

Maintenance strategy for public-rented residential building: a case study in Jakarta, Indonesia

Maintenance
strategy

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Abstract

Purpose – Several public-rented residential buildings in the Jakarta province are in slum conditions. The purpose of this paper is to propose an alternative maintenance strategy to be adopted by public-rented residential buildings to avoid the creation of slum conditions.

Design/methodology/approach – Qualitative and quantitative methods were adopted. The research first identified factors in maintenance management that affect the physical condition of a building through literature review and preliminary interview with the building occupants and building staffs. The factors are then used to develop a questionnaire that is distributed to 856 respondents in four buildings in East Jakarta. Only 552 completed questionnaires were used to identify the dominant factors through descriptive analysis by calculating the percentage of each answer.

Findings – The research found that the dominant factors in maintenance management, which influence the creation of slums condition in public-rented residential building are the level of damage and quality deterioration of the building material and the level of building maintenance budget availability.

Research limitations/implications – The maintenance situation and regulation regarding public-rented residential buildings in other provinces in Indonesia may not be the same with Jakarta Province due to the local autonomy and local problems. Therefore, the result from this research might not be applicable in other provinces in Indonesia.

Originality/value – This research identifies the factors in maintenance management, which affect the creation of slum conditions in public-rented residential buildings so that necessary maintenance measures can be carried out by the agency in charge.

Keywords Strategy, Maintenance, Property management, Jakarta, Residential building, Slums

Paper type Research paper

Introduction

Housing is one aspect of a social infrastructure that accommodates people to live in a suited place and is one of human's basic needs other than food and clothing. Housing in general refers to a building that protects people from the heat of the sun and rain, and also a place to live for a certain period of time. Having a suitable house to live enables human beings to increase their quality of life and well-being.

In Indonesia, it is recorded in the Ministry of Public Works that there are 62 slum areas around 62 districts in Indonesia. According to The National Medium Term Development Plan 2015-2019, it is stated that Indonesia will have 0 percent of slum areas (Directorate General of Human Settlement, 2012). In achieving its target of 0 percent slum areas in Indonesia, according to the Ministry of Public Housing (2011), they are going to build 37,709 units of public-rented residential buildings that is intended for low-income people.

Public-rented residential buildings are residential buildings that are constructed by the government, either by central and/or regional government, for to rent to low-income people, especially for low-income people who live in slum areas. The aim of public-rented residential buildings is to accommodate livable place that is decent to live and affordable, to utilize space effectively and efficiently, to decrease slum areas, to improve the welfare of



low-income people, to develop urban areas and to meet the social and economic needs of the low-income people.

According to the Development Planning Agency at Sub-National Level (2013), there are 518 blocks of public-rented residential buildings to be built, approximately 40,544 units. The construction of public-rented residential buildings in Jakarta alone is around 2,643 units using the Regional Government Budget, while it is 5,200 units using the Central Government Budget.

One of the purposes of building a public-rented residential building is to relocate community from slum areas to a more suitable place to live. However, in reality there are still several public-rented residential buildings that are in slum conditions and not well maintained. A preliminary interview and observation took place in March 2015. According to the preliminary interview with the building occupants in Komaruddin and Pinus Elok public-rented residential building in East Jakarta, the building has been occupied since 2013. Most of the building occupants are relocation victims and most of their complaints from the beginning of their stay are the leakages. It was found (Olanrewaju, 2012) that pipe leakage is ranked 10 out of 32 defects in a university survey. According to the preliminary observation, a lot of units experience leakage, especially in the bathroom and kitchen. From the leakage, this causes the wall to become mossy and eventually after sometime the building looks dirty.

A preliminary interview was also conducted with one of the staff in The Regional Government Housing and Building Office of Jakarta Province regarding the maintenance strategy applied for the public-rented residential building. The maintenance strategy used for the public-rented residential building is corrective maintenance. In corrective maintenance, an element of a building will be replaced or fixed only when failure or defect occurs. Therefore, the building occupant must experience a failure or defect of the building's element first to be able to complain to the building management. In De Silva *et al.* (2012), their survey findings indicates that the building management prefers to implement corrective maintenance and few preventive actions. The lack of knowledge, qualified staff, existing regulations and the attitudes of the maintenance personnel may cause the lack of consideration of the organizational goals and objectives and thus maintenance can be seen as a waste of time for the top management.

