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## **Green Facility Management in a Shanghai Office Building**

### ***A Case Study of the “Asia Building”***

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## Master of Science Thesis

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### Abstract

*This paper aims to explore how well green facility management has performed in Shanghai office building and finds the possible way to improve the situation. Together with two interviews, questionnaire based on benchmarking approach is conducted in a case study of the Asia Building, which lead to the conclusion that green facility management has done a fair work in Asia Building, and suggestions that laws and regulations related to green facility management should be established; governmental organization, the Trade Association of Shanghai Property Management, should take responsibility to improve the situation concerning to the issue; property management company should develop a healthy relationship with property owner and occupiers.*

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# **1 Introduction**

## **1.1 Background**

As the environmental friendly issue has increasingly caught public attention, the sustainable strategy of the company gradually prevail so as to set the good image in terms of corporate social responsibility (CSR). Companies who qualified by environmental credentials have the passport for a greater market (Baharum & Pitt, 2009). In China, the awareness of energy conservation is promoted by government and academic organizations, especially in building sector. Green building is advocated to a large extent because buildings consume up to 27% of the total energy in China (Yang, Xu, & Jian, 2009). However, the accomplishment of refurbishment of green building should not be the end of environment management; instead, facility management takes an important role in implementing the energy saving strategy because FM deals with day to day operation such as energy management, health and safety, recycling, waste management and so on. And an efficient performance in relation to facilities would enhance favorable cost-benefit ratio potentially (Baharum & Pitt, 2009). How to improve the FM arrangement to keep step with sustainable principle in the organization is a vital topic for professionals to work on (Chotipanich & Nutt, 2008).

## **1.2 Aim**

This paper studies how facility management serves Shanghai office building's sustainably in practice and the strength of the various aspects of the facility management with the aim of suggesting possible ways to help green principles to be fulfilled by facility management in operation.

## **1.3 Methodology**

In order to understand how facility management serves Shanghai office building's sustainably in practice the study focuses on a case study of facility management of

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the Asia Building and it starts with a review of literature on facility management followed by performance testing based on a benchmarking model. Interviews with two property managers are also carried out to gain more understanding of the business. One interview with the property manager of Asia Building, the other interview was carried out with property manager of China Pavillion (a green building) to highlight aspects of managing a green building.

#### **1.4 Limitation**

The property (Asia Building) was selected as a study object because of its location in the CBD of Jing'an District. It is taken to be representative of many typical office buildings in Shanghai. However certain differences in management can be expected in comparison to other buildings.

#### **1.5 Disposition**

The first part of the paper is to introduce the background and the aim of the paper. The second part describes what facility management is and its significance. In the third part the green facility management is presented. The fourth part of the paper is about the benchmarking approach used later on in the case study. In the fifth part, the scope of facility management in Shanghai is interpreted followed in the sixth part by a description of the criteria of green facility management based on benchmarking. The case study of the Asia building is presented in part seven. The analysis and conclusions are in part eight.

#### **1.6 Specific term**

BA system: Building Automation System

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## **2 Facility Management**

### **2.1 Definition**

Facility management is, by definition,” a multi-disciplinary area of development and opportunity, not a single discipline in its own right. It requires a multi-professional approach, involving both management and technical competences; the territory that it covers cannot be encompassed by a single profession (Nutt, 1999).” McLennan argue that facility management has a main characteristic of service management. He found that it would be more liable to plan, design and organize the resources if the concept of service is emphasized. Furthermore, when appropriate management technology is adopted, it would be helpful to predict the outcome in the future (McLennan, 2004). “A profession that encompasses multiple disciplines to ensure functionality of the built environment by intergrading people, place, process and technology” is defined by the International Facility Management Association (2006)

### **2.2 Services of Facility Management**

There is a wide range of facility management services offering in practice, such as real estate management, financial management, change management, human resources management, health and safety and contract management, building maintenance, domestic services and utilities supplies. However, different organization has different set of combination; in other words, there is no uniform service package which works perfectly to any organization (Atkin & Brooks, 2009). The facility management of office building in Shanghai basically emphasizes on the sectors in building maintenance, domestic services and utilities supplies.



### **2.3 Significance**

Facility management is not only a package of property services, but also it plays an important role in operation cost control, and extension of building life cycle. It is no long rational to evaluate the business performance by calculating the annual revenue alone, instead, it should contain building portfolio and environment maintenance as well which play an important role to assist the core business of the company (Lavy, 2008). Additionally, From Lavy's case study, whose property objective is a university building which has been used for 20 years, the Life Cycle Cost (LCC) of the building is made up by construction (17%), maintenance (59.8%), and capital renewal (23.2%). This result demonstrates that from the long term perspective, how to more efficiently design and organize the facility work beforehand is a crucial topic to all relevant professions (Lavy, 2008). Keeping and Shiers agree that more attention should be distribute on building maintenance because it is an important element to prolong the life of the building's fabric, services and structure (Keeping & Shiers, 1996).

### **3 Green Facility Management (GFM)**

This paper is about green facility management but before describing GFM a brief introduction is given about green buildings. The Asia Building is not a green building but the advantages due to green facility management are imbedded in the idea of green buildings.

#### **3.1 Benefits of Green Building**

*Low cost:* Green building has the advantage to reduce the costs for the occupiers, especially in energy cost and the other service cost. DaXing Financial Center which is an A class office building took energy saving project in 2004. They use substitute water-based refrigeration for air-conditioning refrigeration equipment; shorten the public lighting; adjust the outdoor lighting according to the degree of sunshine; monitor cooling water temperature, indoor temperature, and the provision of fresh air; implement automatic sensor aiming to decrease the consumption of fresh water. And the project succeeded in reducing electricity power by 23% and saving 17% electricity fee for the occupiers (Kean, 2007). Not only a large portion of energy expense can be saved, maintenance fee also can drop in a sustainable building. For example, when a office building with the size of 30000 m<sup>2</sup> is refurbished into a environmental friendly project by abandoning traditional air-conditioning and installing natural ventilation, 40 per cent service cost is saved because the engineering system turned to be simple (Shiers, 2000).

*Healthy indoor environment:* The world wide problem of poor indoor air quality results from building's tightness which leads to low amount of fresh air since 1970. In developing countries, besides malnutrition and poor quality of water, indoor air quality turns to the third killer to harm human's health. More than 2 million people die of the diseases causing from it annually. On the other hand, if the air quality is raise to a good standard, the work efficiency of the occupiers can be improved by 2

to 16% (Li, Han, Ye, Yuan, & Xie, 2006). Green buildings provide occupiers with a healthier working space comparing with the non-green ones because the air quality is ameliorated by the natural ventilation which leads to the low rate of Legionnaire's Disease happening to the occupiers (Shiers, 2000). Many pollutants in a room with air-conditioner, such as respirable particles, oxides, CO, carbon dioxide and formaldehyde can be decreased by improving ventilation (Li, Han, Ye, Yuan, & Xie, 2006).

