

## THE GREEN BUILDING ASSESSMENT TOOLS FOR WATER EFFICIENCY CRITERIA IN MALAYSIA : AN ANALYSIS

Halmi Zainol<sup>1</sup>, Kartina Alauddin<sup>2</sup>, Nadia Shukri<sup>3</sup>

<sup>1,2,3</sup> Faculty of Architecture, Planning and Surveying,  
Universiti Teknologi MARA, Perak Branch, Seri Iskandar, 32610, Perak,  
Malaysia

E-mail: halmizainol@gmail.com

### ABSTRACT

*It is conventionally accepted that the use of renewable resources has been in uncontrolled stage where the depletion of natural resources is increasing. In order to be sustainable, the use of renewable resources must be at the rate that is less or equal to the rate of natural production. Therefore, there has been few efforts done by certain organisations to create awareness of sustainable built environment among the builders and public. Green assessment rating tools have been developed to act as a reference and guideline in order to create a sustainable development thus encourage a sustainable living. The objective of this paper is to evaluate the assessment criteria for green assessment tools. Four rating tools consists of Green Building Index (GBI), Penarafan Hijau JKR (pH JKR), Green Performance Assessment System (GreenPASS) and Green Real Estate (GreenRE) were selected. The finding shows on how assessment criteria of water efficiency can contribute to the sustainability life cycle thus reducing the depletion of natural resources. These rating tools also can contribute to the designers, builders and building owners during design and construction stage to ensure the green building can be achieved.*

**Keywords:** sustainable, green, rating tools, water efficiency

## **INTRODUCTION**

Sustainability refers to the efficient use of limited resources like water, land, energy and other raw materials, and holistic management of residues, solid waste, effluents or emitted gases (EPU, 2015). To be sustainable, the use of renewable resources must proceed at a rate that is less than or equal to the rate of natural replenishment (Heinberg, 2010). Sustainable city can be defined as a city or society that can be maintained for many centuries (Heinberg, 2010). According to Woods (2008), the trends towards sustainable city in South East Asia can be seen in few issues such as trends in solar sustainable housing, government policy, legislation and structure, standards of energy consumption, initiatives to promote solar housing and marketing (Hyde, Rostvik, Woods & Soebarto, 2008). Globally, energy consumption is projected to increase by 54% during the period of 2004 to 2025, with developing Asia accounting for 40% of total projected world increase (EIA, 2014). Of the developing countries in South East Asia, Malaysia has a high thermal mass materials and energy intensive construction processes with cheaper energy tariff in comparison to neighbouring countries (Hyde et al., 2008).

Co-currently to that, the 11<sup>th</sup> Malaysia Plan thrust IV identified energy efficiency as one of the features in high income and public happiness in national development in terms of pursuing green growth. In 15<sup>th</sup> Conference of Parties in 2009, Prime Minister of Malaysia, YAB Dato' Sri Mohd Najib Tun Abdul Razak mentioned that Malaysia is adopting an indicator of a voluntary reduction of up to 40% in terms of emissions intensity of gross domestic product (GDP) by the year 2020 compared to 2005 levels (KeTTHA, 2014). 11<sup>th</sup> Malaysia Plan also focus on land management, geospatial management, water efficiency, mineral conservation, disaster risk management and also green growth under the chapter of governance and institutional reform.

Other than energy consumption, water consumption is also a critical issue worldwide including our beloved country, Malaysia. As per stated in Business Insider (2014), 70% of Malaysians use more water than they should (Ruslan, 2014). At 226 litres per person every day, we take for granted our wealth of water and good rainfall (Ruslan, 2014). The most recent water cut in the Klang Valley have affected nearly a million of people. However, to

meet the recommended water daily usage at 165 litres per person, Malaysians have to cut their usage by a whole 37% (Ruslan, 2014). From the prospect of government initiative, 11<sup>th</sup> Malaysia Plan, 2016-2020, green growth will be a fundamental shift in how Malaysia sees the role of natural resources and the environment in its socio-economic development, protecting both development gains and biodiversity at the same time (EPU, 2015). To pursue green growth, the enabling environment will be strengthened particularly in terms of policy and regulatory framework, human capital, green technology investment and financial instruments (EPU, 2015). This transformation will ensure sustainability of the nation's natural resources, minimise pollution, and strengthen energy, food and water security (EPU, 2015). In addition, the National Water Resources Policy was launched in 2012 to provide clear directions and strategies for water resources management, including collaborative governance to ensure water security and continued sustainability (EPU, 2015).

