

Evaluating the Awareness Level of Green Office Users: A Case Study

MORTEZA GHAEMPANAH TAJABADI

*Department of Structure and Materials, Faculty of Civil Engineering, Universiti Teknologi Malaysia
morteza.ghaempanah@gmail.com*

MOHAMAD IBRAHIM MOHAMAD

*Assoc. Prof. PhD, Department of Structure and Materials, Faculty of Civil Engineering, Universiti
Teknologi Malaysia*

BEHZAD HAMIDI

*Department of Structure and Materials, Faculty of Civil Engineering, Universiti Teknologi Malaysia
hamidi.behzad@gmail.com*

Abstract

Green offices are office buildings constructed to reduce the impact of new construction on the sustainable development of society. In order to achieve the objectives of sustainable development, all the stakeholders of this sector need to work together. In this regard, the end-users of such buildings are one of the biggest and most important groups of stakeholders who will play a role in the operation phase of the project. A green office building can still perform poorly if the users are not aware of the facilities and services available in the office. The current study intends to evaluate the users' level of awareness in a green office building (Setia Eco Gardens, Johor) as a case study. It covers different aspects of sustainable practices which are tied with the users' choices in everyday office life. The data was gathered using questionnaires that were distributed among the office users and then processed and analyzed by means of statistical software. The results were presented through charts, graphs and tables. The results of the study can be used to clarify the areas where more emphasis is needed in educational materials including posters, leaflets and videos. They can also be used as a decision-making tool for the managers to recognize and implement sustainable-driven policies within the office.

Keywords

Green Office, End-users' Awareness, Sustainable Development

1. Introduction

In order to ensure the correct operation of green buildings in terms of energy and water efficiency, CO₂ emission control, waste control, and other basic criteria, different measures are taken into consideration. These measures range from post-occupancy evaluation to Service-level measurements and environmental attitude surveys. According to Max Deuble and Richard de Dear (2010) the higher the environmental awareness of the occupants, the more they tolerate their building features particularly those featuring green designs, such as natural ventilation. According to their studies, although many green buildings tend to have less favorable features than their non-green counterparts, the occupants can be forgiving if they are aware of the functions of their building. In other words, higher levels of environmental beliefs yield higher levels of tolerance. Whilst buildings take years to build and even months to retrofit, changing the occupants' expectations of the buildings has not been so easy.

In some companies, a group of office users are in charge of providing ideas concerning sustainable changes to their company through open and focused brainstorming sessions, discussions, and forums. They are expected to come up with suggestions concerning different aspects of office practices in order to lessen the environmental burden of their building. These actions were practiced by a lot of companies including David Aplin Recruiting (2008), Harbour Foreshore Authority (2008) and Toronto Community Housing (2007). The aim of these studies, which can be done as a part of a Post Occupancy Evaluation (POE), is to put green culture into action by focusing on behavioral change in office settings.

The UK Government, in a Chartered Institute of Building (CIOB) report on Sustainability and Construction, has set out the ultimate objectives of Sustainable Development as follows:

- Social equity
- Environment protection
- Resource conservation
- Safeguarding economic growth and employment

In the area of environmental protection, the two main goals of sustainable development in construction are related to the health of our cities and reducing the impact of climate change.

In other words, sustainable development in construction is meant to improve the quality of life and create more “Climate Responsive Buildings”. The primary cause of climate change is emissions of CO₂ which most often originate from cars and the generation of electricity.

In order to achieve the objectives of sustainable development in the construction industry, all the stakeholders involved in this sector need to join together and conquer some of the most unmanageable problems of our time. In this regard, the prerequisites for the deployment of this mission are:

- Governments dedication
- Scientists and researchers’ interest and concern
- Designers’ commitment
- Developers and contractors’ commitment
- Users’ awareness

These requirements are linked to each other like the rings of a chain and the loss of even one of these rings will lead to failure. In this regard, the user’s awareness, as the last link of the chain, plays a very important role. The socioeconomic state of the users, their awareness of the green features of their buildings, and their willingness to use them in an effective way are also of great significance.

2. Methodology

The methodology for this research was carefully selected based on the objectives of the study. First, a comprehensive study was carried out on sustainable development in general and in the construction industry, green office and conventional rating systems, green office users’ manuals and practical approaches to minimize the negative effects of offices on the environment. Then, a semi-structured interview was performed to identify the main features of green offices and areas where office users can affect the key features of the building. The data gathered from the green office users was analyzed using a frequency analysis to understand the level of their awareness towards the features of the green office case study. This analysis simply explains what percent of the users chose a specific answer which can, in turn, give an insight into their attitude towards that specific question. Based on what is considered a “correct” or “desirable” answer, one can decide if the majority of the users are aware of that answer or not.

