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Study on The Potential of Salaman River Water Resources for Raw Water Sources in Industrial Area of Jorong, Jorong Subdistrict, Tanah Laut Regency, South Kalimantan

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ABSTRACT : *Entry industrial area of Jorong as a national strategic project area in the National Medium Term Development Term Year 2020-2024 has made the provision of raw water becomes priority. Special target of this research is getting the suitable place for providing raw water.In identifying the study of providing raw water has accomplished by collecting primary data and secondary data also other supporting data. Data has thus analyzed with hydrological analysis, hydraulic analysis, location analysis and quality of water and identify the production capacity and raw water needs. All eligibility parameters is analyzed by Analytical Hierarchy Process (AHP) method for getting the criteria of area which is the most worthy to become alternative raw water intake, where the results show the weight of the Salaman River 0.506, the Riam Adungan river weight of 0.286, and the weight of the Kematian River 0.208 which shows that the Salaman River is the most feasible.*
KEYWORDS *Industrial area of Jorong, providing raw water, Analytical Hierarchy Process (AHP) Salaman River, Riam Adungan River, Kematian River.*

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I. INTRODUCTION

Sub district of Jorong is one of sub districts in region Tanah Laut located at coordinate UTM X: 256188.17; Y: 9567899.55, on the west it is bordered on sub district of Batu Ampar and X: 296020.26; Y: 9569577.70, on the east it is bordered on sub district of Kintap. Sub district of Jorong has an area around 62.800 ha. Sub district of Jorong has been including as a national strategic project area is poured in regulations of the ministry of industry in Constitution No 3 year 2014. The latest one is the presidential regulation of Indonesian Republic No 18 year 2020 about The National Middle Term Development Plan year 2020 until 2024 which explains that the area of industry Jorong has been included as a national strategic project area. One of its priorities is raw water supply. The area of industry Jorong is centered on agro industry and steel. Nowadays it has been prepared infrastructure such as port in Swarangan village, construction of road access, upgrading and manufacturing of power plants, and other infrastructure.

As is the area of industry Jorong expected will increase its regional income and the economy of community around the area. To speed up development of the area of industry Jorong, then it is expected to all elements of government for helping every aspects of support services which if it is connected to water resources, it is related to the fulfillment of raw water.

II. LITERATURE REVIEW

2.1 Standart Quality of Drinking Water

Based on Permenkes RI No 32/2017 concerning environmental Health Quality Standards and Water Health Requirements for Sanitation Hygiene Needs, Swimming Pools, Solus Per Aqua and Public Baths. It means the water can fulfill requirements of physics, microbiologist, chemical, and radioactivity which are safe to be consumed for health.

2.2 Hydrological analysis
The basis of planning needs hydrological data for water building planning and irrigating, a management of river, flood control et cetera. Therefore, there is a need for well planned and continuous program for the required data.

2.3 Projected Water Demand Calculation
To calculate the projecting of clean water demand, standard criteria for domestic and non domestic water supply are needed.

2.4 The Projected Change in Population
In analyzing population projections can use arithmetic method, geometric method, and Last Square method.

2.5 Network Transmission Simulation with the Epanet Program 2.0
Epanet Program 2.0 is a hydraulic simulation program to view water quality behavior in drinking water distribution pipeline. It is based on window with many formats such as colored nodes, designs and tables depending on the type of variable input. Epanet modeling in a water transmission has many connections that are connected to several nodes. With this software, planning can be simulated so that it has several advantages in modeling transmission system.

2.6 Weighting by using Super Decition 3.2 Software
Super decition 3.2 is free software which helps to support choosing decisions by applying Analytic Network Process (ANP) and Analytic Hierarchy Process (AHP)

III. METHODOLOGY

3.1 The selection of location
In study location is selected an upstream area which topographically and geographically support the availability of raw water.

3.2 The Research Object
In This research is done in Kematian River village 33°47'54.34" LS, 114°58'0.64" BT), Riam Adungan River village (3°41'30.77" LS, 115° 9'38.20" BT) and Salaman River village (3°45'19.69" LS, 115° 7'33.25" BT). Those villages are located in upstream area which supports the area of industry Jorong and irrigation area.

