Hydrologic data base Management Analysis of Small Islands in the River Region of Maluku

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Abstract— In order to optimize and develop water resource management, accurate data is needed for regional development. The data is compiled in the form of a database which is a support for the development of the water resource potential of small islands in Maluku River Region. The purpose of this study is to display a database of infrastructure in the form of Rainfall Posts, Climatology Posts, Water estimation posts, pond distribution data, weir distribution data and water quality in Ambon-Seram, Buru, Kei-Aru Islands and Yamdena-Wetar Islands by using the ArcGIS application. The result of the database is a supporting tool in the managing Hydrology and data at Maluku River Region Hall by providing information in the form of graphical data and distribution map.

I. INTRODUCTION

Government institutions and national development organizers institution have carried out development activities throughout Indonesia using maps produced by themselves and from the private parties. This has resulted in the number of maps circulating and used as a basis so that they often become confused in development. To overcome this, firmness is needed in the context of compiling and centralizing mapping systematics. The complexity of water resource problems requires efforts to solve and to anticipate that can not only be done by the government. The view of water resource management areas based on one watershed is not simply accepted by the social environment, because the potential of water resources in a watershed cannot necessarily meet the needs of the people living in the watershed concerned. The concept of integrated management of water resources based on watersheds or river areas is known by the international community as Integrated Water Resources Management (IWRM). Indonesian is one of thecountries that has developed the concept of integrated management of water resources based on river areas. In 2015, a Minister of Public Works and Public Housing Number 4 concerning Criteria and Determination of River areas was stipulated. Hydrological

data management includes data collection, processing and publication activities. All these sequences must be implemented properly. Data collection has been carried out regularly by hydrology unit officers and assisted by postal guards who are scattered throughout the working area of the Maluku River Region Hall.

II. LITERATURE REVIEW

Hydrological Post

A series of observation posts of hydrological data that can describe the hydrological characteristics of a river area to determine the potential of water resources. Examples of hydrological data are rainfall and discharge data. Rainfall is one of the most important aspects in the field of Meteorology, Climatology and Geophysics. The data obtained from rainfall measurements, can find out weather patterns that occur in an area whose scope is not too broad such as district areas. Rainfall that varies greatly, both in space and time scale, variations in rainfall based on space can be explained in geographical events where rainfall and its frequency Variations in rainfall based on time can be seen fromdifferences in the amount of rainfall and its frequency in each season.

Irrigation System and Weir

The irrigation systems include irrigation infrastructure, irrigation water, irrigation management, institutional irrigation management, and human resources. When talking about irrigation, people always think about a rigid infrastructure system and that's not always true. The theory of management, irrigation can be discussed from the point of view of a system because it has elements that are interrelated to achieve one management goal. As a drainage system, the Minister of PUPR Regulation No.30 /PRT/M/2015 concerning the Development and Management of Irrigation Systems considers irrigation to consists of five (5) irrigation pillars, namely: (i) water availability, (ii) infrastructure; (iii) irrigation management; (iv) irrigationinstitution,and (v) human actors. The five elements must be mutually compatible, related and interrelated so that it can be said that irrigation is a system.

Pond

A pond is a water storage structure that is built in a depressed area, usually outside a river. The pond will store water in the rainy season and then the water is used for a village or community group only during the dry season to meet the needs in order of priority: residents, livestock and gardens. The number of needs will determine the height of the pond body, and the tamping capacity of the reservoir. Pond buildings are commonly used in Eastern Indonesia from the island of Bali to Seram island in Maluku Province. The climate in this area is quite dry, where the rainy season generally lasts for 3 to 5 months, while the dry season lasts for 7 to 9 months. For western Indonesia where rainfall is generally high, you can use these reservoir planning guidelines by following the applicable limits or criteria.

