping containers as a building component is by no means new (Sawyers, 2005). Construction using refurbished shipping containers has seen many successful examples around the world as this system presents a huge potential in the field of sustainable construction provided by the recycling of used containers (Bernardo et al., 2011). Repurposing cargo containers into homes is a sustainable construction practice where bulk of the structure are procured from recycled material and many design parameters of cargo container homes are parallel to those of standard home construction methodologies (Moore et al., 2015).

According to Nunes (2009), containers or freight containers are designed to carry and bear very high loads and are able to resist aggressive environments during a lifetime of 15 years and more. Shipping containers are highly durable as they are made of high-grade steel and are built to withstand the salty air and high winds of an ocean voyage (Vijayalaxmi, 2010). They can also be stacked up to nine units high (Griggs, 2008). Therefore, due to its extremely flexible method of construction plus the fact that the freight containers are modular in shape, extremely strong structurally and readily available, they are ideal for office, workspace and housing. They could also be used in disaster areas or areas of need and for key worker homes or student housings (Smith, 2006).

Many examples of construction utilizing shipping containers can be found worldwide and are mainly transformed into single-family and multi-family buildings, residences halls and dormitories, commercial building such as commercial hotels and backpackers lodge, schools, offices, restaurants and arts gallery. All these examples can be accessed in architectural literatures and websites and also by simply searching the World Wide Web. In Malaysia particularly, there has been a developing trend of this new building concept. Originally, used containers were transformed into temporary site offices and workers’ accommodation at construction sites. Presently, containers are also used to build hotels, homestays, housing units and hostels. Accordingly, this particular study refers to two (2) case studies in Malaysia that illustrates the successful construction of such building. Another case study will describe the process involved when constructing with these brilliant structures.

Case Study 1- The Kabin, Kuala Selangor, Malaysia

The Kabin is a unique container-type lodging unit with a smart modular concept, the only one of its kind holiday experience to its guests in Malaysia. Located next to Remis Beach and within the small idyllic historical and coastal town of Kuala Selangor, it is easily accessible via main highway to Kuala Selangor. Beginning its operation in late November 2014, the Kabin is a family-run business jointly operated by the owner’s wife, brother and father. The founder and owner of this unique retreat who wishes to remain

anonymous works as a consultant in the oil and gas industry. Having worked extensively at remote overseas locations such as Sudan, Myanmar and Turkmenistan, he was inspired by the wide usage of containers in the operations of his works. Some of the containers were converted into accommodation units which somehow triggered an idea to transform used containers into luxury accommodations unit for people to experience.

Location wise, the size of the proposed site to build The Kabin was not an issue as the population in Kuala Selangor is not as dense as Kuala Lumpur. Land is abundant and easily accessible by road. Therefore, apart from accommodation rooms, The Kabin also features a 50ft swimming pool, tree house, a café cum reception counter, BBQ place, multipurpose room and a karaoke room, all spread on the ground level (except for the tree house which was build higher). With maximum occupancy of 78 guests at any one time, the Kabin has 18 container-type rooms that can fit a maximum of two to six guests per room. Eight of the rooms are on the upper unit while ten rooms are on the lower unit. All rooms are uniquely named after cities around the world, e.g. Busan, Shanghai, Ho Chi Minh, Melbourne, Colombo, Vancouver and Rotterdam, to name a few. Apart from the rooms, the café cum reception counter, multipurpose room and the karaoke room were made from heavily modified used containers. Other recycled material that came into good use at The Kabin are drums for the BBQ pit.

The owner engaged a special contractor, the Triccoli Interiors; a niche contractor taking projects in small scale to design and carry out the construction works. The construction started off early 2014. The containers used to build the Kabin were a combination of 30 numbers of 20 footers and 4 numbers of 40 footers which were supplied by some companies in Klang Port Terminal. They were transported to site batch by batch with an average of three to four trailer trips at a time. Fortunately, the site is located approximately forty kilometres from the original location of the container supplier, thus enabling multiple trip transportation.

