Study on Sustainable Environmental Impact Management in the Operational Phase of Kasih Ibu Hospital, Jebres, Surakarta

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ABSTRACT

This study aimed to determine the sustainable environmental impact management plan at the operational stage of the Hospital and was researched before the building was built. The research indicators consist of 10 (ten) indicators derived from the applicable regulations, namely *Keputusan Menteri Lingkungan Hidup* No. 86/2002: *Pedoman Pelaksanaan Upaya Pengelolaan Lingkungan Hidup dan Upaya Pemantauan Lingkungan*. Primary data collection is carried out by field surveys, business plan studies, studies of applicable regulations and detailed engineering design studies. Secondary data collection was carried out by reviewing the literature on previous similar studies. The analysis used in this study consists of two analysis models, namely calculation analysis according to all literature used in this research, which aims to determine the magnitude of the impact on each indicator and analysis of research literature studies using the World Cloud and Hierarchy Chart on NVivo Plus 12 software which aims to determine the dominant indicators in this study for environmental impact management plan at the hospital operational stage. The study results show the magnitude of the impact on each research indicator. While the results of the analysis using the World Cloud and Hierarchy Chart on the NVivo 12 Plus software show that the dominant indicator in managing sustainable environmental impacts at the operational stage of the Hospital is the Waste indicator with total non-medical solid waste 428.75 liters/day; Total medical solid waste 459 liters/day; The calculation of medical liquid waste 45 m³/day, the peak discharge of medical wastewater (QQpeak) 2x Qaverage.

Keywords: *Impact management, Environmental impact, Hospital, Hospital waste.*

1. INTRODUCTION

Hospital is a fairly complex building, especially in terms of impact management and utilization of resources and the environment. In the *Peraturan Menteri Kesehatan Republik Indonesia* No. 56/2014 about *Klasifikasi dan Perizinan Rumah Sakit*, starting from the designation of the location and intensity of the building by the provisions of local regulations, the design of the hospital building to controlling environmental impacts by the requirements of the laws and regulations, the hospital as a unit ecosystems need to be responsible for the sustainability of ecological quality and the use of natural resources during the issue of the impact of climate change and global warming and environmental degradation [1].

Following applicable regulations, environmental management and utilization planning are carried out by compiling Environmental Impact Assessment (AMDAL - *Analisis Dampak Lingkungan* also UKL UPL - *Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan*) documents made by the initiator of activities, whether new or not yet operational. The document can identify the impact of activity and how the negative and positive effects are appropriately managed [2]. For this reason, it is necessary to study the management planning and sustainable use of the environment at the operational stage of the hospital.

The limitation of the research is the magnitude of the environmental impact that will arise when the hospital is operational and knowing the parameters of the most dominant effect on the hospital's environmental management. The research aims to become the basis for the management and monitoring the hospital's environment and policymakers to manage ecological impacts for interested parties.

The conceptual framework in this study uses the approach of the *Keputusan Menteri Lingkungan Hidup Nomor* : 86 / 2002 about *Pedoman Pelaksanaan Upaya Pengelolaan Lingkungan Hidup Dan Upaya Pemantauan Lingkungan Hidup* which states that it is necessary to clearly and briefly describe the environmental impacts that may occur, namely the activities that become the source of the effect on the environment, the type of environmental impact that happens, the size was stating the magnitude of the impact and other things that need to be conveyed to explain the environmental impact that will occur on the environment.

There are research variables based on the regulation, namely the aspect of the Scale of Activity consisting of 10 indicators, namely land and buildings, use of equipment and machinery, use of electrical energy and fuel, service and business commodities, labor, water use, waste generation, systems firefighting, water conservation programs and green space development, and parking needs. A study of the literature to find out the magnitude of the impact of each research indicator is carried out as follows:

1.1. Indicator of Land and Building

Hospital open land affects efforts to manage and monitor the surrounding environment and the occupants of the building. Humans have a natural tendency to prefer natural landscapes over built environments, especially in environments that lack vegetation and water [3]. Humans will prefer garden elements such as grass, trees, flowers, and water elements. Ninety per cent of garden users experience positive changes of heart after spending time outdoors. The garden becomes an essential thing because it brings an atmosphere that contrasts with the atmosphere in the hospital, contrasts such as natural atmosphere and artificial atmosphere, fresh air and controlled air, broad mind and anxious mind [4]. According to Roger Ulrich 1999 cit Markus, [4]; some of the advantages of having a garden in the hospital area are reducing stress levels for patients, staff and visitors, reducing patient pain, reducing depression and improving the quality of life for chronic patients (followed by exercise/sports in the hospital). Garden, and improve visuals if the placement of the park is appropriate.