3. Analysis of the Questionnaire Survey Data

3.1 Demography

Equal numbers of questionnaires were distributed among green and non-green office users. To make sure that the users had equal cultural, socio-economic, and educational backgrounds, a demographic study was carried out. The results of the study are presented in table 1. As is shown in the table, the samples are gathered from two homogenous sets of population in terms of gender, age group, race, and education level.

Table 1: Demography of Two Groups of Respondents

	Green Users				Non-green Users			
Education Level	PhD	Masters	Degree	High School	PhD	Masters	Degree	High School
Frequency	-	10%	83.4%	6.6%	-	13.3%	83.4%	3.3%
Age Group	20-29	30-39	40-49	50+	20-29	30-39	40-49	50+
Frequency	56.7%	40%	3.3%	0	53.3%	33.3%	6.7%	6.7%
Race	Malay	Chinese	Indian	Other	Malay	Chinese	Indian	Other
Frequency	46%	43.3%	6.7%	3.3%	96.7%	-	3.3%	-
Gender	Male		Female		Male		Female	
Frequency	30%		70%		40%		60%	

3.2 Frequency Analysis

In the frequency analysis, the awareness of green office users was measured by the percentage of office users who were aware of the key green features and appropriate behavior expected from them. Familiarity with these features helps the users to interact with the building better and increase efficiency in office procedures. The results of the analysis are as follows:

3.2.1 Office Equipment Use

In this section of the questionnaire, questions regarding the way the users interact with the office equipment were asked. The results can be interpreted based on the percentage of office users who demonstrated proper usage and behavior.

As figure 1 shows, only 10 percent of green office users utilize laptops as compared to the 93 percent who use desktop computers. According to the David Aplin Recruiting report, laptops are considered twice as energy efficient as desktops. So, in procurement procedures, it is better to consider purchasing laptops rather than desktop computers. Also, as the use of photocopiers, fax machines, and printers is quite high, appropriate measures should be taken into consideration on behalf of the management to reduce the amount of fine paper use within the office.

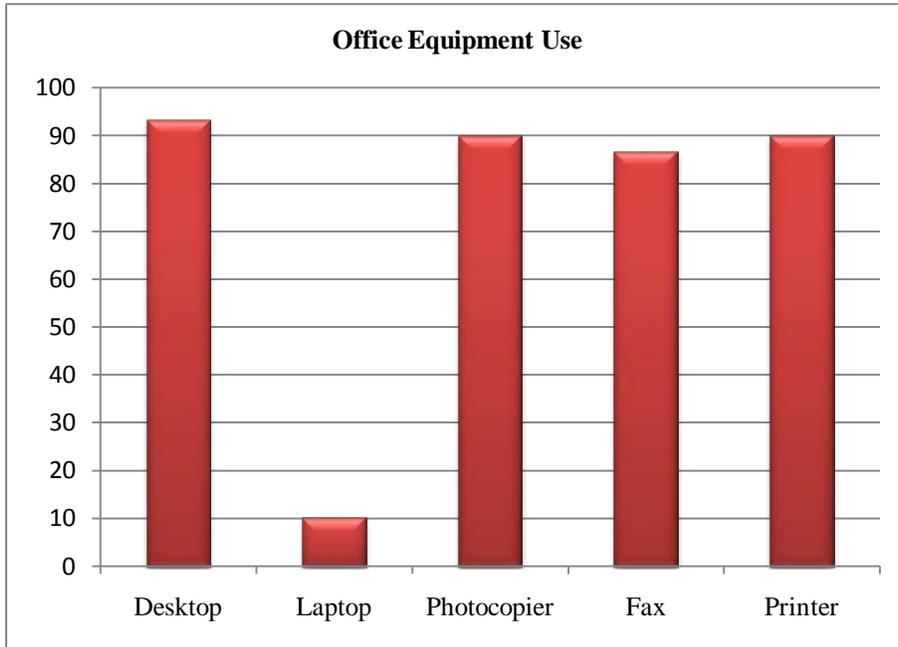


Figure 1: Office Equipment Use among Green Office Users

The behavior office users show when their computer is not in use illustrates the level of their awareness towards the energy use incurred by them. Figure 2 shows a high level of awareness in this particular discipline. 63.3 percent of the respondents said they turn off their computers from the power bar, which is considered the proper behavior to reduce Phantom Loads. Phantom Loads are appliances that use power all the time even if they are turned off including computers and copy machines.

