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Optimization Analysis of Operating Patterns of Guriola Reservoir for Meet the Water Needs of the Community in Raenyale Village District West Sabu East Nusa Tenggara

Adriella Elizabeth Doko[1], Widandi Soetopo[2], Andre Primantyo Hendrawan[3]
[1, 2, 3]Water Resources Engineering, Brawijaya University, Malang, Jawa Timur, Indonesia-65145

Abstract— *Sabu Raijua is one of the regencies in East Nusa Tenggara Province, Sabu Raijua district has a dry climate, with an abridged rainy season of 14 to 69 rainy days. In connection with these conditions, it is necessary to build water structures to meet water needs. One of the recommended water structures is the reservoir. This study aims to determine the availability of water in the pool, choose the pattern of operation of the reservoir, and a linear programming model. The data used in this study consisted of two methods, namely primary data and secondary data related to the need for analysis. The data analysis method in this research is the quantitative analysis method. Based on the Water Balance Analysis results, there is a water deficit during the dry season, ranging from April to December, with a maximum discharge of 0.011 million/m^3 for the dry discharge scenario, 0.0218 million/m3 for the typical and wet discharge scenario. After optimization, there is an increase in the percentage of fulfillment of each rain scenario. the community can well distribute the water contained in the Guriola Embung reservoir. The maximum Fp result for dry water discharge is 7%. With an average optimal clearance of 0.0074 million/ m3, Fp Maximum for normal water discharge is 11% with moderate optimal support of 0.0076 million/m3, Fp Maximum for water discharge with a maximum Fp of 61%. With the optimal release, the average water discharge is 0.0066 million/m3 to meet water needs of 0.008 m^3/s with a total served population of 3351 people.*

Keywords— *Embung Guriola, linear programming, Raenyale Village, optimization, reservoir.*

I. Introduction

Drought is a word that is still often heard in some areas in Indonesia. Water scarcity occurs in parts of Indonesia East alone. However, in remote features of Java, there are still many people who are willing to wait in line for hours to get decent water appropriately used. Not only in Indonesia, according to Barker and Amarasinghe (1999) [1], more than a quarter of the world's population live in areas that will or will experience water scarcity. Apart from the increased surface water conditions reduced, geographical and climatic conditions also affect water availability to meet the community's water needs. The Province of East Nusa Tenggara (NTT), one of the provinces in Indonesia, is difficult to get water. Apart from the relative rainfall low every year, another influencing factor is growth population that is increasing every year (sippa.ciptakarya.go.id) [2], so that the availability of water is not sufficient for needs and activities Public. Sabu Raijua is one of the regencies in Nusa Tenggara Province East Southeast, Sabu Raijua district has a temperate natural condition Alam dry, with an abridged rainy season of 14 to 69 days rain. The dry season in this district ranges from 7 to 8 months, while the short rainy season only occurs from December to with March (saburaijuakab.go.id) [3]. In connection with these conditions, it is necessary to build water structures to meet water needs. One of the recommended water structures is the reservoir. According to Ibnu Kasiro in the Handbook of Design Criteria for Small Embungs for Semi-arid areas in Indonesia, Embungs function to collect rainwater to supply a village in the dry season. During the dry season, the town will use the water to meet residents, livestock, and a few gardens. Reservoir type 2 itself is divided into three, namely fill, concrete or pairs, and composites. The selection of the reservoir body type is adjusted to the conditions and topography of the area where will build the reservoir. One of the efforts made by the government to improve water security and meet the community's needs is to build a Guriola Embung in Raenyale Village, West Sabu District, East Nusa Tenggara Province. Raenyale Village, West Sabu District, is an area with arid climatic conditions. With the Guriola reservoir, it is hoped that it can meet the water needs of the local community. The Guriola Embung has a limited storage capacity so that when the dry season arrives, the water in the reservoir often cannot meet the community's water needs. This study will apply the optimization of the pool to the community's water needs using a linear method.

II. Literature Review

A. Hydrological Analysis

Hydrology is a branch of earth science (Geoscience or Science de la Terre) that explicitly studies the hydrological cycle or the water cycle on the earth's surface with various consequences. The basis of hydrology is a natural phenomenon. The dominant hydrological element in an area is rainfall. Therefore rainfall data for a place is the primary data in determining the magnitude of the planned flood discharge and the mainstay discharge in the area. According to Chay Asdak in the book Hydrology and Watershed Management (2010) [4], Precipitation is the outpouring or falling of water from the atmosphere to the earth's surface and the sea in different forms, namely rainfall in the tropics and rain and snow in temperate climates. At the same time, another sense

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of Precipitation is any product of the condensation of water in the atmosphere. It occurs when the atmosphere becomes saturated, and water then condenses and exits the solution. Air becomes saturated through two processes, cooling or adding water vapor. As for when it reaches the earth's surface, Precipitation occurs in several forms, including rain, freezing rain, drizzle, snow, sleet, and hail. In this study, the Precipitation in question is related to rainfall. The amount or degree of rain is expressed by the amount of rainfall in a unit of time. The team used is mm/hour and is called the intensity of Precipitation. (Sosrodarsono and Takeda, 2003) [5]. Rain data is obtained from a rain gauge installed in one place, which is called the main post, with the requirements of the density between the posts meeting the needs of a region. The final result of rain data processing is the tabulation availability of rain data in a certain period, generally daily rain in one year. If this data is available, it can also be expressed in weekly, primary, semi-monthly, and monthly and yearly data. The calculation of the average daily maximum rainfall data must be carried out correctly to analyze the frequency of rain data. In practice, it is often found that the daily complete rain calculation for each rain post in one year is then averaged to get the rain. This method is considered illogical and accurate because the average rainfall is carried out on the shower from each rain post on different days. The results will deviate far from the actual events on the ground. Adequate rain is the portion of the total rainfall that results in direct runoff. This direct runoff consists of surface runoff and interflow, i.e., water that enters a thin layer below the soil surface with low permeability, which comes out again at a quiet place and turns into surface runoff. So the adequate rain is the total rainfall minus the loss at the beginning of the rain due to interception and infiltration.

B. Embung or Pond

In the Introduction to Embung Planning Module published by the Ministry of Public Works and Public Housing (2017), Embungs are water storage structures built in depressed areas, usually outside rivers. Meanwhile, another definition of the reservoir, according to the book Technical Guidelines for Water Conservation Through Embankment Development (2011), is a water conservation building that has the form of a basin or water flow in the form of soil, stone, concrete, and masonry fill that can hold water for various purposes. The dam will store water in the rainy season, and then the water will be used by a village during the dry season to meet needs, with the priority sequence being residents, livestock, and gardens or rice fields. This amount will determine the height of the body of the reservoir and the capacity of the reservoir. According to the first edition of the Embung Engineering Planning Standard Module (2015), the types of reservoirs are divided into four classes, namely:

a) Types of reservoirs based on construction are divided into two reservoirs: single-purpose dams and multipurpose damns.
b) Types of reservoirs based on their use are divided into three reservoirs: storage dams, diversion dams, and detention dams.
c) Types of reservoirs based on their location to the water flow are divided into two, namely reservoirs on the water flow (on stream) and reservoirs outside the water flow (off-stream).
d) Types of reservoirs based on the formation material are divided into fill dams, embankment dams, and concrete dams.