Water Quality

Water is a natural resource that is needed for the livelihood of many people, even by all living things. Therefore, water resources must be protected so that they can be used properly by humans and other living things. The use of water for various purposes must be done wisely, taking into account current and future generations. Currently, the main problems faced by water resources include the quantity of water that is no longer able to meet the increasing needs and the declining quality of domestic water. River is one of the natural resources. The river is a natural resource that is flowing resources, so the utilization of water upstream will eliminate opportunities downstream. Pollution in the upstream river will cause social costs downstream (*extremality effect*) and conservation in the upstream provides benefits downstream. According to Government Regulation of the Republic of Indonesia No. 82 of 2001 concerning Management Water Quality controlof Water Pollution. Water is all water found above and below the ground surface, including in this sense surface water, groundwater, rainwater and sea water that are utilized on land. Based on the Decree of the Minister of State for the Environment No: 115 of 2003 concerning Guidelines for Determining the status of Water Quality, the definition of Water Quality is the level of water quality conditions that indicates polluted condition or good conditions in a water source within a certain time by comparing with the water quality standards set.

Data Base

Database is a collection of data stored systematically in a computer that can be processed or manipulated using application program software to generate information. The definition of database includes specifications in the form of data types, data structures and also the limitation of the datato be stored. The databases is a very important aspect in the information system where the databases isa data storage warehouses that will be processed further. Databases become important because they can organize data, avoid data duplication, unclear relationships between data andare alsoimproved. Database is a collection of information stored in acomputer systematically so that it can be checked using a computer program to obtain information from the data base.
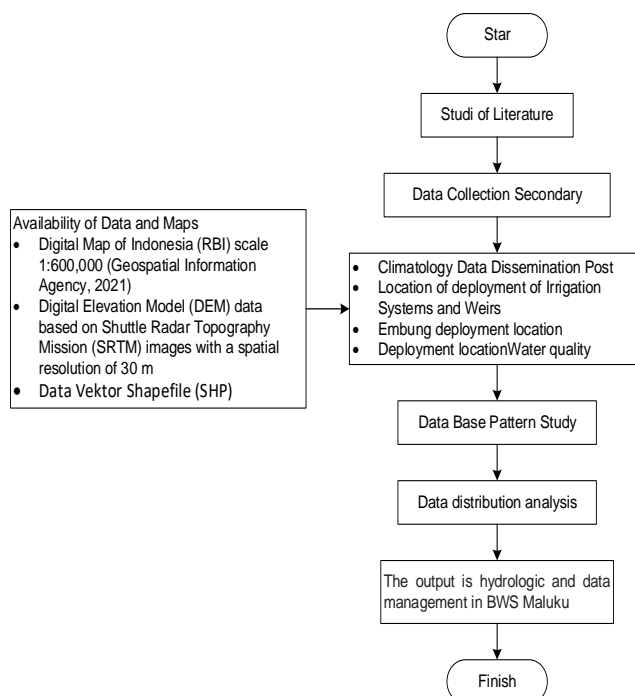
III. METHODOLOGY

Fig.1 Methodology flow chart

IV.   RESULTS AND DISCUSSIONS

1)   Analysis of data distribution

The data analysis of the distribution of hydrological data management of small islands in the Maluku River Region seen in the graphs below.
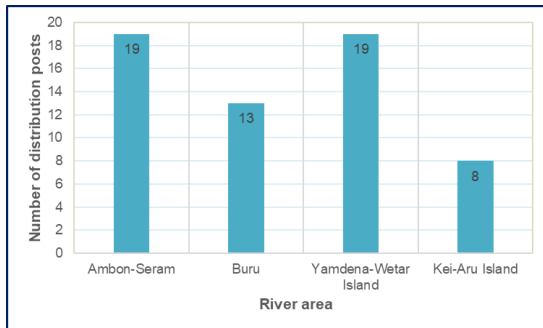