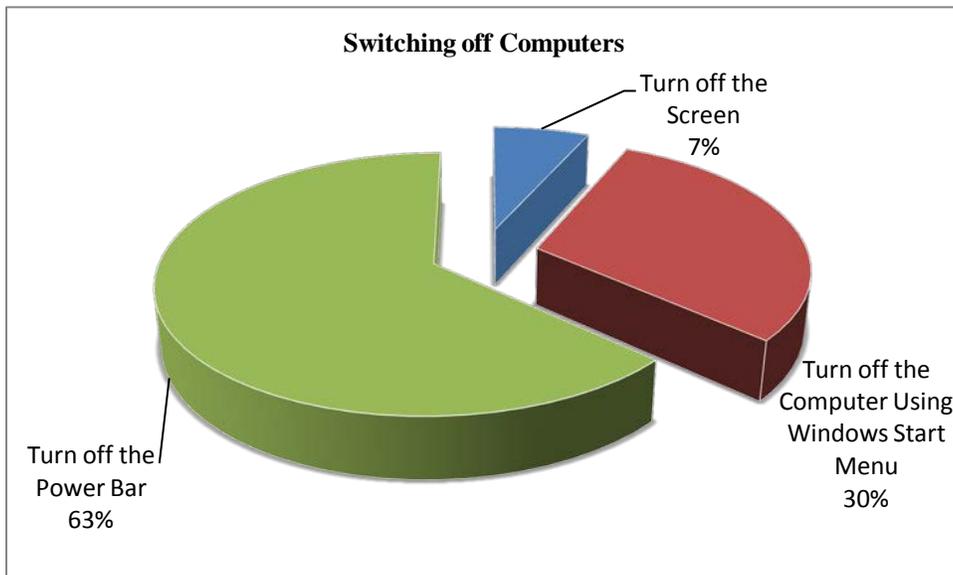


Figure 2: The Behavior of the Users towards Switching off Their Computers

The level of awareness towards the use of power management settings among green office users is also important. In this area also, office users showed a high level of awareness. They were expected to be aware and set their equipment power settings to make sure that, when not in use, their computer monitors would automatically switch off after 15 minutes, the hard drive would be turned off, and the system would go to stand by after 30 minutes and hibernate after 2 hours. Figure 3 shows that 60 percent of office workers set their power management settings accordingly.

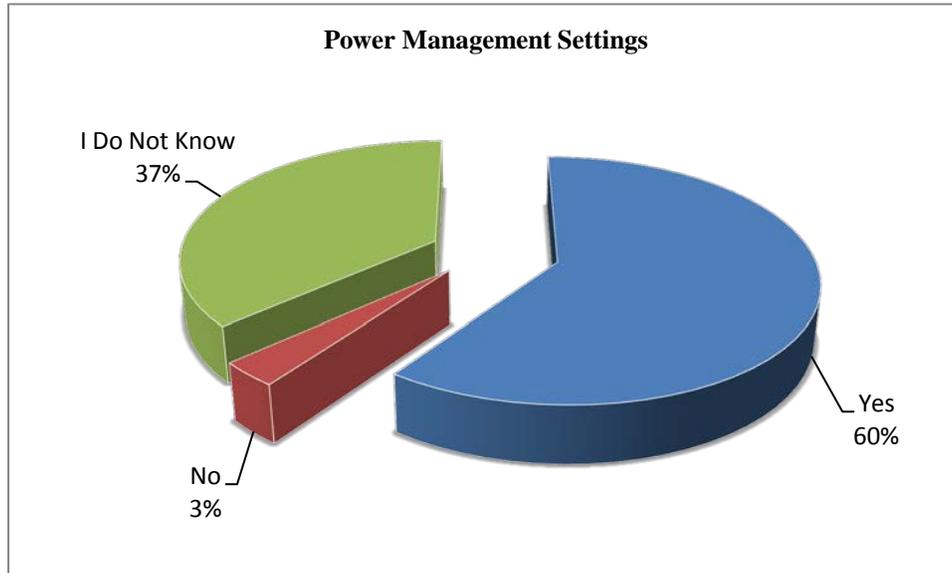


Figure 3: The Level of Awareness towards the Use of Power Management Settings

Figure 4 shows the behavior of the office users towards other office equipment including photocopiers and printers. They were expected to turn off the appliances after each use. Only 57 percent of the respondents showed the expected behavior. In addition to energy savings, turning off the equipment will contribute to less heat generation so the savings are multiplied.

