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ORIGINAL

Distribution of Rain Intensity: Daily Maximum Rainfall Data in The Province of South Sumatera and West Sumatera

Distribución de la intensidad de la lluvia: datos de precipitación máxima diaria en la provincia de Sumatra del Sur y Sumatra Occidental

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ABSTRACT

The high intensity of rain in May 2024 caused flooding in the Sumatra region, especially Padang City and Palembang City. The region of West Sumatra is also known as the ethalae of disasters with frequent earthquakes, floods, and landslides. In Indonesia, many frequency analyses are conducted using the Gumbel distribution without testing data and clear hydrological reasons. It is feared that this method is considered as a routine way, thus causing the risk of unwanted deviations, resulting in many disasters and errors in the planning of water buildings. This research aims to determine and know the type of distribution that is representative for the maximum daily rainfall frequency in West Sumatra and South Sumatra Provinces as a reference for development and disaster mitigation in the region. The research location is in West Sumatra and South Sumatra. The data used for this study were taken from daily maximum rainfall data from rain stations for 35 to 40 years from 24 rain stations in West Sumatra Province, and 16 rain stations for South Sumatra region. This type of research is development research with the 4D development model (Define, Design, Develop, Disseminate). The development method consists of four different phases: Initial Investigation, Design, Realisation and Development. The data of each station was then organised into two types of data series, namely the annual maximum data series and the annual minimum data series. The results of this data series test are expected to follow one or more types of distributions commonly used in Hydrology and Drainage. The distribution results obtained for the South Sumatra region are Gama-III and LP-III, while for the West Sumatra region the distribution types are Gama-III, LP-III Normal Log and Gembel. The conclusion obtained is that West Sumatra does not have only one type of distribution. For the type of test using the SPSS.22 application, the results obtained are goodness of fit test, parametric test, Chi-Square test, Kolmogorov Smirnov test and Anderson-Darling test and Histrogram (visual) method.

Keywords: Distribution; Maxsimum Rainfall Data; Annual Exceedances; Goodness of Fit; South Sumatra and West Sumatera Provinces.

RESUMEN

La gran intensidad de las lluvias de mayo de 2024 provocó inundaciones en la región de Sumatra, especialmente en las ciudades de Padang y Palembang. La región de Sumatra Occidental también es conocida como la etala de los desastres, con frecuentes terremotos, inundaciones y corrimientos de tierra. En Indonesia, muchos análisis de frecuencia se realizan utilizando la distribución de Gumbel sin datos de prueba ni razones

hidrológicas claras. Se teme que este método se considere una forma rutinaria, lo que provoca el riesgo de desviaciones no deseadas, que dan lugar a muchas catástrofes y errores en la planificación de las construcciones hidráulicas. El objetivo de esta investigación es determinar y conocer el tipo de distribución representativa de la frecuencia máxima de precipitaciones diarias en las provincias de Sumatra Occidental y Sumatra Meridional, como referencia para el desarrollo y la mitigación de catástrofes en la región. El lugar de la investigación se encuentra en Sumatra Occidental y Sumatra Meridional. Los datos utilizados para este estudio se tomaron de los datos de precipitaciones máximas diarias de las estaciones pluviométricas durante 35 a 40 años de 24 estaciones pluviométricas de la provincia de Sumatra Occidental, y 16 estaciones pluviométricas de la región de Sumatra Meridional. Este tipo de investigación es una investigación de desarrollo con el modelo de desarrollo 4D (Definir, Diseñar, Desarrollar, Difundir). El método de desarrollo consta de cuatro fases diferentes: Investigación inicial, Diseño, Realización y Desarrollo. A continuación, los datos de cada estación se organizaron en dos tipos de series de datos, a saber, la serie de datos máximos anuales y la serie de datos mínimos anuales. Se espera que los resultados de esta prueba de series de datos sigan uno o varios tipos de distribuciones comúnmente utilizadas en Hidrología y Drenaje. Los resultados de distribución obtenidos para la región de Sumatra Meridional son Gama-III y LP-III, mientras que para la región de Sumatra Occidental los tipos de distribución son Gama-III, LP-III Normal Log y Gembel. La conclusión obtenida es que Sumatra Occidental no tiene un solo tipo de distribución. En cuanto al tipo de prueba mediante la aplicación SPSS.22, los resultados obtenidos son la prueba de bondad de ajuste, la prueba paramétrica, la prueba de Chi-cuadrado, la prueba de Kolmogorov Smirnov y la prueba de Anderson-Darling y el método Histrograma (visual).