Activities related to the operation of the reservoir can be explained as all activities associated with the regulation of the volume of the pool and the use of reservoir water, which includes monitoring the physical condition of the facilities and infrastructure. This activity consists of several sub-sections, which include collecting hydrological data, opening and closing the water gates of the reservoir, and monitoring the reservoir. Water that enters the reservoir consists of two groups, namely surface water from all rainfed areas and effective rainwater that falls directly on the reservoir's surface.

C. Raw Water Needs

Water demand is the amount of water needed for household, industrial, hospital, and other purposes. Priority for water needs includes domestic, industrial, and public water needs. Water needs are categorized into two, namely domestic water needs and non-domestic water needs. Domestic water is needs, namely the need for water used for household purposes, for drinking, cooking, bathing, washing clothes, and other purposes. Meanwhile, non-domestic water needs are water used for offices, places of worship, public places, and others. According to the Directorate General of Human Settlements (2000), the standard of water needs is divided into two, namely:

a) Domestic Water Needs Standard Domestic water demand standards are the water requirements used in private residences to meet daily needs such as cooking, drinking, washing, and other household needs. The unit used is liter/person/day.
b) Standard for Non-Domestic Needs Standard for non-domestic water needs is the need for clean water outside household needs. Non-domestic water needs consist of commercial and industrial uses, namely water use by commercial and industrial agencies. And public use, namely the use of water for government buildings, hospitals, schools, and places of worship.

D. Optimization

Optimization is an activity to get the best results in a given situation. In addition, optimization is also a process of finding the best solution or optimal value of optimization problems. There are optimal problems that seek the maximum value or minimum value (Nyoman Gunantara, 2018). The ultimate goal of all these activities is to minimize the effort (effort) or maximize the desired benefits (benefits). Since the effort required or the expected use can be expressed as a function of the decision variable, optimization can be defined as a process to find conditions that give the minimum or maximum value of a part. Optimization can be interpreted as an activity to get the minimum value of a function because getting the total

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value of a process can be done by finding the minimum of the same position.

E. Optimization Model

The optimization model is the preparation of a model of a system that is by the actual situation, which can later be converted into a mathematical model by separating the main elements so that a solution is achieved by the decision-making goals or objectives of the decision-making. The optimization model is used to overcome the problem of developing water resources in an area with various aspects that need to be studied, including flood control, drainage, drinking water, flushing, irrigation, electric power, recreation, waste disposal, etc.

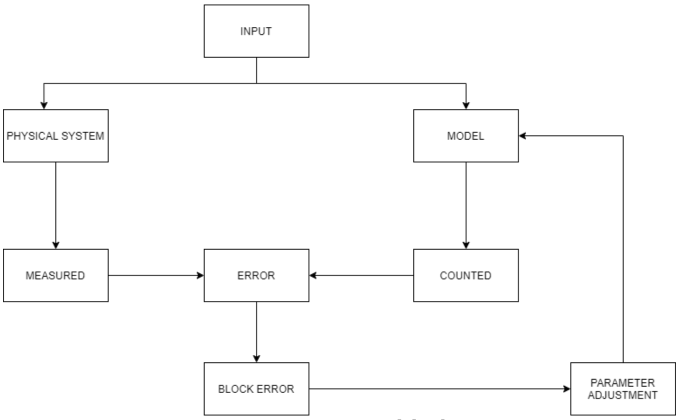

Fig. 1. Optimization model schema.

F. Reservoir Operation and Optimization

The operation of a reservoir is collecting the water flow into a reservoir and releasing water from the water that has been accommodated for various specific purposes (Soetopo, 2010). Completion or policy-making of reservoir operations cannot be separated from optimization to determine maximum profits and or minimum losses for optimal utilization of reservoir water (Dinia Anggraheni, Rachmad Jayadi, and Istiarto, 2014). The guideline for the operation of the reservoir is how to use the reservoir storage capacity in determining the regulation of the flow for specific purposes where the purpose of this reservoir is raw water. To get a solution to the problem to reach an optimal decision, we must choose the most suitable solution method among the available techniques and generally use mathematical solutions as part of "mathematical programming". The guideline for the operation of the reservoir is how to use the reservoir storage capacity in determining the regulation of the flow for specific purposes where the purpose of this reservoir is raw water.

III. Research Methodology

A. Description of Research Area

a) Study area location

Administratively, Embung Guriola is located in Raenyale Village, West Sabu District, East Nusa Tenggara Province. The location of this dam is located upstream of the Loko Teniawu river, which is a combination of three tributaries, namely Loko Huaiken, Loko Daillara, and Loko Eiwau/Guriola. Geographically, the Guriola Embung is located at a position of 10˚ 32' 25" South Latitude and 121˚ 51' 69" East Longitude. Raenyale Village is located at an altitude between 50 ms / d 700 m above sea level, with natural conditions consisting of valleys and hills with an average rainfall per year between 5 mm to 30 mm in rainy months and an average daily temperature 20 C to 35˚C. The boundaries of this area are made by taking into account the constraints and conditions in the field as follows:

1. Availability of primary and secondary information or data
2. The research was only conducted in Raenyale Village, West Sabu District, NTT
3. The research was only conducted on Guriola Reservoir.

b) Method of collecting data

The data used in this study consisted of two methods: primary data obtained directly in the field, namely interviews and documentation of the actual state of the Guriola Embankment. As for secondary data obtained from literature studies, related agencies, and several previous studies related to the need for analysis. The data are as follows:

1. Daily Rainfall Data for the last ten years obtained from the Meteorology and Geophysics Agency Terdamu Sabu
2. Technical data for the reservoir was obtained from the Nusa Tenggara II River Basin Center.
3. Climatological data obtained from the Meteorology and Geophysics Agency Terdamu Sabu
4. Population data of Raenyale Village, West Sabu District, obtained from the Raenyale Village Office Kantor
5. Topographic maps obtained from the Public Works Office of Sabu Raijua Regency.

c) Data Analysis method

The data analysis method used in this study is quantitative, namely analyzing using the equations that have been described in chapter II on the theoretical basis. Based on the theoretical basis, rainfall and the amount of water entering the reservoir will be calculated about the water needs of the residents in Raenyale Village. The results of the following calculation can be described in chapter IV analysis and discussion with the main problems regarding the optimization of the Guriola reservoir's capacity for the water needs of the community. More details on the stages of this activity can be seen in the activity flow chart.

IV. Results and Discussion

A. Rain Data Processing

The rain data used in this study was obtained from the closest location to the Guriola reservoir is the Tardamu Rain Station. The data obtained are daily rainfall data for ten years, from 2010 to the year 2019.

