CONCEPTUAL DESIGN AND OPERATION MODEL OF FLOATING HEALTH CLINIC

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Abstract. Health services in coastal areas of Sidoarjo need to get attention from government. The condition of health clinic in coastal area does not good as the existing health clinic on the centre of Sidoarjo area, the initiative of a floating health facility is an appropriate method to solve the problem. This study aims to plan the operation pattern of floating health clinic. There are four alternatives will be developed for floating health clinic, by using direct call or multi direct call. This analysis was conducted in the coastal area of Sidoarjo city. It results the cheapest total cost from the first alternative that generates a total cost of Rp.3.795.312.600 a year by 42 times roundtrips for 132,39 nm distance. This result required subsidies from the government to fulfill the vessel operational needs for serving coastal communities.
Keywords :*floating health clinic, conceptual design, investment analysis*

I. INTRODUCTION

Health is a need that can not be bargained again, health is one indicator of the progress of a region. Therefore, the health facility is an absolute thing that must be owned as an effort to support public health improvement program. Indonesia is a large area and consists of island islands and coastal areas that tend to occur imbalance of development, especially in areas where access is quite difficult to pass by public vehicle vehicles, therefore it needs an innovation or a special strategy to handle problems, especially in the field of health services . The enormous challenge facing the government in terms of health distribution for archipelagic or coastal areas, health services will be affected by the geographical conditions of a region, the sharing of health development solutions has been implemented but it is still less effective to serve coastal communities or remote islands in need health services similar to other areas that are easily accessible by public transportation such as cars or motorcycles.

Sawohan Village is one of 15 villages located in District Buduran, Sidoarjo regency. This village has two sub-villages, namely Dusun Kepetingan and Dusun Sawahan with total area of 940,594 Ha and settlement area of 10.844 Ha. Sawohan village is located at a height of four meters from sea level with rainfall of 2000 mm / year and average air temperature 30^{o}C. Sawohan village distance from the district government center as far as 8 km and distance from the capital district as far as 12 km. Health facilities that are minimal, or even almost none of these make residents rarely get health care. They only receive health services twice a week, Monday and Thursday from the BuduranPuskesmas staff

II. LITERATURESTUDIES

A. Health Service Review

Health services is a concept used in providing health services to the public. Definition of health services according to Prof. Dr. SoekidjoNotoatmojo is a sub health care system whose main objective is preventive and promotive services with the target of the community. Meanwhile, according to Levey and Loomba (1973), health services are self-organized or joint efforts within an organization to maintain and improve health, prevent and cure diseases and restore the health of families, families, groups or communities. the definition of health services according to the MOH RI (2009) is any effort that is held alone or jointly in an organization to maintain and improve health, prevent and cure diseases and restore the health of individuals, families, groups and atupun society.

B. Function and Purpose of Puskesmas

One of the goals of the Indonesian nation listed in the opening of the 1945 Constitution is the intellectual life of the nation. To achieve these objectives, national development programs are implemented in a sustainable, planned, focused and integrated manner. Puskesmas is a unit of the leading functional health unit that provides basic health services to the community.

Ada 3 fungsiutama yang diembanpuskesmasdalammelaksanakanpelayanankesehatandasar (PKD) kepadaseluruh target sasaranmasyarkat di wilayahkerjanya, yaknisebagaiberikut ;

There are three main functions that are carried out by puskesmas in performing basic health service (PKD) to all target of society target in its working area, that is as follows;

➢ Center for Healthy Development Drivers

Endeavor to move across sectors and businesses in their working areas to conduct health-minded development, actively monitor and report on the health impacts of every development program developer in his working area.

➢ Community Empowerment Center

To strive for individuals, especially community leaders, families have awareness, willingness and ability to serve themselves and society to live healthy. Take an active role in fighting for health interests including financing, as well as participate in determining the implementation and monitoring the implementation of health programs.

➢ Health Service Centers The First Strata Provides comprehensive, integrated and continuous primary health services (primary). Includes individual health services, community health services.