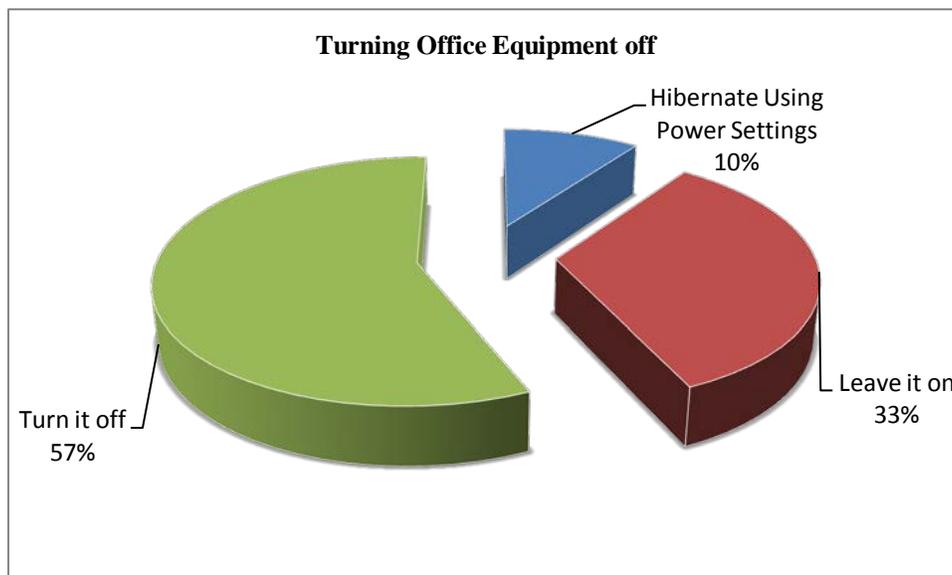


Figure 4: The level of Awareness towards Turning off Office Equipment after Use

3.2.2 Air Conditioning and Ventilation

In this section of the questionnaire, the respondents were asked to describe the way they set their air conditioning system. Considering the tropical climate of Malaysia, special attention should be paid to the reduction of energy consumption resulting from an inappropriate use of air conditioning systems. Choosing proper uniforms to adapt the employees to the environment and installing programmable thermostats for air conditioners are among the actions that should be taken into consideration in this area. Appropriate temperature to be set on air conditioning systems is between 25 to 27 degrees centigrade. This temperature range provides a cool environment for the users to work and saves energy consumption at the same time.

According to figure 5, 63 percent of office users chose the proper range of temperature. This shows a quite high level of awareness towards the use of air conditioning systems in the green office studied in this research.

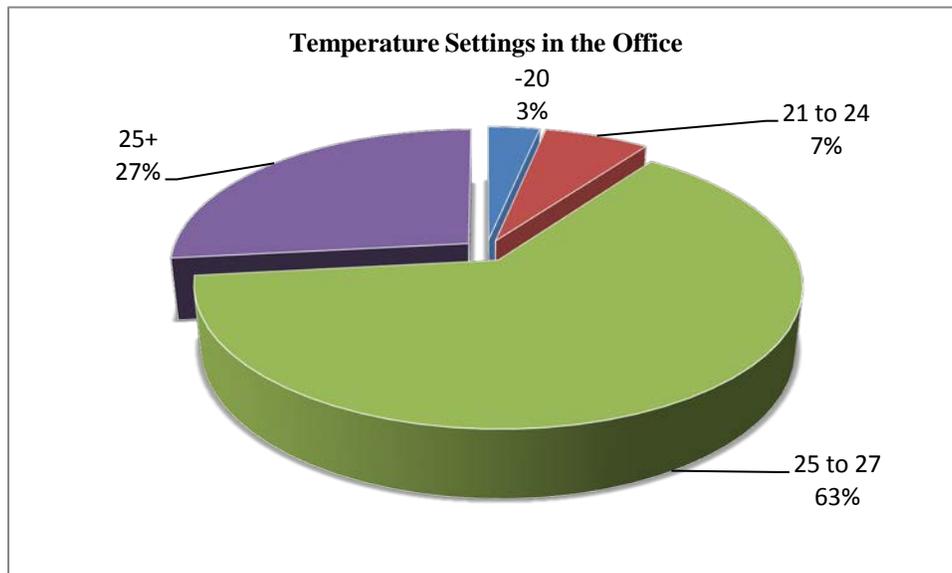


Figure 5: The Level of Awareness towards Temperature Settings in the Office

Accordingly, 83 percent of the office users believed that their dress code was chosen according to the office temperature. This shows high level of satisfaction from the comfort settings in the office.

3.2.3 Lighting

The green building studied in this research makes use of natural light and low consumption lights for illuminating the office. Figure 5.6 shows the percentage of office users who are aware of these facilities. As it is evident, only 33.3 percent of the office users were aware of the use of natural light and 36.7 percent were aware of the installation of low-consumption lights in the office.