1.1.1. Indicator of the Use of Equipment and Machinery

1.1.2. Indicator of the Use of Electricity and Fuel

Hospitals are one of the most complex types of buildings that combine several functions and operate 24 hours a day for 7 of a week, such as emergency rooms, operating rooms, long and short term inpatient rooms according to the type and type of room, laboratories, etc [5]. Indirectly, use of the equipment and electrical energy in hospitals affects the performance of the building. One of the specific issues related to energy and architecture is energy use associated with a large amount of energy demand (both for heating, cooling, operating, etc.) which requires effective monitoring and evaluation to determine the energy use model and steps to be taken [5].

1.1.3. Indicator of Service and Business Commodity

According to Lupiyoadi [6], facilities to facilitate and facilitate functions, namely facilities, are individual components of the offering that are easy to grow or reduce without changing the quality and service model [7]. Facilities and service quality significantly affect service user satisfaction in hospitals. That can create customer satisfaction with supporting facilities and better service [7]. Although smaller than personal contact, physical support at the hospital has a significant and positive effect on patient satisfaction. For this reason, it is necessary to pay attention to the physical facilities supporting patient care [8].

1.1.4. Indicator of Labor

The scale of hospital activities can be estimated by calculating the number of residents, people who stay, and visitors [9].

1.1.5. Indicator of Water Usage

Water needs of Hospitals are related to the scale of hospital activities and can be estimated by approaching the number of residents, stays, and visitors [9]. According to the regulation *Peraturan Menteri Kesehatan RI* No. 7/2019 about *Kesehatan Lingkungan Rumah Sakit* in the appendix, it is stated that a hospital needs to provide water needs for drinking water, water for outpatients, water for hygiene purposes, hospital facilities to water needs for emergency conditions.

1.1.6. Indicator of Waste

Waste management requires a systems approach involving handling, storage, transportation, treatment and disposal of waste in a method that minimizes risks to health and the environment at all stages [10]. The regulation from *Peraturan Menteri Kesehatan Republik Indonesia* No 7 Year 2019 about *Kesehatan Lingkungan Rumah Sakit* states that the Implementation of Safeguarding Waste in hospitals includes safeguards against domestic solid waste, hazardous and toxic waste (B3), liquid waste, and gas waste. Sustainable hospital waste management requires rapid completion with a defined plan for continuous monitoring. Hospital waste consists of mostly non-hazardous waste, although the hazardous wastes cannot be ignored. The hazardous waste content can be in the form of infectious waste composed of toxic chemicals, metals and genotoxic and radioactive substances [11]. According to WHO "Health-Care Waste", the generation of B3 waste in a hospital is 0.5 kg/day/bed in high-income countries and an average of 0.2 kg/day/bed in low-income countries [12]. With the amount of solid medical waste generated, hospitals have a great potential to pollute the environment and possibly cause accidents and disease transmission [13].

1.2. Indicator of Firefighter System

The danger of fire risk can be minimized when the hospital fulfils the existing fire protection system and complies with Indonesian standards and regulations. In addition, it is necessary to carry out broader risk management [14]. Active protection systems in buildings as an effort to save themselves from the threat of danger consist of, among others, detectors, alarms, sprinklers, yard hydrants, building hydrants and light fire extinguishers. The active protection system must also have eligibility requirements in its operation [15]. The fire extinguishing system must be equipped with at least 1 type of automatic, pressurized, and sufficient capacity water supply and can be relied upon at all times. The water used does not contain other ingredients, and saltwater is not permitted unless there is no other water provider provided that it is immediately rinsed with clean water [16].

1.3. Indicator of Water Conservation Program and Green Open Space Development

The development of green space and water conservation is carried out by providing water catchment areas in LRB (*Biopori Infiltration Holes*) or rainwater infiltration wells. The number of biopori holes greatly influences the reduction of surface runoff during unsaturated soil conditions. The more biopori holes, the more significant the runoff reduction [17]. According from regulation *Peraturan Menteri Lingkungan Hidup* No. 12/2009 about *Pemanfaatan Air Hujan*, it's explained that every 25-50 m² of building cover area requires 1 unit of shallow infiltration well, every 500-100m² of building cover area requires an infiltration well in 1 unit and every additional 7 m² building cover area requires another 1 unit of biopori infiltration hole. The indicator of Water Conservation Program and Green Open Space Development obtained from observing the plan for infiltration wells and biopori holes on hospital's DED.