3.3 Research Flow
Research flow can be described as follows :

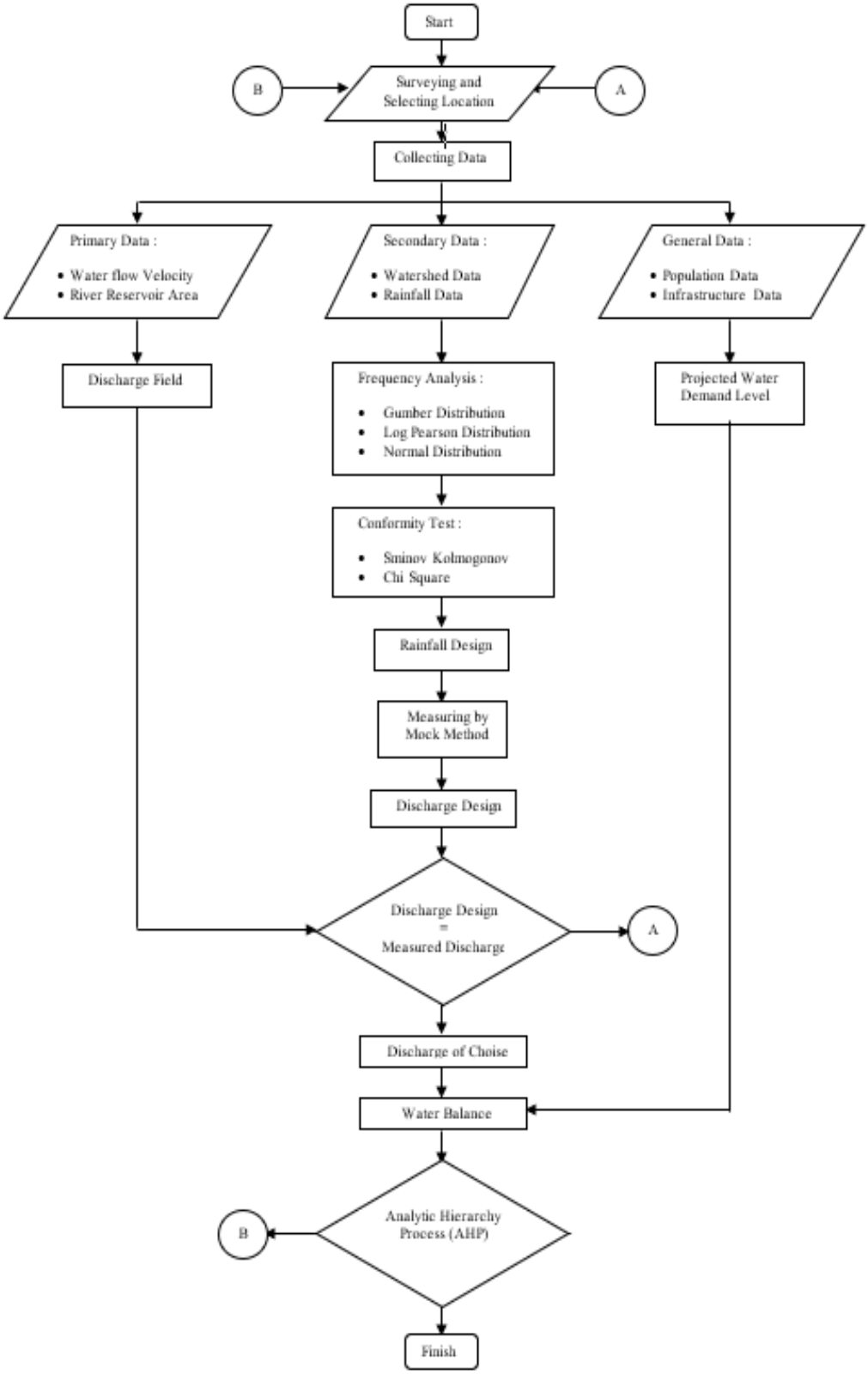

Figure. 1.Research Flowchart

IV. RESULT AN DISCUSSION

4.1 The Testing of Water Quality

Table. 1.The Result of Water Quality

No.	Parameter	The result of analysis					Analysis Method	Governor Regulations
		AB-01	AB-02	AB-03	AB-04	AB-05		
1.	TSS (Mg/l)	21	2	2	2	6	Gravimetric	50
2.	Temperature (^oC)	28,7	28,7	28,7	28,7	29,3	Thermometric	Deviation 3
3.	TDS (Mg/l)	303	75	87	64	139	TDS Meter	1.000
4.	Conductivity (Ms/cm)	0,517	0,112	0,126	0,093	0,210	Conductivity Meter	-
5.	DO	2,7	5,0	5,1	5,1	5,1	Electrometric	6
6.	pH (Mg/l)	5,44	5,70	5,69	5,78	5,53	Potesiometric	6-9
7.	Iron, Fe (Mg/l)	2,84	0,03	0,10	0,55	0,08	Spectrophotometric	0,3
8.	Ammoniac, NH_3 (Mg/l)	0,17	0,12	0,11	0,14	0,02	Spectrophotometric	0,5
9.	Manganese, Mn (Mg/l)	0,5	0,5	0,6	0,6	0,5	Spectrophotometric	0,1
10.	Nitrite, NO_2 (Mg/l)	0,007	0,002	0,004	0,004	0,003	Spectrophotometric	0,06
11.	Sulfate, SO_4 (Mg/l)	21	<2	<2	<2	1,0	Spectrophotometric	400
12.	BOD (Mg/l)	15,52	13,58	10,67	10,67	19,39	Winkler Titrimetric	2
13.	COD (Mg/l)	16,13	15,16	15,16	15,48	20,32	Titrimetric-Permanganate	10

The testing of water quality to 3 (three) locations which appropriates with the Governor Regulations Number 5 Year 2007 are Salaman River village and Riam Adungan River village. Both rivers are worth as source raw water for drinking water.

4.2 Mainstay Discharge Analysis

This study uses rainfall data references from Bajuin station, Batu Ampar, Jorong and Kintap. Meanwhile, Banjarbaru Meteorology Station which is closed and effects to rainfall in the location where the water resources will be studied. By taking the data from 2008 to 2019, it can be explained as follows.

