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Mapping of Alue Ubay Irrigation Area Infrastructure in Paya Bakong Sub-districts Aceh Utara Regency

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ABSTRACT-- *The Alue Ubay Irrigation area which has an irrigation network system consists of a fixed bendung, a primary channels, secondary channels and a disposal channel. Alue Ubay Irrigation area most of the infrastructure is almost 30 years old, so the condition of the building has begun to break down in many places. Research is conducted only on the primary channel as well as building divide/tapping into the existing one in each space. The purpose of this research is to educate the conditions and functions of the irrigation network, especially on the primary. The method used in this research is to merge between the data on the infrastructure condition in the field with other supporting data. The data required in this research are primary data that by conducting surveys and observations, identifying the physical condition of the field and the impact of damages and with interviews involving elements of the relevant agencies, secondary data Obtained from the technical data of Alue Ubay irrigation area and information from related agencies. The result of the assessment obtained an information which was then mapped and input into a GIS-based geospatial map. The information produced is the total length of the primary channel 10,057 m, there are 8 (eight) channel sections ranging from the Intake to the BAU.8, the result is a section of BAU.1-BAU. 2 with a total length of 1,514 m, damaged along 1,509 m, most severely damaged, damage level reaches 99.66%, when referring to Permen PUPR Number 23/PRT/M/2015, the handling priorities on this section are at the rank of 1 (one). For other segments that have similar conditions and functions are the segments of the Intake-BAU.1, BAU.3-BAU.4 dan BAU.6-BAU.7. Condition and function of divide/tapping building consisting of 9 units of building divide/tapping with the number of doors divide 14 units, the door is tapping 19 units, average in good condition (damage rate of < 10%), and still works very well (function category > 90%).*

Keywords— *ubay irrigation infrastructure, paya bakong, utara regency*

I. INTRODUCTION

In the effort to handle, management and development of irrigation infrastructure aims to realize the utilization of water in the field of agriculture, irrigation, environment and other needs organized systematically, integrated and reliable. Various irrigation infrastructure that has been built, namely, weir and irrigation network consisting of primary channels, secondary, tertiary, disposal, building divide/tapping, auxiliary buildings and other hydrolis instruments, must be considered also the operation mechanism, maintenance and development of the irrigation infrastructure. This can only be fulfilled, if it is supported by accurate and up-to-date information, therefore it is necessary to prepare a database that will be informed by venting all supporting aspects that can support the

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maintenance process, development and irrigation services in the form of Alue Ubay irrigation area infrastructure database.

The success in management is highly determined by the availability and the fast and accurate accessibility of the network's historical data and the current state of the existing network according to the actual state of the field. Problems related to the infrastructure of the keirigasian that often arise include irrigation data is not system, not detailed/complete, not operational, not flexible, not familiar, inaccurate, expensive and not reliable.

One way to answer the need above is to present complete information about the infrastructure of the Alue Ubay irrigation area through a series of information consisting of maps, tables, images and visual photographs of irrigation networks about Integrated condition and function between one component and other components. Maps that have been filled with various information are designed with applications based on geographic information Systems (GIS) that describe the conditions and functions of all the infrastructure components of the existing irrigation.

II. RESEARCH METHODS

Research on mapping the infrastructure of Alue Ubay Irrigation Aceh Utara Regency is done to know the conditions and functions and the impact of the infrastructure conditions of Alue Ubay irrigation area from the intake building to the end of the primary network, building divide/tapping and other auxiliary buildings. The research method used in this study is to merge between the data of the infrastructure condition in the field with other supporting data

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2.1 Research Objects and Locations

Alue Ubay Irrigation Area is located in Paya Bakong Sub-District of Aceh Utara Regency, with a potential area of 4,144 ha which includes Paya Bakong Sub-district, Matangkuli Sub-district, Pirak Timu Sub-district and Lhoksukon. According to Kepmen PU Number: 390/KPTS/M/2007 Alue Ubay Irrigation Area is authority of central government, because has service area above 3,000 ha.

2.2 Data Collection

In this research the data collected is primary data and secondary data.

2.2.1 Primary Data

This primary data collection is only done for the primary network segment that starts from Intake door to building BAU.8.