1.4. Indicator of Parking Needs

Statistically, paramedical and employee parameters have no significant effect because they have provided their own parking space, and the number is relatively stable from time to time. In comparison, the beds filled and the number of doctors is the most influential because of the two main reasons hospital visitors visit inpatients or consult a doctor [18]. From regulation *Peraturan Menteri Kesehatan* No 24/2016 *Persyaratan Teknis Bangunan dan Prasarana Rumah Sakit* explained that the design and planning of parking infrastructure in hospitals are essential parking is essential, and vehicle entrances will take up a lot of land. Assuming the calculation of parking space requirements at the hospital ideally is 37.5 m² to 50 m² per bed (including vehicle circulation paths) or adjusts to the socio-economic conditions of the local area and is equipped with parking signs.

2. METHODOLOGY

The analysis carried out in this study consists of two analysis models. The first analysis is an analysis of the calculation of the magnitude of the impact on each indicator by the literature review and approach for each indicator described previously as follows:

Table 1. The result of the impact on each indicator by the literature review

Indicator	Analysis Method
1. Indicator of Land and Building	This indicator is obtained by calculating the building coefficients, including the land covered by buildings and open land, green open space and non-green open space.
2. Indicator of The Use of Equipment and Machinery	This indicator is obtained from data collection on plans for machines, tools, electricity and fuel used when the hospital is operational.
3. Indicator of The Use of Electricity and Fuel Hospitals	
4. Indicator of Service and Business Commodity	This indicator is obtained from data collection on the plans for the facilities provided and sold by the hospital.
5. Indicator of Labor	This indicator is obtained from data collection on the hospital's workforce plan when operational later.
6. Indicator of Water Usage	This indicator is obtained from calculating the assumption of water use by hospital users consisting of residents, people who stay and visitors.
7. Indicator of Waste	This indicator is obtained by calculating the assumption of medical and non-medical waste and liquid waste generated by hospitals and explaining hazardous waste management.
8. Indicator of Firefighter System	This indicator is obtained from observing the fire extinguishing system plan on the hospital's DED.
9. Indicator of Water Conservation Program and Green Open Space Development	This indicator is obtained from observing the plan for infiltration wells and biopori holes on the hospital's DED.
10. Indicator of Parking needs	This indicator is obtained from observing the availability of parking spaces at the hospital's DED.

The second analysis is to use the World Cloud, and Hierarchy Chart on the NVivo Plus 12 software from the total number of literature approaches on all indicators to determine the dominant indicators in the environmental impact management plan at the hospital operational stage. The relationship between the two analysis models is to determine the magnitude of the impact of the most dominant indicator on the environment when the hospital is operational later.

Research data collection is divided into primary data collection and secondary data collection. Primary data collection was carried out by:

- The field survey included the existing condition of the hospital's site, land boundaries, state and status of roads around the site area.
- Review the hospital business plan document to find out the plans for facilities and services available at the hospital and the plan to develop the number of employees to medical personnel.
- Study the rules and regulations that apply to the local area (building code).
- Study of the Detailed Engineering Design of Hospital buildings.
- Secondary data collection was carried out by reviewing previous related studies.

3. RESULTS AND DISCUSSION

The first analysis is the calculation of the magnitude of the impact of each indicator as shown in the following discussion:

3.1. Indicator of Land and Building

Calculation of land use is calculated as a percentage of the land area of 9,172 m2, which is 80.51% of the unbuilt area, which is 7,384.3 m2 and 19.94% of the built area, which is 1,787.7 m2.

Table 2. Area use of each hospital floor

No	Floor	Area use (m^2)	Presentage (%)
1	GWT dan IPAL	345,8	3,04
2	Semi Basement	2.075,9	18,26
3	1^{st} floor	1.787,7	15,72
4	2^{nd} floor	2.175,7	19,14
5	3^{rd} floor	1.631,9	14,35
6	4^{th} floor	1.614,2	14,20
7	5^{th} floor/roof	1.738,1	15,29
	Total building area	11.369,3	100,00

Source: Hospital DED Calculation Analysis, 2020.