Table. 2. The List of Rainfall Station and Meteorology

No	Station	(^{o} S)	(^{o} N)
1.	Banjar Baru meteorology station	-3.46	114.84
2.	Jorong rainfall station	-3.98	114.93
3.	Bajuin rainfall station	-3.78	114.81
4.	Batu Ampar rainfall station	-3.92	114.85
5.	Kintap rainfall station	-3.85	115.29

By doing hydrology analysis FJ Mock method and compared with the direct measurements by using current meter above 3 (three) location, it is obtained data as follows.

Table. 3. The Recapitulation of Discharge Direct Measurements data compared with calculating data List of Rainfall Station and Meteorology

Source	Discharge	Unit
Secondary data		
Mainstay Discharge 90% for Salaman River	831.4375	Liter /second
Mainstay Discharge 90% for Riam Adungan River	161.066	Liter / second
Mainstay Discharge 90% for Kematian River	103.781	Liter /second
Primary data		
Measurement of Salaman River Discharge	1437.50	Liter /second
Measurement of Riam Adungan River Discharge	828.38	Liter /second
Measurement of Kematian River Discharge	74.67	Liter /second

However, when we compare the measurements of both data, it states that the secondary data has no difference score with the primary data.

4.3 Water Demand Projection

By projecting water demand and considering the growth of the area, the master plan of the area of industry Jorong is developed by Jorong Port Development in a form of a port and industrial area which covering an area of 915 hectares.

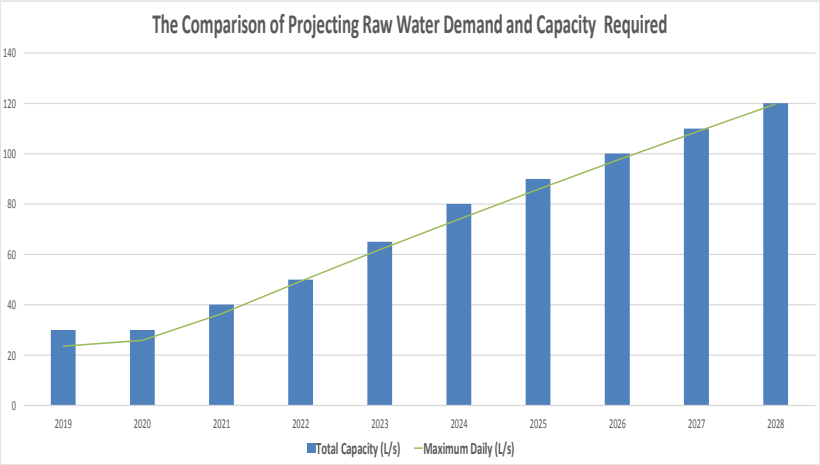

Figure. 2. Comparison Chart of Projecting Raw Water Demand

Projecting raw water demand for community in the sub-district of Jorong projected until year 2028 is 119.63 liter/second at peak hours. Meanwhile, IPA's capacity is only 20 liter/second. That is for the addition of production capacity is much needed.