*Positive image for company:* Green buildings earn a good reputation for the companies. There is an increasing demand of CSR (Corporate Social Responsibility) in relation to environment protection from the public. Therefore, the intangible asset of "environmental responsible" is formed once the companies entering in a green building (Shiers, 2000). As mentioned DaXing Financial Center above, because of its success of energy saving, it honored the golden prize of energy efficiency in Hong Kong (commercial sector) issued by government in 2005 (Kean, 2007).

### **3.2 The Tendency of Green Buildings**

The awareness of energy conservation has not just been advocated. Green building has been supported by government by the means of legislation. In UK, the issue of sustainability has an important role in Planning Policy Guidelines, which even bring about energy tax for building (Shiers, 2000). In 2005, The People's Republic of China Science and Technology and Long-term Development Plan (2005-2020) was published, which indicates that green building and building energy conservation should be a vital sector in the science and technology research. (Yang, Xu, & Jian, 2009) Energy Conservation Law of the People's Republic of China which was revised in 2007 mentions that "Public buildings that use air-conditioners for heating and cooling shall implement a system of indoor temperature control. Specific measures will be formulated by the department of the State Council in charge of construction." In China 27% of the total energy is used in architectural sector. The

number is computed in consideration of existing housing volume and the climate difference as well as other standards of energy conservation. From 2008, the Standard for Energy Consumption Survey of Civil Buildings was carried out, which intend to collect the data of building energy consumption so as to provide the base for the future policy design referring to energy conservation.

### **3.3 Green Facility Management**

Pratt and Kaplan warn that as changes take place with a more rapid speed, which accelerate the differential demands related to facility management, the competence among the FM professionals tends to be intense. The people who can make up to the market can survive in the competition. (Pratt & Kaplan, 2004) It has been decade that environmental friendly issue affects the global, from the governmental policies to business strategies; it seems that everything takes a new cloth of sustainability. Early back to 1996, in Keeping and Shiers's research, the demand of green building from tenant exist in the market. (Keeping & Shiers, 1996)As the FM arrangement always fluctuates with the organizational strategy so that the core business can be efficiently assisted. Therefore, how to form the mechanism of the FM arrangement in the changeable environment externally or internally is a vital topic for professionals to work on (Chotipanich & Nutt, 2008).

Fu zhengyan argue that "First of all, 'green' is a concept of humanity which reflects the improvement of consuming attitude from "quantity-oriented" to "quality-oriented", leading to a healthy property consuming concept. After people realize that it is indifference that human beings are to the environment then we get the punishment, now people discard quick success and turn to cherish the peacefulness of the nature. Secondly, Green facility management should provide the services to the tenants by means of the combination of high technology and the sense of humanism, and the core of it is to present the relationship between human being and nature. Last, green property is an integrative whole which contains much technology content."

During the rest life cycle after it is constructed, the cost of property management is about seven times as much as the cost of construction. However, in china it would be as much as 12 times, among which, the share of energy fee occupies the most.

As the pace of urbanization gets faster and faster, buildings occupy a lot of land resources and ruin the nature space because of the extensive techniques, which result in lots of waste and pollution to river and air. Nowadays, in china the pollution emerging from production of building material and building construction accounts up for 34% of the total (Fu, 2009).

### **3.4 Value of Green Facility Management**

There are bundles of benefits that we can get from the green facility management, however, this paper highlights that green facility management can monitor the energy consuming as well as extend the life cycle of the building. Building maintenance is other criteria of BREEAM 4/93; because on one hand the daily practical maintenance would be a monitor to audit the energy saving system whether work in a good condition, on the other hand a good building maintenance can help to prolong the life of the building including fabric, service and structure. Keeping and Shiers also pointed out that it a well-organized facility management is implemented in a building up to 15 per cent of the building energy consumption will be saved. Moreover, the life expectation of the building will last longer. Therefore, “green maintenance” plays an important part of fulfilling environmental responsibility (Keeping & Shiers, 1996). The market requirement to FM cannot be satisfied with simple services like cleaning and security. Offering more value-added services will be the tendency among all the stakeholders (Cant, 2004).

Another project taking place in YKK industrial building block from 2002 to 2004, basically two aspects they focused: water management and waste management. During the project period, 10.5% water was saved and 105 tons of paper wastes were

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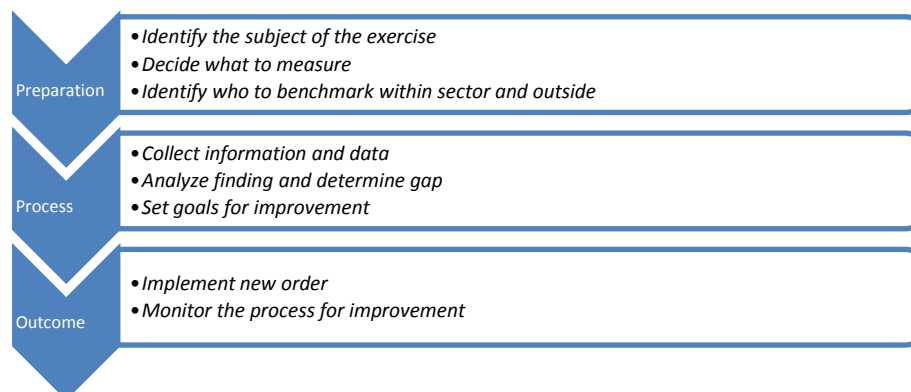
reduced, which could be said that about 6165 trees are saved by the project. Consequently, the golden prizes of Waste Wise were awarded to YKK for three years from 2003 to 2005 (Kean, 2006).

## 4 How to test the performance of Green FM

### 4.1 What is benchmarking

Benchmarking is a process to search the superior performance in the industry and find out the best practice which can be complimented in the specific organization. Benchmarking may be the second generation of development of total quality management, whose main characteristics are continuous improvement, employee involvement and customer-oriented (Ramabadron, Dean Jr, & Evans, 1997). Facility management in many organizations now has routinely collect the data of the property services, both in-house and outsource, such as cost of energy, water, maintenance, cleaning, security and so on. And the process has a great potential for reducing energy and maintenance cost as well as the continuous improvement of the services (Atkin & Brooks, 2009).