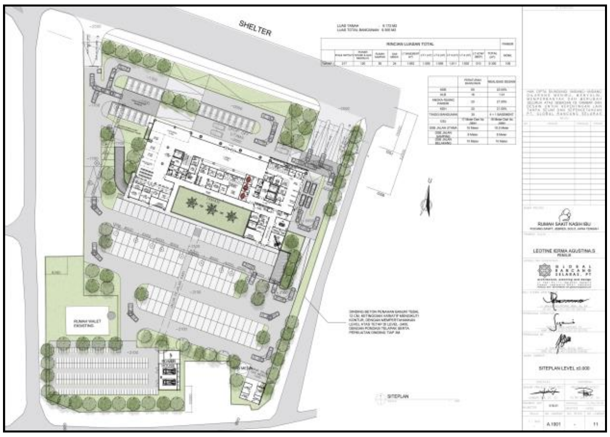

Figure 1 Siteplan Kasih Ibu Hospital.

3.2. Indicator of the Use of Equipment and Machinery

The plan for the equipment and machinery used in the operational phase of the hospital is as follows:

Table 3. Hospital operational equipment and machinery

No	Equipment and Machinery	
1.	Lift	Public Lift
		Medical Lift
2.	Press Fan	Pressurized Fan
3.	Electronic	Server Fire alarm, server sound system, server telephone, server data, server MATV, server CCTV, queuing system
4.	Outdoor Lighting	
5.	Vacuum Air and Compress Air	
6.	Kitchen	Equipment kitchen 16 units
		Refrigerator 6 units
		Axial fan 4 units
7.	Laundry	Washer extractor-electric
		Tumble dryer
		Flatwork dry ironer
		Work table with undershelf
		Equipment laundry
8.	Floors Lighting	
9.	AC	Power AC, axial fan, wall fan, AC micro
10.	Radiology	CT Scan, X-Ray
11.	IGD	Contact Box
12.	Hemodialisa	HD machine, system control panel RO
	CSSD	Equipment CSSD, Getinge ultrasonic 300, steriking sealing machine RS 120, Getinge washer disinfector 46-4S(1), Getinge washer disinfector 46-4S(2), drying cabinet, Getinge steam sterilizer HS 6610-AR-2, Getinge steam sterilizer HC 533 COMBI, low temperature sterilizer
13.	VK	Contact Box
14.	Clean Room	PP OK (5 units), PP ICU, PK AC OK (5 units), PK AC corridor, PK AC R. Post dan Pre Op, PK AC ICU (2 unit), Contact box medical equipment ICU
15.	OK	Room lighting, power door room, Contact box medical equipment
16.	Roof Top	Obstruction lamp, PP atap, PK booster pump, PK heat lamp, lighting, signage, contact box
17.	Firefighter System	Electric hydrant pump, clean water pump, drain GWT, filter WTP (water treatment plan), deepwell, exhaust fan

Source: DED Kasih Ibu Hospital, PT GRS, 2020.

3.3. Indicator of the Use of Electricity and Fuel

The use of energy at the operational stage of the Hospital is as follows:

Table 4. Hospital operational electrical energy usage plan

<table>
<tr><th colspan="5">Total Normal Electric Load</th></tr>
<tr><td colspan="2">Total KVA</td><td colspan="3">1008.4</td></tr>
<tr><td colspan="2">Total KW</td><td colspan="3">759.6</td></tr>
<tr><th colspan="5">Total Emergency Electric Load</th></tr>
<tr><td colspan="2">Total KVA</td><td colspan="3">243.7</td></tr>
<tr><td colspan="2">Total KW</td><td colspan="3">171.3</td></tr>
<tr><th colspan="5">Power Factor Improvement</th></tr>
<tr><td colspan="2">Installation Power Factor</td><td colspan="3">0,75</td></tr>
<tr><td colspan="2">Installation Power Need Factor</td><td colspan="3">0,90</td></tr>
<tr><td colspan="2">Required Capacitor (kVAR)</td><td colspan="3">295,30</td></tr>
<tr><th colspan="5">Bank Capacitor Installation</th></tr>
<tr><td colspan="2">Total Capacitor (kVAR)</td><td colspan="3">360,00</td></tr>
<tr><td colspan="2">Maximum Capacity Activated (kVAR)</td><td colspan="3">300,00</td></tr>
<tr><td colspan="2">Generated Power Factor</td><td colspan="3">0,90</td></tr>
<tr><th colspan="5">Normal Load with Capacitor Bank</th></tr>
<tr><td>S</td><td>P</td><td>R</td><td>S</td><td>T</td></tr>
<tr><td>842,0</td><td>759,6</td><td>1276,9</td><td>1272,8</td><td>1277,3</td></tr>
<tr><th colspan="5">Total KVA = 842,0 ; Total KW = 759,6</th></tr>
</table>

Source: DED Kasih Ibu Hospital, PT GRS, 2020.

