



International High- Performance Built Environment Conference – A Sustainable Built Environment Conference 2016 Series (SBE16), iHBE 2016

A preliminary exploration of the barriers of sustainable refurbishment for commercial building projects in Malaysia

Md Asrul Nasid Masrom^{a*}, Mohd Hilmi Izwan Abd Rahim^b, Siow Chan Ann^c

Sulzakimin Mohamed^d, Kai Chen Goh^e

a,b,c,d,e Department of Construction Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat Johor Malaysia

Abstract

Malaysia is one of the developing countries that faced frequent and serious floods in recent years. Sustainable refurbishment seems to play an important role to fight against the climate change. Additionally, sustainable refurbishment approach is the greatest potential ways for reducing carbon dioxide emissions. Existing commercial buildings in Malaysia have been found for one-third of the total electricity consumption. However, the amounts of sustainable refurbished buildings listed in the Green Building Index (GBI) certified are still considerably lower and not fully explored. That is, this research aims to identify the potential barriers that hinder commercial building owners to implement sustainable refurbishment and to determine the drivers that could improve sustainable refurbishment implementation in Malaysia. The qualitative data were collected through semi-structured interview with an experienced commercial building manager in Kuala Lumpur. The content analysis used in utilizing the entire dataset to identify underlying themes presented through the data. The result indicated that the key barriers of sustainable refurbishment are the higher cost of sustainable refurbishment than traditional methods and lacking of sustainable awareness among Malaysian. This preliminary research also found that the drivers that could improve sustainable refurbishment implementation are able to enhance their corporate image and to reduce the environmental impact. The findings of ongoing research can be beneficial for building owners to deliver their refurbishment projects with a green awareness and environmental considerations in the future.

© 2017 The Authors. Published by Elsevier Ltd.

Peer-review under responsibility of the organizing committee iHBE 2016.

Keywords: Sustainable refurbishment; Commercial building; Malaysia; Sustainability; Barriers; and Drivers.

* Corresponding author. Tel.: +607-4533925; fax: +0-000-000-0000 .
E-mail address: asruln@uthm.edu.my

1. Introduction

Issues on climate change and global warming have been received a wide concern in Malaysia. Transformation existing commercial building to enhance energy efficiency objectives is one the solution ways. Additionally, refurbishment of the existing building becomes more significant with many aged buildings now become less efficient and ready to be upgraded. By considering this scenario, sustainable refurbishment is needed and it plays as an important role in solving climate change. The approach seemed to hold the greatest potential for reducing CO_2 emissions in the short to medium term. There are several countries consider sustainable refurbishment to be an effective approach to reducing the carbon dioxide emissions from the existing buildings.

In the year of 2009, Malaysia launched the National Green Technology policy. The objective is to minimize the growth of energy consumption while enhancing economic development[1]. In spite of all the efforts that have done by the government, commercial buildings are still accounted for 39 terawatt hours (10^{12} Wh) of electricity, which also equivalent to one-third of the total electricity consumption in Malaysia[2]. Electricity consumption is considerably related to the economic activity and hence as the electricity consumption will continue to grow as the country continuing to develop. This will also be translated into a continuous increase in CO_2 emission if there is no further action taken. Hence, this paper focuses on examining barriers and drivers in undertaking sustainable refurbishment project, particularly for a commercial building in Malaysia that retrieved through preliminary interviews. The findings of this research will contribute to the construction industry, which could helpful to promote sustainable refurbishment implementation in developing countries such as Malaysia. Besides, this paper also significant to the industry players as it determines barriers and drivers in enhancing sustainable refurbishment, particularly for commercial buildings that are still not fully discovered yet.

2. Relevant Literature Review on Sustainable refurbishments development

This section explains briefly sustainable refurbishment concept, barriers, and drivers of sustainable refurbishment projects. Additionally, a definition of each main terms used throughout the study is also discussed in this section in order to highlight research gaps.