In total, there are 133 blocks of public-rented residential buildings in Jakarta Province. This research only covers four samples of public-rented residential buildings located in East Jakarta, The Komaruddin, Pinus Elok, Pulo Gebang and Cakung Barat public-rented residential buildings. This region was chosen to be the sample area due to the high density of relocation victims who have relocated into East Jakarta.

The aim of this research is to identify the factors in maintenance management that influence the creation of slum conditions in the public-rented residential building in Jakarta Province and to propose an alternative building maintenance strategy for The Regional Government Housing and Building Office of Jakarta Province to implement.

Overview of public-rented residential building maintenance management in Indonesia

Oladapo (2006) stated the importance of building occupants' involvement in building maintenance and to give feedback to the building manager on the effectiveness of the building maintenance system. Olanrewaju (2012) identified several defects in a university building and classify them according to their urgency. Ali (2009) and De Silva *et al.* (2012) researched on the factors affecting the building maintenance management and the impact on the building maintenance cost. Zawawi *et al.* (2010) and Lai and Lai (2013) researched on the building occupant's satisfaction on the building maintenance management.

From the current problem identification which is the slum conditions of public-rented residential buildings and based on the past research available, this research will investigate

the factors in building maintenance management that lead to the creation of slum conditions of the public-rented residential building and identified the dominant factors.

According to the Ministry of Public Housing (2007), the public-rented residential building maintenance is under the responsibility of the governing body. The governing body for public-rented residential buildings in Jakarta Province is under the responsibility of The Regional Government Housing and Building Office of the Jakarta Province.

There are two types of activities in maintenance according to the Ministry of Public Housing (2007), which are maintenance and treatment. The maintenance of a building is all the activities to ensure the reliability of the building and its facilities to function well. The treatment of a building is all the activities to repair and/or replace building element and/or component, building material, and/or building facility to maintain the feasibility of the building. The treatment of public-rented residential building is classified according to its urgency and level of damages. According to its urgency the building treatment is classified into routine treatment, periodic treatment, urgent treatment and emergency treatment.

According to the Ministry of Public Housing (2007), routine treatments are operational activities, small repair on utility equipments and building security. Periodic treatments are activities which are planned according to the time period and should be managed according to a specific schedule to avoid damage. Periodic treatment covers the replacement of building components, the replacement of spare parts, building painting and mechanical and electrical equipment services. Urgent treatments are activities that are done unplanned and based on the building inspection that needs to be urgently treated. Emergency treatments are activities that need to be done right away to avoid endangering others.

Whereas according to the level of damages the building treatment based on the Ministry of Public Work (2008) is classified into light damage, medium damage and heavy damage. Light damages are damages that occur on the non-structural component of the building and the maximum cost are 35 percent from the cost of a new building having the same criteria. Medium damages are damages that occur on some of the non-structural component of the building and the maximum cost are 45 percent from the cost of a new building having the same criteria. Whereas heavy damages are damages that occur on most of the building components, both structural and non-structural components, and the maximum cost are 65 percent from the cost of a new building having the same criteria.

The quality of a public-rented residential building can be seen from the physical appearance and from the facilities and utilities provided by the building. The deterioration of the building, facilities and utilities can cause the public-rented residential buildings to reach into slum conditions. The physical condition of the public-rented residential building is the result from building occupants' interaction in how they utilize their own unit. When building is maintained according to the current building maintenance regulation, a good condition of the building can be achieved and prevent it from becoming slums (Hendaryono, 2010).

The characteristic of a slum environment is the physical condition of the building that does not meet the technical and health regulations such as the unavailability of adequate facilities and utilities, and bad physical appearances that the building does not function as planned. From Plate 1, it can be seen the comparison of a slum condition public-rented residential building compared to a good condition public-rented residential building, both located in East Jakarta.