C. Ship Design Review

The design process is a process done repeatedly to produce a design that matches what is desired. In the process of building varu ship there are several stages of design, among others (Taggart, 1980):

1. Concept design

2. Preliminary design
3. Contract design
4. Detail design

The four stages of the above design can be described in a spiral design (Evans 1959) which is an iteration process starting from the requirements given by the ship owner to the creation of design details ready for use in the production process.

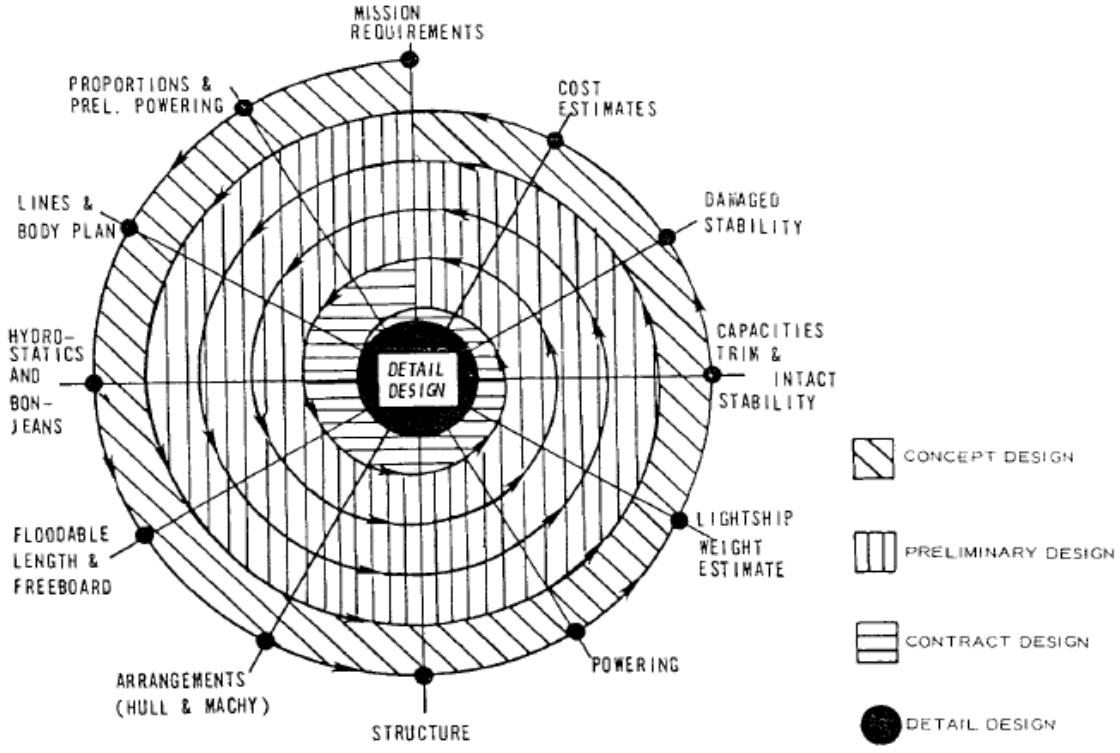


Figure 1 Basic Design Spiral

III. RESEARCH METHOD

1. Problem Identification Phase

At this stage, identification of the issues raised in this final project is done. The issues raised are about the conceptual design and operating patterns of floating health services. The problem that occurs is the happening of the gap of service health due to the access that is difficult to reach by the health department so it needs innovation to support the needs of health services in the area

2. Stages of Literature Studies

At this stage a literature study is conducted with regard to this research. The materials and theories that become literature or literature review is related to the concept of the archipelago as well as health. The material or theory that became the literature is related to the concept of the archipelago, the concept of health services, the concept of ship design and analysis investment feasibility to determine whether the shipbuilding of health services feasible to be developed further.

3. Data Collection Phase

Data collection stage is done by two methods, namely primary and secondary methods. The primary method is the method of taking data directly and the secondary method is the indirect data retrieval. Data collection is done related to the purposes of research, while the necessary data include:

• Statistics of the total population of the operational area
• Data on the number of medical personnel
• Distance between points of operation pattern
• Number of visits to *puskesmas*

4. Data Processing Phase

At this stage is done data processing to find out various things related to the next analysis process.