The containers involved in The Kabin construction were not factory fabricated as it would be too heavy to be transported and a foreseeable problem of fitting properly on site. Thus, the containers were transported to the site raw and all modification works were done at site. The used containers were heavily modified to create windows, bathrooms, etc. and all furnitures are custom made. The internal walls were insulated with layer of Rockwool for noise and heat. It took nearly seven months of construction before The Kabin notably stands as it is now.

Though the initial cost of purchasing the used container is considerably cheap; ranging from 6000 – 9000 Malaysian Ringgit (MYR) depending on its size and condition; the bulk of the cost being to refurbish and refit with an average modification cost from 40,000 – 80,000 MYR per container, depending on its size and fitting. On the basis that The Kabin is a temporary structure that can be dismantled and easily relocated, the owner has submitted the application for Development Order to the authority for approval.

The owner's long term objectives for The Kabin project are to promote compact living lifestyle, encouraging recycling and also for carbon footprint reduction. This project also aims to promote environmental awareness to the public and Government of Malaysia in general. With many sustainable ideas for the future, The Kabin is planning to utilize rain water harvesting and solar power. The owner also plans to build a big meeting room and conference room for The Kabin.

Case Study 2- Container Hotel, Kuala Lumpur

Located strategically in a central position of the city within the 'Golden Triangle' of Kuala Lumpur, the Container Hotel was built on quite a tiny land area of 5000 square feet or about 465 square meters. Due to land area, the owner, Ryan Loo who is also the Chief Executive of the entire Container Hotel Group, decided to use containers for the building structure covering all available space without compromising the comfort of guests. Containers were not the only recycled element; he also transformed concrete drain pipes into room modules. This Container Hotel is technically the first hotel built in Malaysia using recycled material as its main component. Adopting the concept of Kyosho Jutaku which means, "Living large on a tiny footprint, by building a nice and compact house utilizing only a very small space", Loo tried to create a structure that would have been appreciated not just for its facilities but also as a piece of art itself.

During the design stage, Loo realized that a 20 feet length was too long for a room size. He therefore cut the 40 feet container into three pieces, making rooms of about 4 meters long. The hotel master plan basically comprises 6 container double rooms, 7 pipe rooms on the ground floor and 3 container-dormitories on the first floor with a total built up space of 3500 square feet or 325 square meters that can accommodate a total

capacity of 50 people in 16 rooms. There is also a single 40 feet uncut vertical container which contains a staircase and the space beneath it acts as luggage storage for guests. With its door on top, this container also opens up to the water tank. The bar for this hotel is a 20 feet uncut container. A similar container above it provides for a common area. This module which is separated from the guest rooms is larger in size and accessible to both the guests and public.

The City Council took 2 years to grant approval for this first container hotel in Malaysia as the Federal Government did not have any reference on dealing with such application. The entire project design was completed when it was finally approved and hence construction can immediately commence. The inauguration was set for 31st July 2013. Except for the precast reinforced concrete pipe rooms, all rooms including the dormitories were prefabricated in the factory. These 7 pipe rooms, also known as the adventure rooms, took two weeks to complete. The transportation of the container rooms from the factory was made using 13 trailer trucks in total; 12 for the six double rooms and 1 for the staircase. After the completion of the concrete foundation works, the concrete pipes works and wiring works, the delivered container modules were then properly set in place and secured to the plumbing and air-conditioning systems. Corridors and rooftops were later assembled and installed on site. The entire work from the laying of the foundations to the complete installation on site took 2½ months.

The reuse of containers and drain pipes shows the desire to use recycled materials instead of building a new structure. Container rooms are made by the original external metal sheet, and interior insulation layer for noise and heat were made of fiberglass or Rockwool with 2 inches thickness. There are also other recycled components. For example, the flooring of the lobby is made from the wooden foundation of the railway tracks which have since been replaced with concrete foundation. The owner obtained these used wooden foundation from the contractor carrying out the track works. The toilets of the dormitories have a green feature; the water used for the sink is redirected in the top part of the water closet where the flush water is used for the next flush. The recycled materials used in the construction must comply with LEED.