3.4. Indicator of Service and Business Commodity

The services provided at the Kasih Ibu Jebres Hospital in Surakarta are as follows:

Table 5. Types of services on each floor of hospital

Semi Basement Floor
Medical Records, Hospital Maintenance Installations, Canteens, Laboratories, Corpse Installations, Nutrition Installations, Laundry (infectious and non-infectious washing), Security room and Medical Gas room
1st Floor
Admission, Emergency Room, Radiology, 24-hour Clinic, Medical Rehab (pediatrician, growth and development clinic, speech therapy, r. nebulizer), Customer Service, Public Relations, Drugstore, Cafeteria, Shop, Cash Office, Pharmacy
2nd Floor
Neuro Clinic, ENT Clinic, Heart Clinic, Pediatric Clinic, Obstetrics and Gynecology Clinic, Eye Clinic, Surgery Clinic, R Non-surgical procedures, R surgical procedures, R. isolation, R inpatient class 1, R inpatient class 2, Cafeteria , Hemodialysis
3rd Floor
VIP class inpatient room, VIP A class inpatient room, 3rd class inpatient room, isolation room, action room
4rd Floor
VK (VK 3 *bed*, VK VIP 1 *bed)*, action room, babies room; ICU : 6 *bed*, NICU : 2 *bed* , NICU : 2 *bed* , OK (5 room, post OP, pre OP; Sterilizes)

Source: DED Kasih Ibu Hospital Analysis, PT GRS, 2020.

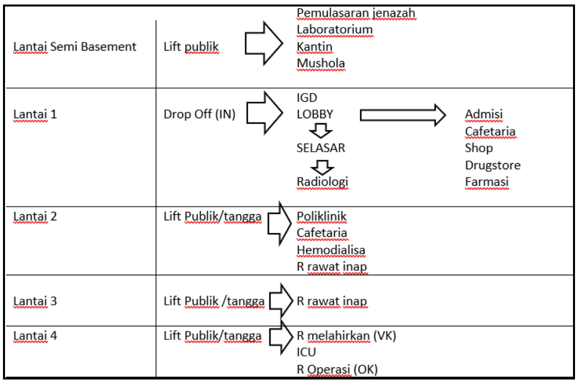

Figure 2 Flow of visits in each floor of Kasih Ibu Hospital.

The bed plan (*Tempat Tidur*) is calculated from the ER 9 TT and 4 rooms, ICU-HCU 6 TT, OK 5 units, VK 4 TT, Perinatology 9 boxes, Hospitalization for all classes and isolation 92 TT, Hemodialysis 9 TT, and clinic 15 modules.

3.5. Indicator of Labor

The number of nursing staff needed for a Class C General Hospital is 2: 3, so with a bed capacity of 100 TT at Kasih Ibu Jebres Hospital, Surakarta, it requires several nurses = 100 X 2/3 = so 67 nurses/midwives are needed. If it is assumed that at the beginning of the operational BOR = 30%, then the initial recruitment of nurses is required = 30% x 67 people = 20 nurses and midwives. Human resource needs for 0 - 6 Months, assuming that BOR = 30%.

The workforce development plan for each unit obtained from the Hospital Business Plan Document has two alternatives, namely 155 people or 146 people. This plan for HR needs is then calculated by calculating the capacity of the number of beds to be operational; after that, the assumption of the occupancy rate projection

(BOR/Bed Occupancy Rate) is made. At the beginning of the operation, it is assumed that the occupancy rate is 30% and will be evaluated every six months.