Climate change has become one of the most significant effects and it has been receiving a wide concern in Malaysia. The sustainable refurbishment is one of the ways that can prevent climate change by creating a positive effect on the environment [3]. According to the World Commission on Environment and Development (1987), sustainability is the capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development has received a major concern in many countries including Malaysia. Furthermore, since 2009, Malaysia construction industry has been focusing and moving towards sustainable construction. However, this approach seems to suffer as it only focused on developing new green buildings, but the sustainable refurbishment of the existing buildings are still not extensively explored. The GBI certified summary data supported that only 9 existing buildings that are certified after sustainable refurbishment [4], although there are at least 1000 refurbishment projects each year for the last 3 years [5].

There are several studies to define the meaning of sustainable refurbishment. The refurbishment is defined as the extending the usefulness of existing building through the adaptation of their basic forms in providing a new or updated version of the original structure [6]. Similarly, previous research added that refurbishment as the extensive renew or modification of secondary elements of a building that may be required to adapt the structure to a new purpose [7]. Besides, there are several other terms that similar to define refurbishment such as conversion, retrofit, rehabilitation, adaptation, renovation, and restoration. As for this study, sustainable refurbishment is referred as upgrading works for existing building by considering sustainable factors namely economic, social and environmental.

Although there is a large amount of refurbishment projects in Malaysia every year, yet there are only a few projects that employ sustainable way in upgrading the existing buildings. This result number of barriers that hinder commercial building owners from implementing the sustainable refurbishment in the projects. The barriers of

sustainable refurbishment are including financial, technical, and social to country regulation on sustainable development. Previous studies determined that several barriers of sustainable refurbishment as shown in Table 1. It indicates that limited budget is the key barriers in undertaking sustainable refurbishment for the most of the countries regardless in developed or developing countries.

Table 1. Barriers of Sustainable Refurbishment

Location	Barriers
Australia [8]	<ul style="list-style-type: none"> • More expensive to retrofit and always contain various hidden costs. • A recent development, building code in the area of fire safety and disability access, prevents a lot of buildings from ever being re-used. • Lack of awareness and expertise with regard to the best use of property.
Finland [9]	<ul style="list-style-type: none"> • Longer payback period. • Limitation of the transformation of the space. • Relatively small budget and short time frame of refurbishment projects than new construction.
United Kingdom [10]	<ul style="list-style-type: none"> • The condition of the existing building is difficult to evaluate. • High upfront costs discourage sustainable refurbishment. • The disconnection between costs and benefits where owner bears the costs and lower energy costs accrue only to tenants.
Australia [11]	<ul style="list-style-type: none"> • Lack of knowledge and experienced workforce • Sustainable retrofits or technology upgrade requires the cooperation and participation of a wide range of stakeholders.
Malaysia [12]	<ul style="list-style-type: none"> • There is no single assessment scheme for the building refurbishment in Malaysia
Malaysia [13]	<ul style="list-style-type: none"> • Lack of awareness among the client for the long-term financial benefit of building green. • Most of the stakeholders mainly priorities on economic issues rather than taking a balanced approach to economic, environment and social sustainability.

According to the current scenario, several efforts are needed in order to improve the numbers of sustainable refurbishment in Malaysia. The authorities should identify the potential drivers in sustainable refurbishment implementation. They also could promote the drivers and make sustainable refurbishment become a mainstream to the positive sustainable development. Previous studies found that the drivers of sustainable refurbishment can be divided into three main factors, namely environmental, social, and economic. Additionally, a benefit for the company’s reputation in terms of corporate image is determined as the key drivers of sustainable refurbishment projects. A summary of the main drivers of sustainable refurbishment from literature is indicated in Table 2.