Figure 1 Steps of Benchmarking (Atkin & Brooks, 2009)



### 4.2 Reasons for benchmarking

Benchmarking is a simple tool to measure the performance and it is widely applied in practice. It helps the manager to continue improving performance and try to reach the best performance (Atkin & Brooks, 2009). According to the goals of this paper, it attempts to find out how is the green facility management going in the current Shanghai office property. And compare to the best practice, how to improve it in the future. The tool of benchmarking offers such a good opportunity to realize it.

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## **5 Facility Management Model in Shanghai**

### **5.1 The Forms of Property Management Companies in Shanghai**

There are several types of property management companies in Shanghai market. Some are established by the developer who owned the building; some are global management companies like DTZ and Jones Lang LaSalle; some are joint-venture companies; some are owned by government; some belong to individuals. According to Jennifer, the quality of the property management firstly depends on the background of the company. Companies like Jones Lang LaSalle have much experience in the field and have a professional academic team to improve their services. They have a mature management system and technology support to help them reach a better performance. (Interview, Jennifer) The quality is also determined by the ability of project manager himself. (Interview, Jennifer)

### **5.2 The relationships of the Property Management Company**

#### **5.2.1 The Relationship with Property Owners**

The contract of property management is awarded by means of bidding. The developer or the property owner invites the bid, and find the property management company to offer the services. However, in practice, the developer can choose whichever company they want to collaborate with.

#### **5.2.2 The Relationship with Occupiers**

Usually, property management company is appointed with the mission of tenants attraction. And after the settlement, property management company provides the service of building maintenance and collect the fee of management and the rent as well for the property owner. In other words, tenants do not have the chance to talk to property owner face to face. Except the physical condition of the building, how to keep the rent rate on a high level is mainly determined by the quality of service as well as the good skill of communication and negotiation of the property



management company.

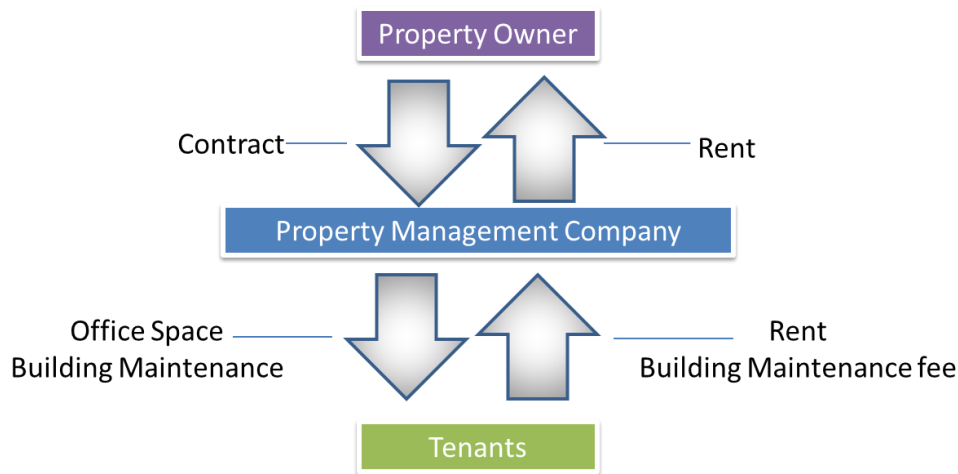


Figure 2 the Relationship between Property Management Company with Property Owner and Tenants

### 5.3 The contract types between Property Owners

There are four kinds of models of charging in the property management in Shanghai, commission, semi lump-sum, human resource only and lump-sum.

#### 1. Commission

Property management company should audit the allocation of human resource, and give the staff list. For example, how many people are needed for cleaning and how many guards are needed, and which positions are they on guard, and who these people are, and how much the payment of each staff is. Finally, the company can get the sum total, and then multiply a profit margin, and the result is the annual property management fee offered by the property management. When the need to buy something new if the old ones are broken, they have to apply to the property owner. Only when the property owner approves it, they can buy it.

#### 2. Semi Lump-sum

Property management company also needs to audit the allocation of the human resource, and ensure that there are staff on every position, but they don't have to

clarify who are the staff. Otherwise this contract form is as same as the form of commission.

### **3. Human resource only**

In this contract form, the facility management company only offers the human resource as well as the staff management. They do not buy goods because everything including consumables and other appliances are provided by the property owner.

### **4. Lump-sum**

In this contract form, facility management company bid the project with the price of 50 RMB (1 USD=6.5 RMB, Bank of China) per day per sqm. They do not need to audit the staff, they nor apply for buying goods because everything is included in the 50 RMB (1 USD=6.5 RMB, Bank of China). They can decide the detail arrangement by themselves. Usually, the contract period is about 3 years. If it is too short, the behavior of property management would become as a short-termism. If it is too long, the property management would be exposed to the risk of high inflation.

## 6 The Green FM Evaluation Criteria

### 6.1 The Framework of the Dialogue

First, the paper sets up the benchmarking developed from “Green building evaluation criteria” which is a Chinese green standard. And it is carried out in the form of questionnaire which would be answered by the facility manager. Second, it uses the web diagram to illustrate the strength and weakness of the service package.

Subsequently, it is acquired which sector should be improved and which sector has already done a good job. Third, combining the result of step 2 and the interviews of the facility managers, this paper tries to figure out the reasons why they fail to take sustainability into action in some aspects. And then an interview to the property manager of China pavilion who has a lot experience of green facility management is carried out. Finally, it gets the conclusion that how to rearrange the FM resources to keep the competitiveness in the Green era.

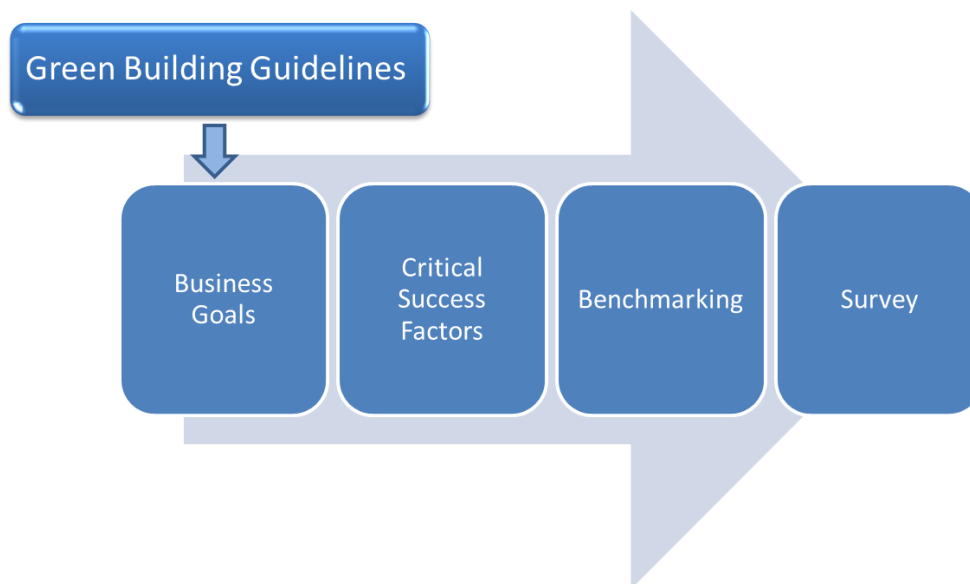


Figure 3 the Frame of Dialogue

## 6.2 The Standard of Green Building in China

In October of 2005, the ministry of construction of China issued the “Green Building Guidelines” and “Green Building Evaluation Criteria”. Land-saving and outdoor environment, energy –saving and energy using, water-saving and water resource using, material-saving and material using, indoor environment quality and management of operation are the six sectors consisting for the criteria system.