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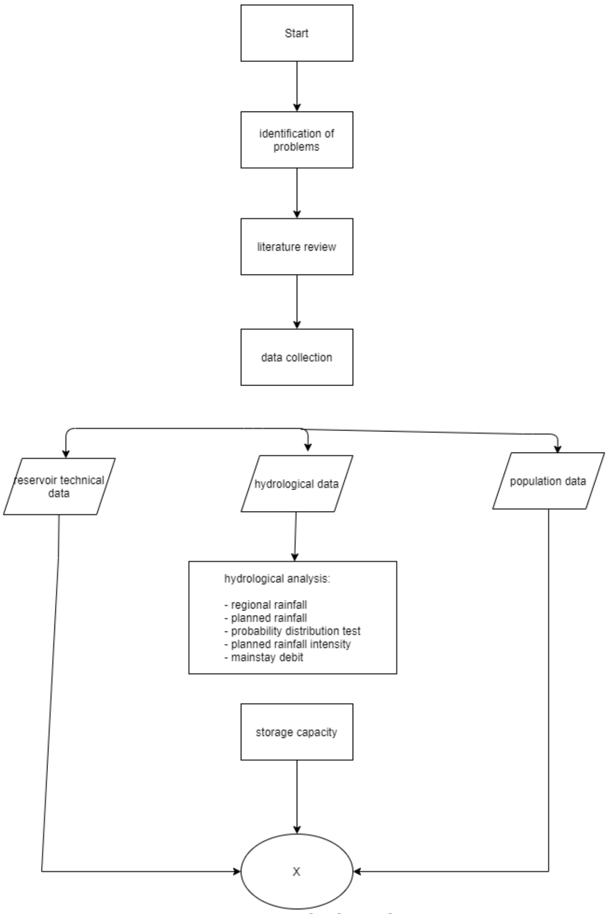

Fig. 2. Research Flow Chart.

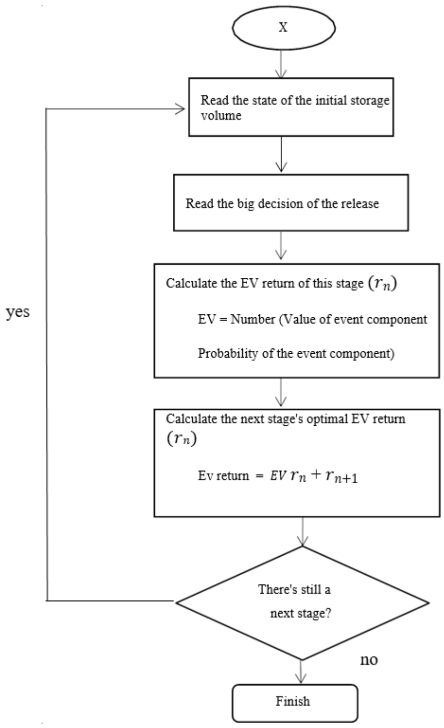

Fig. 3. Stochastic Dynamic Program Optimization Flowchart.

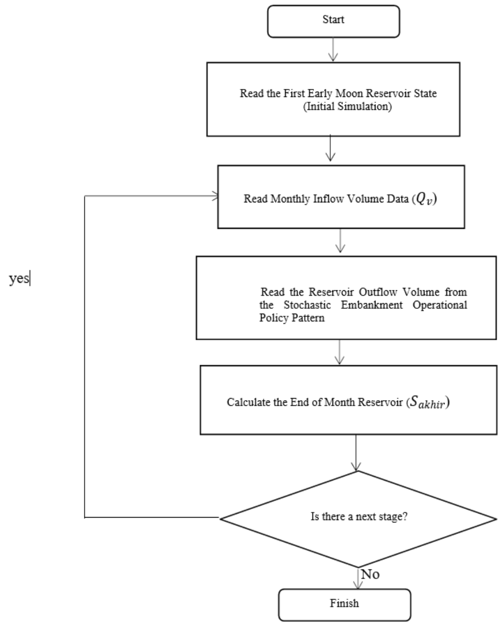

Fig. 4. Embankment Simulation Flowchart.

Data Consistency Test

From the rain data obtained, it is necessary to test the consistency of the data, which aims to test the correctness of the available data. The rain data used is rain data from 2010 to 2019, which was obtained from the Tardamu Rain Station. The method used is the Re-Adjusted Partial Sums (RAPS) method.

TABLE I. Rainfall Plan St. Tardamu.

No	Year	Daily Rainfall (mm)
		Tardamu Station
1	2019	94,8
2	2018	76,9
3	2017	126,7
4	2016	96,9
5	2015	192,5
6	2014	83,7
7	2013	96,2
8	2012	100
9	2011	181,9
10	2010	145,5
Amount		1195,1
Mean		119,51

From the rain data above, a cumulative calculation is carried out from the average value divided by the cumulative root of the deviation squared to the mean value. It can be seen in figure below.

No	Tahun	X	Xi - Xrata-rata	Sk*	(Xi - Xrata-rata)²/n	Sk**
-1	-2	-3	-4	-5	-6	-7
1	2019	94,8	-24,71	-24,71	61,06	-0,64
2	2018	76,9	-42,61	-67,32	181,56	-1,73
3	2017	126,7	7,19	-60,13	5,17	-1,55
4	2016	96,9	-22,61	-82,74	51,12	-2,13
5	2015	192,5	72,99	-9,75	532,75	-0,25
6	2014	83,7	-35,81	-45,56	128,24	-1,17
7	2013	96,2	-23,31	-68,87	54,34	-1,77
8	2012	100	-19,51	-88,38	38,06	-2,28
9	2011	181,9	62,39	-25,99	389,25	-0,67
10	2010	145,5	25,99	0,00	67,55	-4,39E-15

Fig. 5. Tardamu Station Consistency Test with RAPS Method.
Source: Calculation Results.

From the calculation results above, it can be calculated:

$\bar{X} = \sum X = 1195{,}1 = 119{,}51$
$n \quad 10$
$Q = |Sk|{**}maks = 2{,}28$
$R = Sk{**}min - Sk{**}maks = -2{,}28 - (-0{,}25) = 2{,}02$

From the table of Critical Q and R values, we can see the value according to the amount of data available, namely (n) = 10, then:

a. Critical Q 95% = 3.60
b. R Critical 95% = 4.05

So based on the above calculation, the value obtained is:
= 2.28 < Qcritical = 3.60
= 2.02 < Qcritical = 4.05

From the statistical data calculated, the value of and can be searched and then compared with the value of and in the table. The conditions for testing the data can be accepted if the weight and count are smaller than the value and in the table. Based on the results of the calculations carried out on the rain data of the Tardamu station, based on the RAPS test, the value and count are smaller than the values. In the table, so it can be concluded that the existing data is entirely consistent at 95% probability. The Smirnov-Kolmogorf test is a distribution test of the deviation of the data in the horizontal direction to determine whether a data has the type of theoretical distribution selected or not. The Smirnov-Kolmogorof test is used to calculate the Gumbel Probability Distribution, Perarson III Log, Normal and Normal Log. Then in this study conducted the Chi-Square Test. Smirnov-Kolmogorof test and Chi-Square test for the four distributions met the requirements, but of the four distributions only one was used, namely the distribution that had the smallest value. Based on the calculations carried out by researchers, it can be concluded that the smallest value is the Gumbel Probability Distribution.