Methodology

There are two research questions in this research and two different approaches are used to answer the research question:

- RQ1.* What are the factors in maintenance management that influence the creation of slum conditions in public-rented residential buildings?

RQ2. What are the dominant factors in maintenance management that influence the creation of slum conditions in public-rented residential buildings?

This research is based on a mixed method research using the explanatory sequential mixed method, where the first research question uses a qualitative method involving a series of interviews with the building occupants and building management staff and observation by taking pictures of the existing condition of the public-rented residential building. Interviews and observations were done to identify the factors in maintenance management that influence the creation of slum conditions in public-rented residential buildings. These factors are backed up by the literature review. The total number of interviewees is six people, three building management and three building occupants.

After the factors are identified, in the second research question a quantitative research approach is used through survey. Questionnaires were distributed to the building occupants and building management to four public-rented residential buildings in East Jakarta. The content of the questionnaire are from the factors identified in the first research question. The answers from the questionnaire are analyzed using descriptive statistic by calculating the percentage of each answer of each respondent to the corresponding question.

The sampling method used during survey is a simple random sampling with a margin of error of 5 percent. In simple random sampling every population unit has the same chance of being selected in the sample (Singh and Mangat, 1996). The total number of completed questionnaires is 552 from a total of 856 samples of respondents. In all, 20 questionnaires were given out to the building management staffs and 532 questionnaires were given out to the building occupants. According to Gillham (2000), the minimum response requirement for a survey is 30 percent. This research has reached 64.5 percent response rate, hence it has exceeded the minimum requirement. In Figure 1, the profile of the respondents can be seen.

Result for *RQ1*

In answering *RQ1*, the factors in building maintenance that influence the creation of slum conditions in public-rented residential buildings is achieved through interviews conducted with six interviewees and through a literature review. Those factors will then be used as guidance in developing the question in the questionnaire in answering *RQ2*. According to the interviews and literature review, there are four main factors in maintenance management that influence the creation of slum conditions in public-rented residential buildings.

The level of damage and deterioration of quality of the building material

The main function of a building is to protect the users from the outside weather. It is crucial to facilitate facilities to accommodate the main function of a building. Hence, a building must be strong structurally and have firm ground to support the axial load above. Structural damage in a building can occur due to excess load (Richardson, 2001).

The design stage of a building can be a positive or negative burden to the maintenance work (Chohan *et al.*, 2010). Several buildings are designed poorly affecting the maintenance

Plate 1.
Public-rented residential building in slum conditions (left) compared to public-rented residential buildings in good condition (right)