Table 2. Drivers of sustainable refurbishment

Location	Drivers
Nigeria [14]	<ul style="list-style-type: none"> • Increase in corporate image • Green job creation for local communities
Croatia [15]	<ul style="list-style-type: none"> • Waste reduction • Reduced production cost • Increased market competition • Regulatory requirement • Corporate social responsibility
United Kingdom [16]	<ul style="list-style-type: none"> • Tax rebate and the removal of the value-added tax disparity between new build and refurbishment • Increased government supplied low carbon programs which provide subsidiary occupational and investment benefits
United Kingdom [10]	<ul style="list-style-type: none"> • Regulatory Incentives • Market Pressures • Corporate Responsibility

United Kingdom [17]	<ul style="list-style-type: none"> • Energy bill saving • To increase comfort
Australia [18]	<ul style="list-style-type: none"> • Reduce the environmental impact • Refurbishment scenario with the lowest environmental impact using Life Cycle Assessment (LCA)

3. Methodology

This section describes research design, sample selection, strategies to access respondents, data collection and data analysis used in this study. It is important to treat the research task as a sequential process involving several clearly defined steps, but not require completion of each step before going to the next [19]. This study carried out based on the total amount of the existing commercial building in Kuala Lumpur which is 3300 [20]. However, by considering this study is only preliminary exploration, therefore only a small sample size (four companies) was used in data collection.

Face-to-face interviews were conducted with commercial building managers who mostly have been involved in the building refurbishment projects. The preliminary interview was conducted to capture the respondent's general views and to understand their individual perceptions. The interview questions were piloted by different respondents to detect any ambiguities and to ensure that the questions easy to answer and clear [21]. The data collected was analyzed by using content analysis and depicted in the form of matrix table. The content analysis is helpful in utilizing an entire dataset to identify underlying themes presented through the data [22]. The data was comprehended and key themes identified, then discussing as explained in the subsequent section.

4. Results

The semi-structured interview data was conducted from four distinctive interviews of four different commercial office building managers in Kuala Lumpur. The following section presented results gathered from the interviews.

4.1. Respondents details

This section presents respondents' details as depicted in Table 3. The respondents for the preliminary interview are managerial employees from four different commercial office buildings in Kuala Lumpur. They are an eligible respondent based on the positions (top level management), expertise and experience in commercial building refurbishment.

Table 3. Respondents' profiles

Respondent	Working Experience	Position	Department
R1	20 years	Senior Project and Building Manager	Building Management Department
R2	More than 20 years	Building Executive	Building Maintenance Department
R3	More than 10 years	Facility Manager	Building Management Department
R4	15 years	Assistant Building Manager	Building Management Department

4.2. Overview of sustainable refurbishment

The qualitative data collected through preliminary interviews were presented as follows:

- General Issues and Opinions toward Sustainable Refurbishment

Table 4 shows that the main issues to be considered in the decision- making the process for building refurbishment from all the respondents. The majority of the respondents agreed that the cost of refurbishment is one

of the main issues to be considered in the decision-making process for building refurbishment. Besides, issues that highlighted by most of the respondents are related to tenant requirements and the condition of the existing building.

Table 4. Main issues in sustainable refurbishment

Respondent	Main Issues
R1	<ul style="list-style-type: none"> • Market condition, requirements of tenants • Age of the building system • Cost, the return of investment
R2	<ul style="list-style-type: none"> • Cost, return on investment • Impact of the building
R3	<ul style="list-style-type: none"> • Requirements of tenants • Budget/Cost
R4	<ul style="list-style-type: none"> • Budget/Cost • The condition of the building

- Respondent's opinion toward sustainable practice

Based on the interviews, the majority of the respondents agreed that implementation of sustainable practice for commercial buildings is significant in terms of economy and social factors. In addition, R1 and R2 highlighted that by implementing sustainable practices, the commercial building could reduce operation cost and waste that produced by the building.

“It is important because each building produces more waste than it can be handled. It produces a lot of waste, and Malaysia has no dedicated recycling program at the moment, which in result all that (waste produced) is going to the landfill and that is just unsustainable” (R1).