Additionally, the six sectors then are subdivided into several sub-criteria, which are clarified with different scenarios, such as planning, construction, design, life cycle and so on (Rao, 2006). See Appendix 1. The facility manager can answer a questionnaire based on the sub-criteria such as in Appendix 2 in order to benchmark the green facility management in the building. The questions in Appendix 2 have been compiled from several sources (DTZ, 2008; Han, Liu, & Yang, 2006; Li, Han, Ye, Yuan, & Xie, 2006) in order to reflect items that can be used for benchmarking the GFM. In appendix 3, each question has three kinds of score: 2 points, 1 point and 0 point. If the building does a good job, it can get the full points (2); if the building does a fair job, it can get half of full points (1); if the performance of the building is unacceptable, it will get 0 point. For example, for the question “ Do you use pesticides or phosphorus chemical products?” if the building always or frequently or often use it, it gets 0 point for this question. If the building seldom use it, it gets 1 point for this question. If the building never use the products, it gets 2 points for the question. And there are six questions araised in the first sector, if the building does a very good job for the sector, it gets the full points like 2 points \* 6 = 12 points in all. For the other sector, it would be the same.

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	Land	Energy	Water	Material	Indoor	Operation
<b>Total</b>	12	12	12	4	16	18

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Table 1, Total score of the benchmarking

## 7 Case Study

### 7.1 Property Background

Asia building is an office building in the CBD in Jing'an District. There are 17 floors in the building (no 14<sup>th</sup> floor in it), and podium area is from second floor to the fifth floor, and from 6<sup>th</sup> floor to 17<sup>th</sup> floor is used for office space, and an underground garage for two floors. Three customer elevators and 1 goods lift serve the building. The total building area is 19,822.21sqm and the average area per floor is 1036.45sqm and the area efficiency rate of 70%. The occupancy rate the building is about 85.6 % (interview with property manager). The average tenancy contract duration is 2-3 years. The building is managed by a property management company, mainly providing services like security, facility maintenance, cleaning, gardening and customer service.



Figure 1: Picture of CBD of Jing'an District (edoushi website)

### 7.2 Presentation data collected

The questionnaire in appendix 2 was given to the manager of Asia Building and the results are presented in appendix 3. The questionnaire was administrated electronically and the questions appeared in a random order. The interviewee was given a set choice of alternatives which were “Always, Frequently, Occasionally,

Seldom, Never” to match the situation happening in the object property. The maximum points to each question are 2 and minimum is 0 point.

Using the benchmarking model presented in the previous chapter the following set of data for the Asia Building was collected. See Appendix 4

	Land	Energy	Water	Material	Indoor	Operation
<b>Total</b>	12	12	12	4	16	18
<b>Full Score</b>	5	6	6	3	11	9
<b>Total/Full Score</b>	42%	50%	50%	75%	69%	50%

Table 2: Summary of data on sub-criteria for Asia Building

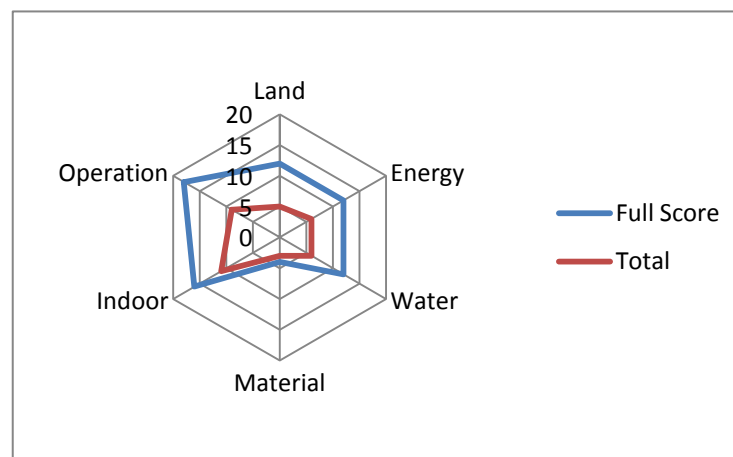


Figure 2: Radar diagram of the result

From table1 above we can see that the property management of Asia Building did a quite fair job concerning to “green issue”. They got 42% for land, 50% for energy, 50% for water, and 75% for material, 69% for indoor and 50% for operation.

- 1) They got the least score in Land with 42% because they still use the products which contain phosphorus and insecticides which may pollute outdoor environment. Because the location of the building is in the heart of West Nanjing Road where it is hard to find car parking, they reserve some parking positions for the potential tenants. Otherwise, the new comer cannot get parking space in the building. They seldom care about the amount of waste because it does not

cost them a lot to deal with it, and usually the amount is certain expect that some tenants fix up the office room. And if once there is some company decorates their office, they have to pay extra money for the building rubbles to property Management Company. They don't know what kind of plant grows in their green area, either whether they are good for fresh the air or not. However, they regularly take care of the plant because this is one of the main responsibilities. And they pay attention to keep the traffic order in control at the entrance.

- 2) *They got 50% for energy saving.* They concern the electricity bills every month because it cost a lot for the company. Property Management Company pays the total electricity bill, including public and the ones used by tenants in their own units. And then the accountant of property Management Company distributes the invoices to tenants and informs them to pay back the money that they used last month. And they periodically clean and maintain the energy-consuming equipment, such like air-conditioner and elevator in order to keep them working in a good condition. Additionally, they adjust the setting-temperature of air-conditioner according the weather so as to achieve energy efficiency. However, because of the lack of sustainable technology and facility, they do not use renewable energy.
- 3) *They got 50% for water saving.* They used the water-saving faucet and toilet tank, and inspect them to ensure that there is no water leakage. And they have the pipe system which can separate sewage and rain. However, they failed to take good advantage of the rain and the recycling water. They still use fresh water for plant, land irrigation and cleaning because the cost of water occupies a small share in their whole expenses, in other words, it is quite cheap to use water, so they do not have to pay attention to saving water.
- 4) *They got 75% for material saving.* Property Management Company in Asia

Building uses green material when they decorate their own office area, and they recommend their clients to use it as well. Actually, when the building completely finish the construction, there is little can be done concerning to the material from the perspective of property management.