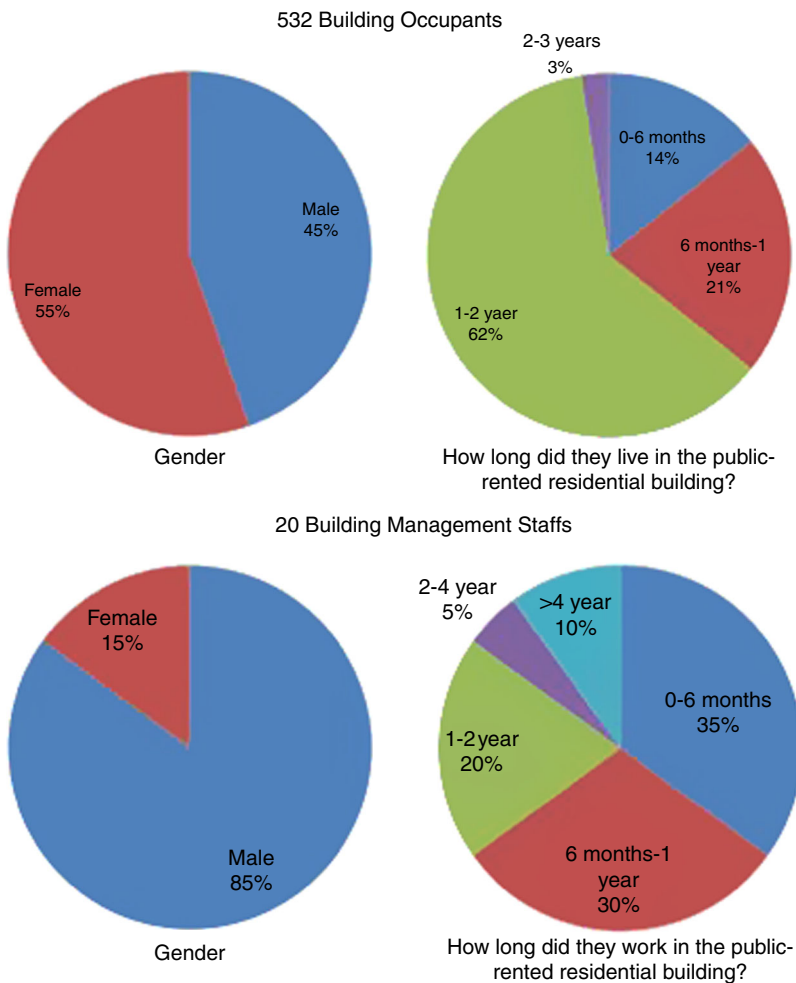


Figure 1.
Respondent's profile

work to become difficult, expensive and risky. An effective maintenance plan is related to the design stage (Olanrewaju and Abdul-Aziz, 2015). The little consideration of the maintenance work during the design stage of a building will result in a lot of maintenance work. It can be concluded that a good building design can minimize the maintenance work due to less damage, and the quality of the design stage can strongly influence the building maintenance. There will not be enough maintenance work to fix a poorly designed building. The construction stage can also be another factor that influences the damage occurrence in a building (Chohan *et al.*, 2010).

The level of building management services

The building management performance in maintenance work is regarded as the main activity in maintaining a building. Good performance of the building management is related to the day-to-day today activities such as cleaning services, the repair of building elements and building security (Myeda *et al.*, 2011).

The level of building occupants' involvement

Building occupants contribute to the condition of a building in two ways. First, their daily use naturally reduces the quality of the building. Second, the misuse of the building, especially vandalism, will result in damages in the elements of the building (Oladapo, 2006). According to Olubodun and Mole (1997), passive vandalism is when the building occupant deliberately neglected to maintain the building. This behavior will therefore add more damage to the current building condition which already needs maintaining. The misuse of building element function also speeds up the deterioration of building quality (De Silva *et al.*, 2012).

The level of building maintenance budget availability

The building maintenance activity must be supported by a sufficient budget. One of the obstacles in building maintenance planning is the allocation of budget. It is not unusual that the building management reduces their budget due to the limited budget available. A limited budget can result in the low quality of material used in building maintenance (Ali, 2009). The building maintenance budget of the public-rented residential buildings in Jakarta Province is allocated by The Regional Government Housing and Building Office of Jakarta Province.

The subfactors of each factor influencing the creation of slum conditions in public-rented residential buildings are shown in Table I.

Result for RQ2

The four factors identified are used to develop a questionnaire that will be given out to building management and building occupants. For the fourth factor regarding the level of maintenance budget availability, this question was only asked to the building management staffs. This is due to the fact that only the building management staff has the knowledge of availability of the maintenance budget.

The questionnaire will give an illustration on how each sub-factor affects the creation of slum conditions in public-rented residential buildings through the percentage and frequency of answers from each respondent.

Factor	Sub-factor
The level of damage and deterioration of quality of the building material The level of building management services	Building construction Material used during construction
	The number of cleaning services to clean the area Routine inspection frequency of cleaning services Cleanliness condition of the indoor and outdoor area Sanitation and drainage system condition The responsiveness of technically competent staff to the building occupants' complains The number of technically competent staff Routine inspection frequency by the technically competent staff in maintaining the building's facilities
The level of building occupants' involvement	The level of building occupants' awareness to maintain the indoor and outdoor area of the building The level of building occupants' awareness to clean and maintain cleanliness of the indoor and outdoor area of the building Vandalism
The level of maintenance budget availability	Misuse of facility and utility function The budget for maintenance activities

Table I.
Factors in maintenance management influencing the creation of slum conditions in public-rented residential buildings

After the percentages from the questionnaire survey have been found, it is then triangulated with the result of the interview and observation to enrich the illustration of the real condition of the building. Hence, the dominant factors identified are based on 3 results: survey, interview and observation combined and analyzed together. The result is as follows.