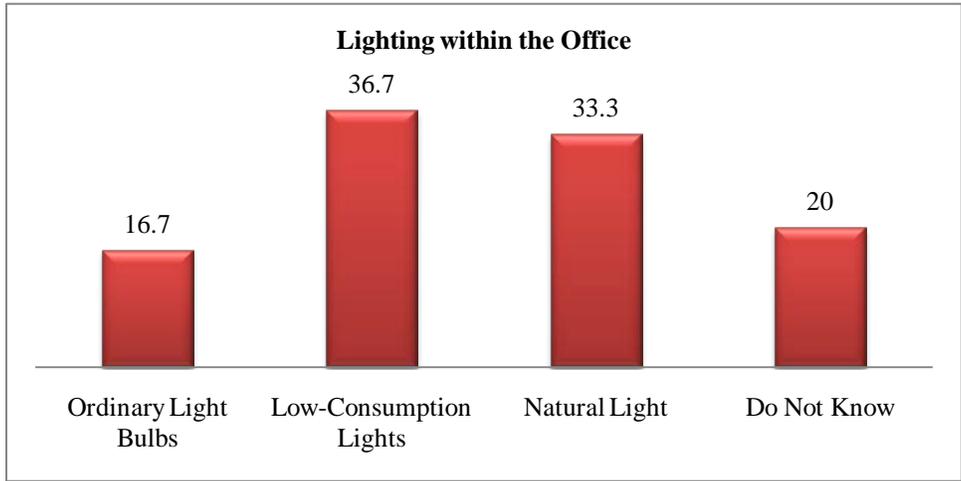


Figure 6: The level of Awareness towards Energy-efficient lighting within the Office

3.2.4 Transportation

The amount of CO₂ emission is one of the factors that are used to evaluate the greenness of an organization. In office buildings this criterion mostly depends on the frequency in which office workers travel to and from work by private vehicle. Figure 7 shows the frequency in which green office workers travel to work by different vehicles. As the graph shows, only 6.7 percent of the respondents were regular users of carpooling. 70 percent of the respondents use carpooling only 0 to 1 time while 16.7 percent use their private cars more than 10 times a week.

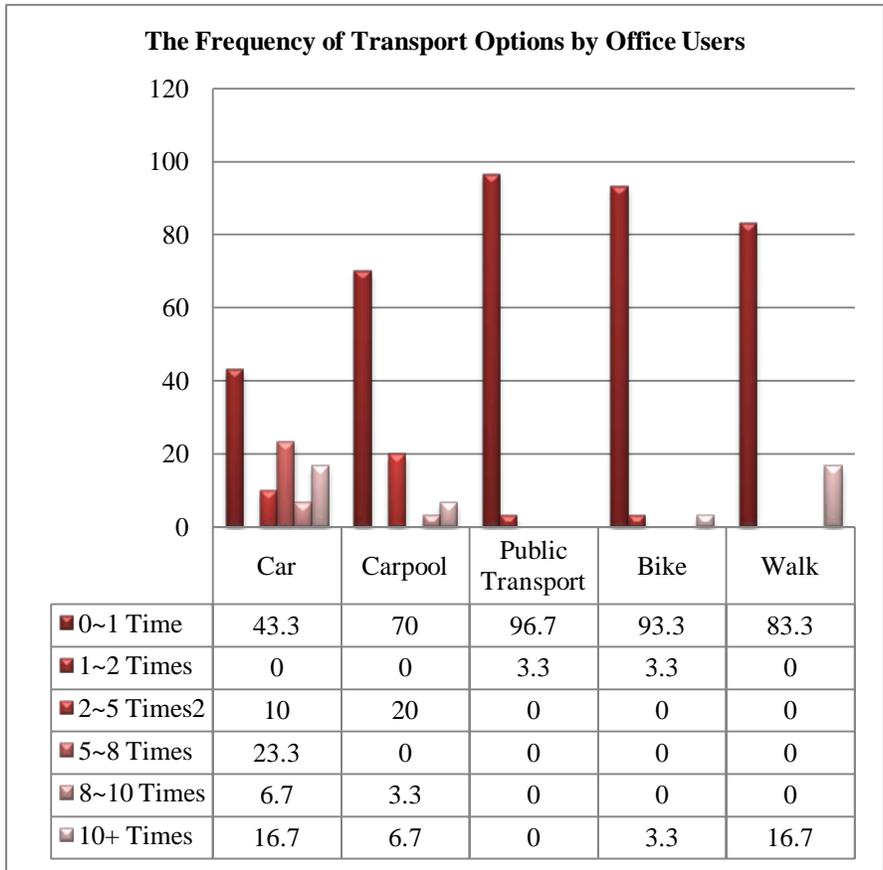


Figure 7: The Frequency of Transport Options by Office Users

3.2.5 Waste

Waste control is another parameter which is studied within the office. In the first stage of the analysis, only waste in food services was taken into consideration and the other areas will be considered in the comparative study. Figure 8 shows the percentage of users who use styrofoam, bottled water, paper napkins and reusable utensils in the studied green office. According to the graph, the percentage of unrecyclable materials used, including styrofoam, bottled water and paper napkins, is quite high in comparison with reusable utensils. Proper measures should be taken to decrease the use of these products.