In contrast, two respondents (R3 and R4) pointed out that sustainable practices implementation should be focusing more on the new development as older buildings are not equipped and designed for the sustainable practice and it requires a higher amount of fund to implement it.

“If for the old building, it is difficult to convert into the sustainable building as the building was not equipped with that type of design. If for a new building or new development then is important. Especially like the TRX (Tun Razak Exchange) project, they are developing one whole new area and hence they should implement sustainable aspect into the project.” (R3)

This indicated that respondents are aware that the importance of sustainable practices in refurbishment projects. Additionally, it also shows that to have a successful outcome in sustainable refurbishment mainly for commercial building required commitment from all the parties involved and hence, the respondents mentioned that sustainable practices should give more focus on a new development.

4.3. Barriers to sustainable refurbishment implementation

This section discusses five barriers that suggested by the interviewees who have been involved in the sustainable refurbishment projects. Table 5 presents the perception of four respondents towards the barriers of sustainable refurbishment in commercial buildings, including cost, government initiative, expertise, knowledge and awareness. The perceptions of the respondents are varies by considering their different background, experience and knowledge in regards to sustainable refurbishment projects.

Table 5. Barriers of Sustainable Refurbishment Implementation

Respondents	Barriers				
	Cost of Sustainable Refurbishment	Government Initiative on Sustainable Refurbishment	Expertise in Sustainable Refurbishment	Knowledge Related to Sustainable Refurbishment	Sustainability Awareness
R1	✓	✓	✓	✓	✓
R2	✓	✓	✓	✗	✓
R3	✓	✗	✗	✗	✓
R4	✓	✓	✗	✗	✓

- **Cost of Sustainable Refurbishment**

All respondents agreed that costs incurred in sustainable refurbishment as a significant barrier in commercial buildings. Additionally, respondents also mentioned that the cost of implementing sustainable refurbishment is considerably high and the budget is limited. R1 pointed out that one of the reasons they implemented sustainable refurbishment despite it is costly is due to the requirements of the tenants. As for R2, sustainable refurbishment is still used to fulfill company corporate social responsibility program. Respondents with the experience of sustainable refurbishment agreed that sustainable refurbishment has a longer payback period. Furthermore, R3 and R4 mentioned that it is a risky investment as the company has to raise the rent, and it may result in a loss the existing tenants.

- **Government Initiative on Sustainable Refurbishment**

The majority of the respondents have a similar consensus with agreed that the government is still lacking in encouraging sustainable concept in refurbishment project in Malaysia. With reference to the respondents, they also mentioned that the government should enhance their efforts in promoting the sustainable practices to construction players and community. Besides, it is also important for the government to motivate developers to enhancing their refurbishment projects sustainable to be more feasible and viable.

“I do not see them (government) set the sustainable practice as one of the government project criteria. For instance, government supposed to set all the new government buildings from 2015 onwards must be GBI certificated as an example for the market to follow.” (Respondent 2)

- **Expertise in Sustainable Refurbishment**

Two of the respondents agreed that lacking of expertise in implementing sustainable refurbishment is one of the barriers should be concerned. The results also show that to have a sufficient expertise is significant in ensuring the sustainable refurbishment works can be delivered successfully and achieve the project objectives. However, there is a scenario where the experts seem reluctant to embed sustainable concept in their design.

“No, you can take an example of me. Before this, I do not know anything about GBI. When I join this company and they want to implement this. Then only I started to learn from there.” (R2)

“Actually, our consultants are all fully aware of GBI. They are all qualified to do this. But the developers do not want to implement this (GBI).” (R3)

- **Knowledge Related to Sustainable Refurbishment**

The majority of the respondents highlighted that the construction industry is equipped with a sufficient knowledge in regards to sustainable refurbishment. This means that knowledge is not the main barriers to undertaking sustainable refurbishment of commercial buildings. Interestingly, the respondent also addressed that there are several parties refuse to change their mindset towards sustainable concepts as they still prefer the conventional ways.