The Container Hotel cost less than 1.5 million MYR, which is around 350,000 Euro. The 20 feet and 40 feet containers, bought from the shipping Malaysian company costs about 6,000 – 9,000 MYR and 13,000 - 16,000 MYR respectively. The lifecycle of these containers is about 10 -15 years. So basically the containers used for this hotel have reached their expiration period for shipping purposes.

The owner started this project to establish a strong base in Malaysia before planning to extend to South Asia. Apart from hotels, he also intends to build the very first container shopping mall (similar to London's Box Park). The discussion on this possibility is ongoing with the Council. Presently the owner is continuously seeking to learn and understand more on the trade of working with containers for hotels, recognise any issues and strive to improve or resolve them.

(All information are extracted from the book titled "Pop-Up Hotel Revolution: The Architectural Innovation About to come in the Hotel Industry" page 97 – 124, written by Chiara Butta, Joseph Di Pasquale and Paola Zatti)

Case Study 3- Development Project of Akademi Insan Prihatin Complex, Desa Surada, Sungai Ramal Dalam, Kajang, Selangor

This particular project was selected due to its novelty. It is entirely built from scratch with no paid labourers and nearly 90% of the materials and machineries involved are recycled. At the time of visit to the site, about 36 containers of 40 footers have been delivered and appropriately positioned. The owners of this project estimated about 200 containers, both 40 and 20 footers, would be required to build the entire building of 6-storey high. The cost of acquiring these containers alone is already 1,000,000 MYR. Another 1,000,000 MYR has been spent on other materials and machineries.

This project is finance entirely through benefaction either from the owners or from endowment for charitable purposes (*waqf*). Built on a land of approximately 1 acre, the original landscape was a dumping area for domestic waste. The owners progressively cleared the land and later decided to turn it into an academy with a view of making it a central academy. Due to the financial nature of this project, there is no time frame for completion; construction progresses steadily concomitant with financial adequacy.

A slight introduction to this academy; it is co-founded by 20 individuals with same mission and vision through cooperative efforts. These individuals dedicate their wealth and life to form this academy which they envisage to be a research and development institution focussing on moral development and Islamic civilization. The academy which houses orphans, abandoned children and teenagers shoulders the responsibility to groom its occupants to be a better and great generation that lead their life according to the peaceful teachings of Islam. The academy is now a proud home to 275 less fortunate children and youngsters. To finance their essentials, the co-founders initiate various start-up businesses from used-car sales, garages and workshops, used-items shops, clothing boutique, printing business and many more upcoming businesses. They successfully acquired the land from the income generated from these businesses and use it as capital to build their visionary academy.

This building does not use pile foundation. Each container is supported by two columns held by a raft foundation. The containers on the first floor are arranged close to each other to act as an additional support system similar to a load bearing wall concept. The building starts from the first floor onwards and upon completion all 200 containers will be arranged to form a 6-storey high building. The time taken to cast the foundation, erect the columns and deliver the first 36 containers to site took approximately 2 months. These containers were delivered in 2 days, one on each trailer trip. Containers on the first floor level will not be extensively modified to maintain its original strength. Notwithstanding that piling is not used in this project, the design arrangement for the first floor level which resembles the load bearing wall system will provide extra support for the additional levels of containers above it. Furthermore, the uniform size and shape of the containers allow them to be stacked up to a dozen numbers without requiring significant external reinforcements.

The original layout of the academy illustrates a building which comprises a hostel, classrooms, administration centre and storage area that can accommodate approximately 300 people. This project is not spared from many doubtful perception of the public, amongst others, from the usage of materials which are almost entirely recycled, the foundation of multiple storey building with no piling and the concept of used containers. Quoted from a review of a professional engineer on the construction concept of this building, 'the weld should be stronger than parent metal base. Thanks to "6013" which represent 60000 psi yield stress. There is only vertical static stress applied (topside load) and slightly horizontal dynamic stress occurs due to maximum 15 knot wind speed from west to east.' The column to support each container was made of recycled steel which is then weld to hold it together. It was then encased with concrete. The base of the column is a raft foundation with thickness of approximately 1 foot high above ground.

There are many obstacles waiting to suspend the construction of this academy. Nevertheless, if the authority grants the development order for this project, it will be a pioneer for ultimate green building and sustainable construction concept in Malaysia which emphasizes on all the factors of sustainable construction, economically, environmentally and socially.