5) *They got 69% for indoor environment.* For the reason that Tony Leung property Management Company arranges a guard at the entrance and exit, there is little chance that car horns there. And they put some indoor green in the lobby and some public area on each floor. For one hand, it can improve the image of the building, and on the other hand, it also refreshes the indoor air quality.

Additionally, they supervise the process of the decoration when there is some tenant new coming in. In this case, first, they ensure the material used should meet the requirement of “OUTLINES”; second, they ensure that the decoration team cannot disturb other tenants in the building. For example, the construction cannot continue during working time; and the decoration material and tools cannot be put in the public area. However, because of the expensive operation fee of BA system, they abandon to use it although they install it already.

Therefore, they cannot measure the air quality and cannot calculate how much fresh air should let into the air supply grille. Moreover, elevators make a sound to notice people when it opens door on floors, which disturbs occupiers whose desks are close to the elevators.

6) *They got 50% for operation.* They do a good job of waste recycling. There are some cleaning staff of the property management company collect garbage from the tenants and separate them. Additionally, they bridge the communication between two tenants, one is out, and one is in. Because as the regulation, when every tenant is going to leave the building they should make the office room as what it was when they moved in. However, for some reasons some company which has just moved in for 3 years decides to settle to another building, in this case, all the decoration and



office furniture are new and in a good condition. If the new tenant who feels comfortable with room decoration, it will save a lot of energy and resources. However, they give up the BA system which can help to save a lot of energy and can offer data of energy consuming. And they do not have the plan of how to redesign the space to reach the maximum of utilization, for example, car parking area.

### **7.3 Interviews with Property Managers**

#### **7.3.1 Interview with Property Manager of Asia Building**

Mrs. Jennifer Xu, the property manager of the Asia Building, who has worked in the field for more than 10 years. From 2006 as the construction of the building was completed, Mrs. Xu has appointed to be the property manager and organized and managed her team. She knows how the property management take places in the building as well as why it appears like this.

Firstly, she admitted that the building has not been equipped with any advanced technologies related to sustainability, which limit the development of green facility management.

Secondly, TL property Management Company emphasizes consciousness of service. They concern about the communication with tenants and keep a good relationship with the occupiers, other than just operate the routine works. Therefore, it is essential to listen to clients' voices on the issue of "Green Management" and follow the opinion of majority. However, clients are coming from different industries and fields, and they may have different culture, and they have different awareness of environmental issues. As a result, property management has to discuss and negotiate with all the clients with a small-scale, even one by one. Property Management Company recommends clients to use green material when they fix up their office room. However, nothing can be done beyond recommendation because they do not have the right to compulsory them to do so. Additionally, property Management

Company supervises the decoration material during the process and to see whether the material is flame retardant and fulfill the requirements raised in the OUTLINES which focus on the fire-protect. Concerning to green facility management, it is not a key point in the “OUTLINES”, so the working focus in practice would not lie in how to make it in a sustainable way. The property management company is processing the plan how to manage elevators zone and time shared, in other words, they tempt to run one or two elevators serving for high zone, and the rest for low zone, and as well as should take rush hours into account. In this way, people can get to the office that they want in an efficient way. However, considering of the expenses of setting fee and labor cost about 20,000 RMB (3,052 USD), they have to apply for the permit and budget to property owner. Moreover, it is necessary to talk with the tenants in the building and obtain their support if the operation model of the elevator is going to change. Some employees of the property management company observe the regular schedule of companies in the building, as well as some habit of some occupiers. For example, some occupiers are used to arrive at office at 9 am so as to lock in the card, and then they go out of the building to have breakfast, which leads to the extra burden to the utility of elevator during 8:40 to 9:15 when people have to wait in queue to get in the elevator. Currently, some guards in the lobby organize people wait in a queue and guide them to get into elevators.

Property Management Company substitutes all the energy saving bulbs for the traditional ones in the public lighting area. And intellectual system can be used in floor 7 and 8 because they are the model floors when the building during development. The BA system turns off the lights which are not necessary in the evening, and remains the ones which can provide enough light for monitor recording.

### **7.3.2 Interview with the Property Manager of China Pavilion**

China Pavilion is a green building, not only from the view of architecture design but

also from the sustainable techniques using in the building. Mr. Cai Qing, the property manager of China Pavilion of Expo in Shanghai, has taken part in all the events from the infant stage of the project until the routine operation after the Expo exhibition. There are tons of experience that he has accumulated concerning to the green facility management. And last year he was awarded the honor of “Model Worker” by the chairman of the republic of China for his outstanding work performance.

From the view of Mr. Cai, the definition of **environmental management** should be whether the cleaning and appliance would cause harm to the public. For example, the sharp appliance and some cleaner which does harm to the staff when they do cleaning job, or does harm to the public’s health after it volatilizes into air. Meanwhile, it also should been taken into account whether the consumables are harmful to the facilities. For example, a metal scourer may polish the facility as it was new. However, it destroys the coating of it. Another example, we should use high quality toilet tissue. For one hand, we should avoid those with Fluorescent pigment which are not good for human’s health. On the other hand, we should choose those which can easily dissolve in the water, so it would be helpful to prolong the life of pipes.

### **Conservation**

The department of conservation is a team focusing on maintenance of wood flooring and polished tiles. And for the reason that different methods should be applied to the floor with different materials, there is a technical group providing professional advice to support the department in order to achieve a better performance on the maintenance. For example, concerning to marbles, the staff should do the mirror-surface treatment every week; concerning to wood floors, the staff should polish them by essential oil, other than some products which wax the surface of floor. What we should do is not limited within the appearance, the most important thing is to keep the facility in good condition and extend its service age. The operation cost

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under the standard like this surely increases than usual because all the consumables are imported products. However, the high operation cost is invisible, so the property owner who aims to max the profit cannot understand why the cost is so high.

### **Hygiene and Defense**

As a public building, we should be more careful of the problem of hygiene and defense, especially during the season of flu. We clean and disinfect the public facility frequently, such as telephone and escalator. And the quality of indoor air basically relies on indoor green and the operation system of air engineering. There is BA system installing in the building whose main function is to turn on and off the lighting and air-condition and other machines; is to monitor the temperature and the amount of fresh air and modify the setting automatically; is to provide the data record to design the energy plan in the future.