Palabras clave: Distribución; Datos de precipitaciones máximas; Excedencias anuales; Bondad de ajuste; Provincias de Sumatra Meridional y Sumatra Occidental.

INTRODUCTION

Palembang is one of the metropolitan cities in Indonesia that is geographically located between 2052'-305'LS and 104052'BT. The area of the city of Palembang is 400,61 km^2 with an average height of 8 meters above sea level. With the northern, eastern and western boundaries is Banyuasin district, and the southern boundary is Muara Enim district. While the city of Padang is the largest city located on the west coast of the island of Sumatra, this city is the western gateway of Indonesia from the Indian Ocean. The area of the city of Padang is 694,96 km^2 with geographical conditions bordering the sea and surrounded by hills with an altitude of 1,853 meters above sea level. Padang has a coastline of 68,126 km on the mainland of Sumatra. The author's interest in this study is due to the fact that the area studied is the same island but has a different georological position.[12]

Harto (1993)1 states that the selection of inappropriate distribution types can invite considerable errors, both 'over-estimated' and 'under-estimated', both of which are undesirable. Harto (1993) also stated that in Indonesia, frequency analysis using Gumbel distribution is carried out without data testing and clear hydrological reasons. It is feared that this method is considered a routine method, resulting in the risk of unwanted deviations. Previously, there had been research on the problem of this type of distribution, including.[11,25] The author's interest in this study is due to the fact that the area studied is the climate line of West Sumatra in general is tropical with a fairly high air temperature, which is between 22,6 °C to 31,5 °C.

This province is also traversed by the Equator, precisely in Bonjol, Pasaman. In this province, there are a number of large rivers that drain into the east coast of Sumatra such as Batang Hari, Siak, Inderagiri (referred to as Batang Kuantan in the upstream part), and Kampar. Meanwhile, the rivers that drain into the west coast are Batang Anai, Batang Arau, and Batang Tarusan5.Because of the many tributaries that stretch out, this is a characteristic for the province of West Sumatra.The goodness of fit test used is the histogram method, parametric test, Chi-Squared test, Kolmogorov-Smirnov (K-S) test and Anderson-Darling (A-D) test.[32]

METHOD

The process of conducting this research is divided into three parts, namely data collection, data processing and output in the form of conclusions and recommendations from the research results. 8 research steps are outlined as follows :

1. Collect maximum rainfall data in South Sumatra Province through the PSDA Office of South Sumatra Province and maximum rainfall data in West Sumatra Province through the PSDA of West Sumatra Province.
2. Compiling the maximum rainfall data series in South Sumatra and West Sumatra by means of annual maxima and annual exceedances;
3. Calculating the base ten logarithm or natural logarithm of the annual maxima and annual exceedances data series from the discharge data at each station. Mera (2011)3 states that data before

logging is called original data, while data after logging is called unoriginal data;

4. Create histograms of the annual maxima and annual exceedances discharge data series at each station to visually determine the distribution;

5. Calculate the statistical parameters of each annual maxima and annual exceedances data series at each station;

6. Match the calculated statistical parameters with the parameters that characterise several distributions namely Normal distribution, Normal-log distribution, Gumbel distribution and LP-III distribution;

7. Testing the distribution of data statistically by Chi-square, K-S and A-D methods. the types of distributions tested are Normal distribution, Normal-log distribution, Gumbel distribution, LP-III distribution, Gama II distribution and Gama III distribution;

8. Compare and determine the representative distribution of the Annual Maxima and Annual Exceedances data series of maximum rainfall data in South Sumatra and West Sumatra.