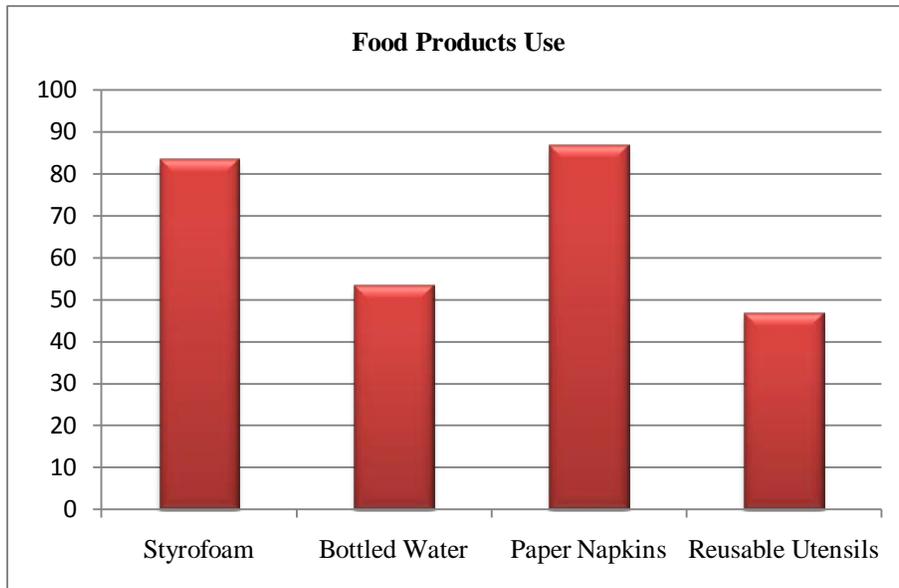


Figure 8: The Percentage of Unrecyclable Food Product Use within the Office

3.2.6 Maintenance, Mechanical and Electrical Installations

In this section, the awareness of office users towards maintenance and mechanical and electrical installations is evaluated. Figure 9 illustrates the level of awareness towards the installation of high efficiency water taps and devices. As can be seen, office users showed a high level of awareness in this area. 76.7 percent of the respondents were aware of these devices.

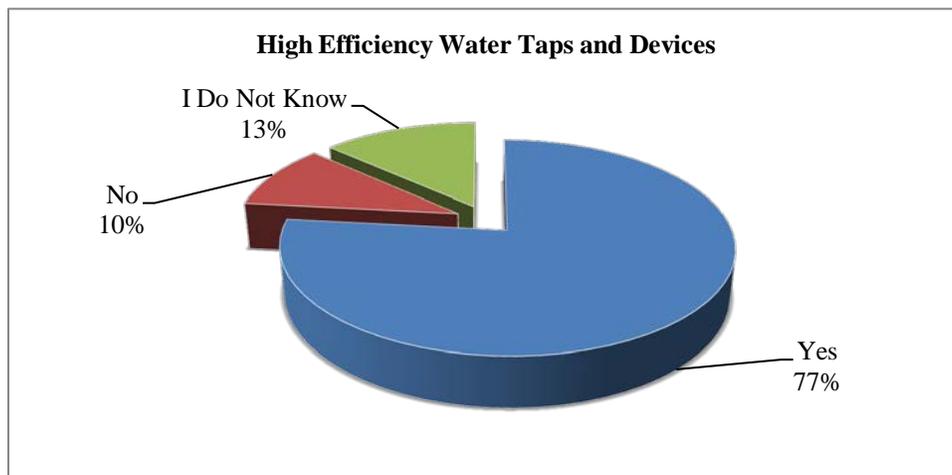


Figure 9: The Level of Awareness towards the Existence of High Efficiency Water Taps and Devices in the Office

The awareness towards the existence of efficient lights was quite lower than the previous criterion. Only 50 percent of the respondents were aware of such equipment in the office. Figure 10 shows the statistics related to this criterion.