From the year of 2013 to 2014, water cuts and shortages have hurt the Malaysian deeply where hundreds of thousands of people are unable to get access to clean water. Now it's time for us to takes steps to reduce the impact of water shortage and scarcity thus avoiding the depletion of our natural resources to ensure sustainable usage. We have to proactively take steps to control our water usage thus cut on the wastage. Beside manual control of water usage, implementation of water saving technology may contribute to water conservation. Hopefully with the development of green assessment tools in industry such as Green Building Index, Green Real Estate, Green Performance Assessment System and *PenarafanHijau JKR*, Malaysia can go towards sustainability with the beneficial of water efficiency thus avoiding the depletion of our natural resources for future use. The review on these tools will be discussed in the next chapter.

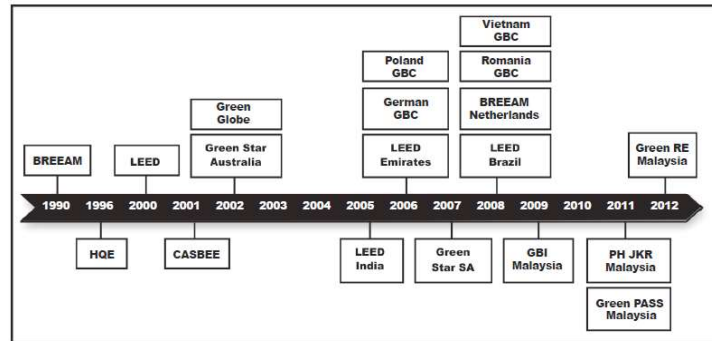
## RESEARCH METHODOLOGY

The study focused on green assessment tools in Malaysian construction industry. Four assessment rating tools such as Green Building Index (GBI), *PenarafanHijau JKR* (pH JKR), Green Performance Assessment System (GreenPASS) and Green Real Estate (GreenRE) are reviewed in this paper. The common assessment criteria in these rating tools are Energy Efficiency,

Indoor Environmental Quality, Sustainable Site Planning and Management, Material and Resources, Innovation, Waste Management and other green features. The review is concentrated on water efficiency assessment criteria. The assessment approaches such as water efficiency, rainwater harvesting, water recycling, water efficiency for irrigation/landscaping and fittings, leak detection and water consumption of cooling tower will be explored. The score of each approach will be tabulated and compared among the assessment rating tools. The importance of water efficiency will contribute to the sustainability of life cycle.

## **GREEN BUILDING AND SUSTAINABLE BACKGROUND**

The last couple of years had seen few growth of building sustainability assessment tools in Malaysia. The purpose of green assessment tools is to encourage the development of more efficient buildings in local climate. For example, by improving energy efficiency by building design, the harmful impact of the building to the environment can be mitigated. Healthier and sustainable environment can be achieved if the industry and public are aware of the importance of green environment. The established assessment tools such as Building Research Establishment Environment Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED), CASBEE, BCA Green Mark has been a benchmark in other developing countries to develop their own rating tools (see Figure 1). By this occurrence, few assessment tools in Malaysia has been developed by certain organisations to encourage the design and build industry towards sustainability which starting with the Green Building Index (GBI) in 2009, followed by *Penarafan Hijau JKR* (pH JKR) and Green Performance Assessment System (GreenPASS) and lastly is Green Real Estate (GreenRE) in 2012. There are six assessment approaches for water efficiency being developed by GBI, pH JKR, GreenPASS and GreenRE. The element consists of rainwater harvesting, water recycling, water efficient of landscape irrigation, water efficient fittings, metering and leak detection system and also water consumption of cooling tower.



(Source: Fauzi and Malek, 2013)

Figure 1: Development of Rating Tools

### GBI by PAM and ACEM

Green Building Index (GBI) is the first rating tools in Malaysia and was developed by Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM) in 2009. The main objective of GBI is to act as a way to enhance and promoting the sustainable built environment as well as igniting the awareness for every parties involved with buildings about the issues in environments and sustainability for the future generations (Halim, 2012; Fauzi & Malek, 2013). GBI rating tool provides an opportunity for developers and building owners to design and construct green, sustainable buildings that can provide energy savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects and reduce our impact on the environment (Bahaudin , Elias & Saifudin, 2013; GBI, 2013). Three main rating tools that has been developed by GBI are GBI Residential, GBI Non-Residential, and GBI Township (GBI, 2013).