There is a sensor to test the flow of carbon dioxide and oxygen, and then adjust how much fresh air should be injected in. Generally, the supply air grille sends the cooling air in which fresh air occupies 20%. However, it should always be adjusted according to the actual situation. If there is a very high dense population, we can also turn down the air conditioner's temperature from 23 degree to 22 degree so as to keep the air in a good quality. And usually, when we design an office room, 2 sqm /person at least can ensure the health indoor air environment.

### **Disease and Insect Control**

There are some mushroom- shaped appliances in the expo garden, which are used to collect mosquitos by the means of solar energy. In this way, it avoids traditional way by using pesticides, which pollutes the outdoor environment. On the other hand, the resource of energy is renewable, so the product realizes the principle of sustainability completely. There is rat poison putting in the pavilion, but the dosage of the poison is measured carefully which can kill the rats but cannot harm the

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children in case they eat the pills by mistake. Generally, the work which needs the professional knowledge like disease and insect control is outsourced to other institution.

### **Landscaping**

The working highlights of landscaping is greening and gardening, including green maintenance, indoor greening and miniature gardening, which not only provides a feast for the eye, but also refresh the air in the building. In the beginning of the project, we invite professional gardening company to design the space concerning to the landscaping, including correspondence between the spots and how to put the desk plants with a perfect angle and height. And at the end, everything should be determined by the property owner. Later, routine maintenance is outsourced to professional gardening company, and property Management Company has the responsibility of supervision. Minghua property Management Company has the advantage of green outsourcing because they have 28 projects so far and most of which are the public buildings, such like china pavilion, science museum and shanghai urban planning exhibition hall. Minghua collaborate with a gardening company over all these projects. In this case, the gardening company has to pay much attention to the projects they receive from Minghua because once there is any problem occurring to one of them, Minghua would cancel the rest 27 projects next year.

### **Waste Management**

In the stage of construction, a waste pneumatic transmission system which collects garbage in the distributed garbage can by air pressure was invested by Chinese government, and the system serves four main pavilions and the main avenue in the Expo Park. Thanks to the huge investment, a lot of human resource is saved; meanwhile, the cleanness of the environment is improved. However, considering the problem of anti-terrorism, the system was just used for one week during the test run.

After that, all the garbage cans were closed and the system was abandoned. Even after the exhibition of Expo, the system failed to be reused because the high operation fee would be spread to less pavilions as most are dismantled. The traditional collection is determined to be used, and classification dustbins which cost 1 million RMB are distributed in the Expo Park, among which there are 80 dustbins making of recycling milk cartons. On the issue which style and size of the dustbin should be installed at each spot, open-end or close-end, big one or small one, should be taken into account carefully. All the arrangements should be in accordance with the requirements of Expo standard; furthermore, an on-spot measurement is necessary. For example, concerning to the size of the dustbin, it should take 2 hours for the dustbin to collect garbage from empty to two-third full (half full for the ones in toilet). And the capacity of the dustbin can meet this requirement is the one using at that spot. For the reason why is two is to avoid the garbage corrupting because the weather temperature during Expo is extremely high. And for the reason why it is two-third full is to avoid waste human resource if it is less as well as to avoid the risk of spilling if it is more. Moreover, when deciding the route of the collecting trash, we should be careful of the frequency as well as being away from the public. No trash can stay overnight. There are 280 garbage cans (240 L) of trashes in China Pavilion every day. PET bottles occupies half to two-third in the total volume. In the process of recycling, they are classified and recycled by staff.

### **Operate in Green Ways**

The rain is collect in china pavilion, which is taken good advantage to water the land and flush the toilet. The supply of the rain is sufficient to meet the demand of the greening and toilet using, and the surplus of the rain should be released in case it begins smell. There is solar system in China Pavilion, but owing to the geographic position which determines that very limited energy can be absorbed, which cannot content its consuming (10 million kWh per day). Therefore, they send the energy to somewhere out of the building. However, in order to save energy, China pavilion

adopts the ice-making air conditioner which can store electricity during non-peak time by physical character of water (water-ice), then release the energy during daytime (ice-water).

The promotion of green facility management needs the support and understanding from the property owner. For example, in the practice, most office building equipped with BA system, but it is still a problem whether the system is used in all those buildings because when the property owner unwilling to pay for premium cost causing from the maintenance of the system, little can be done by property management company. The system would be nothing but a decoration. In the infant stage of green building, the sense of society responsibility and the investment of the green building construction and refurbishment as well as the solution of energy conservation are the primary elements.

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## **8 Analysis and Conclusions**

### **8.1 How well it works as Green Facility Management?**

According to the result of the questionnaire conducted above as well as the detail information provided by the property manager, we get to the clear picture of what aspect has done a good job and what aspect has not in the Asia Building. The property management succeeds in land (42%) by means of green area caring; in energy saving (50%) by means of maintaining air-conditioner and adjusting it according to the weather; in water saving (50%) by means of utilizing water-saving faucet and toilet tank and installing pipe system which can separate swage and rain; in material saving (75%) by means of using green material and advocating of it; in indoor environment (69%) by means of controlling the noise at the entrance and strict management of indoor decoration; in operation (50%) by means of waste recycling.

### **8.2 What can be learned for China Pavillion**

First of all, the Asia Building should take advantage of BA system, which can make the consumption of electricity more efficient and refresh the indoor air, as well as improve the indoor environment by control the temperature. Second, the Asia Building may abandon using pesticides and adopt some advanced equipment to control the disease and insect, such as the mushroom-shaped applicants which attacks insects by solar every. Third, the Asia building should use the recycling water to plant tree and flush the toilet, other than let it go. Forth, the Asia Building may take the idea “to keep the facility in good condition and extend its service age” If they operate the work of facility management, they would have a long-term perspective, and work with a sustainable mind.

### **8.3 What can be improved**

Actually, some of the unsatisfying performance can be corrected immediately as



long as we appreciate green facility management. First, phosphorus and insecticides can be substituted by the applicant, which attacks the insect by using sound wave. In order to improve the air quality of outdoor environment, they can plant some trees in the garden. Concerning to the shortage of parking space, they even can invite some professionals who expertizes at space planning to redesign the car parking area. For the water-saving part, they may start to use the rain collected to irrigate the land and flush the toilet. Last but not the least, BA system should be used in operation, which not only can tell the energy using data, but also would help to determine the solution of energy conservation. Moreover, BA system is one of the facilities installing in the building, property management company has the responsibility to keep it in a good condition. And it would depreciate without using and maintenance.