5. Phase of Planning Pattern of Operation

This stage is done planning the pattern of operations against various concepts. The pattern of operation is based on the area of operation, distance, number of fleets, scheduling. In this operating pattern is determined which operating patterns produce the most minimal and optimal cost.

6. Cost Analysis Phase

Cost analysis is done to know the financing of each concept of the optimum and done comparison between concepts. From this cost analysis is done sensitivity analysis to health care

IV. RESEARCH LOCATION

A. Geographical Condition

Sidoarjo regency is one of regencies in eastern Java province. The capital is Sidoarjo. Sidoarjo regency is a district that is squeezed by two rivers, namely Surabaya and Porong rivers, so that Sidoarjo is known as the delta city. The regency of Sidoarjo is located between 112 5 'and 112 9' east longitude and between 7 3 'and 7 5' south latitude. The northern boundary is the municipality of Surabaya and Gresik regency, the south is Pasuruan regency, the east is the Madura strait and the west is Mojokerto regency. The characteristics of Sidoarjo district are divided into three regions. The first area with a percentage of 40.81% is an area located in the middle and fresh water. Second, the area located on the east side which is a coastal area and aquaculture with a percentage of 29.99%. Sidoarjo regency consists of 18 districts that are divided into 332 villages and 31 urban villages

B. General Description of Population

As a district with a relatively large population Sidoarjo has a great challenge in realizing the welfare of people in isolated and remote areas of the city center. This should be guaranteed by the government for the welfare of the population to be guaranteed. The total population for each region is as follows

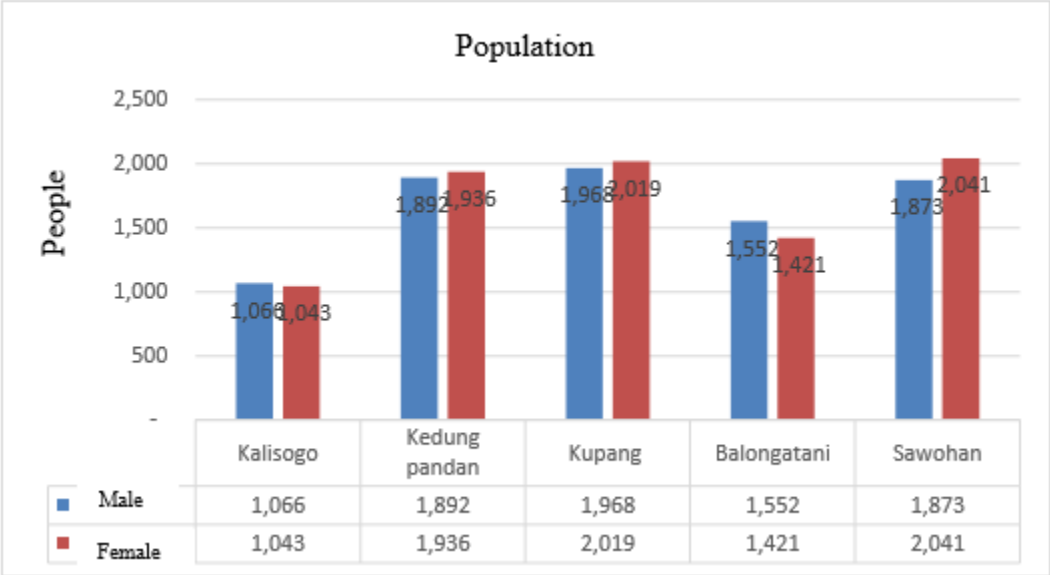


Figure 2 Total Population

C. Type of Disease Based on Patient Visits

Health problems are very serious for every region, because health is one benchmark for the progress of the area. In this health problem that often disrupted his health is children and elderly. Below is the 10 most dominant diseases in the community by 2015.