### pH JKR by JKR

Jabatan Kerja Raya (JKR) has developed rating tools focus on two categories which are building sector (non-residential) and road sector. The tool can be used by the implementer of government projects to assess the level of sustainability of a development related to the two categories (Samad, 2012). It was built based on the level of operation and development of our

government and also the needs that has been indicated for government projects. Therefore, this tool is friendly to the level of achievement for the development by the government (Samad, 2012). Objectives of pH JKR are to be a measurement tools for the sustainability of the government projects and development, to facilitate improvement from time to time. The fuction of pH JKR is also to be an incentive to the sustainable development and operation (Samad, 2012). Besides, the advantages of the implementation of pH JKR is also to decrease the use of natural resources, reduce the use of fossil fuel, reduce carbon footprint, lessen the water consumption, reduce gas emission to our air and also preserve and conserve our natural habitat.

### **GreenPASS by CIDB**

GreenPASS or Green Performance Assessment System by Construction Industry Development Board (CIDB) Malaysia focuses on environmental consequences from construction. CIDB has published a manual of *Standard Industri Pembinaan* (Construction Industry Standard), CIS 7:2006 that explain in details of GreenPASS tools for construction. Basically, GreenPASS developed with two categories of building construction and building operations. GreenPASS initiatives are to evaluate the environmental impact of construction an operational performance of buildings in relations to carbon emission reduction; to give due recognition for low carbon building construction and operations; and to align and support the Low Carbon Cities Framework and Assessment System (LCCF&AS) initiatives (Ismail, 2012). Besides GreenPASS also encourage peer review of construction and operations management practices towards sustainable construction and also focus to increase awareness of carbon reduction and environmental impact in construction and building operations amongst project stakeholders (Ismail, 2012).

### **GreenRE by REHDA**

GreenRE is an assessment tools that has been developed in 2012 by REHDA; a non-profit initiative organisation which committed to encourage the property development industry to be sustainable, emphasising on passive design (REHDA, 2015). In the quest for sustainability, particularly in the real estate industry, GreenRE has incorporated several measures to inform developers of properties, be it residential or non-residential, of the many

advantages of going green (REHDA, 2015). These various measures are derived from seven main branches of the proverbial ‘tree’ of sustainability which are efficient air conditioning, daylighting, indoor air quality, sustainable construction, greenery, water conservation and other green features. With the mission to become the leading green rating standard in Malaysia, GreenRE focused for Real Estate and construction industry where they try to encourage and enhance the participation of industry professionals to design and built green and sustainable building in integrated manner. Latest tools of GreenRE are consist of Existing Non-Residential Building (ENRB v2.0), Non-Residential Building (NRB v2.0), Residential Building (RES v2.0) and Township Tools v1.0 which are available online through their website.

## **WATER CONSERVATION AND EFFICIENCY**

Although water covers more than 70% of the earth’s surface, on a small percentage of it is usable, the rest is saltwater or frozen in polar ice caps (Liming, 2011). Awareness of the water crisis is arising, and so is implementation of water-saving technology in the building sector. Green buildings contribute to conservation efforts by finding additional sources of water and by being designed to lessen water usage both indoors and outdoors (Liming, 2011). Besides the green technology such as the use of low-flow fixtures and other conservation measures, designers and builders has started a method of on-site water capture and reuse. In Malaysia recently, there is a new flash on green effort to save water by the state of Selangor. Dewan Jubli Perak in Bangunan Sultan Salahuddin Abdul Aziz Shah in Shah Alam will adopt rainwater harvesting. The water conservation system will cater to the toilet flushing of about 16 restrooms located within the public banquet hall (Chen, 2015). As said by Selangor Executive Councilor Elizabeth Wong, the harvesting tank is expected to fulfill 75% of the hall’s needs (Chen, 2015). This planning is essential in the effort of conserving our natural resources in the process of 3R which are to reduce, reuse and recycle for conservation towards sustainability.

The last couple of decade has seen tremendous growth of sustainable assessment tools worldwide. The first recognised tools; BREEAM had emerged in 1990 with the latest tools from Asia and other developing

countries. In Malaysia, starting with GBI, other parties in built environment also has started to develop their rating tools that shows our country has grown the awareness of sustainability, with the mean of conserving natural resources and built a development without giving any bad impact to our environment. The comparative review of rating tools in Malaysia will be discussed in the next chapter.