#### **8.4 What we can learn from the case study on the Asia Building**

There are three things that the property management company cares the most. The first one is regulation because if they cannot pass the inspection from the relevant department, the property management company would get punishment from the government. As a result, they strive to keep all the performance along with the “Outlines”. For example, they use all the material of decoration which should be fire resistant material, not only for themselves, but also require all their occupiers. For the reason that using green material is not compulsory by law, they just recommend their tenants to use green material.

Second is cost control. Property management company does a lot of jobs to pay more attention to electricity conservation than water-saving and waste recycling because from the view of accounting, the cost of electricity consumption takes a big share of the total expense. However, compared with electricity, the expenditure of water is quite cheap, so they do not make effort to save water, even if they have the pipe system of collecting rain. Additionally, they reluctant to use eco-insecticides which would cost property management company a premium cost in insect control.

And abandoning the utility of BA system is another evidence that they have a strong value of cost control. The high operation fee and maintenance fee, eventually lead to being idle.

The last thing is customer satisfaction. Property management company strive to keep a good relationship with the tenants. They ask for advices and agreement before they intend to make any change in operation, they do not set strict requirement concerning to green material. And most these phenomenon are due to the duration of the contract usually is 3 years. If the occupiers cannot be contented with the services offered by the property management company, they would shift to other office building in the area after the fulfillment of contract. And in this case, property management company would lost the income of management fee. Additionally, they would run the risk of a low occupier rate, which is not acceptable for the property owner. As a result, it would threaten the property management company to obtain the future contract from the property owner.

## **8.5 Concluding remarks**

Firstly, no laws or regulations related to green facility management exist. Even the standard of green facility management used in this paper is borrowed from the standard of green building. As mentioned above that property management behavior strictly to the regulations, the green performance can be expected if the relevant laws are announced. In the law, it should clarify the standard of green facility management, including what should do and what should not do, as well as the punishment in case the property management company does not obey the rules.

Secondly, the organization, the Trade Association of Shanghai Property Management, which is directed by Shanghai government and whose vital responsibility is to bridge the information between the government and the industry, now has more than 1000 property management companies registering as member. And the duty of the organization is to offer the member property management companies with training,

consulting, and information sharing, such as magazine issuing and website operation. The Trade Association of Shanghai Property Management is able to affect the property management companies positively concerning to the green facility management. The training of green facility management can be provided from the view both in management and technique. And the successful experience can be shared in the magazine of Shanghai Property Management.

Finally, the subtle position of property management company between occupiers and property owner is another primary and tough issue. *From the perspective of tenants*, it is attractive to work in a green environment, which is clean, healthy, comfortable, and even cheap. As long as the rent is control on an average level, the green facility management is a bonus to the occupiers. In other words, it would not be a problem to continue the future contract with the tenants if the green property management, instead, the green principle can attract them. *From the view of property owner*, they should swift the mind of short term to long term both monetarily and environmentally.

#### *Monetary side*

Many property management companies suffer the situation like the Asia Building that there is limited sustainable equipment installed in the office building, and even they have the BA system, they reluctant to use it because of the high running operation fee. Equipping an advanced facility causes a premium cost today, and which lead to a low profit result in the annual accounting report. However, from the view of long term, an intellectual system can save a lot of energy expenses and prolong the service life of the building, which can be considered as attracting occupiers and gain an extension of capital.

#### *Environmental side*

The invisible cost of environmental pollution is an heavy cost to the society, which cannot be appear in the companies' accounting report, however, it will be paid back

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in future by means of environmental tax. This is an international tendency as mentioned in previous chapter. Once the environmental tax is complimented, it may be even more expensive than adopting sustainable technology.

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# Appendixes

Appendix 1. Green Building Evaluation Criteria (Rao, 2006)

Criteria	Sub-criteria	Scenario
Land-saving and outdoor environment	Building Area	■ ★
	Land Saving	■ ▲
	Reducing environmental burden	●
	Green Land	●
	Facility of Transportation	■ ▲ ◆
Energy –saving and energy using	Reducing Building’s Energy Consuming	●
	Improving Energy Efficiency	■ ★ ◆
	Utilizing Renewable Energy	■ ▲ ◆
Water-saving and water resource using	Planning of water saving	■
	Raising efficiency of water using	●
	Integrated use of swage and rain	■ ▲ ◆
Material-saving and material using	Material-saving	▲ ★ ◆
	Utilizing green material	▲ ★ ◆
Indoor environment quality	Light	■ ▲
	Heat	▲ ◆
	Noise	▲ ◆
	Air quality	▲ ◆
Management of operation	Intelligent system	■ ▲ ◆
	Management of Resources	◆
	Making use of altering	▲ ◆
	System of environmental management	◆

■Planning ▲Design ★Construction ◆Operational management ●Life cycles

## Appendix 2 Questions to sub criteria concerning Green Facility Management (compiled from several sources.)

### Land-saving and outdoor environment

Reducing environmental burden	Do you use pesticides or phosphorus chemical products?
	Do you care about the monthly garbage volume?
Green Land	Do you take care of the green area all the time?
	Do you have the plants which are good for air purification?
Facility of Transportation	Do you maximize the utility of parking space?
	Is there any speed limitation when cars pass through the entrance?

### Energy –saving and energy using

Reducing Building's Energy Consuming	Do you care about the monthly invoice of electricity?
	Do you operate the elevator under the zoning and time distribution?
Improving Energy Efficiency	Do you adjust the temperature of air-conditioner according to the weather and outdoor temperature?
	Do you periodically maintain, clean and inspect the power-consuming equipment, such as air-conditioner, elevator.
Utilizing Renewable Energy	Do you use renewable energy?
	Do you have renewable energy equipment used in the building?

### Water-saving and water resource using

Raising efficiency of water using	Do you care about the monthly invoice of water?
	Do you use the water-saving products, such like faucets and toilet tank, and with periodical maintenance?
	Do you advocate saving water?
Integrated use of swage and rain	Do you diverge rain and sewage?
	Is the recycling water used to gardening, landscape irrigation and for cleaning purpose?
	Do you take good advantage of rain?

### Material-saving and material using

Material-saving	Do you use green material in the building?
Utilizing green material	Do you advocate tenants to use green material when they fix up their offices?



## Indoor environment quality

Heat	Do you measure temperature and moisture timely?
	Do you educate your tenants how to form proper habits in a green building so as to achieve max energy efficiency?
Noise	Is there any vehicles horn at Entrance?
	Is there any noise from elevator?
	Do you keep the time of decoration in control?
Air quality	Do you periodically clean the vent and air-conditioner?
	Is there any the indoor green?
	Do you monitor the supply of fresh air?