Table 1 Disease based on visiting patient

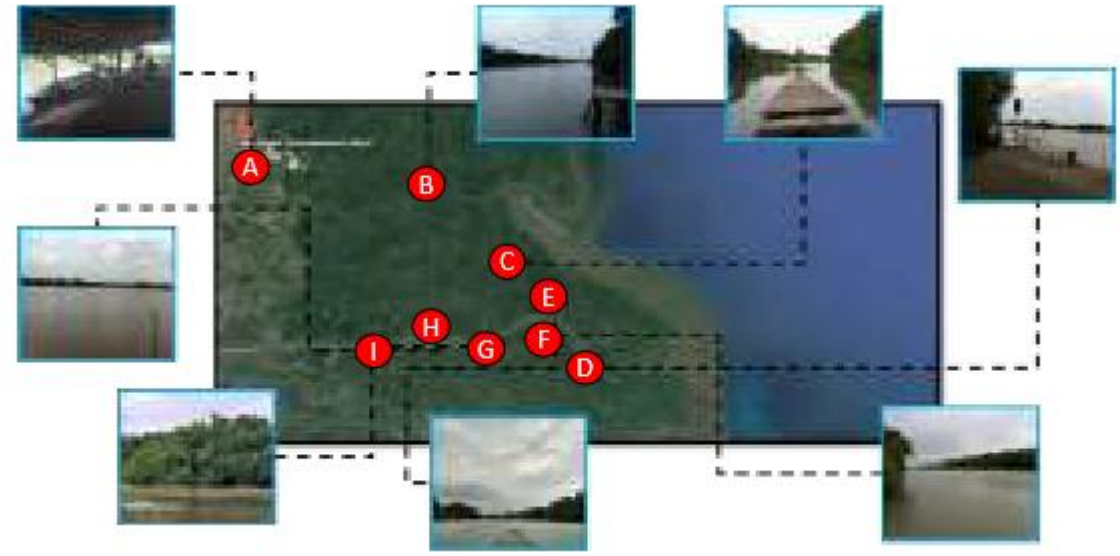
No	Disease	Patient
1	ISPA	14%
2	Binding tissue disease	9%
3	Gastric ulcer disease	5%
4	High blood pressure	5%
5	Pulpa	3%
6	Dent disease	2%
7	Skin infection	2%
8	Skin allergetic	2%
9	Diare	2%
10	Influenza	2%

(Biro pusat statistik,2016)

V. RESEARCH ANALYSIS

A. Planning of Operation Patterns and Routes

In planning the operation pattern of this mobile health center ship will adopt the concept of operation of mobile health center that is on land. Mobile health center on the ground to visit every destination point of operation routinely within the specified period. For mobile clinic on the ground usually visit the post every once a month, this is adjusted to the budget provided by the local city health office, besides the mobile health center on the ground will be different from the mobile health clinic in the sea or river, because the mobile health centers in the river or the sea is more complicated than mobile health centers on the ground, this is because the mobile health clinic access is relatively easy. The mobile health clinic is planned to visit each post with a predetermined frequency. The operating pattern to be calculated is to use 4 alternatives, the first alternative is to use 1 ship for 7 destination points and return to the place of origin of the ship with the limit of operational hours is not more than 8 hours per day. As for the alternative operating pattern 2 is almost the same as the alternative operating pattern 1 which differentiate the 2 alternatives directly in each destination without returning to the point of origin where the vessel departs and if the vessel operates beyond the operational hours, the vessel will overnight at that point of operation. As for the alternative 3 that is with two points of origin, where each destination point is served by using two ships that each ship has different destination points. The 4th pattern of operation is the same as the alternative pattern of operation 2, which distinguishes the alternative 4 using two ships and directly without returning to where the origin



Picture 3. Operating Location Floating Health Clinic

B. Alternative Operating Patterns 1

Alternative 1 uses the principle of point to point. In general this alternative serves each point in turn where the ship only operates 8 hours in a day, if service time exceeds the operational hours then the vessel will return again to the initial depot of the departing vessel, the vessel will operate for 4.5 hours at each point of operation. Long sailing vessels depending on the distance between the depots to the point of operation of the ship, the farther the distance between the depots with the operating point the longer the vessel is sailing, assuming the ship is sailing at 10 knots. it also affects how much fuel the ship needs. below is an alternative image of ship operations