2.2.2 Secondary Data

Secondary data includes data retrieval activities through literary studies, previous research results in other irrigation areas or other data obtained from related agencies relating to this research.

2.3 Surveying and Field Observations

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Surveys and field observations include the search activities of irrigation networks from upstream to downstream, aiming to measure, observe, identify conditions and function and to assess them. The inventory of irrigation networks is carried out to obtain the data of the length, cross section, type, condition and function of the entire assets of irrigation area Alue Ubay.

2.4 Equipment

In conducting survey and field observation, there are several equipments used to support the implementation of the activities. The equipments used are as follows:

1. GPS (Global Positioning System) atau Hand Phone Android-enabled. The GPS or HP is used to determine the coordinates of the survey location and also as a determining coordinate of the field measurements. GPS is also used to determine the channel slope elevation/slope.
2. Measuring instrument 50 meters and 7 meters. The meter is used to measure the cross section and channel length.
3. Camera used to take documentation photos of survey activities and field observations.
4. Stationery used to record measurement results and other research activities.

2.5 Data Processing

Data processing here is the process of processing existing data to be ready for use in the construction of the development of regional infrastructure mapping Alue Ubay based GIS (geographic information systems). The data will be processed consisting of various sources and types of data. GIS requires spatial or descriptive data input. Some of the data sources include:

1) Analog map, namely maps in the form of prints, among others is topographical map, soil map, irrigation area Map, vegetation distribution map and other.
2) Data from remote sensing systems, such as satellite imagery, Google Eart maps, aerial photographs and more.
3) Data on the measurement and observation of the field, among others, the boundaries of irrigation, channel length, channel condition and other.
4) Data from GPS in the form of coordinate points and route routes of irrigation network. GPS technology provides an important breakthrough in providing GIS data with high accuracy, this data is usually presented in vector format.
5) Other supporting data needed in the mapping process of Alue Ubay irrigation area

2.6 Physical Condition and Iration of Network Function

Assessment of physical condition of irrigation network or damage level obtained from survey result and field observation are as follows.

Carrying Line components:

$$\text{Percentage of physical condition} = \frac{Existing\ damage\ length\ (m)}{Total\ length\ of\ existing\ channels\ (m)}\ x\ 100\% \qquad (1)$$

III. RESULTS AND DISCUSSION

3.1 Identification of Physical Condition of Irrigation Network

From survey results and field observations to the irrigation network that is done can be known the latest physical condition of irrigation network Alue Ubay.

Dari hasil survei dan observasi lapangan terhadap jaringan irigasi yang dilakukan dapat diketahui kondisi fisik terbaru jaringan irigasi Alue Ubay. These surveys and observations are carried out on the line of the main channel starting from the Intake up to the BAU.8 with a length of 10,057 km. The conditions found in this field were then recorded, collected, researched, studied and processed to be a useful information.

3.1.1 Primary Channel Physical Condition

Alue Ubay's primary channel has a length of 10,057 Km starting from Inrake to the building BAU.8, with physical conditions can be seen in Table 1 below.

Table 1: Recapitulation of Primary Channel Physical Condition Assessment

No.	Channel Sections	Channel Length (m)	Total Length of Damage (m)	Damage Level (%)	
1.	Intake-BAU.1	313,00	278,00	88,81	Severely Damaged (>40%)
2.	BAU.1-BAU.2	1.514,00	1.509,00	99,66	Severely Damaged (>40%)
3.	BAU.2-BAU.3	1.696,00	148,00	8,72	Good (<10%)
4.	BAU.3-BAU.4	2.100,00	988,00	47,04	Severely Damaged (>40%)
5.	BAU.4-BAU.5	1.703,00	533,00	31,29	Medium Damage (21-40%)
6.	BAU.5-BAU.6	1.285,00	92,00	7,15	Good (<10%)
7.	BAU.6-BAU.7	728,00	327,00	44,91	Severely Damaged (>40%)

8.	BAU.7-BAU.8	718,00	-	-	Good (<10%)

According to Permen PUPR Number 32/PRT/M/2007, physical condition of the primary channel Alue Ubay there are 3 (three) condition categories are good, damaged medium and severely damaged according to the severity of the damage. The most severe section of the damage is the BAU.1-BAU. 2 with a damage level of >40% that is 99.66% of the amount of the length of the channel, so it takes corrective action and replacement.