The level of damage and deterioration of quality of the building material

According to the interview conducted, building occupants complained about the leakages that occur frequently in their homes. The leakages mostly occur in their bathroom and kitchen. This statement is justified in Table II by the result of percentages of building components that experience defects such as the walls, ceilings, floors and pipes. There are some other building components that experience defect; however, their results are not significant.

Based on the observation conducted, which can be seen from Plate 1, the defect caused by the leakage causes the building to look mossy and hence this created the slum conditions of the building.

The level of building management services

According to the interview conducted in Komaruddin, Pulo Gebang and Cakung Barat, the number of cleaning and technically competent staffs is not sufficient to cover a vast area of the public-rented residential building. For example in Cakung Barat, there are only six cleaning staff and two technically competent staffs to manage four blocks. The lack of cleanliness of the building is said to be aggravated by the leakage happening around the building. After several periods of time, the leakage can lead to the creation of moss and hereafter the creation of slum conditions.

However, not all of the sampled public-rented residential buildings experienced the shortage of cleaning and technically competent staffs. This is justified by the result in Table II

No	Category		Survey percentage (%)				
			Komaruddin	Pinus Elok	Pulo Gebang	Cakung Barat	
1	The level of damage and deterioration of quality of the building material	Deterioration or defect occurring on the	Wall	52.6	56.8	44.1	51.3
			Ceiling	39.2	26.5	29.7	57.4
			Floor	25.7	12.3	28.8	23.5
			Pipe	64.9	29.7	27.9	50.4
2	The level of building management services	The number of cleaning staff	Enough	22.2	51.6	32.4	29.6
			Not enough	76.6	48.4	67.6	68.7
			Don't know	1.2	0.0	0.0	1.7
	The number of technically competent staff	Enough	25.1	79.4	42.3	22.6	
		Not enough	73.7	19.4	56.8	75.7	
		Don't know	1.2	1.3	0.9	1.7	
3	The level of building occupants' involvement	Important	91.3	96.8	94.6	96.5	
		Not important	7.6	2.3	4.5	3.5	
		Don't know	1.1	0.9	0.9	0.0	
4	The level of maintenance budget availability ^a	More than enough	40.0	0.0	0.0	0.0	
		Enough	60.0	60.0	80.0	100.0	
		Not enough	0.0	40.0	20.0	0.0	

Note: ^aThis factor is an additional question given to building management staff

Table II.
Statistics of the survey result

that only Pinus Elok has a sufficient amount of cleaning and technically competent staffs. The other three buildings experience shortage of staffs. The condition of Pinus Elok is justified by the observation conducted. According to the observation, the common area of the building is kept clean and the cleaning staffs are always seen on-site doing their job. According to the interviews conducted with building occupants, technically competent staffs are always available when needed.

The level of building occupants' involvement

According to the interviews conducted with building management staffs, building occupants' involvement in maintaining and keeping the building area clean is still minimal. Building occupants are still not aware of the importance of maintaining the building. This statement is justified from the observation conducted; there were still garbage scattered around the building area and there are some vandalism in Komaruddin and Cakung Barat. However, in Pinus Elok and Pulo Gebang, the common area and unit area is kept clean and no vandalism. There is also a community service organized by the building occupant to regularly clean the building area.

On the basis of the survey result in Table II, it indicates that the building occupants are aware of the importance of maintaining the building but apparently are not followed by real action. Hence, some of the building occupants still throw garbage around the common area and especially through water pipes which can cause leakage even though they know that it is their job to maintain the building and keep the building clean.