“It is not easy to change the mindset of people, we tend to follow what our senior did. Hence, even you have the

knowledge, but the mindset still the same, then it just needed time.” (R 4)

- **Sustainability Awareness**

The results revealed that lacking of awareness among Malaysian could be defined as the barrier impedes the commercial building owner to implement the sustainable refurbishment extensively. As an example, R1 highlighted that:

“Normally owner will only respond to the tenant or the market trend, so it depends on the tenants in the building. If they do not have the awareness and it is not really important to them, then the owner will not respond. The building owner will not just go sustainable voluntarily, the tenant has to be pushed.” (R1)

4.4. Drivers that encourage sustainable refurbishment implementation

This study investigates further by gathering information in regards to drivers that encourage sustainable refurbishment projects. The interview questions were set to determine the drivers that encourage sustainable refurbishment implementation. There are four drivers that identified from the literature review. The respondents were asked towards the drivers and the suggestions as shown in Table 6.

Table 6. Drivers to Enhance Sustainable Refurbishment Implementation

Respondents	Drivers			
	Reduction in Operation Cost	Increase Market Competition and Corporate Image	Regulatory Requirement	Reduce the Environmental Impact
R1	✓	✓	✓	✓
R2	✓	✓	✗	✓
R3	✗	✓	✓	✓
R4	✓	✓	✗	✓

- **Reduction in Operation Cost**

The result shows that three out of four respondents agreed that the reduction in operation cost will be a good driver for encouraging more sustainable refurbishment implementation. The operation cost is included electricity and water consumption.

“Of course, normally when we calculate the return on investment we will calculate the saving in operation that is part of our return on investment calculation. For example, we just changed our chillers to more efficient green chiles and they run more efficiently and we are saving 15% to 20% a month in electricity.” (R1).

“I’m doing one project now, we are going to install inverter for the motor condenser water pump. Our target is 15%, but manufacturer promises 20%. We can see the return in 2 or 3 years.” (R2).

- **Increase Market Competition and Corporate Image**

All respondents agreed that as the sustainable development has received a wide concern, it will be drivers for the company to adopt sustainable practices to increase company’s marketability and corporate image. R1 and R2 mentioned that this is one of the benefits that encourage them to implement the sustainable refurbishment of their commercial buildings.

- **Regulatory Requirement**

Respondents have mixed opinions toward the regulatory requirement. R1 and R3 both pointed out that regulatory requirement can be a significant driver for motivating more sustainable refurbishment. However, Malaysia is still not ready for this type of regulation. In short, regulatory requirement is not a sufficient driver.

- **Reduce the Environmental Impact**

All the respondents agreed that implementing sustainable practice will reduce the environmental impact. R1 highlighted an example that their tenant feels the impact of climate change that is getting worse and causing the tenant feels unsatisfactory.

- **Other Drivers**

Table 7 shows the other drivers suggested by respondents that can encourage more sustainable refurbishment. Most of the suggestions provided by the respondents are in regards to finance. Hence, this also means that financial support is the main drivers that able to encourage sustainable refurbishment to be used extensively in commercial buildings.

Table 7. Other Drivers

Respondent	Other Drivers
R1	<ul style="list-style-type: none"> • People mindset has to change
R2	<ul style="list-style-type: none"> • Green/sustainable award
R3	<ul style="list-style-type: none"> • More taxes exception and incentives
R4	<ul style="list-style-type: none"> • Loan for small company • More tax rebate

5. Discussion

This section explains the findings of the research. Data from the interview concluded that the main barriers that impede commercial building to apply sustainable refurbishment are the high cost and the lack of awareness among practitioners and community in Malaysia. The result showed that the knowledge of the person involved in the construction industry is sufficient, however, there is still a gap, particularly awareness between among Malaysian. This is similar to the finding of previous study where they mentioned that there is a wide gap of awareness on sustainable building practice in Malaysia [13]. This means that the government should enhance their efforts in raising the awareness level of Malaysian, mainly those who are not involved in the construction industry.