5. Conclusion

From the review of the case studies, it can be concluded that used shipping containers can be the future for alternative sustainable construction in Malaysia. Celebrated worldwide as a cheap and easy way to provide pre-fab building, the modular design of containers plus their original strength obtained through internationally standardized (ISO) certification can be manipulated into endless number of configuration as they can fit together similar to real-world Legos. Cargo containers, when refurbished with flooring, insulation, air-conditioning, electricity, plumbing and other modern conveniences will result in creative green structures which only require a fraction of the energy, materials, time, labour and costs of construction.

The original specification of a container itself is robust. Made from weathering steel material, the container provides not only corrosion protection but also strength and a long life span. With the movement towards sustainable construction practices, the recycling and refurbishing of used containers for construction materials transformed an unused product to used product and provides a second life to them as functional building materials. Furthermore, used cargo containers are abundance in supply due to their limited functional life span as freights agents. However, since the nature of weathering steel is highly corrosive resistant, the containers possess a long life span.

Therefore, with the encouragement from the government to adopt construction utilizing used containers as the main structure, it will be beneficial from the economic, environmental and social aspects due to the practice of true sustainable construction concept. It is a win-win situation for all. The government can be seen as the true agents of green building supporters; the environment is spare to survive for another century; the citizen will get their basic living accommodation. What is not appealing with the container construction concept is when restrict our creativity from venturing into an innovation that is proven beneficial to all. Taken together, when it costs less than a fraction of the original cost with equivalent specification as other new materials, there is no reason to not favour used container.

6. Recommendations

The three case studies illustrate both the benefits and challenges of construction using used containers in Malaysia. From the analysis carried out, it can be concluded that the idea of construction with used containers will require strong support from the government since at the moment, the development order application for this type of construction is granted on the basis of temporary structure that can be dismantled and easily relocated. Globally, used containers as building structure is not new. Hence, it is timely for the Malaysian government to draft specific guidelines that recognize and acknowledge the mushrooming of movement towards alternative construction in Malaysia with reference to the many examples from developed countries that have long encouraged this type of construction.

In the era where sustainable lifestyle is the sought after modern lifestyle, with the proven concept of construction using used containers, it is about time that we take a serious leap in actively changing our approach in construction. True sustainable construction model will account for the economic, environment and social aspect of living and used containers construction is the better candidate. We should embrace the idea with an open arm and mind set. With some creative and innovative approach, the used containers construction it can be utilized to meet the requirement for all standards of living.

Furthermore, since construction using used containers is proven to be time saving and cost efficient, the government should consider opting for this alternative building system when planning for a post-disaster recovery plan. For instance, during the worst flood tragedy on December 2014 in Kelantan where thousands loss their homes, this construction method, if seriously considered could have tremendously resolved some of the accommodation issues. Nevertheless, there is still much research and study to be conducted on construction using used containers in Malaysia to raise more awareness and understanding of the benefits it may particularly bring to the public and country.