3.1.2 Physical Condition for Building Divide/Tapping

Based on an identification survey of the building conditions for which has been implemented, the data obtained by the physical condition of the building, amount of buildings, amount of doors, types of doors, location of buildings and visual photographs of the field, can be shown in Table 2 below.

Table 2: Recapitulation of Physical Condition for Building Divide/Tapping Assessment Results

No.	Building Name	Damage Level	Condition Category
1.	Intake	< 10%	Good
2.	BAU.1	> 40%	Severely Damaged
3.	BAU.2	< 10%	Good
4.	BAU.3	< 10%	Good
5.	BAU.4	< 10%	Good
6.	BAU.5	10-20%	Damaged
7.	BAU.6	10-20%	Damaged
8.	BAU.7	< 10%	Good
9.	BAU.8	< 10%	Good

According to Permen PUPR Number 32/PRT/M/2007, the physical condition of the building divide/tapping there are 2 (two) condition categories are good and damaged. Buildings with damaged physical conditions are buildings BAU.5 and BAU.6 with a damage level of 10-20%, so it takes periodic maintenance action.

3.1.2 Physical Conditions Other Complementary Buildings

These buildings serve to support the achievement of targets in the operation and maintenance of irrigation networks, the physical achievement assessment of complementary buildings can be shown in Table 3 below.

Table 3: Recapitulation of Physical Condition Complementary Building Assessment.

No.	Building Name	Amount of Buildings (unit)	Damage Level	Condition Category

1.	Pluge	2	>40% & <10%	Severely Damaged/ Good
2.	Champer	2	< 10%	Good
3.	Concrete Plate Bridge	36	(10-20%) & < 10%	Severely Damaged
4.	People crossing Bridge	11	>40% & <10%	Severely Damaged/ Good

According to Permen PUPR Number 32/PRT/M/2007, the physical conditions vary considerably from good (damage level <10%), damage (damage level 10-20%) and severely damaged (damage level >40%) so regular/periodic maintenance measures are needed until heavy repair and replacement.

3.2 Irrigation Network Function Assessment

The physical function of irrigation networks is assessed based on the water drain compared to the plan capacity.

3.2.1 Primary Channel Function Assessments

From the results of the assessment can be determined the function of irrigation network especially the primary channel Alue Ubay according to Permen PUPR Number 23/PRT/M/2015, the primary channel function assessment results can be seen in Table 4 below.

Table 4: Recapitulation of Primary Channel Function Assessment Results

No.	Channel Sections	Area of Service (ha)	Condition Category	Category Functions
1.	Intake-BAU.1	2.743,00	Severely Damaged (>40%)	Bad (<55%)
2.	BAU.1-BAU.2	2.689,50	Severely Damaged (>40%)	Bad (<55%)
3.	BAU.2-BAU.3	2.598,00	Good (<10%)	Very Good (>90%)
4.	BAU.3-BAU.4	2.457,00	Severely Damaged (>40%)	Buruk (<55%)
5.	BAU.4-BAU.5	2.213,50	Medium Damage (21-40%)	Medium (55-69%)

6.	BAU.5-BAU.6	2.141,50	Good (<10%)	Very Good (>90%)
7.	BAU.6-BAU.7	2.048,15	Severely Damaged (>40%)	Bad (<55%)
8.	BAU.7-BAU.8	1.871,50	Good (<10%)	Very Good (>90%)

The area of Intake-BAU.1 has a total service area of 2,743.00 ha or the whole of functional area that exists in irrigation areas of Alue Ubay, so that if this segment has decreased function, then all existing areas will have decreased level of Service. If the decline in function occurs < 55%, then it can be ensured only part of the service area that can be served well, it can be assumed that the area that can be served good 54% of the existing 2,743.00 ha ie only 1,481 ha, showing the indicators of the function of bad functions, so that the segment requires action/solution completion of heavy repairs and replacement as soon as possible.