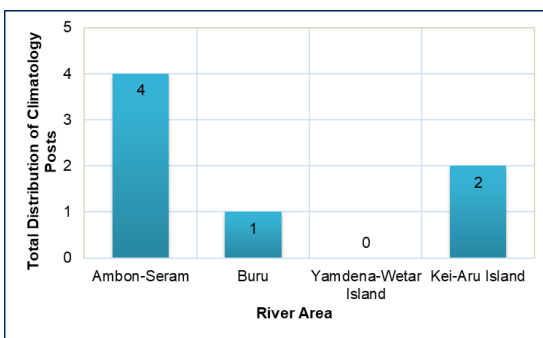
Fig.2 Total Distribution of Rainfall Posts
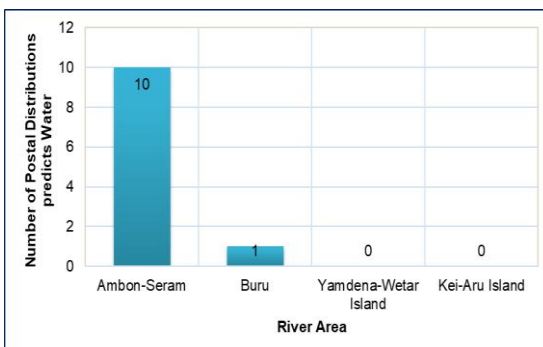

Fig.3 Total Distribution of Climatology Posts

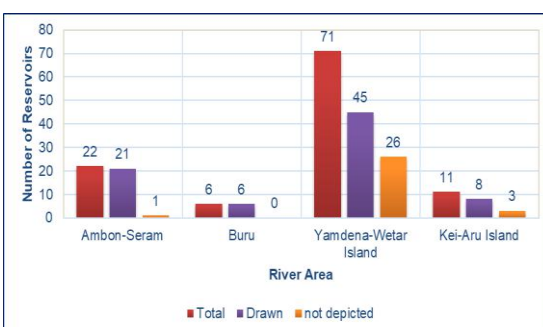*Fig.4 Number of Posts Spreading the water*
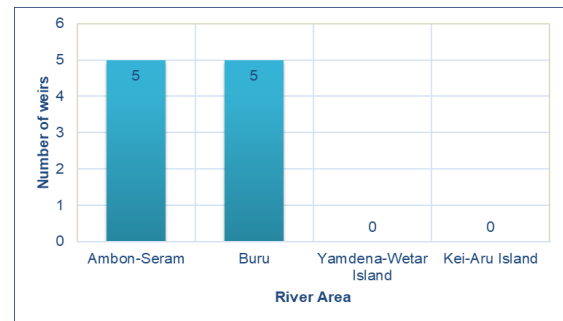

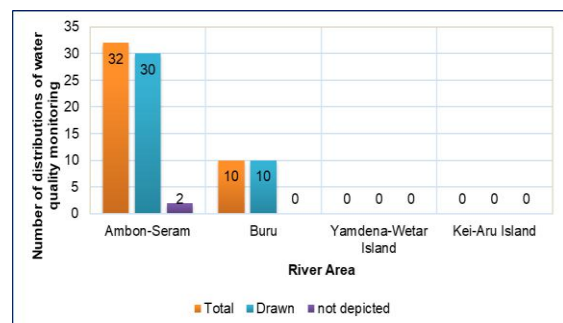*Fig.5 Number of pond Spread*

Fig.6 Total Weir Spread

Fig.7 Amount of water quality stabilization distribution

2)   Data base analysis

The overall analysis of the distribution of Hydrological data in Maluku Province is based on total data as presented in Figure 8which can be explained that, in fact there are variations related to the distribution of Rainfall Posts, Climatology Posts, Spreading the waterPosts, Water Quality Monitoring Posts, pond and weir. Ambon Seram river area, has a total of92 hydrological facilities, and is the highest number compared to other rivers in Maluku Province, followed by the Yamdena-Wetarriver region which numbers 90 facilities. Meanwhile, the river side of Buru and Kei-Aru Islands have a smaller distribution of hydrological facilities with 36 facilities and 21 facilities respectively. From the aspect of the type of facilities, it can be explained that, for river regionof Ambon Seram, it turns out to have all types of hydrological condition facilities, but has a Climatology Post that is relatively only 4%, therefore with the existing data needs, the Climatology Post on the Ambon-Seram river region still needs to be improved, in addition to other hydrological conditions facilities. For the river region of Buru, it can be explained that of the 36 hydrological condition facilities, it turns out that 36% is the number of Rainfall Posts, 3% is the number of Climatology Posts, and 3% is the number of Spreading the water Posts, 17% is the number of pond compared to river region Ambon Seram. For the Yamdena-Wetar Islands River, it can be explained that of the 90 facilities of hydrological conditions, it turns out that 79% is the number of pond and 21% is the