4.4 Network transmission simulation with Program of Epanet 2.0

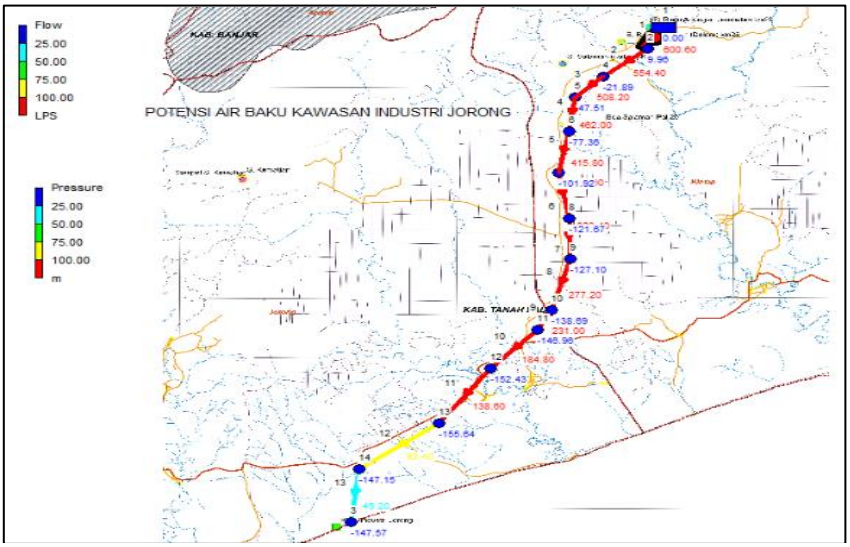

Figure. 3. Output of Hydrological Simulation Results for Riam Adungan River

The result of hydrological simulation by using epanet software states that it is required pumping system to drain water to the area of industry Jorong. It is required pumping system by using parallel pump method to be able to get head total in order to not losing preassure.

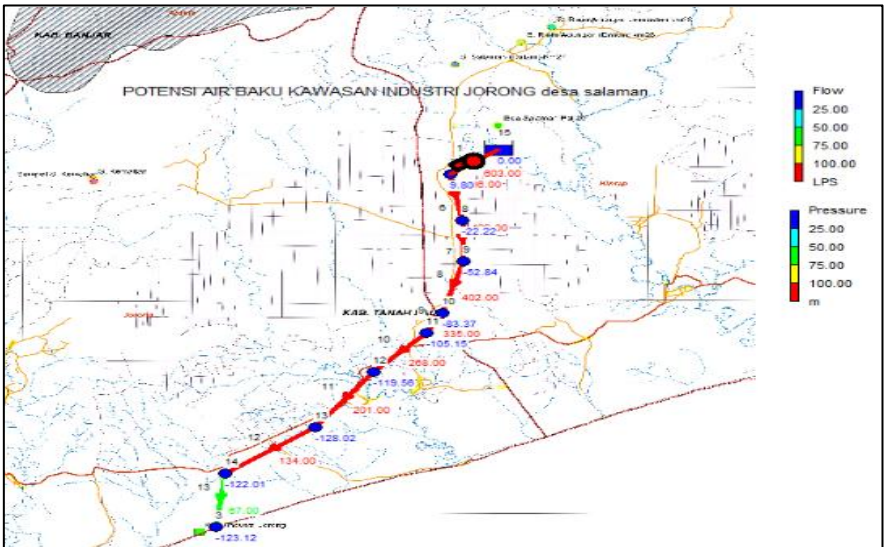

Figure. 4. Output of Hydrological Simulation Results for Salaman River

The simulation results above show the same results as the Riam Adungan river that it is required pumping system to drain water to the area of industry Jorong.