3.2.2 Building Function Rating Divide/Tapping

The results of the assessment can be determined by the building function to from the results of the assessment can be determined the function of the building divide/tapping in accordance with the Permen PUPR Number 23/PRT/M/2015, the result of the function assessment can be seen in Table 5 below.

Table 5: Recapitulation of the Building Function Divide/Tapping

No.	Building Name	Condition Category	Damage Level	Category Functions
1.	Intake	Good	< 10%	Very Good (>90%)
2.	BAU.1	Severely Damaged	> 40%	Bad (<55%)
3.	BAU.2	Good	< 10%	Very Good (>90%)
4.	BAU.3	Good	< 10%	Very Good (>90%)
5.	BAU.4	Good	< 10%	Very Good (>90%)
6.	BAU.5	Damage	10-20%	Good (70-90%)
7.	BAU.6	Damage	10-20%	Good (70-90%)
8.	BAU.7	Good	< 10%	Very Good (>90%)
9.	BAU.8	Good	< 10%	Very Good (>90%)

In general the function of the building for the/Sadap in the category is good and still functioning perfectly, only the building BAU.1 whose function is bad (< 55%), but the BAU.1 does not have a door divide, so it does not affect the level of service of existing acreage. From the results of the assessment that the building divide/tapping on the primary channel of Alue Ubay average still functioning > 85% of the initial plan, so that only require action/solution settlement in the form of periodic maintenance.

3.2.3 Other Complementary Building Function Assessments

From the results of the assessment can generally be concluded that most of the complementary buildings still work with categories very good (>90%), good (70-90%) %) and there are only six (6) units that have decreased function with the category of bad (<55%).

3.3 Map of Alue Ubay Irrigation Regional Master Network GIS-based

The data displayed on the map can provide information about the conditions and functions of the Alue Ubay Irrigation regional primary network. Such Data is the location of a breakdown, damage or condition of the channel and visual photograph of the field that can inform the damage condition of a location on the primay network.

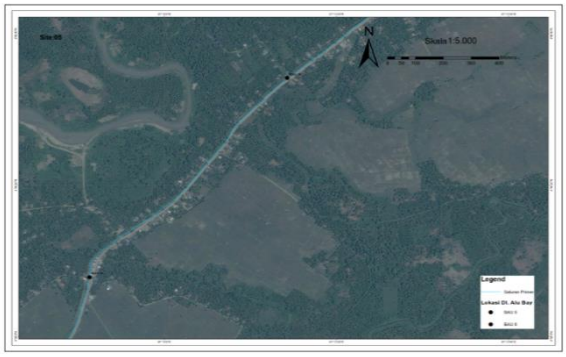

Figure 1: Irrigation Network Map Display

3.4 Handling and Priority Improvement of Irrigation Network

From the results of assessment of conditions and functions against the infrastructure of irrigation area Alue Ubay especially the primary network, then can be carried out action/solutions that are adjusted to the handling scale and improvement priorities according to the condition of damage. To determine the scale handling and priority improvements can be seen in Table 6 below.

Table 6: Recapitulation of Scale Handlers and Improvement Priorities

No.	Channel Sections	Condition	Functions	Priority Ranking
1.	Intake-BAU.1	SD	B	1
2.	BAU.1-BAU.2	SD	B	1
No.	Channel Sections	Condition	Functions	Priority Ranking
3.	BAU.2-BAU.3	G	VG	4
4.	BAU.3-BAU.4	SD	B	1
5.	BAU.4-BAU.5	MD	M	3
6.	BAU.5-BAU.6	G	VG	4
7.	BAU.6-BAU.7	SD	B	1

8.	BAU.7-BAU.8	G	VG	4

If referring to the Permen PUPR Number 23/PRT/M/2015 this bad category means a decline in function occurs until <55%. If not immediately, the handlers feared will have an impact on the disruption of the planting season process.