number of Rainfall Posts, while they do not yet have hydrological condition facilities in the form of Climatology Post, Spreading the water Posts and Water Quality Monitoring Post compared to other river region in Maluku Province.

For the Kei-Aru Islands River Wilayah, it can be explained that of the 21 facilities of hydrological conditions, it turns out that 52% is the number of ponds, 38% is the number of Rainfall Posts, and 9% is a Climatology Post, while it does not have hydrological condition facilities in the form of Spreading the water Posts and Water Quality Monitoring Posts compared to other river region in Maluku Province.
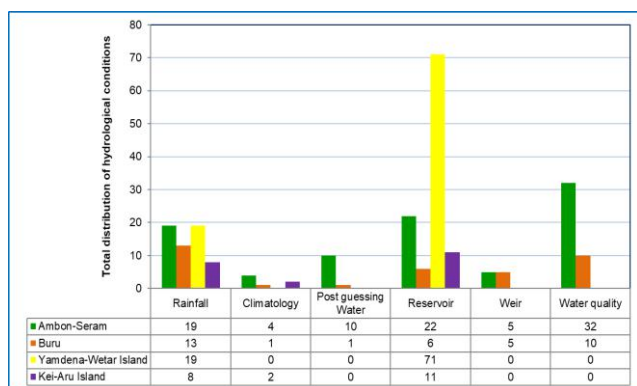

	Rainfall	Climatology	Post guessing Water	Reservoir	Weir	Water quality
Ambon-Seram	19	4	10	22	5	32
Buru	13	1	1	6	5	10
Yamdena-Wetar Island	19	0	0	71	0	0
Kei-Aru Island	8	2	0	11	0	0

Fig.8 Graph of Distribution of Total Hydrological Data in Maluku

The overall analysis of the distribution of Hydrological data in Maluku Province based on the illustrated data (*which has a coordinate position*) as presented in Figure 9, it can be explained that, there are variations related to the distribution of Rainfall Posts, Climatology Posts, Spreading water Posts, Water Quality Monitoring Posts, pond and weir. Theriver region of Ambon Seram, has a total of 89 hydrological condition facilities, which is the highest number compared to other rivers in Maluku Province, followed by theYamdena-Wetar Islands River with 64 facilities. Meanwhile, theriver region of Buru and WS Kei-Aru Islands have fewer hydrological facilities with 36 facilities and 18 facilities respectively.
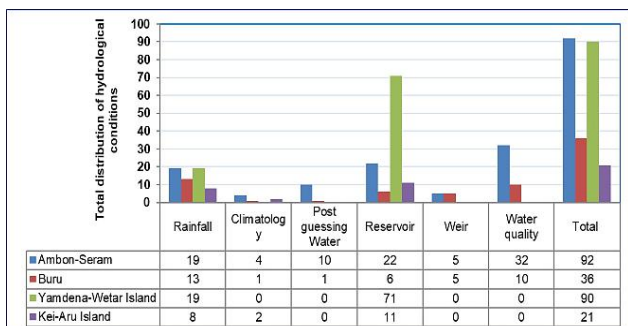

	Rainfall	Climatology	Post guessing Water	Reservoir	Weir	Water quality	Total
Ambon-Seram	19	4	10	22	5	32	92
Buru	13	1	1	6	5	10	36
Yamdena-Wetar Island	19	0	0	71	0	0	90
Kei-Aru Island	8	2	0	11	0	0	21