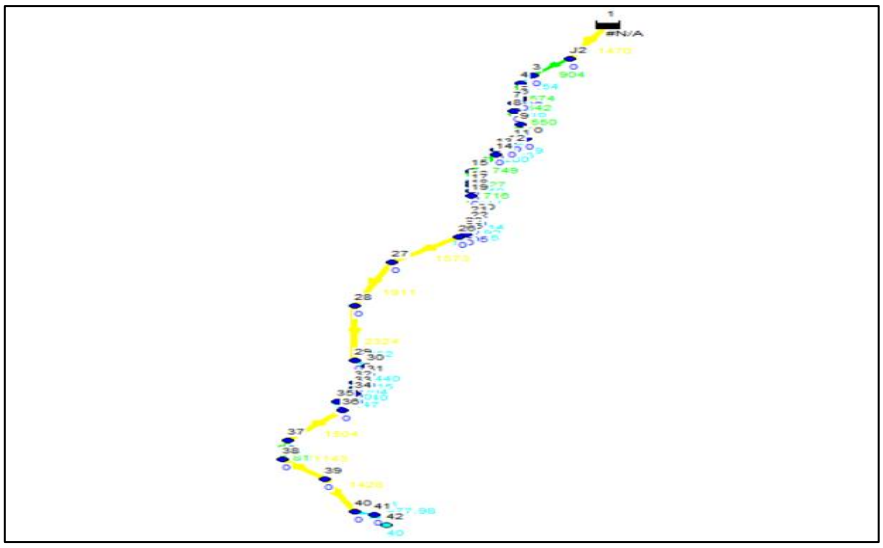

Figure. 5. Output of Hydrological Simulation Results for Kematian River

Based on the result of hydrology simulation by using epanet program for raw water source in Kematian River, it still needed the pumping system to flow water to the area of industry Jorong. It is caused the location of raw water source has a high enough elevation namely 250 meter so that the pumping system does not require high enough pump head because it has been helped by the gravity system so that the transmission system has enough pressure to get into the area of industry Jorong.

4.5 Spatial Suitability Analysis

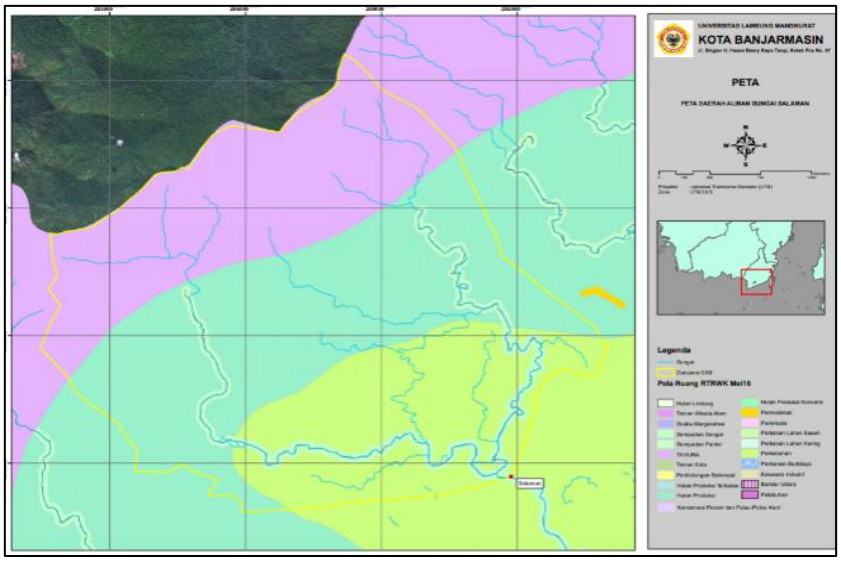

Figure. 5. Analysis of spatial suitability of Salaman Watershed

From the image above, it is seen that the catchment area of Watershed Salaman which is in the upstream is Nature Tourism Park, in the middle is conversion production forest and in the downstream is plantation. From the spatial plan, it seems that there is no problem if there are construction activities in the downstream.