No	Distribusi Probabilitas	Uji Kesesuaian					
		Smirnov-Kolmogorof			Chi-Kuadrat		
		Δ maks	Δ kritis	Keterangan	Δ maks	Δ kritis	Keterangan
-1	-2	-3	-4	-5	-6	-7	-8
1	Gumbel	0,162	0,41	Dapat diterima	1,2	5,991	Dapat Diterima
2	Log Pearson Type III	0,640	0,41	Tidak Dapat diterima	1,2	5,991	Dapat diterima
3	Normal	0,230	0,41	Dapat diterima	1,2	5,991	Dapat Diterima
4	Log Normal	0,205	0,41	Dapat diterima	2	5,991	Dapat diterima

Fig. 6. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

B. *Reliability Analysis of Guriola Reservoir Capacity*

Parameters that influence the calculation of reservoir capacity include evapotranspiration which in this study is calculated using the Modified Penman method. In addition, the parameter that influences this calculation is the water demand for the community as a result of the projection for the next ten years, namely in 2029 with a population of 3351 people. The results of reliability calculations with various rain scenarios indicate that the water in the reservoir cannot meet the community's water needs. The simulation of the reservoir operation pattern was successful in months with moderately high rainfall ranging from January to May and failed in the dry season months with a total water requirement of 0.08 m3/sec. For the reliability of dry water discharge, the probability of reservoir reliability is 47%, with a reservoir failure probability of 53%. In contrast, for normal discharge, the reservoir reliability probability is 64%, with a reservoir failure probability of 36%.

C. *Optimization Analysis*

Optimization is carried out using a linear program with the help of an excel solver to obtain the optimum function in a linear equation, then the objective function and the limiting function must first be known. The objective function and the target function formulate the main objective, namely the relationship between the variables to be optimized. And the mathematical model used in the optimization is as follows.

1. Objective function
   - Maximize Fp Value
2. Constraint function
   - Reservoir Balance Constraint [KW-i]

     $Ii + Si - Oi - Si{+}1 = 0$

     Where :
     Ii = series of inflow discharge to reservoir
     Si = the first active reservoir series of the period
     Oi = reservoir discharge series
   - Active Storage Constraint

     $Si \leq C$

     Where:
     Si = the first active reservoir series of the period
     C = reservoir active storage capacity
   - Release Constraints

     $Oi - FpRi \geq 0$

     Where:
     Oi = reservoir discharge series
     Fp = fulfillment factor
     Ri = demand discharge series in supply area

D. *Optimization Results*

For the water management in the Guriola Reservoir with a capacity of about 0.0885 million/m3 to run correctly and efficiently according to its function, optimization is carried out to find the most optimal release to maximize the percentage of water fulfillment. After that, the results of the optimization calculations are compared with the simulation results based on water balance. Moreover, for the optimization of the Guriola Reservoir with this limited storage capacity, the optimum solution is obtained after optimization after optimization.

1. Maximum Fp for dry water discharge of 7%, with an average optimal discharge of 0.0074 million/m3 and reservoir reliability of 89%
2. Maximum Fp for normal water discharge of 11% with an average optimal discharge of 0.0076 million/m3 and reservoir reliability of 92%
3. Maximum Fp for sufficient water flow with a maximum Fp of 61%. With optimal discharge, the average water discharge is 0.0066 million/m3, and the reservoir reliability is 100%

The highest rainfall occurs in December for the three most significant release scenarios, and the highest inflow occurs in January. For the complete calculation and running results in Excel Solver, see Figures 7-12.

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No	Bulan	Periode	Jumlah	Inflow	Kebutuhan Air Baku	A	Evaporasi	Total Outflow	S_{n+1}	S akhir periode	S total periode	Spillout	El Mk Air Wdk	Keterangan
			Hari	(juta m^3)	(juta m^3)	km^2	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(m)	
[1]	[2]	[3]	[4]	[5]	[10]	[12]	[13]	[15]	[16]	[17]	[18]	[19]	[20]	[21]
										0.09	0.09			
1	Jan.	1	15	0.01819	0.0105	0.10650	0.0010	0.1057	0.088	0.09	0.09	0.00000	56.000	sukses
2		2	16	0.01941	0.0112	0.10650	0.0010	0.0194	0.000	0.00	0.00	0.00000	46.200	gagal
3	Feb.	1	15	0.01628	0.0105	0.10650	0.0010	0.0163	0.000	0.00	0.00	0.00000	46.200	gagal
4		2	14	0.01411	0.0091	0.10650	0.0009	0.0141	0.000	0.00	0.00	0.00000	46.200	gagal
5	Mar.	1	15	0.01190	0.0105	0.10650	0.0008	0.0029	0.000	0.00	0.00	0.00000	46.200	gagal
6		2	16	0.01270	0.0112	0.10650	0.0009	0.0009	0.009	0.01	0.01	0.00000	49.127	sukses
7	Apr.	1	15	0.00950	0.0105	0.10650	0.0009	0.0008	0.021	0.02	0.02	0.00000	50.468	sukses
8		2	15	0.00950	0.0105	0.10650	0.0009	0.0008	0.029	0.03	0.03	0.00000	51.208	sukses
9	Mei	1	15	0.00735	0.0105	0.10650	0.0011	0.0008	0.038	0.04	0.04	0.00000	51.843	sukses
10		2	16	0.00784	0.0112	0.10650	0.0012	0.0009	0.045	0.04	0.04	0.00000	52.320	sukses
11	Jun.	1	15	0.00607	0.0105	0.10650	0.0011	0.0008	0.052	0.05	0.05	0.00000	52.829	sukses
12		2	15	0.00607	0.0105	0.10650	0.0011	0.0008	0.057	0.06	0.06	0.00000	53.239	sukses
13	Jul.	1	15	0.00470	0.0105	0.10650	0.0011	0.0008	0.062	0.06	0.06	0.00000	53.670	sukses
14		2	16	0.00502	0.0112	0.10650	0.0012	0.0009	0.066	0.07	0.07	0.00000	53.988	sukses
15	Agt.	1	15	0.00376	0.0105	0.10650	0.0013	0.0008	0.070	0.07	0.07	0.00000	54.286	sukses
16		2	16	0.00401	0.0112	0.10650	0.0014	0.0009	0.073	0.07	0.07	0.00000	54.497	sukses
17	Sept.	1	15	0.00311	0.0105	0.10650	0.0014	0.0008	0.076	0.08	0.08	0.00000	54.721	sukses
18		2	15	0.00311	0.0105	0.10650	0.0014	0.0008	0.078	0.08	0.08	0.00000	54.885	sukses
19	Okt.	1	15	0.00241	0.0105	0.10650	0.0014	0.0008	0.081	0.08	0.08	0.00000	55.040	sukses
20		2	16	0.00257	0.0112	0.10650	0.0015	0.0009	0.082	0.08	0.08	0.00000	55.132	sukses
21	Nop.	1	15	0.00243	0.0105	0.10650	0.0013	0.0008	0.084	0.08	0.08	0.00000	55.231	sukses
22		2	15	0.00243	0.0105	0.10650	0.0013	0.0008	0.085	0.09	0.09	0.00000	55.324	sukses
23	Des.	1	15	0.00224	0.0105	0.10650	0.0014	0.0008	0.087	0.09	0.09	0.00000	55.418	sukses
24		2	16	0.00238	0.0112	0.10650	0.0015	0.0009	0.088	0.09	0.09	0.00	56.000	sukses