The level of building maintenance budget availability

While the survey result from Table II indicates that there is enough budget available to fix defect in the building, the result from the interview says otherwise. The fourth factor in the questionnaire was only given to building management staff and not to the building occupants. On the basis of the building management point of view according to the interview, the budget do become available in public-rented residential buildings, however after the budget requested is approved by the Regional Government Housing and Building Office of Jakarta Province. This process can take a very long time, up to six months. According to the interview with building occupants, due to the urgency of the damage, building occupants prefer to fix the defects with personal expenses rather than to have to wait for the budget to become available on-site. On the basis of the observation, there are still defects around the public-rented residential buildings, which indicate that defects are not fixed immediately due to the fact that there is no available budget at the time of need.

The limited budget availability on-site is also caused by the regulation that says that public-rented residential buildings does not have operational fund on-site, all of the fund are centralized and managed by the governing body which is The Regional Government Housing and Building Office of Jakarta Province. The limited budget availability can also be seen from the observation conducted. There are still a lot of defects occurring in public-rented residential buildings especially caused by the leakage, which means that there are limited/no available funds to fix the leakage on-site.

Proposed solution for public-rented residential buildings

On the basis of the triangulation from the interviews, observation and survey result, it is concluded that the dominant factors affecting the creation of slum conditions in public-rented residential buildings are the level of damage and deterioration of quality of the building materials and the level of maintenance budget availability. The selection of dominant factors is also based on the researcher's judgment on the issue and supported by the evidence at hand.

It is seen that although the factor of “The level of building management services” and “The level of building occupants’ involvement” affects some of the sampled public-rented residential building, it does not affect all of the 4 buildings. Hence according to the researcher’s judgment, these factors do not affect the creation of slum conditions in public-rented residential buildings.

“The level of damage and deterioration of quality of the building material” factor is a dominant factor due to the result from the survey, and based on the interview and observation conducted which shows that there are still a lot of defects/damages in public-rented residential buildings which leads to slum condition. “The level of building maintenance budget availability” is also a dominant factor because based on the facts on hand the budget is only available approximately 6 months after the budget is requested. In this case, building occupants are left with no choice than to use personal expenses to fix the defect. This means that there is no available budget at that moment of need.

Building component defects cannot be fixed if there is a limit in the budget. However, reparation of the defect can be prioritised even when the building maintenance budget is limited. Thus, an alternative maintenance strategy is proposed for public-rented residential buildings so defects can be prioritized on the limited budget available. Thus value-based maintenance management strategy is proposed.

This strategy focuses on the needs and wants of the building user, in this case is the building occupant. The building occupant will be placed as the center of the building maintenance activity. By doing this, the building is said to give value to the users.

In the case of a product or service, the user or the consumer determines the value of the product or service. In the case of building maintenance, the value of the building is derived from the services it provides to the user. The services provided not only during the usage of the building, but from the start of the building construction until the end of the building’s lifetime. A building is a facility for the users to do their day-to-day activity. Building component defects and lack of technical and cleaning staff can limit the building occupants’ day-to-day activity and hence decrease the value of the building to the users.

A building needs maintenance to optimize its performance over its effective lifetime. To the building user, the most important aspect is the building’s abilities to support users’ activities effectively and efficiently, whether it is inside or outside the building area. Users tend to be unsatisfied when the building does not meet their needs and wants regarding the building’s function. A building is said to be valued when the needs and wants of the users has been fulfilled with the current available resources (Olanrewaju, 2010).

In the case of the public-rented residential buildings in Jakarta, the limited budget is the main problem. With limited budget not all of the defects can be fixed in a one-year budget plan. Thus to fix all of the defects, it needs to be prioritized to which defects affect most to the building occupants. On the basis of the survey, a list of defects is identified and the severity of each defect can also be seen. With this list of defects, a three-year plan is proposed to The Regional Government Housing and Building Office of Jakarta Province that priorities the defects that needs to be urgently fixed with the limited budget on hand.