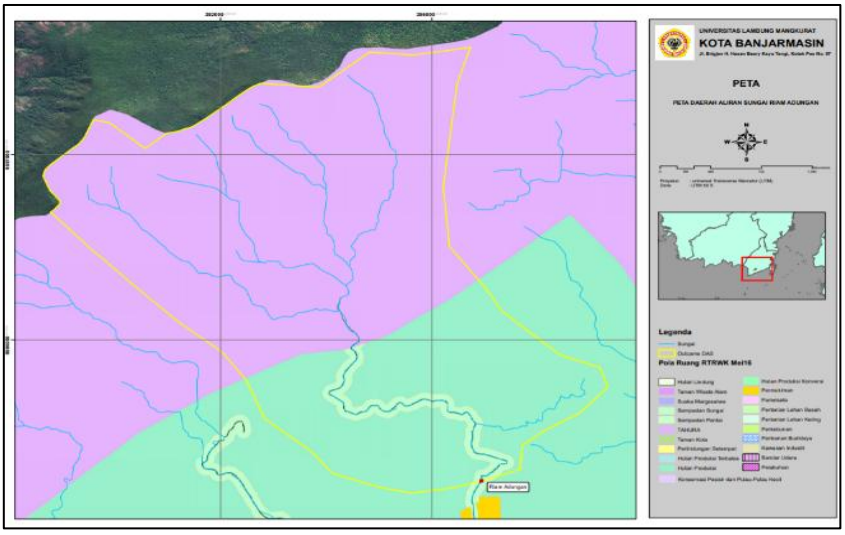

Figure. 6. Analysis of spatial suitability of Riam Adungan Watershed

From the image above, it is seen that the catchment area in Riam Adungan Watershed which is in the upstream is Nature Tourism Park, in the downstream is conversion production forest. From the spatial plan, it is seen that there is no problem if there are construction activities in the downstream.

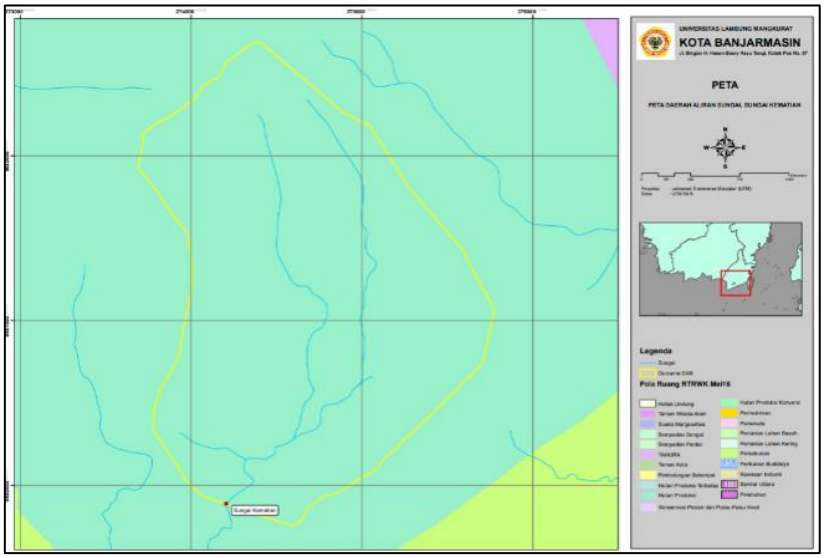

Figure. 7. Analysis of spatial suitability of Kematian River Watershed

From the image above, it is seen that the catchment area in Kematian Watershed in a whole section is conversion production forest. From the spatial plan, it is seen that there is no problem if doing construction activities.

4.6 Site Feasibility Analysis by using Analytical Hierarchy Process (AHP) Method

In decision making by using AHP can be grouped into 3 (three) compositions as follows ;