The procedure of the research is illustrated in the flowchart below:

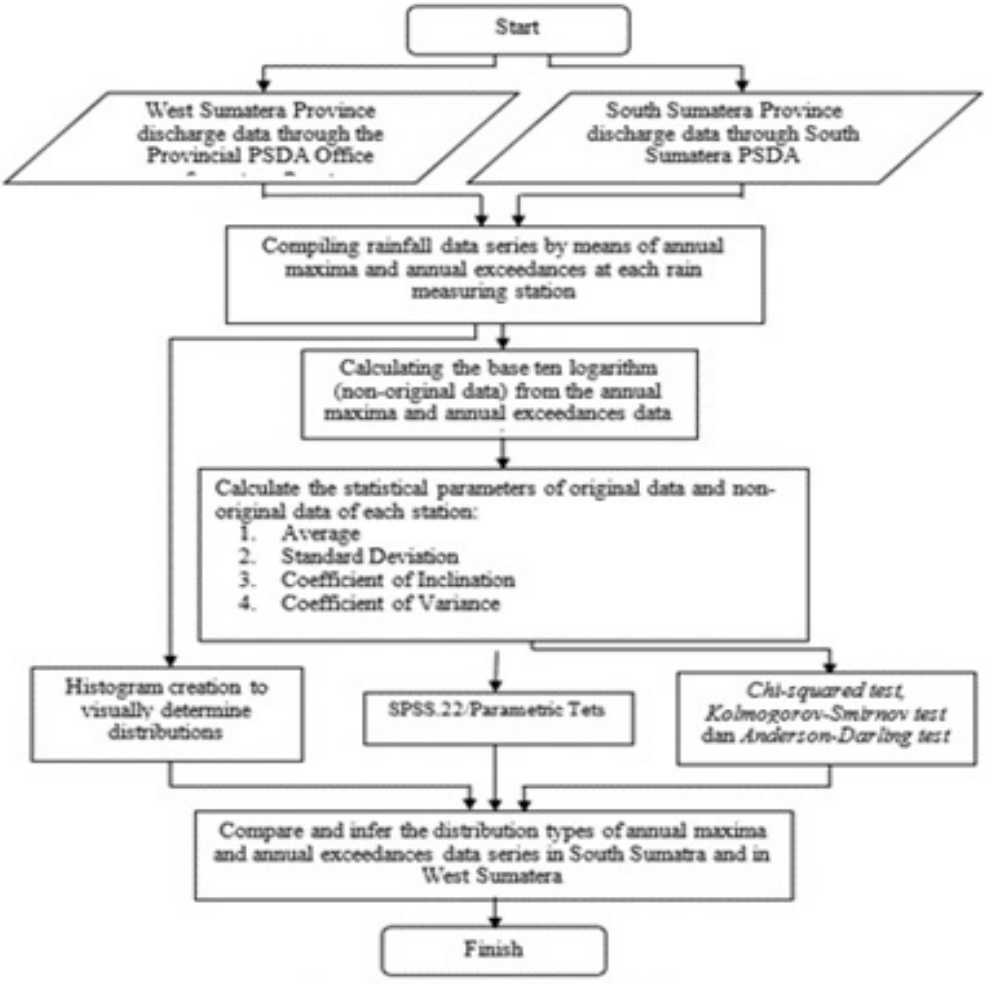

Figure 1. Research flowchart

The results obtained from this study are to determine the representative type of distribution for rainfall obtained from rainfall measuring stations in South Sumatra and West Sumatra Provinces. For this reason, the secondary objectives of this study are:

a. Compiling a series of monthly maximum rainfall data in South Sumatera and in West Sumatera with the annual maximum series and annual exceedance series.

b. Determine the distribution of daily maximum rainfall data in South Sumatera Province and in West Sumatera, visually by making a histogram.

c. Determine the distribution by parametric test, namely matching the skew coefficient of the Normal distribution, the Normal-log distribution, the Gumbel distribution, the Gama-II distribution, the Gama-III distribution and the LP-III distribution with the skew coefficient obtained from the data series in South Sumatra and West Sumatra.