IV. CONCLUSIONS

Based on the results of the calculations and assessments that have been executed, it can be concluded as follows:

1. The primary channel of irrigation area of Alue Ubay in several sections has suffered considerable damage with damage level reached 88,81%, condition category of severely damaged (>40%), the category of bad functions (<55%), this occurs on the Intake-BAU.1, on the BAU.1-BAU.2 with a damage level of 99.6%, this section is at the upstream of the primary network in the Alue Ubay irrigation field, this will cause the level of service of the irrigation area.
2. Based on Permen PUPR Number 23/PRT/M/2015 if the decline in function occurs <55%, then it is certain that only part of the service area that can be served well, can be assumed that the area that can be served well 54% of the existing 2,743.00 ha, only 1,481 ha that can be served well.
3. The classification of the physical condition of the building divide/tapping according to Permen PUPR Number 32/PRT/M/2007, the physical condition of the building divide/tapping there are 2 (two) condition categories are good and damaged, the building with damaged physical condition is the building BAU.5 and BAU.6 with a damage level of 10-20%, So it can be assumed that the building divide/tapping on the primary channel irrigation area Alue Ubay average still functioning >85% of the initial plan.
4. Identification result of physical condition of irrigation network Alue Ubay irrigated area is input into a GIS-based geospatial map, where all existing physical condition data in field is incorporated to be an understandable information and Easily accessible.

REFERENCES

1. Amalludin, 2014, Analisa Jaringan Irigasi Bendungan Sangkub Kabupaten Bolaang Mongondow Utara Berbasis Spasial, Jurnal Skripsi Universitas Sam Ratulangi, Manado.
2. Departemen Pekerjaan Umum, 2007, Peraturan Menteri Pekerjaan Umum Nomor: 32/PRT/M/2007, Tentang Pedoman Operasi dan Pemeliharaan Jaringan Irigasi, Direktorat Jenderal Sumber Daya Air, Jakarta.
3. Ernawati, 2014, Sistem Informasi Geografis Pembangunan Jaringan Irigasi di Provinsi Bengkulu Berbasis Website Menggunakan Google Map, Vol. 10 No. 2, Jurnal Skripsi Universitas Dehasen Bengkulu.
4. Husaini, 2019, Evaluasi Kinerja Jaringan Irigasi Baro Kanan Kabupaten Pidie, Tesis Pasacasarjana Universitas Syiah Kuala, Banda Aceh.
5. Kementrian Pekerjaan Umum, 2012, Peraturan Menteri Pekerjaan Umum Nomor: 13/PRT/M/2012, Tentang Pedoman Pengelolaan Aset Irigasi, Direktorat Jenderal Sumber Daya Air, Jakarta.

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6. Kementrian Pekerjaan Umum, 2013, Standar Perencanaan Irigasi, Kriteria Perencanaan, Bagian Perencanaan Jaringan Irigasi (KP-01), Direktorat Jenderal Sumber Daya Air, Jakarta.
7. Kementerian PUPR, 2015, Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor: 23/PRT/M/2015, Tentang Pengelolaan Aset Irigasi, Direktorat Jenderal Sumber Daya Air, Jakarta.
8. Nijiyati, S. 1993, Sistem Penyaluran Air Dalam Dampak Petunjuk Mengairi Tanaman. Penebar Swadaya, Jakarta.
9. Oktavianti, 2014, "Pemetaan Jaringan Irigasi Daerah Jawa Barat Berbasis Sistem Informasi Geografis (SIG)", Vol. 2 No. 1. Jurnal Skripsi Universitas Islam 45 Bekasi.
10. Pemerintah RI, 2006, Peraturan Pemerintah Nomor 20, Tentang Irigasi.
11. Pemerintah RI, 2015, Peraturan Pemerintah Nomor 121, Tentang Pengusahaan Sumber Daya Air.
12. Pemerintah RI, 2019, Undang-Undang Nomor 17, Tentang Sumber Daya Air.
13. Ryan Hernawan, 2013, "Pemodelan Decision Support System Manajemen Aset Irigasi Berbasis SIG" MMT-ITS, Surabaya.
14. Sriyana, 2010, "Sistem Informasi Jaringan Irigasi (SIJARI) Kabupaten Sukoharjo Berbasis Program Arcview GIS 3.3", Vol. 31 No.1, Jurnal Universitas Diponegoro, Semarang.