Fig.9 Graph of Hydrological Data Distribution depicted in Maluku
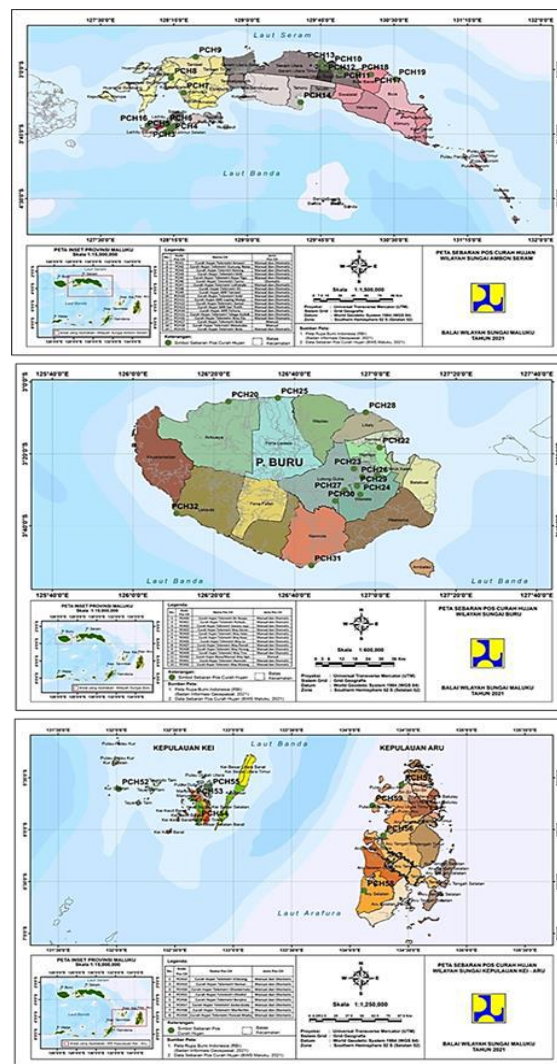

Fig.10 Map of Distribution of Rainfall Posts for Maluku River Basin

From the aspect of the type of facilities, it can be explained that, for the river regionof Ambon Seram, itturns out to have all types of hydrological condition facilities, but has a Climatology Post that is relatively only 4%, therefore with the existing data needs, the Climatology Post on the Ambon-Seram river region still needs to be improved, in addition to other hydrological conditions facilities. Forthe river region ofBuru, it can be explained that of the 36 facilities of hydrological conditions, it turns out that 36% is the number of Rainfall Posts, 3% is the number of Climatology Posts, and 3% is the number of Spreading the water Posts, 17% is the number of pond compared toriver region Seram.

For theYamdena-Wetar Islands River, it can be explained that of the 64 facilities of hydrological conditions, it turns out that 70% is the number of pond and 30% is the number of Rainfall Posts, while it does not have hydrological condition facilities in the form of Climatology Posts,

Spreading the water Posts and Water Quality Monitoring Posts compared to other river region in Maluku Province.