In addition, lacking of awareness among the building owners and the costs associated with the sustainable upgrades are the barriers for refurbishing existing commercial buildings. This is in line with the result that obtained from respondents. The finding of previous study supported that is unable to be applied in Malaysia as the result indicates that the knowledge and expertise in Malaysia are insufficient for the sustainable refurbishment practice [23]. Therefore, continuous efforts such as promoting a relevant trainings and courses in relation to sustainable concepts is necessary.

Besides, the findings also shows that the main drivers that encourage sustainable refurbishment implementation are increased corporate image and market competition and ability to reduce the environmental impact. The result revealed that the commercial building owners are willing to invest the fund for enhancing their market competition and corporate image. Similar to previous study as the most significant driver for implementing sustainable practice is to improve their corporate image [24]. Hence, the government should take advantage of this driver and make sustainable as a market trend in order to attract more sustainable implementation from local and international companies.

Although the awareness in Malaysia is relatively low, but all the respondent pointed out that reduce environmental impact is one of the significant drivers. This is consistent with the finding of where previous studies mentioned that individuals are likely to perform energy efficiency work for three principal reasons – energy bill saving, to increase comfort and to reduce their environmental impact [17]. This means that the government may need to educate the public, in terms of benefits of reducing environment negative impact [25].

However, in terms of regulatory requirement, it is important as a driver for encouraging sustainable

refurbishment implementation. The result that provided by respondents are contradicting with the finding of the previous study [15][26]. Half of the respondents agreed that awareness among Malaysian towards regulatory requirement are still need to be improved. Additionally, several respondents mentioned that lack of enforcement regarding regulatory requirement is also one of the problems that regulatory requirement implementation is still not effective in Malaysia.

6. Conclusion and Recommendations

This study presents the findings of the preliminary investigation of the potential barriers in implementing sustainable refurbishment, particularly for commercial buildings. The findings indicate that the main barriers that hinder commercial owners to implement sustainable refurbishment extensively are the high cost of sustainable refurbishment and the lacking of sustainable awareness among Malaysian. Those barriers need to be overcome in order to ensure that sustainable refurbishment can be accepted widely in Malaysia. Besides, the findings indicated that the drivers that potentially encourage sustainable refurbishment implementation to reduce the environmental impact and increase in corporate image. The findings of the preliminary exploration would be significant for developer and building owners in identifying potential barriers before they commence the refurbishment projects. Additionally, the findings of the ongoing research can be beneficial for building owners to deliver their refurbishment projects with a green awareness and environmental considerations in the future. The findings of the study will be extended further by developing a sustainable refurbishment framework that potentially useful for the key construction players.

Acknowledgements

The author would like to thank the Ministry of Education (MOE), Research Grant MDR U097 and RACE Vot Number 1517, Universiti Tun Hussein Onn Malaysia, Research, Innovation, Commercialization, and Consultancy Management Office (ORICC) UTHM, Department of Construction Management, Faculty of Technology Management and Business, UTHM, for supporting this research.