Fig. 7. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

No	Bulan	Periode	Jumlah	Inflow	Kebutuhan Air Baku	A	Evaporasi	Total Outflow	S_{n+1}	S akhir periode	S total periode	Spillout	El Mk Air Wdk	Keterangan
			Hari	(juta m^3)	(juta m^3)	km^2	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(m)	
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
										0.09	0.09			
1	Jan.	1	15	0.01854	0.0105	0.107	0.0010	0.1060	0.088	0.088	0.089	0.000	56.000	sukses
2		2	16	0.01977	0.0112	0.107	0.0010	0.0187	0.000	0.000	0.000	0.000	46.200	gagal
3	Feb.	1	15	0.01696	0.0105	0.107	0.0010	0.0170	0.000	0.000	0.000	0.000	46.200	gagal
4		2	14	0.01469	0.0091	0.107	0.0009	0.0114	0.000	0.000	0.000	0.000	46.200	gagal
5	Mar.	1	15	0.01208	0.0105	0.107	0.0008	0.0012	0.003	0.003	0.004	0.000	47.842	sukses
6		2	16	0.01288	0.0112	0.107	0.0009	0.0013	0.014	0.014	0.014	0.000	49.801	sukses
7	Apr.	1	15	0.00993	0.0105	0.107	0.0009	0.0012	0.026	0.026	0.026	0.000	50.916	sukses
8		2	15	0.00993	0.0105	0.107	0.0009	0.0012	0.034	0.034	0.035	0.000	51.570	sukses
9	Mei	1	15	0.00740	0.0105	0.107	0.0011	0.0012	0.043	0.043	0.043	0.000	52.207	sukses
10		2	16	0.00790	0.0112	0.107	0.0012	0.0013	0.049	0.049	0.050	0.000	52.658	sukses
11	Jun.	1	15	0.00612	0.0105	0.107	0.0011	0.0012	0.056	0.056	0.056	0.000	53.157	sukses
12		2	15	0.00612	0.0105	0.107	0.0011	0.0012	0.061	0.061	0.061	0.000	53.558	sukses
13	Jul.	1	15	0.00474	0.0105	0.107	0.0011	0.0012	0.066	0.066	0.066	0.000	53.960	sukses
14		2	16	0.00505	0.0112	0.107	0.0012	0.0013	0.069	0.069	0.069	0.000	54.217	sukses
15	Agt.	1	15	0.00379	0.0105	0.107	0.0013	0.0012	0.073	0.073	0.073	0.000	54.485	sukses
16		2	16	0.00404	0.0112	0.107	0.0014	0.0013	0.075	0.075	0.076	0.000	54.668	sukses
17	Sept.	1	15	0.00313	0.0105	0.107	0.0014	0.0012	0.078	0.078	0.078	0.000	54.864	sukses
18		2	15	0.00313	0.0105	0.107	0.0014	0.0012	0.080	0.080	0.080	0.000	55.000	sukses
19	Okt.	1	15	0.00243	0.0105	0.107	0.0014	0.0012	0.082	0.082	0.082	0.000	55.112	sukses
20		2	16	0.00259	0.0112	0.107	0.0015	0.0013	0.083	0.083	0.083	0.000	55.181	sukses
21	Nop.	1	15	0.00267	0.0105	0.107	0.0013	0.0012	0.084	0.084	0.085	0.000	55.256	sukses
22		2	15	0.00267	0.0105	0.107	0.0013	0.0012	0.086	0.086	0.086	0.000	55.340	sukses
23	Des.	1	15	0.00253	0.0105	0.107	0.0014	0.0012	0.087	0.087	0.088	0.000	55.424	sukses
24		2	16	0.00281	0.0112	0.107	0.0015	0.0013	0.088	0.088	0.089	0.000	56.000	sukses

Fig. 8. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

No	Bulan	Periode	Jumlah	Inflow	Kebutuhan Air Baku	A	Evaporasi	Total Outflow	S_{n+1}	S akhir periode	S total periode	Spillout	El Mk Air Wdk	Keterangan
			Hari	(juta m^3)	(juta m^3)	km^2	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(juta m^3)	(m)	
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
										0.09	0.09			
1	Jan.	1	15	0.01865	0.0105	0.107	0.0010	0.0065	0.088	0.088	0.089	0.00	56.000	sukses
2		2	16	0.01989	0.0112	0.107	0.0010	0.0069	0.177	0.088	0.089	0.09	56.000	sukses
3	Feb.	1	15	0.01728	0.0105	0.107	0.0010	0.0065	0.265	0.088	0.089	0.18	56.000	sukses
4		2	14	0.01497	0.0091	0.107	0.0009	0.0056	0.041	0.041	0.041	0.00	52.044	sukses
5	Mar.	1	15	0.01246	0.0105	0.107	0.0008	0.0065	0.049	0.049	0.050	0.00	52.664	sukses
6		2	16	0.01329	0.0112	0.107	0.0009	0.0069	0.055	0.055	0.055	0.00	53.050	sukses
7	Apr.	1	15	0.01032	0.0105	0.107	0.0009	0.0065	0.060	0.060	0.060	0.00	53.506	sukses
8		2	15	0.01032	0.0105	0.107	0.0009	0.0065	0.063	0.063	0.063	0.00	53.749	sukses
9	Mei	1	15	0.00747	0.0105	0.107	0.0011	0.0065	0.066	0.066	0.066	0.00	53.992	sukses
10		2	16	0.00797	0.0112	0.107	0.0012	0.0069	0.066	0.066	0.066	0.00	53.985	sukses
11	Jun.	1	15	0.00618	0.0105	0.107	0.0011	0.0065	0.066	0.066	0.066	0.00	53.977	sukses
12		2	15	0.00618	0.0105	0.107	0.0011	0.0065	0.064	0.064	0.065	0.00	53.859	sukses
13	Jul.	1	15	0.00478	0.0105	0.107	0.0011	0.0065	0.063	0.063	0.063	0.00	53.741	sukses
14		2	16	0.00510	0.0112	0.107	0.0012	0.0069	0.060	0.060	0.060	0.00	53.511	sukses
15	Agt.	1	15	0.00383	0.0105	0.107	0.0013	0.0065	0.057	0.057	0.057	0.00	53.264	sukses
16		2	16	0.00408	0.0112	0.107	0.0014	0.0069	0.053	0.053	0.053	0.00	52.945	sukses
17	Sept.	1	15	0.00316	0.0105	0.107	0.0014	0.0065	0.049	0.049	0.049	0.00	52.635	sukses
18		2	15	0.00316	0.0105	0.107	0.0014	0.0065	0.044	0.044	0.045	0.00	52.291	sukses
19	Okt.	1	15	0.00245	0.0105	0.107	0.0014	0.0065	0.040	0.040	0.040	0.00	51.947	sukses
20		2	16	0.00261	0.0112	0.107	0.0015	0.0069	0.034	0.034	0.034	0.00	51.549	sukses
21	Nop.	1	15	0.00293	0.0105	0.107	0.0013	0.0065	0.028	0.028	0.029	0.00	51.125	sukses
22		2	15	0.00293	0.0105	0.107	0.0013	0.0065	0.023	0.023	0.024	0.00	50.713	sukses
23	Des.	1	15	0.00264	0.0105	0.107	0.0014	0.0065	0.019	0.019	0.019	0.00	50.270	sukses
24		2	16	0.00281	0.0112	0.107	0.0015	0.0069	0.013	0.013	0.014	0.00	49.704	sukses

