REVITALIZATION AYEK SELANGIS JEMAIR IRRIGATION AREA ON FASTER OF URBAN INFRASTRUCTURE DEVELOPMENT

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Abstract: *Geograpically, Pagaralam resources has an economic and social stratum to served for urban infrastructure development for agriculture sector through the strong ins based in industrial development.*

Irrigation Infrastructure development revitalization area was ayek selangis hoped jemair that can improve paddy production for Used Pagar Alam area, the tourism sector and micro-hydro development.

The Result of this study was designed discharge for any return period for $Q_2 = 14.628$ m^3/s; $Q_5 = 17.912$ m^3/s *and* $Q_{10} = 19.942$ m^3 */ sec with the shaped of the primary canal was trapezium Nowhere b and h 2.50 m and has a slide 1: ½, secondary canal was b = 2.40 m and h = 2.50 m.*

Keyword: Revitalization, Design discharge, Canal dimension

I. INTRODUCTION

1.1. Background

In order to support agricultural development activities and toward food self-sufficiency and provide a solid foundation for industrial development, it is necessary also spurred the development of other sectors such as industry, tourism and others. This is because in the future, development in these sectors will continue to expand along with population growth.

Given Pagaralam City area when viewed from the geographic location, available resources, both natural resources and other resources as well as socio-economic level, population, has enough potential to sustain economic activities mentioned above.

With so much needed a supporting facility of which one is the rehabilitation / revitalization of irrigation ayek selangis jemair. After functioning Irrigation Ayek Selangis Jemair expected to trigger the production of rice to the needs of the City of Pagaralam and development of tourism sector, fisheries and development of hydroelectric power *(Micro-hydro)*.

In order to support the development of agricultural activities, particularly food crops and to provide a solid foundation for industrial development, the rehabilitation and revitalization of Irrigation Ayek Selangis Jemair need to be **implemented.**

1.2. Scope

Irrigation Revitalisation Ayek Selangis Jemair generally meant is: conduct detailed design that is by measuring the topography, the situation in the context of planning the location of construction / rehabilitation of the main channels (primary) and secondary to the coverage Ayek Selangis Jemair Irrigation Area with the aim of accelerating development in the urban and infra-structure countryside.

II. Pagaralam City Overview

2.1. Geographic Location and Administration

Geographically, the city Pagaralam located between 03 ° 59 '08 "- 04 ° 15' 45" south latitude and 103 ° 07 '00 "- 103 ° 27' 26" East Longitude. Pagaralam city administrative boundaries are as follows:

- The northern district bordering the Lahat

- In the south bordering the province of Bengkulu,

- The eastern districts bordering Lahat

- Westside Lahat district borders.

Pagaralam urban areas situated on the Bukit Barisan, mostly originating from soil conditions and types Latosol Andosol with a wavy surface shape up to the level of hilly terrain slope 3% - 40%, at an altitude between 441 to 1000 m above sea level. . Pagaralam urban areas covering 63 366 ha or 633.66 $km^{2.}$

2.2. Climatology

City Pagaralam wet tropical climate and is influenced by changes in wind direction. The average rainfall a year varies between 1462 mm - 5199 mm, which is uneven across the region. Temperatures ranged between 20 ° - 28 ° C with the conditions of rainfall recorded during the last ten years ie from 1993 until 2002, recorded on a tea plantation, PTPN VII Mount Dempo.

2.3. Topography and Morphology

Based on his physical condition, Pagaralam town is hilly and mountainous areas mainly located in the Northwest (Dempo volcano) and the south-southeast. Middle East to parts of the sea is a sloping plateau.

Altitude region between the District of quite diverse, ranging from 441 to 1000 m above sea level. In the northeast to the center, covering a small area in Pagaralam subdistricts, with gradients varying between 3 to less than 40%.

Hilly to mountainous areas located at an altitude between 1250 to 3000 m in mountain areas Dempo with gradients ranging from 12% to more than 40%. Area encompasses approximately 58.19% of the total area of the City District Pagaralam Dempo Dempo Central and South, and little in the District of North Pagaralam, Pagaralam Dempo South and North.

2.4. Geology

Pagaralam regional geology in the bottom bagioan Pasemah composed by formation consisting of Tuff. Bintunan formations deposited thereon composed of tuffaceous sandstone floating rocky, sandy tuffs, conglomerates and Tuff. Pasemah formation and this formation was deposited on kala Bintunan Pilosan end until the Pleistocene.

At the top is dominated by volcanic breccia rocks spread evenly up to the southern part of Pagaralam which is also composed of lava and tuff result of the eruption GunungDempo. Volcano Breccia Unit is expected to Holocene age. Geological structure that works in Pagaralam not so complex only in the form-straightness straightness are predicted to be-trending faults that have a main direction northwest-southeast.

2.5. Hydrology

In the District of North Pagaralam and South Pagaralam surface water sources that there are quite a lot especially in the tributaries Selangis River stretching to the Northern District of Dempo.