3.6. Indicator of Water Usage

The occupants of the Kasih Ibu Hospital in Surakarta are employees/employees/medical personnel who work alternately in one day. For now the average daily water usage of each occupant and the estimated number of residents by assuming the number of human resources as many as 146 people, the calculation of water needs for residents is the number of people multiplied by 120L/day, which is 17,520 L/day assuming a Bed Occupancy Rate of 100%. The occupants of the Kasih Ibu Hospital in Surakarta are employees/employees/medical personnel who work alternately in one day. What can know the average daily water usage of each occupant and the estimated number of residents? By assuming the number of human resources as many as 146 people, the calculation of water needs for residents is the number of people multiplied by 120L/day, which is 17,520 L/day assuming a Bed Occupancy Rate of 100%. Clean water needed by visitors is assumed to be 5% of the use of clean water for residents; this is based on not all visitors using existing clean water facilities [19]. It was obtained as much as 876L/day. The total assumed hospital water demand at the operational stage is as follows:

Table 6. Calculation of clean water needs at Kasih Ibu Jebres Hospital, Surakarta

Clean Water User	Needs (L/day)
Occupants	17.520
Visitors	876
Residents	55.320
TOTAL water needs for humans	73.716
Building maintenance (20%)	14.743
Firefighter System (5%)	3.686
Clean water hospital backup (10%)	7.372
TOTAL water needs	99.517 L/day
= 99,517 m^3/day->4,14 m^3/hour	

Source: Analysis of Hospital Water Needs Calculation, 2020.

3.7. Indicator of Waste

The total non-medical solid waste generation is calculated from SNI 3242:2008 concerning waste management in residential areas, so the amount of domestic waste in big cities is 2.5 liters/person/day with a span of 1 day is 24 hours. Meanwhile, hospital support units are assumed to be used within 10-12 hours per day so that the amount of non-medical solid waste in these units is 1.25 liters/person/day. The assumption is that the amount of non-medical solid waste in the hospital service support unit is 1.25 liters/person/day x 139 people, 173.75 liters/day. Meanwhile, the assumption of non-medical solid waste generation per bed inpatients is 2.5 liters/person/day x 102 beds, which is 255 liters/day. The non-medical solid waste generation is 428.75 liter/day, equivalent to 0.428 m3/day.

Hospital solid waste is estimated at 3 liter/person/day for medical waste and 2.5 liter/person/day for non-medical waste, namely the average solid waste per day per person SNI 3242 of 2008 concerning solid waste/garbage for urban settlements. Thus, the assumption of medical waste generation at Kasih Ibu Hospital is calculated from the planned capacity of the hospital, namely the number of beds and rooms and modules x 3 liters/person/day equals 153 x 3 liters/person/day with a result of 459 liters/day or equivalent to 0.459 m3/day.

The handling of B3 solid medical waste conforms to the Regulation *Peraturan Menteri Lingkungan Hidup dan Kehutanan* No. P.56/*menlhk-setjen*/2015 about *Tata Cara Dan Persyaratan Teknis Pengelolaan Limbah Bahan Berbahaya Dan Beracun Dari Fasilitas Pelayanan Kesehatan*, according to the standards stated in the regulation and it is stated that the storage of B3 waste must meet the compatibility rule, namely classifying storage according to its characteristics.

The calculation of medical liquid waste is calculated based on data on total clean water usage in hospitals, with 45% used for medical purposes. The value of 45% comes from data from a class C hospital used as a reference for calculating medical wastewater discharge based on the amount of medical wastewater discharge collected in hospital chopsticks [20]. So that the total water demand discharge is 99.52 m/day (100 m/day) with medical wastewater discharge (Qaverage) being 45% of the total, namely 45 m/day (1.87 m^3/hour), and the peak discharge of medical wastewater (QQpeak) is assumed to be 2x Qaverage which is 90 m^3/day (3.75 m^3/hour). To overcome medical liquid waste at Jebres Hospital Surakarta, Kasih Ibu Hospital will use Extended Aeration WWTP with a capacity of 150 m/day.

3.8. Indicator of Firefighter System

Installation of a fire extinguishing system for each floor consists of Upright Sprinkler 20 pcs on the semi-basement floor, Sprinkler Pendant 73 – 92 pcs/floor, Sidewall Sprinkler, Branch Control Valve, Drain Control Valve 1 set/floor, Indoor Hydrant box two pcs/floor, Fire Extinguisher 3.5 kg 5 pcs/floor, Fire Extinguisher CO2 5 kg 1 pcs/floor and 2 pcs on the semi-basement floor, Outdoor Hydrant Box 4 pcs, Siamese Connection 2 pcs and Hydrant Pillar 4 pcs.