For the Kei-Aru Islands river region, it can be explained that of the 18 facilities of hydrological conditions, it turns out that 44% is the number of pond, 44% is the number of Rainfall Posts, and 11% is a Climatology Post, while it does not have hydrological condition facilities in the form of Spreading the water Posts and Water Quality Monitoring Post compared to other river region in Maluku Province.
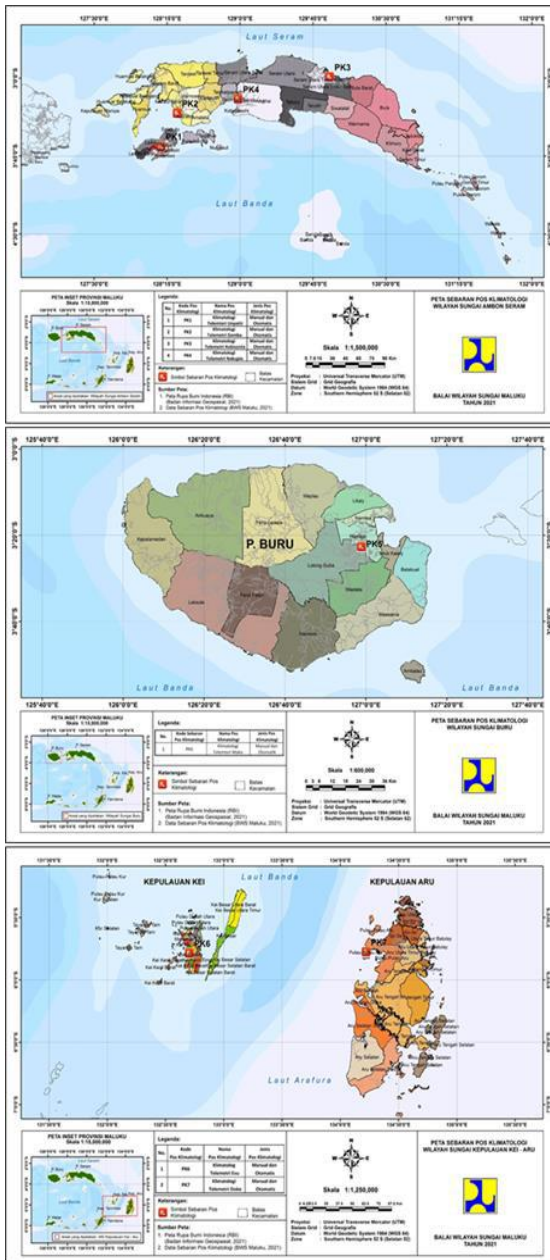

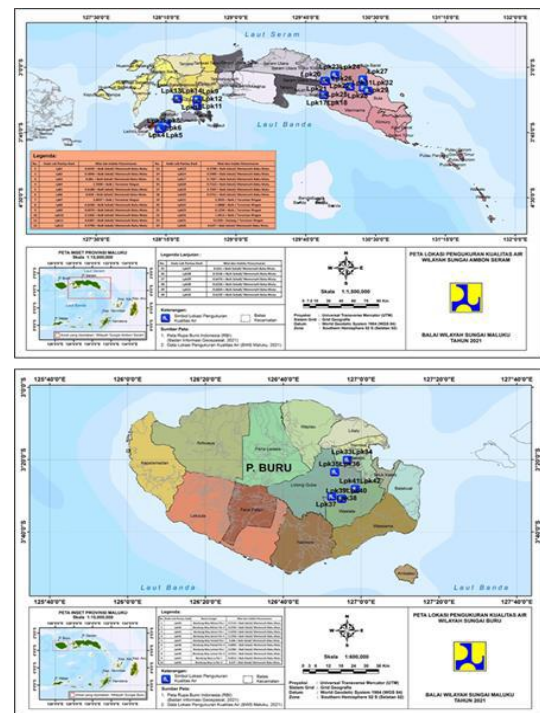*Fig.11 Distribution Map of the Climatology Post for the Maluku River Basin.*

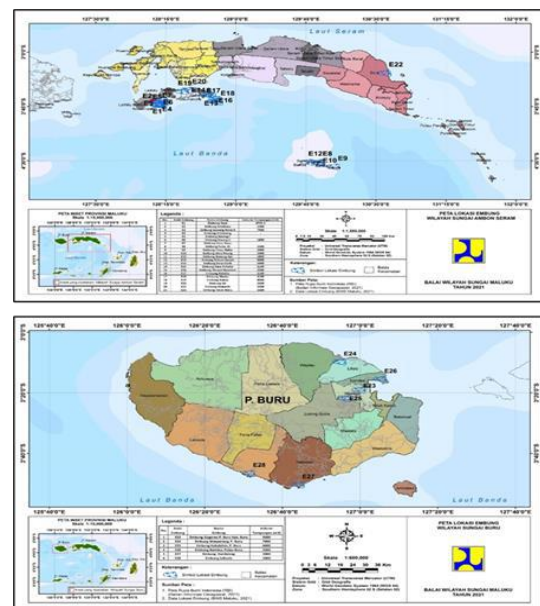*Fig.12 Distribution Map of the Moluccas River Basin Post for Water Consumption*