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d. Determine the distribution of daily maximum rainfall data in South Sumatra and West Sumatra based on Chi-Square test, K-S test and A-D test of Normal distribution, Normal-log distribution, Gumbel distribution, Gama-II distribution, Gama-III distribution, and LP-III distribution

The data table below taken is the daily maximum rainfall for 20 years to 40 years from 1974 to 2015 in West Sumatra Province obtained from the West Sumatra Provincial PSDA Office as many as 24 (Twenty-four) stations in accordance with figure 2. based on the availability of existing data.[20]

Figure 2. Map of the Research Location

The limitations of the problem of this study are:

1. The regions studied are South Sumatra and West Sumatra
2. Topographic map and map of the location of rain stations in the provinces of South Sumatra and West Sumatra (figure 1)
3. The data taken is the data on the maximum daily rainfall for 20 years from 1994 to 2014 in South Sumatra Province which was obtained from the South Sumatra Provincial PSDA Office as many as 16 (Sixteen) stations.
4. The data taken is the maximum daily rainfall for 20 years to 40 thousand from 1973 to 2014 in West Sumatra Province which was obtained from the West Sumatra Provincial PSDA Office as many as 24 (Twenty-four) stations in accordance with Table 2. based on the availability of existing data.The following is an explanation of the table 1.1 The data taken is the daily maximum rainfall data for 20years from 1995 to 2015 in South Sumatra Province which is obtained from the PSDA Office of South Sumatra Province as many as 16 (Sixteen).

RESULTS

In compiling a data series to determine the representative distribution of planned rainfall in the provinces of South Sumatra and West Sumatra by using maximum rainfall data, the data is compiled into two types of data series, namely the annual maximum data series (series of annual maxima) and the series of annual larger data (series of annual exceedances). A series of annual maxima is a series of data obtained from a data set with a maximum value every year, where each year one data with a maximum value is taken. Meanwhile, a series of annual exceedances is a series of data obtained from a collection of n amounts of data that have a value of n years larger. This second series includes data that has a second, third, and subsequent large value in a given year that is larger than the data that has a first large value in another year.

In other words, this second data series could have taken more than one data in a given year and not in another year (Mera, 2011). Many people make histograms as an initial assumption to determine the type of distribution to the data being studied. Mera (2011) stated that the height and general shape of the histogram are useful for seeing data characteristics such as whether the data is symmetrical or tilted/tilted/skewed. Data is considered normally distributed if the histogram formed by the data is symmetrical. Meanwhile, the data is considered not normally distributed if the histogram formed by the data is skewed as shown in figure 3.

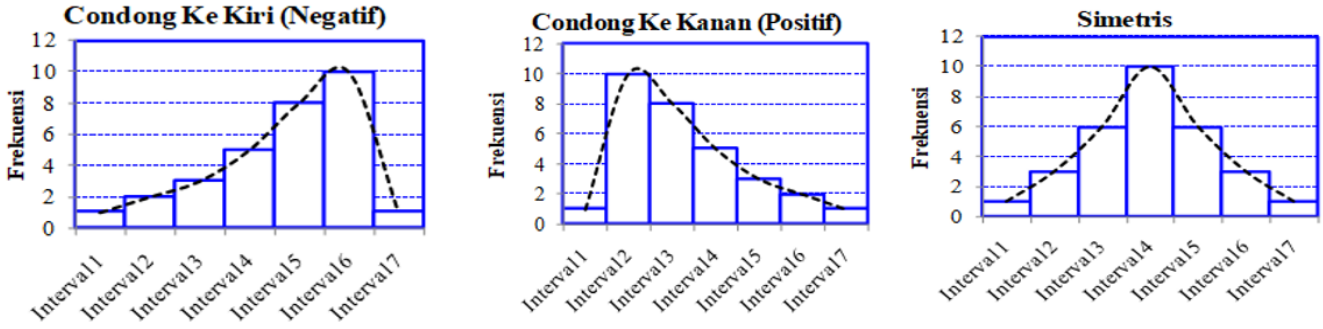

Figure 3. Tistogram formed by the data is skewed

In figure 3, it is explained that if the graphic image is skewed to the right or left, the data is not evenly distributed if it is in the middle, the distribution spreads evenly, if the pattern is skewed to the right. This means that the data follows Normal-log, Gumbel, Gama II, Gama III and LP-III distributions.