3.9. Indicator of Water Conservation Program and Green Open Space Development

There are 42 infiltration holes in the Kasih Ibu Hospital, Surakarta @ 2 m³. On the roof floor, 4th floor, 3rd floor, 2nd floor and 1st floor, there is a rainwater standpipe, and in the semi-basement area, there are rainwater chopsticks equipped with a drain pump. The development of green spaces uses plants that can support various functions, including therapeutic functions (aromatherapy functions), aesthetic functions (colour harmonization), and ecological functions (maintaining soil fertility and refreshing the surrounding air), and prioritize local plants and low maintenance.

3.10. Indicator of Parking Needs

The parking availability at Kasih Ibu Hospital is calculated at 3,825 m2, obtained with a parking ratio of 37.5m² to accommodate 100-102 beds in 100% BOR conditions. It can see from the DED RS that the parking area is divided into a pavement/paving ground area and a car park and motorbike parking area.

After the first analysis is carried out, namely the magnitude of the impact of each indicator, a second analysis is carried out to determine the dominant indicator that occurs from all of the literature used to find the magnitude of the impact of all existing indicators. The analysis using the World Cloud and Hierarchy Chart on the NVivo Plus 12 was obtained from the entire literature used as the basis for calculating the magnitude of the impact described above. So that from a total of 18 literature which are divided into 9 nodes, the following results are obtained:

Figure 3 World cloud NVIVO 12 Plus, 2020.

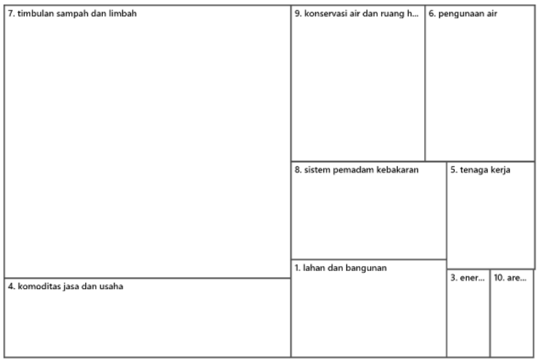

Figure 4 Hierarchy chart NVIVO 12 Plus, 2020.

4. CONCLUSION

The results of the analysis and discussion of the research show the calculation of the magnitude of the impact that will occur on each indicator when the hospital is operational as follows 80.51% of the unbuilt area and 19.94% of the built area; the plan for the equipment and machinery will used; the use of electricity and energy will used 759,6 kw; service and business commodity 153 bed plan; the number of employee is 146 employee; total non-medical solid waste 428.75 liter/day; total medical solid waste 459 liters/day; handling of B3 solid medical waste conforms to the Regulation; calculation of medical liquid waste is 45 m³/day (1.87 m³/hour), and the peak discharge of medical wastewater (QQpeak) is assumed to be 2x Qaverage; the plan for Installation of a fire extinguishing system for each floor; 42 infiltration holes and development of green spaces uses plants that can support various functions; parking availability is calculated at 3,825 m^2.

The analysis results using the Word Cloud on NVivo 12 above show that waste is the indicator that most often appears. The Hierarchy Chart analysis on Nvivo 12 above indicates that the highest reference codes are the waste generation indicator and waste with the magnitude total non-medical solid waste 428.75 liter/day; total medical solid waste 459 liters/day; handling of B3 solid medical waste conforms to the Regulation; calculation of medical liquid waste is 45 m³/day (1.87 m³/hour), and the peak discharge of medical wastewater (QQpeak) is assumed to be 2x Qaverage. So it can conclude that the indicators of waste generation and waste are the dominant and leading indicators in the management and monitoring of environmental impacts in hospitals when operating.

Suggestions for future research are related to follow-up management and monitoring of impacts on each known indicator scale, including those in charge of the relevant stakeholders.

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REFERENCES

[1] B.H.P. Sigalingging, N. Nadiroh, and S. Sucahyanto, "Gambaran Rumah Sakit Ramah Lingkungan," Jurnal Green Growth dan Manajemen Lingkungan, vol. 9, no. (2), pp. 61-70, 2020.

[2] N.P. Tias, Efektivitas Pelaksanaan AMDAL dan UKL UPL dalam Pengelolaan Lingkungan Hidup di Kabupaten Kudus. Semarang: Universitas Diponegoro, 2009.