Table 2. Total Time Floating Health, Model I

Rute	Distance	Sea time	Port time	Total Time
A-B-A	5.89	1.18	3.5	4.68
A-C-A	10.14	2.02	3.67	5.69
A-D-A	16.13	3.22	3.67	6.89
A-E-A	16.7	3.34	3.67	7.01
A-F-A	17.76	3.56	3.67	7.23
A-G-A	20.02	4	2	6
A-H-A	22.61	4.52	3.5	8.02
A-I-A	23.14	4.62	2.67	7.29

C. Alternative Operating Pattern 2

In skneraio 2, the floating ship serves each operating point in turn and after the vessel's operation does not return to the initial depot, if the vessel operates beyond the operational limit of the yaiut hours for 8 hours, the vessel will overnight at the last point of the vessel operating, and will proceed the next day. The health service ship will serve every operational point for 4.5 hours. Below is a visualization of the route to be served by alternative vessels 2

Table 3. Total Time Floating Health, Model 2

Rute	Distance	Sea time	Port time	Total Time
A-B	5.89	0.59	3.5	4.09
B-C	4.25	0.43	3.67	4.09
C-D	5.99	0.6	3.67	4.27
D-E	0.57	0.06	3.67	3.72
E-F	1.06	0.11	3.67	3.77
F-G	2.26	0.23	2	2.23
G-H	2.59	0.26	3.5	3.76
H-I	0.53	0.05	2.67	2.72

D. Alternative Operating Pattern 3

In alternative 3, the alternative concept of operating pattern is similar to the concept of operation pattern 1, but the difference here is where the alternative pattern of operation 1 uses 1 ship with 1 depot and many goals. However, for alternative operating pattern 3 is almost the same only distinguish is, alternative operating patterns 3 using 2 boats and 2 depot point, for the first depot is at the fish auction dock, and the second depot is in kupang village. In each depot there is a vessel that serves a predetermined destination point, where the ship will return to the origin depot after serving the point of operation pattern of each ship. the vessel will operate for 4.5 hours at each operating point and in one day the ship will operate for 8 hours, if the ship operates beyond the operating hours the ship will return to their respective depots.

Table 4. Total Time Floating Health Model 3 with ship 1

Rute	Distance	Sea time	Port time	Total Time
A	0	0	0	0
A-B-A	5.89	1.18	3.5	4.68
A-C-A	30.34	2.02	3.67	5.69
A-D-A	36.33	3.22	3.67	6.89
A-E-A	16.7	3.34	3.67	7

Table 5. Total Time Floating Health Model 3 with ship 2

Rute	Distance	Sea time	Port time	Total Time
A	0	0	0	0
F	0	3.7	0	3.7
F-G-F	2.26	0.46	2	2.46
F-H-F	4.86	0.98	3.5	4.48
F-I-F	5.38	1.08	2.7	3.74

E. Alternative Operating Patterns 4

This alternative uses the principle of division of the operation area into 2 (two), where each region has its own depot and each depot serves the designated point of operation, alternatively 4 (four) operating patterns are almost identical to those of the operating pattern 2, is, if alternative 2 has only a single depot and a vessel serving only one (different) alternative to the alternative operating pattern of 4 (four) having two depots and two vessels. The concept of this alternative is the ships without going back to the initial depot.

Table 6. Total Time Floating Health Model 4 with ship 1

Rute	Distance	Sea time	Port time	Total Time
A	0	0	0	0
A-B	5.89	0.59	3.5	4.09
B-C	4.25	0.43	3.7	4.13
C-D	5.99	0.6	3.7	4.17
D-E	0.57	0.06	3.7	3.76

Table 7. Total Time Floating Health Model 4 with ship 2

Rute	Distance	Sea time	Port time	Total Time
F	0	0	3.7	3.7
F-G	2.26	0.23	2	2.23
G-H	2.59	0.26	3.5	3.76
H-I	0.53	0.56	2.7	3.26

F. Conceptual Design of Ships

In planning the development of the ship health service is needed to identify what space will be needed in the vessel, this is to know and find the main size of the ship to be built. In identifying the space needed for a vessel of health care, there are several aspects to be considered, namely how many standards of room size should be designed, such as a poly room to check patients visiting a ship for treatment. From the initial identification researchers get the main size of the ship are:

• Main Deck

In the main deck there are several main spaces of ship health services, because of easy access then the health service spaces are placed on the main deck section of the ship. the following are the spaces contained in the main deck of the ship health services:

1. General poly room

General poly room is a service place in charge of handling and medical treatment of patients, the activities undertaken by the general polis is to conduct general patient examination with visual indication or symptoms suffered by the patient.