Fig.13 Map of the distribution of the Moluccas River Basin pond
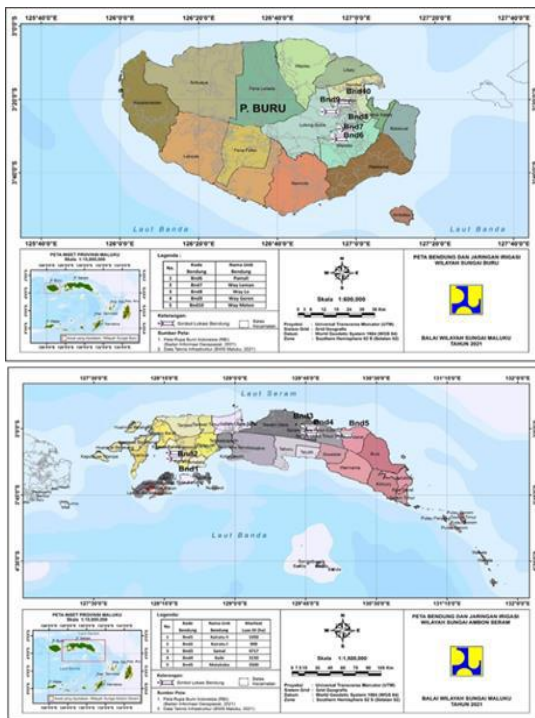
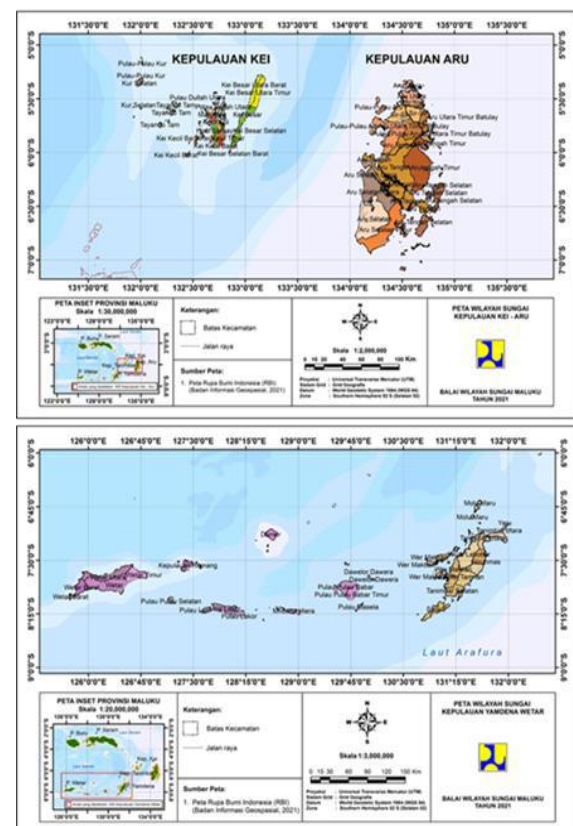*Fig.14 Map of Moluccas River Basin Weir Distribution*

Fig.15 Maluku River Basin Map

V. CONCLUSION

1. Data base management of sustainable water resources on small islands is the main requirement for achieving synergiesin building an integrated system in the Maluku River Region.

2. Vital infrastructure facilities are immediately taken seriously both quality and quantity distributed geospatially in all river areas in Maluku Province, so as to reduce the performance role of the system.

3. There are regulations built that have been developed relating to the use and maintenance of measuring instruments at the rainfall and climatological posts.

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