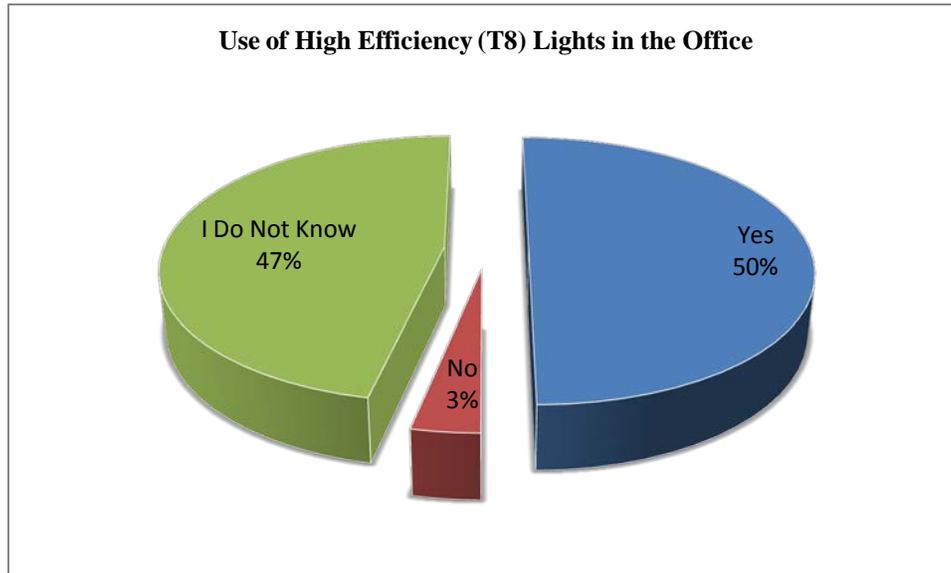


Figure 10: The level of Awareness towards the Existence of High Efficiency (T8) Lights in the Office

It is important for green offices to have precise and efficient leak detection systems in order to reduce water waste. The level of awareness towards this criterion in the green office under this study is shown in figure 11. According to the graph, green users showed a relatively good level of awareness in this area. 76.7 percent of the respondents were aware of this system.

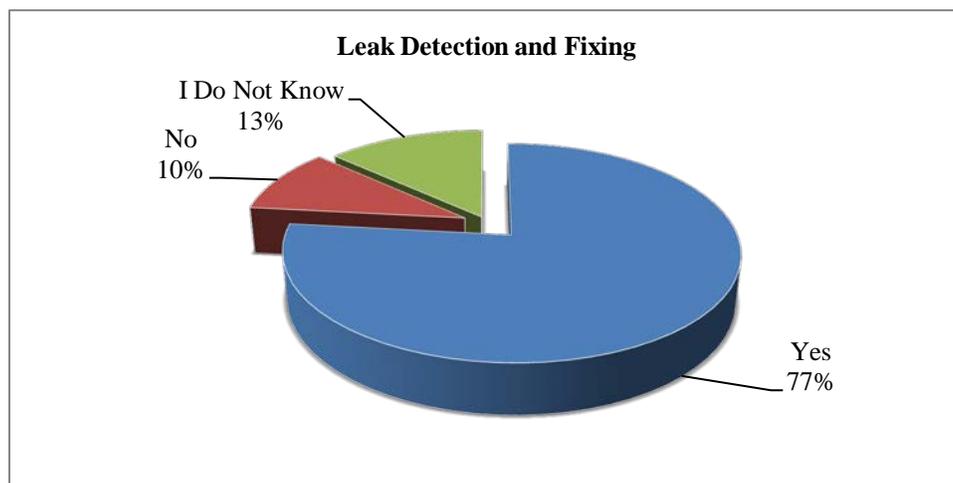


Figure 11: The Level of awareness towards Leak detection and Fixing Systems

In order to use paper efficiently, it is recommended that the printer and photocopier toners and cartridges be replaced regularly. 86.7 percent of the users said that the toners and cartridges are replaced regularly. Figure 12 illustrates the frequency of this criterion in the case study office.