Also found other surface water including rivers Lematang in District Central Dempo with several tributaries including the Red River, Clear, Lematang Cawang Cawang River Right and the Right and the Left Cawang.

Endikat River in the District of South Dempo is a source of surface water as well with a few small rivers which are Endikat Endikat Right and the Left and the Monkey River and White River.

Sub North Dempo surface water sources such as small rivers such as rivers and streams Cawang big Selangis covering about fourteen amak river.

2.6. Space Utilization

From an area of 63 366 ha area, the area is 11 684 ha area of awakening or 18.44% for the largest use of protected forest plantations including encroachment which reached

45.36%. Then followed plantation land area is 23.44%. Other use is to wet land that is equal to 5.91%, 3.63% and moor at a large plantation for tea that is equal to 3.12%.

2.7. Water Administration System

System of water contained in the planning area consists of technical irrigation defunct due to lack of operational and maintenance performed routinely.

With this condition, the average is not / was not properly managed at the level of water users and farmers groups are generally not functioned well as a channel then the channel is not utilized even disappear altogether.

III. METHODOLOGY & EXISTING CONDITION

3.1. Weir Construction

Selangis, a fixed weir dam was built in 1955 with its main function is as a structure, but the condition itself has weir functioned technically can not due to aging dam itself.

3.2. Main Channels

In view of this activity is the rehabilitation and revitalization, the existing channels will be checked again the channel dimensions and channel structure that is damaged will be redesigned so that they can be used as in the past.

In addition to existing channels, the new channel should be designed in areas that do not have the channel.

3.3. Objector Gutter Construction

In the structure, building gutters and objector (foundation) does not become a single entity. Therefore, for a buffer will be designed in accordance with the current condition of the materials are cheap and strong.

3.4. Building For

Likewise for the building should be designed so that they can be used as appropriate and if necessary buildings for the newly created secondary channels altogether.

IV. SURVEY AND ANALYSIS

4.1. Topographic Surveying and Measurement Channels

Topographic survey and measurement of the trace is to get a picture (map) situation and the location of either the channel cross-section, cut lengthwise or *longitudinal section* which will then be used as a basis for planning.

As a reference for the implementation of topographic measurements used fixed points are shown by local officials, for the deployment of each location installed several BM (Bench Mark) to the reference implementation of future projects.

Measurement methods include:

a. Measurement of horizontal angle and distance (polygon).

   This measurement is done on the base line is installed adjacent to the channel or on the shoulder of the road (embankment). Through a peg-peg that has been fitted with a flat angle measured double series method (ordinary / extraordinary) and the distance measured by the chain double readings. By the way are expected to minimize the angle and distance measurement error.

b. Waterpass measurements (leveling)

   This measurement is performed using double-stand or two times in each measuring plane tuning peg that has been installed. By the way are expected to minimize errors.

c. Measurement of Cross Section

   This measurement is performed on each peg that is placed with a distance of + 50 m intervals, each of which already has a peg in the elevation or altitude drawn from the fixed point gauge wearing carpenter's level or waterpass.

d. Bench Mark

   Installation of Bench Mark dibut of peg size 15 x 15 x 80 cm installed at strategic places, easy to look back and expected to be safe. Patok BM (Bench Mark) ini dipakai untuk acuan ketinggian maupun arah horizontalnya terhadap utara magnetis atau azimuth. Peg BM (Bench Mark) was used for a reference altitude or horizontal direction or azimuth of magnetic north. In a project, the peg-peg will be needed, for the presence of peg-peg BM inidibuat concrete description in a note.

4.2. Hydrology Analysis

4.2.1. General

In planning the channel, one very important thing is to determine how much the flood discharge which is used as the basis for mendimensi size channel. Flood discharge is called the *design* flood discharge or *flood*, the flood discharge is planned to determine the channel capacity.

Flooding or *flood* discharge *design* for each different type of channel with channel function if the main channels (primary), secondary hydraulic or other buildings.

To seek *re-design flood* at a particular period will achieve good results if the streamflow data are known. Because streamflow data there is often no data recording, calculations based on the design flood rainfall data, where data is taken from the station PTPN VII Tea Plantation Mount Dempo recorded from 1993 up until the month of July 2002 (see Table 4-1)

4.2.2 Calculation of Rainfall Plan

Rainfall for the plan year return period T (RT) was calculated with the equation or the method of EJ Gumbel Gumbel Statistical Analysis as follows:

(1). Gumbel Statistical Analysis Method

$RT = R + (Y - Yn) . \sigma / \sigma n$ .... (4.1)

with:

RT = rainfall with T-year return period (mm)

R = average rainfall (mm)

$\sigma = \sqrt{} (R\text{-}Ri)^2 / (n-1)$

Ri = maximum rainfall with a period I (mm)

Yn = Expected mean of reduced extreme (table 3-1)

σ n = Reduced standard deviation (table 3-2)

Y = Reduced variate (Table 3-3)