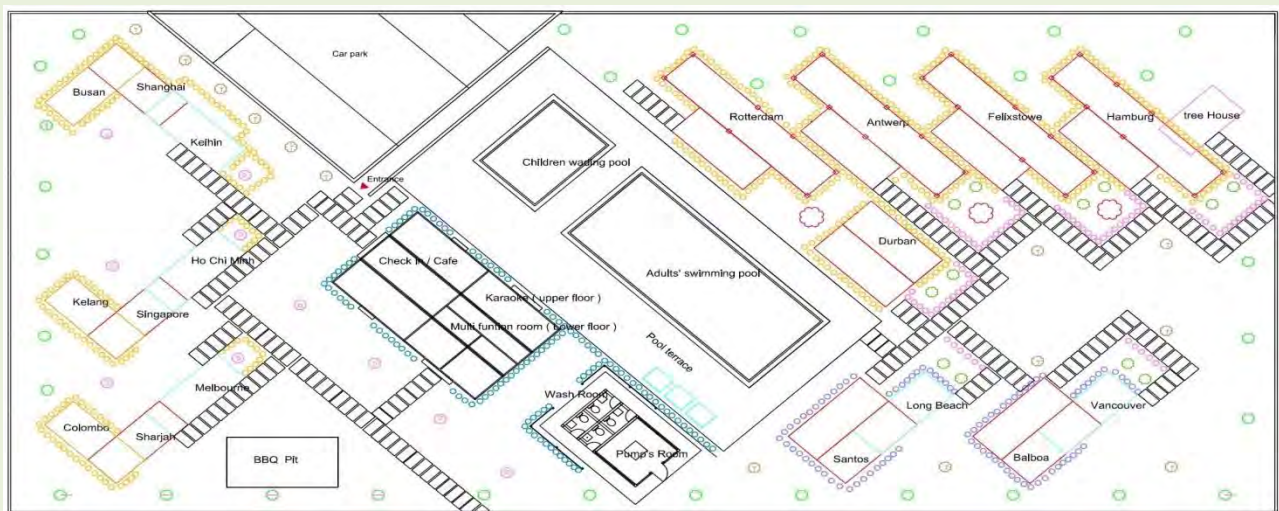
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Case Study 1: The Kabin

Owner	The founder and the owner of this unique retreat whom like to remain anonymous works as a consultant in the oil and gas industry
Location	Remis Beach, Kuala Selangor, Selangor, Malaysia
Year	2014
Timing	7 months (The containers were not factory fabricated. All modification works were done at site.)
Cost	<ul style="list-style-type: none"> Initial cost of purchasing the used container is considerably cheap; ranging from 6000 – 9000 Malaysian Ringgit (MYR) depending on its size and condition. Cost of refurbish and refit with an average modification cost from 40,000 – 80,000 MYR per container, depending on its size and fitting
Typology	30 numbers of 20 footers and 4 numbers of 40 footers
Capacity	78 guests in 18 container-type rooms. Eight of the rooms are on the upper unit while ten rooms are on the lower unit.
Levels	2
Services	Toilets, 50ft swimming pool, tree house, a café cum reception counter, BBQ place, multipurpose room and a karaoke room
Local Authority Approval	The local council is considering approving the submitted Development Order on the basis that the building was constructed as a temporary structure that can be dismantled and easily relocated.



Case Study 2: Container Hotel	
Owner	Mr. Ryan Loo (Chief Executive of Container Hotel Group)
Location	Kuala Lumpur, Malaysia
Year	2013
Timing	2 ½ months (Except for the precast reinforced concrete pipe rooms, all containers rooms including the dormitories were prefabricated in the factory)
Cost	1.5 million Malaysian Ringgit
Typology	12 containers and 7 concrete tubes
Capacity	50 guests in 16 rooms
Levels	3
Services	Toilets, bar, common area
Local Authority Approval	Approved

(All information are extracted from the book titled “Pop-Up Hotel Revolution: The Architectural Innovation About to come in the Hotel Industry” page 97 – 124, written by Chiara Butta, Joseph Di Pasquale and Paola Zatti)



**Case Study 3: Development Project of Akademi Insan Prihatin Complex, Desa Surada,
Sungai Ramal Dalam, Kajang, Selangor**

Owner	Co-founded by 20 individuals whom form this academy which they envisage to be a research and development institution focussing on moral development and Islamic civilization
Location	Kajang, Selangor, Malaysia
Year	February 2016
Timing	No time frame for completion; construction progresses steadily concomitant with financial adequacy.
Cost	<ul style="list-style-type: none"> • The cost of acquiring these containers alone is already 1,000,000 MYR. Another 1,000,000 MYR has been spent on other materials and machineries. • This project is finance entirely through benefaction either from the owners or from endowment for charitable-purposes (<i>waqf</i>).
Typology	<ul style="list-style-type: none"> • Estimated about 200 containers, both 40 and 20 footers, would be required to build the entire building of 6-storey high. • At the time of visit to the site, about 36 containers of 40 footers have been delivered and appropriately positioned.
Capacity	Approximately 300 people
Levels	6
Services	Hostel, classrooms, administration centre and storage area
Local Authority Approval	In the process of submission for approval of Development Order to the Local Council