Fig. 9. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

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DATA		Variabel		Fungsi Tujuan	0.0795		
Fn	0.0885	Keputusan					
C	0.09			Kendala KW-1	-0.08	=	0
		Fp	0.0795	Kendala KW-2	0.00	=	0
I1	0.01819	O1	0.10568	Kendala KW-3	0.00	=	0
I2	0.01941	O2	0.01941	Kendala KW-4	0.00	=	0
I3	0.01628	O3	0.01628	Kendala KW-5	0	=	0
I4	0.01411	O4	0.01411	Kendala KW-6	0	=	0
I5	0.01190	O5	0.00292	Kendala KW-7	0	=	0
I6	0.01270	O6	0.00089	Kendala KW-8	0	=	0
I7	0.00950	O7	0.00084	Kendala KW-9	0	=	0
I8	0.00950	O8	0.00084	Kendala KW-10	0	=	0
I9	0.00735	O9	0.00084	Kendala KW-11	0	=	0
I10	0.00784	O10	0.00089	Kendala KW-12	0	=	0
I11	0.00607	O11	0.00084	Kendala KW-13	0	=	0
I12	0.00607	O12	0.00084	Kendala KW-14	0	=	0
I13	0.00470	O13	0.00084	Kendala KW-15	0	=	0
I14	0.00502	O14	0.00089	Kendala KW-16	0	=	0
I15	0.00376	O15	0.00084	Kendala KW-17	0	=	0
I16	0.00401	O16	0.00089	Kendala KW-18	0	=	0
I17	0.00311	O17	0.00084	Kendala KW-19	0	=	0
I18	0.00311	O18	0.00084	Kendala KW-20	0	=	0
I19	0.00241	O19	0.00084	Kendala KW-21	0	=	0
I20	0.00257	O20	0.00089	Kendala KW-22	0	=	0
I21	0.00243	O21	0.00084	Kendala KW-23	0	=	0
I22	0.00243	O22	0.00084	Kendala KW-24	0.08	=	0
I23	0.00224	O23	0.00084	Kendala Tamp Aktif-2	0.000	≤	0.0885
I24	0.00238	O24	0.00089	Kendala Tamp Aktif-3	0	≤	0.0885
		S2	0.000	Kendala Tamp Aktif-4	0	≤	0.0885
R1	0.01052	S3	0.000	Kendala Tamp Aktif-5	0	≤	0.0885
R2	0.01122	S4	0.000	Kendala Tamp Aktif-6	0.009	≤	0.0885
R3	0.01052	S5	0.000	Kendala Tamp Aktif-7	0.0208	≤	0.0885
R4	0.00912	S6	0.009	Kendala Tamp Aktif-8	0.0295	≤	0.0885
R5	0.01052	S7	0.021	Kendala Tamp Aktif-9	0.0381	≤	0.0885
R6	0.01122	S8	0.029	Kendala Tamp Aktif-10	0.0446	≤	0.0885
R7	0.01052	S9	0.038	Kendala Tamp Aktif-11	0.0516	≤	0.0885
R8	0.01052	S10	0.045	Kendala Tamp Aktif-12	0.0568	≤	0.0885
R9	0.01052	S11	0.052	Kendala Tamp Aktif-13	0.0621	≤	0.0885
R10	0.01122	S12	0.057	Kendala Tamp Aktif-14	0.0659	≤	0.0885
R11	0.01052	S13	0.062	Kendala Tamp Aktif-15	0.07	≤	0.0885
R12	0.01052	S14	0.066	Kendala Tamp Aktif-16	0.073	≤	0.0885
R13	0.01052	S15	0.070	Kendala Tamp Aktif-17	0.0761	≤	0.0885
R14	0.01122	S16	0.073	Kendala Tamp Aktif-18	0.0784	≤	0.0885
R15	0.01052	S17	0.076	Kendala Tamp Aktif-19	0.0806	≤	0.0885
R16	0.01122	S18	0.078	Kendala Tamp Aktif-20	0.0822	≤	0.0885
R17	0.01052	S19	0.081	Kendala Tamp Aktif-21	0.0839	≤	0.0885
R18	0.01052	S20	0.082	Kendala Tamp Aktif-22	0.0855	≤	0.0885
R19	0.01052	S21	0.084	Kendala Tamp Aktif-23	0.0871	≤	0.0885
R20	0.01122	S22	0.085	Kendala Tamp Aktif-24	0.0885	≤	0.0885
R21	0.01052	S23	0.087	Kendala Lepasan-1	0.10	≥	0
R22	0.01052	S24	0.088	Kendala Lepasan-2	0.02	≥	0
R23	0.01052			Kendala Lepasan-3	0.02	≥	0
R24	0.01122			Kendala Lepasan-4	0.01	≥	0
				Kendala Lepasan-5	0.00	≥	0
E1	0.0010			Kendala Lepasan-6	0.00	≥	0
E2	0.0010			Kendala Lepasan-7	0.00	≥	0
E3	0.0010			Kendala Lepasan-8	0.00	≥	0
E4	0.0009			Kendala Lepasan-9	0.00	≥	0
E5	0.0008			Kendala Lepasan-10	0.00	≥	0
E6	0.0009			Kendala Lepasan-11	0.00	≥	0
E7	0.0009			Kendala Lepasan-12	0.00	≥	0
E8	0.0009			Kendala Lepasan-13	0.00	≥	0
E9	0.0011			Kendala Lepasan-14	0.00	≥	0
E10	0.0012			Kendala Lepasan-15	0.00	≥	0
E11	0.0011			Kendala Lepasan-16	0.00	≥	0
E12	0.0011			Kendala Lepasan-17	0.00	≥	0
E13	0.0011			Kendala Lepasan-18	0.00	≥	0
E14	0.0012			Kendala Lepasan-19	0.00	≥	0
E15	0.0013			Kendala Lepasan-20	0.00	≥	0
E16	0.0014			Kendala Lepasan-21	0.00	≥	0
E17	0.0014			Kendala Lepasan-22	0.00	≥	0
E18	0.0014			Kendala Lepasan-23	0.00	≥	0
E19	0.0014			Kendala Lepasan-24	0.00	≥	0
E20	0.0015						
E21	0.0013						
E22	0.0013						
E23	0.0014						
E24	0.0015						