[3] N.J. Georgi and P.K. Anthopoulos, "Landscape preference evaluation for hospital environmental design," Journal of Environmental Protection, vol. 02, no. (05), pp. 639–47, 2011.

[4] C.C. Marcus, "Healing gardens in hospitals," Interdisciplinary design and research e-Journal, vol. 1, no. (1), pp. 1-27, 2007.

[5] J. Gaspari, K. Fabbri, and L. Gabrielli, "A study on parametric design application to hospital retrofitting for improving energy savings and comfort conditions," Buildings, vol. 9, no. (10), pp. 220, 2019.

[6] R. Lupiyoadi, Kewirausahaan: From Mindset to Strategy. Jakarta: LPUI, 2005.

[7] S. Mongkaren, "Fasilitas dan Kualitas Pelayanan Pengaruhnya Terhadap Kepuasan Penguna Jasa Rumah Sakit Advent Manado," Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi, vol. 1, no. (4), 2013.

[8] A.H. Ramli, "Patient service and satisfaction Systems," Business and Entrepreneurial Review, vol. 15, no. (2), pp. 189-200, 2016.

[9] R. Dewi, Analisa Kebutuhan Air Bersih Rumah Sakit Umum Daerah Kota Mataram Gedung Graha Mentaram. Doctoral dissertation, Universitas Muhammadiyah Mataram, 2020.

[10] M.H. Dehghani, K. Azam, F. Changani, and E.D. Fard, "Assessment of medical waste management in educational hospitals of Tehran university medical sciences," Journal of Environmental Health Science & Engineering, vol. 5, no. (2), pp. 131-136, 2008.

[11] M. Farzadkia and S. Jorfi, "Hospital Waste Management Practices: A Case Study in Iran," International Journal of Environmental and Ecological Engineering, vol. 10, no. (2), pp. 142-146, 2016.

[12] A. Hanako and Y. Trihadiningrum, "Kajian Pengelolaan Limbah Padat B3 di Rumah Sakit X Surabaya," Jurnal Teknik ITS, vol. 9, no. (2), pp. C133-C138, 2021.

[13] N. Arisma, "Gambaran Pengelolaan Limbah Medis Padat Di Rumah Sakit Hi Muhammad Yusuf Kalibalangan Kotabumi Tahun 2019," Ruwa Jurai: Jurnal Kesehatan Lingkungan, vol. 15, no. (2), pp. 85-91, 2021.

[14] T. Martiana and Y.D.A. Wahyudiono, "Fire risk Analysis with Fishbone Analysis Method in Surabaya Hospital," Indian Journal of Public Health Research and Development, vol. 9, no. (3), pp. 195-199, 2018.

[15] M.R. Mufida and T. Martiana, "Sistem Tanggap Darurat Kebakaran Di Gedung Administrasi Perusahaan Listrik Fire Emergency Response System in Administration Building Electrical Industry," The Indonesian Journal of Occupational Safety and Health, vol. 8, no. (1), pp. 47-56, 2019.

[16] M. Al Haramain, R. Effendi, and F. Irianto, "Perancangan Sistem Pemadam Kebakaran pada Perkantoran dan Pabrik Label Makanan PT XYZ dengan Luas Bangunan 1125 m2," SINTEK JURNAL: Jurnal Ilmiah Teknik Mesin, vol. 11, no. (2), pp. 129-150, 2017.

[17] E. Victorianto, S. Qomariyah, and S. Sobriyah, "Pengaruh Lubang Resapan Biopori terhadap Limpasan Permukaan," Matriks Teknik Sipil, vol. 2, no. (3), pp. 423–30, 2014.

[18] T. Hirtanto, Ismiyati, and S. Prabandiyani, "Analisis Kebutuhan Ruang Parkir Pada Rumah Sakit Umum Kelas B di Kota Semarang," PILAR, vol. 15, no. (1), pp. 51–59, 2006.

[19] S.M. Noerbambang and T. Morimura, Perancangan dan pemeliharaan sistem plambing. Jakarta: PT. Pradnya Paramita, 1986.

[20] G.O. Batubara, Perencanaan Instalasi Pengolahan Air Limbah Medis dan Daur Ulang Efluen IPAL di Rumah Sakit Kelas C. Doctoral dissertation, Institut Teknologi Sepuluh Nopember, 2017.