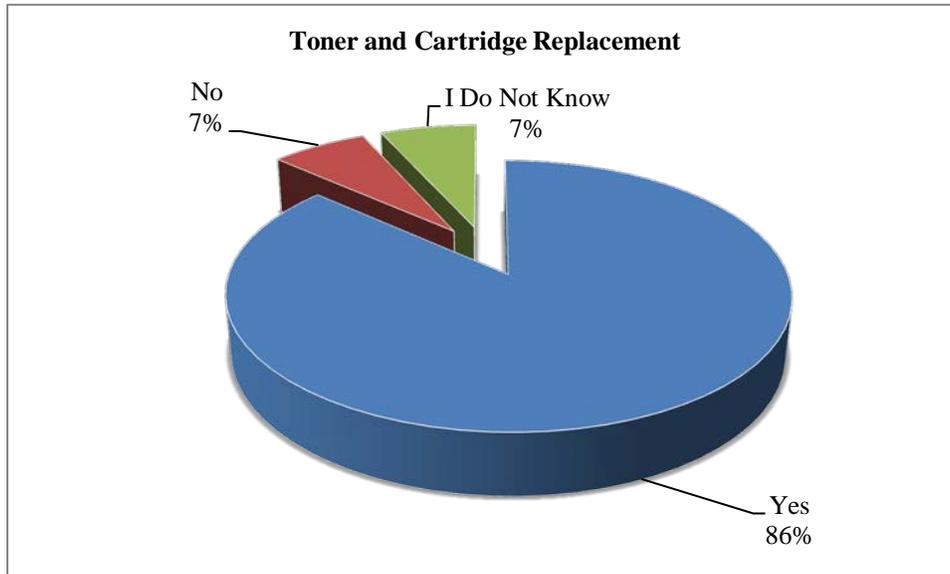


Figure 12: Toner and Cartridge Replacement

The awareness of green office users towards the installation of programmable thermostats for air conditioning systems helps them to use it effectively. Figure 5.13 shows that only 30 percent of the respondents knew about this device. Appropriate action should be taken to raise the awareness in this area.

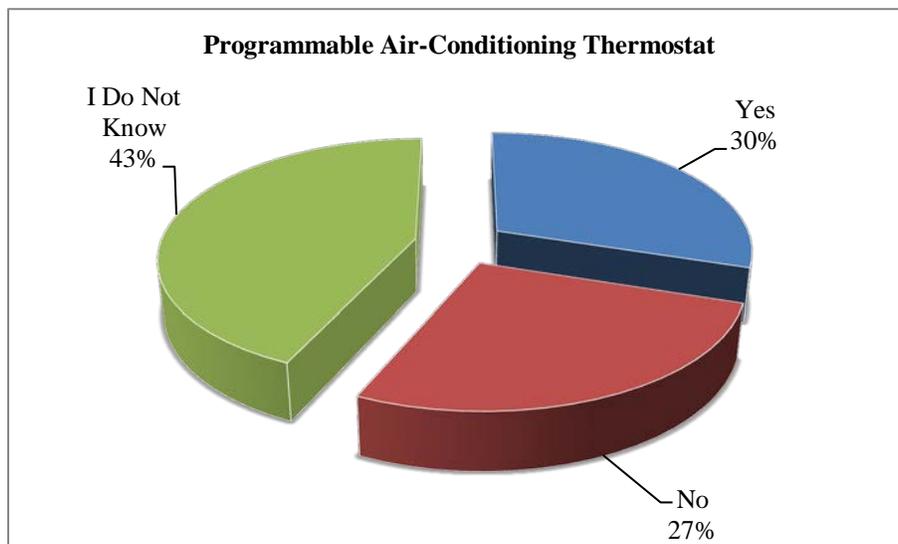


Figure 13: The Level of Awareness towards the Existence of Programmable Air-conditioning Thermostat

4. References

CIB Agenda 21 on Sustainable Construction (1999), *CIB Report Publication 237*

Derek Clements-Croome (2004). *Intelligent Buildings: Design, Management and Operation*, Thomas Telford Publications, ISBN 0-7277-3266-8

Green Building Index (2010), *GBI Assessment Criteria for NON-RESIDENTIAL NEW CONSTRUCTION (RNC), FIRST EDITION*, JUNE 2009, Version 1.0

Jerry Yuldson et al. (2008). *The Green Building Revolution*, ISLANDPRESS Publications, ISBN 978-1-59726-178-4

Jerry Yuldson (2009), *Green Building through Integrated Design*, Mc Graw Hill Publications, ISBN 978-0-07-154601-0

Leaman, A., Bordass, W. (2007), Are Users More Tolerant of Green Buildings?, *Building Research and Information*, 35(6):662-667

Leaman, A., Thomas, L. and Vandenberg M (2008), Green Buildings: What Australian Building Users Are Saying, *Ecolibrium*, November 2008, p 22-30

Max Deuble, Richard de Dear (2010), Green Occupants for Green Buildings: The Missing Link?, UK, *Adapting to Change: New Thinking on Comfort*.

Nazirah Zainul Abidin (2009), Sustainable Construction in Malaysia – Developers' Awareness. World Academy of Science, *Engineering and Technology* 53