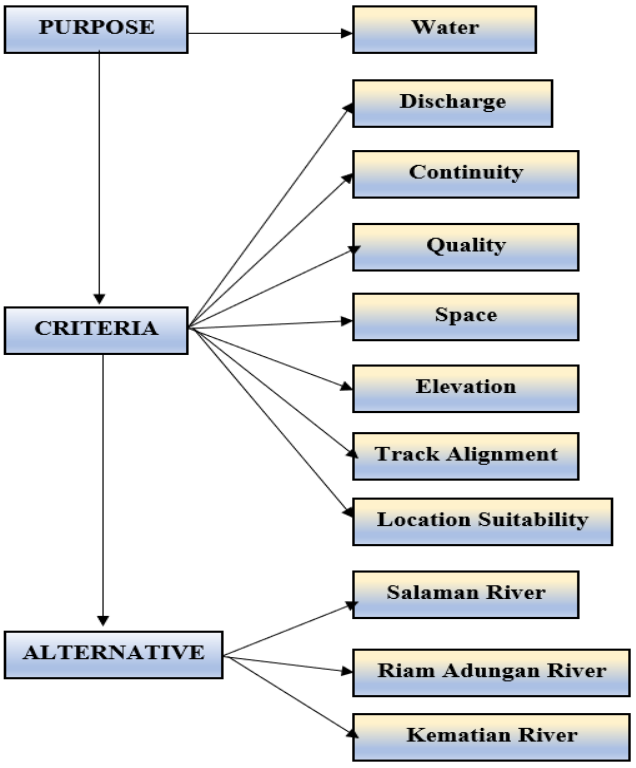

Figure. 8. The Structure of The Subject Matter Identification of The Problem

With the aim of raw water, there are 7 (seven) criteria which is made in choosing 3 (three) locations. They are Riam Adungan river village, Salaman river village, and Kematian river village. Furthermore, those criteria are sorted from the most influential to the least influential, and the points are assessed in the criteria matrix comparison as follows.

Table. 4. The Table of Analysis Results Per Location

	SALAMAN RIVER	KEMATIAN RIVER	RIAM ADUNGAN RIVER
Dischargetion	831.4375 Liter/second	103.781 Liter/second	161.066 Liter/second
Continuity	Most Stable (1)	Most Stable (3)	Most stable (2)
Water Quality	1	3	2
Service Distance	20.9 Km to the nearest SPAM	23.7 Km to the nearest SPAM	28.6 Km to the nearest SPAM
Elevation	From +19 m to +7m	from +147 m to +20 m	from +53 m to +7 m
Traverse Trajectory	2. the flat slope is 1.5%-1.6%	1. the flat slope is 2%-2.4%	3. the flat slope is 1.9%-2.1%
Clear Location	2 In upstream is conversion production forest area, in the middle is production forest, in the downstream is plantation area	1. The whole is in conversion production forest	3. One part is conversion production forest area, and some others is in production forest

From the previously obtained analysis, there were 7 (seven) factors for the three river locations, then assessed subjectively for each variable relatively. After that, it is appointed the highest variable for the most influential results. The results of the assessment are made ranking as follows

Table. 5. The Table of Ranking Location

Location	Weight	Ranking
SALAMAN RIVER	0.506	1
KEMATIAN RIVER	0.208	3
RIAM ADUNGAN RIVER	0.286	2
TOTAL	1	

For the three assessed river locations, it can be concluded that Salaman river gets the highest ranking (0.506), compared with Riam Adungan river (0.286) and Kematian river (0.208)

4.7 Weighting by using the software of Super Decision version 3.2

The results of manual measuring compared with the results by using the software of Super Decision version 3.2 generate ranking data as follows

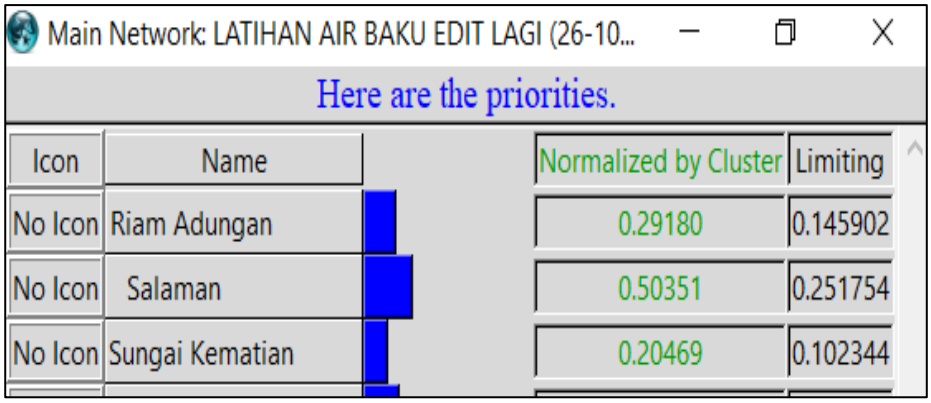

Figure. 9. The Results of Ranking Location by Super Decision version 3.2

From the data above, it seems like manual measuring and using software shows the same results for the highest feasibility for the source of raw water is Salaman River.

V. CONCLUSION

The results of this research are sufficient to prove that based on the weighting of 3 (three) areas tested by using AHP method which consist of discharge variable, continuity, water quality, trajectory tracing, and free location shows the resulting weight of Salaman River is 0.506, Riam Adungan River is 0.286 and Kematian River is 0.208. If the weights are compared with the software of Super Decision version 3.2, it shows that Salaman River is 0.50351, Riam Adungan River is 0.2918, Kematian River is 0.20469. Both of results show that Salaman River is the most feasible location for the raw water sources.

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