Fig. 10. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

DATA		Variabel		Fungsi Tujuan	0.1178352		
Fn	0.0885	Keputusan					
C	0.09			Kendala KW-1	-0.08	=	0
		Fp	0.1178	Kendala KW-2	0.00	=	0
I1	0.01854	O1	0.10603	Kendala KW-3	0.00	=	0
I2	0.01977	O2	0.01874	Kendala KW-4	0.00	=	0
I3	0.01696	O3	0.01696	Kendala KW-5	0.00	=	0
I4	0.01469	O4	0.01140	Kendala KW-6	0.00	=	0
I5	0.01208	O5	0.00124	Kendala KW-7	0.00	=	0
I6	0.01288	O6	0.00132	Kendala KW-8	0.00	=	0
I7	0.00993	O7	0.00124	Kendala KW-9	0.00	=	0
I8	0.00993	O8	0.00124	Kendala KW-10	0.00	=	0
I9	0.00740	O9	0.00124	Kendala KW-11	0.00	=	0
I10	0.00790	O10	0.00132	Kendala KW-12	0.00	=	0
I11	0.00612	O11	0.00124	Kendala KW-13	0.00	=	0
I12	0.00612	O12	0.00124	Kendala KW-14	0.00	=	0
I13	0.00474	O13	0.00124	Kendala KW-15	0.00	=	0
I14	0.00505	O14	0.00132	Kendala KW-16	0.00	=	0
I15	0.00379	O15	0.00124	Kendala KW-17	0.00	=	0
I16	0.00404	O16	0.00132	Kendala KW-18	0.00	=	0
I17	0.00313	O17	0.00124	Kendala KW-19	0.00	=	0
I18	0.00313	O18	0.00124	Kendala KW-20	0.00	=	0
I19	0.00243	O19	0.00124	Kendala KW-21	0.00	=	0
I20	0.00259	O20	0.00132	Kendala KW-22	0.00	=	0
I21	0.00267	O21	0.00124	Kendala KW-23	0.00	=	0
I22	0.00267	O22	0.00124	Kendala KW-24	0.08	=	0
I23	0.00253	O23	0.00124	Kendala Tamp Aktif-2	0.000	≤	0.0885
I24	0.00281	O24	0.00132	Kendala Tamp Aktif-3	0.000	≤	0.0885
		S2	0.000	Kendala Tamp Aktif-4	0.000	≤	0.0885
R1	0.0105	S3	0.000	Kendala Tamp Aktif-5	0.003	≤	0.0885
R2	0.0112	S4	0.000	Kendala Tamp Aktif-6	0.014	≤	0.0885
R3	0.0105	S5	0.003	Kendala Tamp Aktif-7	0.026	≤	0.0885
R4	0.0091	S6	0.014	Kendala Tamp Aktif-8	0.034	≤	0.0885
R5	0.0105	S7	0.026	Kendala Tamp Aktif-9	0.043	≤	0.0885
R6	0.0112	S8	0.034	Kendala Tamp Aktif-10	0.049	≤	0.0885
R7	0.0105	S9	0.043	Kendala Tamp Aktif-11	0.056	≤	0.0885
R8	0.0105	S10	0.049	Kendala Tamp Aktif-12	0.061	≤	0.0885
R9	0.0105	S11	0.056	Kendala Tamp Aktif-13	0.066	≤	0.0885
R10	0.0112	S12	0.061	Kendala Tamp Aktif-14	0.069	≤	0.0885
R11	0.0105	S13	0.066	Kendala Tamp Aktif-15	0.073	≤	0.0885
R12	0.0105	S14	0.069	Kendala Tamp Aktif-16	0.075	≤	0.0885
R13	0.0105	S15	0.073	Kendala Tamp Aktif-17	0.078	≤	0.0885
R14	0.0112	S16	0.075	Kendala Tamp Aktif-18	0.080	≤	0.0885
R15	0.0105	S17	0.078	Kendala Tamp Aktif-19	0.082	≤	0.0885
R16	0.0112	S18	0.080	Kendala Tamp Aktif-20	0.083	≤	0.0885
R17	0.0105	S19	0.082	Kendala Tamp Aktif-21	0.084	≤	0.0885
R18	0.0105	S20	0.083	Kendala Tamp Aktif-22	0.086	≤	0.0885
R19	0.0105	S21	0.084	Kendala Tamp Aktif-23	0.087	≤	0.0885
R20	0.0112	S22	0.086	Kendala Tamp Aktif-24	0.088	≤	0.0885
R21	0.0105	S23	0.087	Kendala Lepasan-1	0.10	≥	0
R22	0.0105	S24	0.088	Kendala Lepasan-2	0.02	≥	0
R23	0.0105			Kendala Lepasan-3	0.02	≥	0
R24	0.0112			Kendala Lepasan-4	0.01	≥	0
				Kendala Lepasan-5	0.00	≥	0
				Kendala Lepasan-6	0.00	≥	0
E1	0.0010			Kendala Lepasan-7	0.00	≥	0
E2	0.0010			Kendala Lepasan-8	0.00	≥	0
E3	0.0010			Kendala Lepasan-9	0.00	≥	0
E4	0.0009			Kendala Lepasan-10	0.00	≥	0
E5	0.0008			Kendala Lepasan-11	0.00	≥	0
E6	0.0009			Kendala Lepasan-12	0.00	≥	0
E7	0.0009			Kendala Lepasan-13	0.00	≥	0
E8	0.0009			Kendala Lepasan-14	0.00	≥	0
E9	0.0011			Kendala Lepasan-15	0.00	≥	0
E10	0.0012			Kendala Lepasan-16	0.00	≥	0
E11	0.0011			Kendala Lepasan-17	0.00	≥	0
E12	0.0011			Kendala Lepasan-18	0.00	≥	0
E13	0.0011			Kendala Lepasan-19	0.00	≥	0
E14	0.0012			Kendala Lepasan-20	0.00	≥	0
E15	0.0013			Kendala Lepasan-21	0.00	≥	0
E16	0.0014			Kendala Lepasan-22	0.00	≥	0
E17	0.0014			Kendala Lepasan-23	0.00	≥	0
E18	0.0014			Kendala Lepasan-24	0.00	≥	0
E19	0.0014						
E20	0.0015						
E21	0.0013						
E22	0.0013						
E23	0.0014						
E24	0.0015						