On the basis of Table II it can also be seen that several public-rented residential building needs an additional cleaning and technically competent staffs to improve their service to the building occupants. Therefore with the limited budget, the addition of the cleaning and technically competent staffs is also prioritized in the three-year plan. However as this is not a dominant factor, it is placed as a second priority in the three-year plan proposed. The three-year plan proposed can be seen in Table III.

In addition to the three-year plan proposed, a guidance program for new building occupants needs to be established as well. The guidance program is proposed due to the lack of building occupants’ involvement in maintaining the building. In the guidance program, new building occupants will be given a briefing session on the rules and regulations on how

Table III.
A 3-year plan
proposed to the
regional government
housing and building
office of Jakarta
province

Public-rented residential building	Priority	Activity	1st year	2nd year	3rd year
Komaruddin	I	Building repair	1. Water pipe leakage 2. Cracked/seepage wall	1. Ceiling leakage 2. Cracked floor	1. Water supply system 2. Cracked floor stairs 3. Sewage system 4. Electricity network
Pinus Elok	II	Add cleaning staff	3 staff → 6 – 8 staff	5 staff → 8 – 12 staff	
	I	Adding technically competent staff Building repair	1. Unit's ceiling leakage 2. Cracked/seepage of the outdoor wall	1. Water supply system 2. Water pipe leakage 3. Outdoor's ceiling leakage 4. Unit's cracked/seepage wall	1. Sewage system 2. Cracked floor 3. Cracked floor stairs
Pulo Gebang	II	Add technically competent staff		4 staff → 6 – 8 staff	
	I	Building repair		1. Cracked/seepage wall 2. Cracked floor	1. Water pipe leakage 2. Sewage system 3. Electricity network 4. Cracked floor stairs
Cakung Barat	II	Add cleaning staff	4 staff → 6 – 8 staff	8 staff → 8 – 12 staff	
	I	Adding technically competent staff Building repair	1. Ceiling leakage 2. Cracked/seepage of the outdoor wall	1. Water pipe leakage 2. Unit's cracked/seepage wall	1. Cracked floor 2. Water supply system 3. Sewage system 4. Cracked stairs 5. Electricity network
	II	Add cleaning staff Add technically competent staff	2 staff → 3 – 5 staff	6 staff → 8 – 12 staff	

to live and behave in a public-rented residential building. One session of guidance program will need to be established before the building occupant starts renting the unit, and one or two sessions every year to control their behavior in obeying the rules and regulations of the public-rented residential building. With this guidance program, it is hoped that the building occupants will be more involved in maintaining the public-rented residential building.

The policy of a building maintenance management must also be input as one of the responsibilities of the top management of a company, not only as operational activities (Olanrewaju, 2009). With this strategy, it is hoped that gradually the building will give more value to the building occupants in spite of the lack of building maintenance budget availability. The three-year plan proposed can be seen in Table III.

Conclusions

The research has identified the factors affecting the slums creation in public-rented residential buildings. Those factors are the level of damages and deterioration of quality of the building material, the level of building management services, the level of building occupants' involvement and the level of maintenance budget availability. However, the dominant factors are only the level of damages and deterioration of quality of building material and the level of maintenance budget availability.

On the basis of the factors identified, building maintenance strategy based on value is proposed to The Regional Government Housing and Building Office of Jakarta Province. This strategy focuses on the building user, which is the building occupant, as the center of the building maintenance activities. In addition to the alternative building maintenance strategy, a three-year plan is proposed. This plan contains a priority plan to fix building components' defects, to add cleaning and technically competent staffs and to establish a guidance program for building occupants with the limited budget on hand.

This priority plan will be additional information to enable The Regional Government Housing and Building Office of Jakarta Province to get the whole picture of the budget needs for public-rented residential buildings in terms of building maintenance. According to the priority plan in Table III, the governing body is able to plan the maintenance budget needed for each of the public-rented residential buildings according to the buildings' need. In doing so, budget can be available at the time of need; hence the building occupants do not have to wait for a long time for the disbursement of funds. It is hoped that by planning the right amount of budget according to the building maintenance needs, the public-rented residential buildings can be improved in terms of reducing the slum condition of the building.

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