## DISCUSSION AND FINDINGS

Refers to previous explanation, Malaysia has developed four assessment tools for green building from 2009–2012 inclusive of GBI, pH JKR, GreenPASS and GreenRE. Each rating tools is to be compared (see Table 1) to review its contribution towards sustainable design and later detail review for assessment criteria of water efficiency will be analysed.

**Table 1: Review Criteria of Four Rating Tools in Malaysia**

Criteria	GBI	pH JKR	GreenPASS	GreenRE
Year of Establishment	2009	2011	2011	2012
Developed by	PAM and ACEM	JKR	CIDB	REHDA
Running Body	GBI Sdn. Bhd	Jabatan Kerja Raya / Malaysia Government	CIDB Malaysia Sdn.Bhd	REHDA Malaysia Sdn.Bhd
Certification Process	Voluntary; no regulatory obligation	Voluntary; no regulatory obligation	Voluntary; no regulatory obligation	Voluntary; no regulatory obligation
Assessment Phase	Design & construction	Design & construction	Construction & operation	Design & Construction
Mode of Assessment	Criteria checklist	Criteria checklist	Based on CO <sub>2</sub> emission measurement	Criteria checklist
Implementation Area	Private and semi-government building	Government building	Government building	Private building



Rating Categories	Non-residential New construction (NRNC), Non-residential existing building (NREB), Residential new construction (RNC), Industrial existing building (IEB), Industrial new construction (INC) Township tool.	Building sector; Non-residential new building (KBI), Non-residential existing building (KB2), Non-residential w/o air-conditioner building (KB3), Health services building (KB4).	Building construction, Building operation	Real estate industry; Existing non-residential building (ENRB), Non-residential building (NRB), Residential building (RES), Township tool.
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From the table above, it can be seen that GBI is the earliest green rating tools being developed in Malaysia, followed by pH JKR, GreenPASS and then GreenRE. Basically all four developed rating tools is not related to regulatory obligations therefore it is an option for the developer to certify their building with green label. GBI and GreenRE developed their tools based on international normative references such as BREEAM, GREENMARK, LEED and GREENSTAR while pH JKR and GreenPASS developed their tools based on their standard requirement that has been established earlier. Therefore the rating categories of the rating systems show that GBI and GreenRE is more flexible to be applied for most built environment design while pH JKR and GreenPASS is more focus on related design and built that always been implemented with the systems of government buildings. For example, GreenPASS focuses more on the CO<sub>2</sub> emissions during the operation phase of a government owned building while pH JKR was build based on the operation level and development of the existing government buildings.

Based on the rating categories, GBI and GreenRE allow for a fair comparison since both focuses on the design and construction phase of most related buildings in the industry; residential and non-residential and also township categories. Meanwhile, other two evaluation tools can be categorised as a stand-alone rating tools of pH JKR and GreenPASS because of different aspect of green evaluation. Similarly, GBI, pH JKR, GreenPASS and GreenRE focus on energy, water and indoor quality as the main criteria. It shows that there has been an arisen of awareness among designers and builders towards the responsibility of preserving our natural resources and decreasing the depletion of energy and clean water source for future usage. Other than that, environmental comfort also has been seen as an essential element to create a healthy lifestyle thus enable the concern of indoor health and arisen of green technology that may contribute to a sustainable indoor environmental quality.

Besides energy efficiency, water efficiency and indoor environmental quality, other criteria such as sustainable site planning and management, material and resources, innovation, waste management, environmental protection, carbon emission of development and other green features also are being considered in the rating tools system accordingly to the objectives of the rating tools itself. The weighing distribution of each assessment criteria of each rating tools can be seen in Table 2. In terms of scoring and weighing, GBI and GreenRE having the same process of cumulative points while pH JKR and GreenPASS scoring are based on cumulative percentage

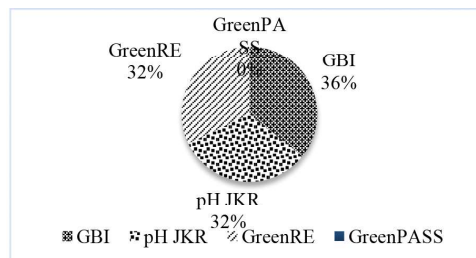
**Table 2: Scoring and Percentage Distribution of Assessment Criteria for Each Rating Tools**