2. Maternity and maternity room

Poly KIA (maternal and child health) is room to get health service related mother and child, visitor served by midwife in charge of early diagnose to patient.

3. Dental poly

Toothpaste room is one of the must-have facilities in every health center, according to work guidance of puskesmas, basic dental services given in the form of treatment, tooth extraction, coral cleansing, and others.

4. Pharmacy

A pharmacy is a component of space that should also be in a health center, where the pharmacy is where the patient can redeem drugs.

5. Drug warehouse

The medicine warehouse is the place of reception, storage, distribution, and maintenance of supplies in the form of medicines, medical devices and other health supplies.

6. Lounge area

The waiting room is a room that must be at *puskesmas*, because this space serves as a waiting area patients who will perform treatment.

7. Toilet Is a sanitation facility for a place to defecate and small, where washing responsibly.

• Bridge Deck In this deck is a place where rooms for floating healthcare workers, there is nurse room, doctor room, midwife room and crew room crew room. each room is 3.5 meters long and 2 meters wide.

• Navigation Deck In the navigation room is a space to drive the ship, in the navigation deck there is also a ship captain's room as well as boating room ship. in the navigation deck is the top deck in the ship.

G. Cost Analysis

In the operational calculation of the vessel of health services there are several accommodations in order to support the operation of the ship health service, the type of accommodation in question is the capital cost consists of the cost of ship building, variable cost consists of salary from crew ship, medical crew salary, ship maintenance and repair costs, which is derived from 5% of ship price and vessel insurance cost which is obtained from 3% of ship price. cost, voyage cost consisting of ship fuel cost.

• Capital Cost

Capital cost is the price of the ship when purchased or built, the price of the vessel is obtained from the calculation of the weight of steel, the weight of ship steel consists of structural cost ie empty vessel weight, outfitting cost consisting of the cost of ship equipment, machinery cost consisting of ship engine and non-weight cost obtained from 10% of the total 3 component costs above. From the above ship price calculation, found the price of ship building is Rp.2.193.042.700 and after added with profit, inflation and tax then total ship price equal to Rp.2.543.929.600.

• Operational Cost

The operational cost of the vessel consists of the cost of salary for crew of the ship and medical crew, as well as the cost of ship repair and vessel insurance. the more the crew the greater the operational cost of the vessel.

Table 8. Cost Operation

Item	Unit cost	Quantity	Intensity	Total	Total 1 year
Salary					
Doctor	Rp4,300,000	3	/month	Rp12,900,000	Rp154,800,000
Midwife	Rp2,500,000	1	/month	Rp2,500,000	Rp30,000,000
Nurse	Rp1,700,000	4	/month	Rp6,800,000	Rp81,600,000
Office counter	Rp1,000,000	1	/month	Rp1,000,000	Rp12,000,000
Pharmacist	Rp2,000,000	1	/month	Rp2,000,000	Rp24,000,000
Captain	Rp4,500,000	1	/month	Rp4,500,000	Rp54,000,000
Chief Officer	Rp3,000,000	1	/month	Rp3,000,000	Rp36,000,000
Chief Engineer	Rp3,000,000	1	/month	Rp3,000,000	Rp36,000,000
Co-Pilot	Rp2,500,000	1	/month	Rp2,500,000	Rp30,000,000
Oiler	Rp1,000,000	1	/month	Rp1,000,000	Rp12,000,000
Food	Rp15,000	15	1 each	Rp225,000	Rp81,000,000
Ship					
Ship maintenance	Rp76,317,888	1	/year	Rp76,317,888	Rp76,317,888
Ship insurance	Rp127,196,480	1	/year	Rp127,196,480	Rp127,196,480
Medicine	Rp5,000	226949	/year	Rp1,134,745,000	Rp1,134,745,000

• Voyage Cost

Voyage cost is the variable costs incurred by the vessel for the needs during the voyage. The components of shipping costs are the fuel costs for the parent and auxiliary machinery. Below is the cost of ship fuels issued based on the operation pattern of each alternative ship health service.