Fig. 11. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

DATA		Variabel Keputusan		Fungsi Tujuan	0.6141		
Fn	0.0885						
C	0.0885			Kendala KW-1	0.000	=	0
		Fp	0.61414	Kendala KW-2	0.000	=	0
I1	0.01865	O1	0.0065	Kendala KW-3	0.000	=	0
I2	0.01989	O2	0.0069	Kendala KW-4	0.000	=	0
I3	0.01728	O3	0.0065	Kendala KW-5	0.000	=	0
I4	0.01497	O4	0.0056	Kendala KW-6	0.000	=	0
I5	0.01246	O5	0.0065	Kendala KW-7	0.000	=	0
I6	0.01329	O6	0.0069	Kendala KW-8	0.000	=	0
I7	0.01032	O7	0.0065	Kendala KW-9	0.000	=	0
I8	0.01032	O8	0.0065	Kendala KW-10	0.000	=	0
I9	0.00747	O9	0.0065	Kendala KW-11	0.000	=	0
I10	0.00797	O10	0.0069	Kendala KW-12	0.000	=	0
I11	0.00618	O11	0.0065	Kendala KW-13	0.000	=	0
I12	0.00618	O12	0.0065	Kendala KW-14	0.000	=	0
I13	0.00478	O13	0.0065	Kendala KW-15	0.000	=	0
I14	0.00510	O14	0.0069	Kendala KW-16	0.000	=	0
I15	0.00383	O15	0.0065	Kendala KW-17	0.000	=	0
I16	0.00408	O16	0.0069	Kendala KW-18	0.000	=	0
I17	0.00316	O17	0.0065	Kendala KW-19	0.000	=	0
I18	0.00316	O18	0.0065	Kendala KW-20	0.000	=	0
I19	0.00245	O19	0.0065	Kendala KW-21	0.000	=	0
I20	0.00261	O20	0.0069	Kendala KW-22	0.000	=	0
I21	0.00293	O21	0.0065	Kendala KW-23	0.000	=	0
I22	0.00293	O22	0.0065	Kendala KW-24	0.000	=	0
I23	0.00264	O23	0.0065	Kendala Tamp Aktif-2	0.019	≤	0.0885
I24	0.00281	O24	0.0069	Kendala Tamp Aktif-3	0.031	≤	0.0885
		S2	0.0190	Kendala Tamp Aktif-4	0.041	≤	0.0885
R1	0.0105	S3	0.0310	Kendala Tamp Aktif-5	0.049	≤	0.0885
R2	0.0112	S4	0.0409	Kendala Tamp Aktif-6	0.055	≤	0.0885
R3	0.0105	S5	0.0493	Kendala Tamp Aktif-7	0.060	≤	0.0885
R4	0.0091	S6	0.0545	Kendala Tamp Aktif-8	0.063	≤	0.0885
R5	0.0105	S7	0.0601	Kendala Tamp Aktif-9	0.066	≤	0.0885
R6	0.0112	S8	0.0630	Kendala Tamp Aktif-10	0.066	≤	0.0885
R7	0.0105	S9	0.0660	Kendala Tamp Aktif-11	0.066	≤	0.0885
R8	0.0105	S10	0.0659	Kendala Tamp Aktif-12	0.064	≤	0.0885
R9	0.0105	S11	0.0658	Kendala Tamp Aktif-13	0.063	≤	0.0885
R10	0.0112	S12	0.0643	Kendala Tamp Aktif-14	0.060	≤	0.0885
R11	0.0105	S13	0.0629	Kendala Tamp Aktif-15	0.057	≤	0.0885
R12	0.0105	S14	0.0601	Kendala Tamp Aktif-16	0.053	≤	0.0885
R13	0.0105	S15	0.0571	Kendala Tamp Aktif-17	0.049	≤	0.0885
R14	0.0112	S16	0.0532	Kendala Tamp Aktif-18	0.044	≤	0.0885
R15	0.0105	S17	0.0489	Kendala Tamp Aktif-19	0.040	≤	0.0885
R16	0.0112	S18	0.0442	Kendala Tamp Aktif-20	0.034	≤	0.0885
R17	0.0105	S19	0.0395	Kendala Tamp Aktif-21	0.028	≤	0.0885
R18	0.0105	S20	0.0341	Kendala Tamp Aktif-22	0.023	≤	0.0885
R19	0.0105	S21	0.0283	Kendala Tamp Aktif-23	0.019	≤	0.0885
R20	0.0112	S22	0.0235	Kendala Tamp Aktif-24	0.013	≤	0.0885
R21	0.0105	S23	0.0186	Kendala Lepasan-1	0.000	≥	0
R22	0.0105	S24	0.0134	Kendala Lepasan-2	0.000	≥	0
R23	0.0105			Kendala Lepasan-3	0.000	≥	0
R24	0.0112			Kendala Lepasan-4	0.000	≥	0
				Kendala Lepasan-5	0.000	≥	0
E1	0.0010			Kendala Lepasan-6	0.000	≥	0
E2	0.0010			Kendala Lepasan-7	0.000	≥	0
E3	0.0010			Kendala Lepasan-8	0.000	≥	0
E4	0.0009			Kendala Lepasan-9	0.000	≥	0
E5	0.0008			Kendala Lepasan-10	0.000	≥	0
E6	0.0009			Kendala Lepasan-11	0.000	≥	0
E7	0.0009			Kendala Lepasan-12	0.000	≥	0
E8	0.0009			Kendala Lepasan-13	0.000	≥	0
E9	0.0011			Kendala Lepasan-14	0.000	≥	0
E10	0.0012			Kendala Lepasan-15	0.000	≥	0
E11	0.0011			Kendala Lepasan-16	0.000	≥	0
E12	0.0011			Kendala Lepasan-17	0.000	≥	0
E13	0.0011			Kendala Lepasan-18	0.000	≥	0
E14	0.0012			Kendala Lepasan-19	0.000	≥	0
E15	0.0013			Kendala Lepasan-20	0.000	≥	0
E16	0.0014			Kendala Lepasan-21	0.000	≥	0
E17	0.0014			Kendala Lepasan-22	0.000	≥	0
E18	0.0014			Kendala Lepasan-23	0.000	≥	0
E19	0.0014			Kendala Lepasan-24	0.000	≥	0
E20	0.0015						
E21	0.0013						
E22	0.0013						
E23	0.0014						

Fig. 12. Smirnov and Chi-Square Test Recapitulation Results for each Distribution.

V. Conclusion

Based on the Water Balance Analysis results, there is a water deficit during the dry season, ranging from April to December, with a maximum discharge of 0.011 million/m^3 for the dry discharge scenario, 0.0218 million/m^3 for the typical and wet discharge scenario. With the reliability level of dry water discharge, the probability of reservoir reliability is 47%, with a 53% chance of reservoir failure. In comparison, for normal discharge, the reservoir's reliability is 64%, with a 36% chance of reservoir failure. For wet discharge, the reservoir reliability is 61%, with reservoir failure. by 39%.

After optimization, there is an increase in the percentage of fulfillment of each rain scenario so that the water contained in the Guriola Embung reservoir can be well distributed to the community. The maximum Fp result for dry water discharge is 7%, with an average optimal discharge of 0.0074 million/m^3, the maximum Fp for normal water discharge is 11% with an average optimal discharge of 0.0076 million/m3, the maximum Fp for water discharge with a maximum Fp of 61%. With optimal discharge, the average water discharge is 0.0066 million/m3 to meet water needs of 0.008 m^3/s with a total served population of 3351 people.

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