Assessment Criteria	GBI	pH JKR	GreenPASS	GreenRE
Energy Efficiency (EE)	√ 35 / 35%	√ 43 / 37%	√ n/a	√ 105 / 60%
Indoor Environmental Quality (IEQ)	√ 21 / 21%	√ 26 / 22%	√ n/a	√ 10 / 5%
Sustainable Site Planning & Management (SP)	√ 16 / 16%	√ 24 / 20%	√ n/a	-
Material and Resources	√ 11 / 11%	√ 8 / 7%	√ n/a	-
Water Efficiency	√ 10 / 10%	√ 10 / 9%	√ n/a	√ 15 / 9%

Innovation	√	7 / 7%	√	6 / 5%		-		-
Waste Management		-		-	√	n/a		-
Environmental Protection		-		-		-	√	41 / 20%
Other Green Features		-		-		-	√	7 / 4%
Carbon Emission of Development		-		-		-	√	4 / 2%
TOTAL		100 / 100%		117 / 100%		n/a		182 / 100%

\* n/a – resources not available / not visible to public access

Referring to Figure 2, the chart shows that GBI, pH JKR and GreenRE having almost similar and balance weighing on water efficiency criteria, 32% and 36% respectively. It is again shows that this criteria is essential in order to classify a building as green with efficiency usage of natural resources. Generally, GBI focus on the design implementation of a building by the usage of rainwater harvesting, water reuse and recycle for landscape irrigation, green technology for water efficient fittings and metering and leak detection system. Other tools, pH JKR having almost the same consideration with GBI with the exception of water recycle and reuse for landscape irrigation maybe because government building having less requirement area for landscaping therefore the water consumption for landscape irrigation does not bring a big impact to the whole water consumption of the building.



\* 0% (GreenPASS) – resources not available / not visible to public access

**Figure 2: Weighing Percentage of Water Efficiency between Different Tools**

While for GreenRE, their focus on water efficiency is more towards the selection of fittings and strategies on water consumption during construction and building operation. Therefore they did not focus on the rainwater harvesting besides the water reuse and recycle. GreenPASS intent for water efficiency is to ensure the effective use of water during operation. However, because of limited resources, it is hard to review on their detail assessment approach. The details assessment approach for water efficiency in every rating tools may be viewed in Table 3.

**Table 3: Scoring Distribution of Assessment Approaches for Each Rating Tools**

Water Efficiency Assessment Approaches	GBI		pH JKR		GreenPASS		GreenRE	
	✓		✓					
Rainwater Harvesting	✓	2 / 20%	✓	3 / 30%		n/a		-
Water Recycling	✓	2 / 20%	✓	2 / 20%		n/a		-
Water Efficient – Irrigation /Landscaping	✓	2 / 20%		-		n/a	✓	3 / 20%
Water Efficient Fittings	✓	2 / 20%	✓	2 / 20%		n/a	✓	8 / 54%
Metering and Leak Detection System	✓	2 / 20%	✓	3 / 30%		n/a	✓	2 / 13%
Water Consumption of Cooling Tower		-		-		n/a	✓	2 / 13%
TOTAL		10 /100%		10 /100%		n/a		15 /100%

Refers to above Table 3, basically there are six assessment approaches for water efficiency being developed by GBI, pH JKR, GreenPASS and GreenRE consists of rainwater harvesting, water recycling, water efficient of landscape irrigation, water efficient fittings, metering and leak detection system and also water consumption of cooling tower. Basically, GBI has the most assessment approaches of all listed above, followed by pH JKR and GreenRE. However, among all listed assessment approaches, only water efficient fittings is being implemented by all four rating tools and water consumption of cooling tower is only being implemented by GreenRE. This is understandable as human daily activity such as washing, cleaning

and bath contribute to the most water consumption as per discussed in early chapter. Thus, this phenomenon contributes to the weighing system assessment whereas water efficient fitting has the highest points for GBI and GreenPASS. Whereas pH JKR may not consider to weight more on water efficient fittings mainly because their focus is more towards government building where most of the building only being occupied during the day and no major activities related to water consumption except for toilet flushing and washing, etc.

It also can be seen that GBI having an even scores for all related assessment approaches while GreenRE focus more on water efficient fittings. It shows that GBI is developing a balance usage of water either recycles or potable water to maintain the water consumption by reuse of rainwater harvesting and increased efficiency in any approach while GreenRE is focus on water use efficiency by the fitting technology. In comparison of assessment approach and scoring and weighing of all four rating tools for water efficiency, GBI has the most efficient and functional assessment comprises of all approach of reduce, reuse and recycle of rainwater and potable water while the other tools developed their assessment based on the needs of the implementation area such as pH JKR and GreenPASS which focus only on government building.