Table 9. Total Voyage Cost

Ship quantity	Node	Sea time	Frequency / year	Bunker cost ME	Bunker Cost AE	Total Cost
1 ship	1 node	8	42	Rp1,084,423.48	Rp1,444,652.97	Rp3,795,312,670.95
2 ships	1 node	0	0	0	0	
1 ship	multi node	4	83	Rp94,771.34	Rp1,444,652.97	Rp3,816,863,686.00
2 ships	multi node	0	0	0	0	
1 ship	one node	4	83	Rp400,218.46	Rp795,473.47	Rp7,576,607,673.00
2 ships	one node	3	110	Rp252,477.83	Rp649,179.50	
1 ship	multi node	2	165	Rp136,791.82	Rp795,473.47	Rp7,671,170,748.97
2 ships	multi node	2	165	Rp194,238.92	Rp649,179.50	

• Recapitulation of Operating Patterns

Development of health services by using 4 (four) alternative operating patterns. Below is the result of the recapitulation of the selected floating ship floating ship operation pattern: 1. In terms of cost, operation pattern 1 is alternative with the lowest total cost, which is Rp.3.795.312.670 per year. However, in terms of alternative service 1 is not maximal, because it can only serve every 8 days on every pattern of operation. 2. In terms of the best service is alternative operating

pattern 4, where the ship can serve all the points in two days, alternative 4 operation patterns using 2 ships as supporting operational activities. But the weakness of alternative 4 that is in terms of the cost is too large that is, Rp 7,671,170,748

VI. CONCLUSION

Based on the calculation and analysis, it can be concluded as follows:

1. From the research result of this final task, condition of health service condition in coastal area need to get attention from local government, health service in coastal region of Sidoarjo only served once every week by local health officer, hence the existence of innovation in serving society especially in health, with the presence of ship floating health service is expected to help the surrounding community in solving health service problems.

a. There are 4 alternative operating patterns of floating health services with various operational limitations, as follows:

b. Alternative pattern of operation 1 with point to point service pattern system with ship distance as far as 132.39 nautical mile with number of ship 1 can fulfill all point of operation pattern within 8 days and can serve 42 roundtrip in one year with total cost equal to Rp 3,795. 312,600 per year

c. Alternative operation pattern 2 with multi point service pattern system with the distance of ship as far as 23.14 nautical mile with number of vessel 1 can meet all point of operation pattern within

4 days and can serve 83 roundtrip in one year, with total cost Rp. 3,816,863,700. per year.

d. Alternative pattern of operation 3 with point to point service pattern system using 2 vessels, each vessel has its own operational point, with the first 48.36 nautical mile ship distance and can meet the point of operation pattern within 4 days and the second vessel 12.49 nautical mile can serve all operating pattern points within 3 days and can be 83 roundtrip per year for ship 1 and 110 roundtrip per year for ship 2 with total cost of Rp. 7,576,607,700 per year.

e. Alternative pattern of operation 4 with point to point service pattern system using two vessels, each vessel already has its own operational point, which can serve the operating point with the intensity of 165 roundtrip for ship 1 and 165 roundtrip for ship 2 with total cost of Rp. 7,671,170,700 per year.

2. In terms of cost, operation pattern 1 is alternative with the lowest total cost, which is Rp.3.795.312.670 per year. However, in terms of alternative service one is not maximal, because it can only serve 8 days once on every pattern of operation.

3. In terms of the best service is the alternative operating pattern 4, where the ship can serve all the points in two days, alternative 4 operation patterns using 2 ships as supporting operational

activities. But the weakness of alternative 4 that is in terms of the cost is too large that is, Rp 7,671,170,748.

4. From the identification of the needs of the room in get the main size of the ship ie
LPP = 28 Meter
Dwt = 15. 22 ton

B = 7.5 Meter

Cb = 0.530

H = 3.5 Meter

T = 1.5 Meter

Vs = 7 Knot

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