## Management of operation

Intelligent system	Do you have the intellectual system?
	Do you have professional staff to operate and maintain the intellectual system?
	Do you have emergency plan, when intellectual system fails?
Management of Resources	Do you have waste recycling center?
	Is it effective of the work of waste recycling?
	Do you advocate saving material, such as encouraging clerks to abandon disposable tableware?
Making use of altering	Do you improve the communication between tenants in order to avoid the waste of decoration?
	Do you modify the utilization of some unused area?
System of environmental management	Do you have collaboration with energy management companies?

### Appendix 3 Results of sub-criteria scoring for the Asia Building

A= Always; F= Frequently; O=Often; S=Seldom; N=Never

The maximum points to each question are 2 and minimum is 0 point.

#### Questions on land-saving and outdoor environment

Question	A	F	O	S	N
Do you use pesticides or phosphorus chemical products?	0	0	0	1	2
Do you care about the monthly garbage volume?	2	1	0	0	0
Do you take care of the green area all the time?	2	1	0	0	0
Do you have the plants which are good for air purification?	2	1	0	0	0
Do you maximize the utility of parking space?	2	1	0	0	0
Is there any speed limitation when cars pass through the entrance?	2	1	0	0	0

#### Questions on energy –saving and energy using

Question	A	F	O	S	N
Do you care about the monthly invoice of electricity?	2	1	0	0	0
Do you operate the elevator under the zoning and time distribution?	2	1	0	0	0
Do you adjust the temperature of air-conditioner according to the weather and outdoor temperature?	2	1	0	0	0
Do you periodically maintain, clean and inspect the power-consuming equipment, such as air-conditioner, elevator.	2	1	0	0	0
Do you use renewable energy?	2	1	0	0	0
Do you have renewable energy equipment used in the building?	2	1	0	0	0

#### Questions on water-saving and water resource using

Question	A	F	O	S	N
Do you care about the monthly invoice of water ?	2	1	0	0	0
Do you use the water-saving products, such like faucets and toilet tank, and with periodical maintenance?	2	1	0	0	0
Do you advocate saving water?	2	1	0	0	0
Do you diverge rain and sewage?	2	1	0	0	0
Is the recycling water used to gardening, landscape irrigation and for cleaning purpose?	2	1	0	0	0
Do you take good advantage of rain?	2	1	0	0	0

### Questions on material-saving and material using

Question	A	F	O	S	N
Do you use green material in the building?	2	1	0	0	0
Do you advocate tenants to use green material when they fix up their offices?	2	1	0	0	0

### Questions on indoor environment quality

Question	A	F	O	S	N
Do you measure temperature and moisture timely?	2	1	0	0	0
Do you educate your tenants how to form proper habits in a green building so as to achieve max energy efficiency?	2	1	0	0	0
Is there any vehicles horn at Entrance?	0	0	0	1	2
Is there any noise from elevator?	0	0	0	1	2
Do you keep the time of decoration in control?	2	1	0	0	0
Do you periodically clean the vent and air-conditioner?	2	1	0	0	0
Is there any the indoor green?	2	1	0	0	0
Do you monitor the supply of fresh air?	2	1	0	0	0

### Questions on management of operation

Question	A	F	O	S	N
Do you have the intellectual system?	2	1	0	0	0
Do you have professional staff to operate and maintain the intellectual system?	2	1	0	0	0
Do you have emergency plan, when intellectual system fails?	2	1	0	0	0
Do you have waste recycling center?	2	1	0	0	0
Is it effective of the work of waste recycling?	2	1	0	0	0
Do you advocate saving material, such as encouraging clerks to abandon disposable tableware?	2	1	0	0	0
Do you improve the communication between tenants in order to avoid the waste of decoration?	2	1	0	0	0
Do you modify the utilization of some unused area?	2	1	0	0	0
Do you have collaboration with energy management companies?	2	1	0	0	0

### SUMMARY OF RESULTS

	Land	Energy	Water	Material	Indoor	Operation
<b>Total</b>	12	12	12	4	16	18
<b>Full Score</b>	5	6	6	3	11	9
<b>Total/Full Score</b>	42%	50%	50%	75%	69%	50%

Table 1: Summary of data on sub-criteria for Asia Building

### Appendix 4 The test result of the Asia building

Do you use pesticides or phosphorus chemical products?	A	F	O	S	N
Do you take care of the green area all the time?	A	F	O	S	N
Do you maximize the utility of parking space?	A	F	O	S	N
Do you care about the monthly invoice of electricity ?	A	F	O	S	N
Do you adjust the temperature of air-conditioner according to the weather and out door	A	F	O	S	N
Do you use renewable energy?	A	F	O	S	N
Do you care about the monthly invoice of water ?	A	F	O	S	N
Do you diverge rain and sewage?	A	F	O	S	N
Do you use green material in the building?	A	F	O	S	N
Do you measure temperature and moisture timely?	A	F	O	S	N
Is there any vehicles horn at Entrance?	A	F	O	S	N
Do you periodically clean the vent and air-conditioner?	A	F	O	S	N
Do you have the intellectual system?	A	F	O	S	N
Do you have waste recycling center?	A	F	O	S	N
Do you improve the communication between tenants in order to avoid the waste of	A	F	O	S	N
Do you care about the monthly garbage volume?	A	F	O	S	N
Do you have the plant which are good for air purification?	A	F	O	S	N
Is there any speed limitation when cars pass through the entrance?	A	F	O	S	N
Do you operate the elevator under the zoning and time distribution?	A	F	O	S	N
Do you periodically maintain, clean and inspect the power-consuming equipment, such as	A	F	O	S	N
Do you have renewable energy equipments used in the building?	A	F	O	S	N
Do you use the water-saving products, such like faucets and toilet tank, and with	A	F	O	S	N
Is the recycling water used to gardening, landscape irrigation and for cleaning purpose?	A	F	O	S	N
Do you advocate tenants to use green material when they fix up their offices?	A	F	O	S	N
Do you educate your tenants how to form proper habits in a green building so as to	A	F	O	S	N
Is there any noise from elevator?	A	F	O	S	N
Is there any the indoor green?	A	F	O	S	N
Do you have professional staff to operate and maintain the intellectual system?	A	F	O	S	N
Is it effective of the work of waste recycling?	A	F	O	S	N
Do you modify the utilization of some unused area?	A	F	O	S	N
Do you advocate to save water?	A	F	O	S	N
Do you take good advantage of rain?	A	F	O	S	N
Do you keep the time of decoration in control?	A	F	O	S	N
Do you monitor the supply of fresh air?	A	F	O	S	N
Do you have emergency plan, when intellectual system fails?	A	F	O	S	N
Do you advocate to save material, such as encourage clerks to abandon disposable	A	F	O	S	N
Do you have collaboration with energy management companies?	A	F	O	S	N