## **CONCLUSION**

Generally, GBI and GreenRE are the most well-known green rating tools in Malaysia where they cover a wider scope of green assessments. These assessment tools can be implemented by most of the developments such as residential, non-residential, retail, township, etc compare with pH JKR, GreenPASS where they just focus on certain area of development and government based projects. Therefore, GBI and GreenRE can be seen as more comprehensive compare to pH JKR and GreenPASS. Besides, the assessment tools give benefits to all parties of design and build to create a sustainable building and environment not only in terms of water efficiency but also all other elements such as energy usage, indoor environmental quality and health, waste management and also sustainable site planning in order to have a sustainable living. Besides, by implementing a water efficiency approach, we can reduce the potable water consumption by reuse

of rainwater harvesting and water recycling, and also by using a water efficient fitting to ensure a sufficient use of water without wasting any of it. In addition, all of these green assessment rating tools can contribute to the designers and builders during the design and construction stage to ensure the performance of the built environment.

Throughout this study, it can be concluded that different green assessment rating tools in Malaysia has different approaches and objectives even the assessment criteria are almost related to each other. It has been clarified by each tools of their functions such as GBI focus on the act to enhance awareness of sustainability in built environment among designer and developers while GreenRE focus on the effort to encourage the property development industry to be sustainable by emphasising on passive design. GreenPASS and pH JKR focusses more on the construction and operation of government buildings to minimise construction impact towards our environment where GreenPASS highlighting on the emission of CO<sub>2</sub> and pH JKR enable the assessment on the sustainability on the road sector. Lastly, this paper shows the comparison on the assessment criteria of water efficiency for each rating tools in Malaysia. From the analysis, we can see that all rating tools highlighting almost 80% of the same assessment approaches of water efficiency whereby the design and build consideration highlighting the water reduce, reuse and recycle of rainwater and waste water thus encourage reduction in potable water consumption for sustainable use. It is hope that the assessment for green building is to ensure that the implementation of the development is not harmful to the human and environment.

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## REFERENCES

- Bahaudin, A.Y., Elias, E.M., & Saifudin, A.M. (2013). A comparison of the green building's criteria, The 3<sup>rd</sup> *International Building Control Conference 2013*. Kuala Lumpur. 21 Nov. 2013. 772-779.
- Chen, G. (2015). *Green Effort to Save Water*. Retrieved from The Star Online website: <http://www.thestaronline.com> on 7/3/2015
- EIA. (2014). *Energy Information Administration - International Energy Outlook 2014*. Washington, DC: Office of Integrated and International Energy Analysis, U.S. Department of Energy.
- EPU. (2015). Eleventh Malaysia Plan 2016-2020; Anchoring Growth On People. Retrieved from <http://www.epu.gov.my>
- Fauzi, M. A., & Malek, N. A. (2013). Green Building assessment tools: Evaluating different tools for green roof system. *International Journal of Education and Research*, 1 (11), 1-4.
- GBI. (2013). *Green Building Index; what is a green building*. Retrieved 6th June 2015, from <http://www.greenbuildingindex.org/>
- Halim, B.M. (2012). Economic issues on green office building in malaysia. *International Real Estate Research Symposium*. Kuala Lumpur. 1-13
- Heinberg, R. (2010). *What Is A Sustainable City*. Retrieved from Edmonton website: <http://www.edmonton.ca> on 4/3/2016
- Hyde, R., Rostvik, H., Woods, P., & Soebarto, V. (2008). *Bioclimatic housing: innovative designs for warm climates*. R. Hyde (Ed.) .
- Ismail, E. (2012). Green Technology in Construction. CIDB Initiatives. CIDB. Retrieved from <http://www.cidb.gov.my> on 8/7/2012
- KeTTHA. (2014). *Government initiatives on energy efficiency in Malaysia (S. E. Division, Trans.)*: Ministry of Energy, Green Technology and Water. Kuala Lumpur
- Liming, D. (2011). *Careers in Green Construction*. US: US Bureau of Labor Statistic.

REHDA. (2015). Retrieved on June 5, 2015 from <http://www.greenre.org/GreenRE>

Ruslan, A. (2014). *Is Malaysia Facing A Future Water Shortage?* Retrieved from Business Insider. Retrieved on January 13, 2016 from <http://www.businessinsider.my/thelife>

Samad, F. (2012). *Penarafan Hijau JKR* (C. A. S. Tenaga, Trans.): Jabatan Kerja Raya. Kuala Lumpur.