= 0.834032 to 2.3 log.log (T/T-1)

T = (n - 1) / m

m = rank

n = number of observation periods

Table 4-1. Test of Homogeneity of Rainfall Data

No.	Year	Annual Rainfall (mm)	Ranking of the largest	Probability P = (m / n +1) x 100%
1.	2002	2.598	5.199	90,0
2.	2001	5.199	3.847	81,8
3.	2000	3.847	3.022	72,7
4.	1999	2.985	2.985	63,6
5.	1998	3.022	2.805	54,5
6.	1997	1.462	2.725	45,4
7.	1996	2.725	2.653	36,4
8.	1995	2.805	2.598	27,3
9.	1994	2.414	2.414	18,2
10.	1993	2.653	1.462	9,10

Source: Analysis Results LPUP, 2008

Table 4-2. Maximum Daily Rainfall Pagaralam town (PTPN VII G. Dempo)

No.	Year	R_1 (mm)	$(R_1 - R)$ (mm)	$(R_1 - R)^2$ (mm)
1.	2002	84	7	49
2.	2001	126	49	2401
3.	2000	93	16	256
4.	1999	79	2	4
5.	1998	98	21	441
6.	1997	44	- 33	1089
7.	1996	69	- 8	64

8.	1995	55	- 22	484
9.	1994	65	- 12	144
10	1993	55	- 22	484
	ΣR_1	768	$\Sigma (R_1 - R)^2$	5416

Source: Analysis Results LPUP, 2008

The value of each plan rainfall return periods can be seen in table 5.3. Follows:

Table 4-3. Recapitalization Plan Rainfall Values (mm)

No.	Return Period (Years)	Gumbel (mm)	Haspers (mm)	Combination(Average) (mm)
1.	2	74	84	79
2.	5	103	92	98
3.	10	122	99	110
4.	25	147	103	125
5.	50	165	113	139
6.	100	183	117	150

Source: Analysis Results LPUP, 2008

4.3. Calculation of discharge

4.3.1. Main channel

The method used is from Haspers method with the following formula:

$QT = \alpha \cdot \beta \cdot q \cdot A$ .... (4.2)

with:

QT = discharge plan with T-year return period

α = coefficient of run-off

β = coefficient of reduction

q = intensity of rainfall in the account

A = drainage area (km $^{2)}$

$\alpha = [1 + 0.012\ A^{0.7]} / [1 + 0.075\ A^{0.7]}$

$1/\ \beta = 1 + ((t + 3.7^{-0.4}\ x10^{\ t)} / (t^{2} + 15))\ x\ ((A^{0.75)} / 12\ t = 0.1\ x\ L^{0.8}\ x\ I^{-0,3}$

$q = P / (3.6\ t)$

- For t < 2 hours:

$rt = Rt / [t + 1\ \text{to}\ 0.0008\ (260 - Rt)\ x\ (2 - t)^{2]}$

- For two hours < t < 19 hours:

$rt = (tx\ Rt) / (t + 1)$

- For t > 19 hours:

$rt = 0.707\ x\ Rt\ (t + 1)$

The result of such design flow calculations in table 4-6 as follows:

Table 4-6. Recapitulation of the Plan Period discharge

No.	Repeat Period (Years)	Plan discharge (m3/sec)	Channel Type
1.	2	14,628	Tertiary
2.	5	17,912	Secondary
3.	10	19,942	Primary

Source: Analysis Results LPUP, 2008

4.3.2. Dimensions of Main Channels

Based on "ASAE Standard Concrete Lining" in Hydraulic Design Practice of Canal Structures by YCLim & DSKim, then the main channel dimensions are recommended:

Q = 19.942 m3/sec

b = 2.50 m

h = 2.50 m

V = 1.35 m / s

V max = 2.40 m / s

Mannings n = 0.014

m = 1 : 0,5 m = 1: 0.5

Thickness "lining" = 0.75 to 1.00 m

fb (free board) = 1.00 m

I = 1/4.000

4.3.3. Secondary channel

Q = 17.912 m3/s

b = 2.40 m

h = 2.50 m

V = 1.195 m / s

V max = 2.40 m / s

Mannings n = 0.014

m = 1: 0.5

Thickness "lining" = 0.75 to 1.00 m

fb (free board) = 1.00 m

I = 1/5.000

V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusion

From this research can be concluded as follows:

a. Rainfall values derived from the formula Hasper more significant than the Gumbel, but for the accuracy of retrieved mean value of precipitation from these two formulas.
b. Flood discharge channel function well adapted to the main channel, secondary and tertiary.
c. Flood discharge values for the main channel of 19.942 m^3 / s, as well as flood discharge for the secondary channel that is equal to 17.912 m^3 / sec.

5.2. Suggestion

a. It should be corrected secondary data recorded with field data, in order to obtain more accurate results.

b. Keep a combined analysis of the frequency of rainfall data from rainfall, so that in the comparative accuracy results can be obtained.

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