a. Data Series Matching Test with Parametric Test

The determination of distribution based on parametric tests is to calculate statistical parameters from the data and match them with the required statistical characteristics of each distribution. The distributions tested were Normal, Normal-Log, Gumbel, Gama-II, Gama-III distributions and LP-III distributions. Because in general, the data used for frequency analysis in the field of engineering hydrology is relatively small, so the coefficient of inclination is the most priority.

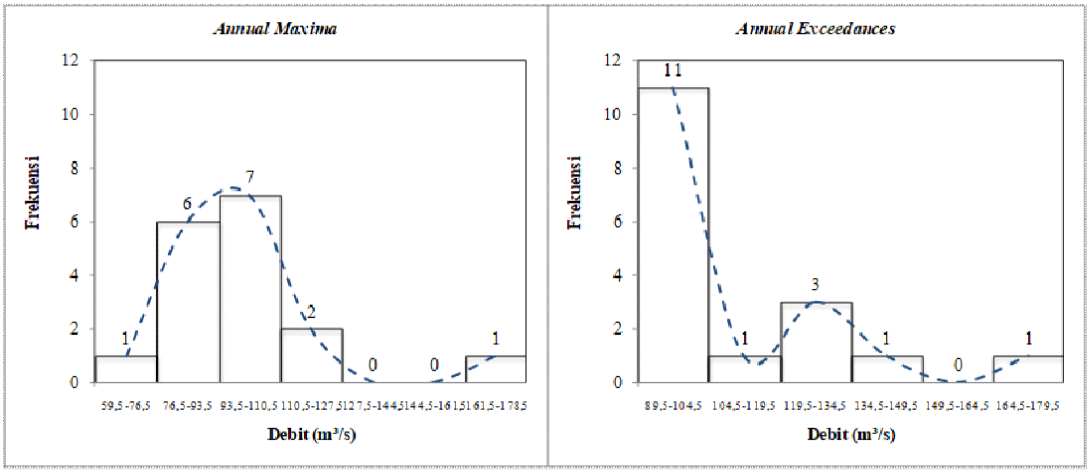

Figure 4. Histogram shape

Based on figure 4, the research results are obtained for the Histogram Shape of the Annual Maxima and Annual Exceedances Debit Data Series of Rivers in West Sumatra for Tarusan station.

Determination of distribution based on parametric test is to calculate the statistical parameters of the data and match them with the required statistical characteristics of each distribution. The distributions tested are Normal, Normal-Log, Gumbel, Gama-II, Gama-III and LP-III distributions. Since in general, the data used for frequency analysis in the field of engineering hydrology is relatively small, the skewness coefficient is the most prioritized. Figure 5 is the statistical parameters required in the parametric test.[32]

No.	Jenis Distribusi	Koefisien Kecondongan
1	Normal	$C_s = 0$
2	Normal-log	$C_s = C_v^3 + 3\,C_v$
3	Gumbel	$C_s = 1.14$
4	Gama-II	$C_s = 2\,C_v^2$
5	Gama-III	Selain syarat pada no. 1 s.d. 4
6	Log-Pearson-III	Selain syarat pada no. 1 s.d. 4

Figure 5. Statistical Parameters required by some distributions (Mera, 2011; Bedient and Huber, 1992)

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Recapitulation of the distribution type of the annual exceedances discharge data series from West Sumatra Province based on parametric tests can be seen in figures 6, 7, 8 and 9 as shown below. Figure 6 shows recapitulation of the type of distribution of the annual maxima annual discharge data series in South Sumatera based on parametric tests.