References

- [1] National Property Information Centre. (2012). Property Stock Report: Commercial Property Stock Table Q4 2014.
- [2] Energy Commission, E. (2013). Performance and Statistical Information on Electricity Supply Industry in Malaysia. Putrajaya.
- [3] United Nations Environment Programme (UNEP). 2009. Building and climate change summary for decision makers. Sustainable United Nations. UNEP DTIE Sustainable Consumption & Production Branch. France.
- [4] Green Building Index Organization. (2015). Executive Summary as of 15 February 2015.
- [5] CIDB. (2015). CIDB Construction Quarterly Bulletin - Fourth Quarter 2014.
- [6] Riley, M., & Cotgrave, A. (2005). Construction Technology 3. New York: Palgrave Macmillan.
- Saunders, M., Lewis, P., & Thornhill, A. (2007). Research Methods for Business Students (Fourth ed.) London: Prentice Hall.
- [7] Prodromou, M. K. (2010). The sustainable refurbishment of BK city, 145.
- [8] Bruce, T., Zuo, J., Rameezdeen, R., & Pullen, S. (2015). Factors influencing the retrofitting of existing office buildings using Adelaide, South Australia as a case study.
- [9] Haeyon, R. (2014). Sustainable Building Refurbishment. Aalto University.
- [10] Sunil, S. (2012). Sustainable Refurbishment. Chichester: Wiley-Blackwell.
- [11] Miller, E., & Buys, L. (2008). Retrofitting Commercial Office Buildings for Sustainability: Tenants' Perspectives. Journal of Property Investment & Finance, 26(6), 552–561. <http://doi.org/10.1108/14635780810908398>
- [12] Asra Zaliza Asbollah, Nordiana Mohd Isa & Syahrul Nizam Kamaruzzaman. 2016. Sustainability and facilities management in Malaysia. 4th International Building Conference (IBCC, 2016). 0085.pp5. MATEC Web Conference.
- [13] Shari, Z., & Soebarto, V. (2014). Investigating sustainable practices in the Malaysian office building developments. Construction Innovation: Information, Process, Management, 14(1), 17–37. <http://doi.org/10.1108/CI-12-2012-0064>
- [14] Dubem I, L., & Stephen O., O. (2014). An Investigation on Policy Direction and Drivers for Sustainable Facilities Management Practice in Nigeria. Journal of Facilities Management, 12(3), 303–322. <http://doi.org/10.1108/JFM-02-2013-0013>
- [15] Bukarica, V., & Robić, S. (2013). Implementing Energy Efficiency Policy in Croatia: Stakeholder Interactions for Closing the Gap. Energy Policy, 61, 414–422. <http://doi.org/10.1016/j.enpol.2013.06.052>

- [16] Davies, P., & Osmani, M. (2011). Low Carbon Housing Refurbishment Challenges and Incentives: Architects' Perspectives. *Building and Environment*, 46(8), 1691–1698. <http://doi.org/10.1016/j.buildenv.2011.02.011>
- [17] Organ, S., Proverbs, D., & Squires, G. (2012). Motivations for Energy Efficiency Refurbishment in Owner-Occupied Housing. *Structural Survey*, 31(2), 101–120. <http://doi.org/10.1108/02630801311317527>
- [18] Passer
- [19] Donald R. Cooper & Pamela S. Schindler. 2014. *Business Research Methods*. Twelfth Editions. ISBN-13:978-0073521503. McGraw-Hills Publications.
- [20] NAPIC National Property Information Centre. (2014). *Property Stock Report 2014*.
- [21] Donald R., C., & Pamela S., S. (2014). *Business Research Methods*. New York: McGraw-Hill/Irwin.
- [22] Dellinger, A., & Leech, N. L. (2007). A validity framework: A unified approach to evaluating validity of empirical research. *Journal of Mixed Methods Research*, 1, 309-332. doi:10.1177/1558689807306147
- [23] Keivani, R., Tah, J. H. M., Kurul, E., & Abanda, H. (2010). *Green Jobs Creation Through Sustainable Refurbishment in the Developing Countries*. Geneva: International Labour Organization 2010.
- [24] Adams, J., T.A. Khan, H., Raeside, R., & White, D. (2007). *Research Methods for Graduate Business and Social Science Students*. New Delhi: Response Books
- [25] Rasiah, R., Al-Amin, A.Q., Ahmed, A., Filho, W.L., & Calvo, E. (2016). *Journal of Cleaner Production*, 133, 271-283.
- [26] Wong, J.K.W., Chan, J.K.S., & Wadu, M.J. (2016). *Journal of Cleaner Production*, 135, 850-871.