No	Nama Stasiun	Jumlah Data	$C_{s\ syarat}$						C_s	Jenis Distribusi
			N	N-L	G	G-II	G-III	LP-III		
1	Terawas	20	0	3.06	1.14	1.38	**2.83**	**2.83**	**2.83**	Gama-III dan LP-III
2	Belitang	20	0	0.53	1.14	0.06	**0.32**	**0.32**	**0.32**	Gama-III dan LP-III
3	Simpang Mambang	22	0	12.21	1.14	7.03	**5.39**	**5.39**	**5.39**	Gama-III dan LP-III
4	R- Dinggin Lama	23	0	2.19	1.14	0.83	**2.62**	**2.62**	**2.62**	Gama-III dan LP-III
5	Pagar alam	20	0	0.54	1.14	0.06	**2.14**	**2.14**	**2.14**	Gama-III dan LP-III
6	R-Muara Dua	20	**0**	1.05	1.14	0.23			**-0.04**	Normal
7	Waterpang	20	0	**0.57**	1.14	0.07			**0.51**	Normal-log
8	Muara Rupit	20	**0**	1.88	1.14	0.64			**0.07**	Normal
9	Pinang Balirk	20	0	1.07	**1.14**	0.24			**1.13**	Gumbel
10	R- Merangga	22	0	1.08	1.14	0.24	**0.59**	**0.59**	**0.59**	Gama-III dan LP-III
11	Pangkalan Balai	20	0	0.59	1.14	0.08	**0.94**	**0.94**	**0.94**	Gama-III dan LP-III
12	R-Linggasari	21	0	2.75	1.14	1.18	**3.52**	**3.52**	**3.52**	Gama-III dan LP-III
13	Sekayu	22	0	0.64	1.14	0.09	**1.56**	**1.56**	**1.56**	Gama-III dan LP-III
14	Embacang	20	0	3.09	1.14	**1.40**			**1.54**	Gama-II
15	Raksa Jiwa	23	0	2.91	**1.14**	1.28			**2.84**	Normal-log
16	Cilika	22	0	1.37	1.14	0.37	**0.58**	**0.58**	**0.58**	Gama-III dan LP-III

Figure 6. Recapitulation of the distribution type of annual excedances discharge data series in South Sumatra based on parametric tests

No	Nama Stasiun	Jumlah Data	$C_{s\ syarat}$						C_s	Jenis Distribusi
			N	N-L	G	G-II	G-III	LP-III		
1	Terawas	20	0	2.15	1.14	0.80	**2.63**	**2.63**	**2.63**	Gama-III dan LP-III
2	Belitang	20	0	0.35	1.14	0.03	**0.82**	**0.82**	**0.82**	Gama-III dan LP-III
3	Simpang Mambang	22	0	7.52	1.14	4.28	**3.80**	**3.80**	**3.80**	Gama-III dan LP-III
4	R- Dinggin Lama	23	0	1.53	1.14	0.45	**2.51**	**2.51**	**2.51**	Gama-III dan LP-III
5	Pagar alam	20	0	0.51	1.14	0.06	**2.67**	**2.67**	**2.67**	Gama-III dan LP-III
6	R-Muara Dua	20	0	**0.44**	1.14	0.04			**0.32**	Normal-log
7	Waterpang	20	0	0.31	**1.14**	0.02			**1.07**	Gumbel
8	Muara Rupit	20	0	0.44	1.14	0.04	**0.97**	**0.97**	**0.97**	Gama-III dan LP-III
9	Pinang Balirk	20	0	0.65	1.14	0.09	**1.64**	**1.64**	**1.64**	Gama-III dan LP-III
10	R- Merangga	22	0	0.52	1.14	0.06	**1.88**	**1.88**	**1.88**	Gama-III dan LP-III
11	Pangkalan Balai	20	0	0.41	**1.14**	0.04			**1.19**	Gumbel
12	R-Linggasari	21	0	2.02	1.14	0.72	**2.79**	**2.79**	**2.79**	Gama-III dan LP-III
13	Sekayu	22	0	0.54	1.14	0.06	**1.93**	**1.93**	**1.93**	Gama-III dan LP-III
14	Embacang	20	0	1.45	**1.14**	0.41			**1.26**	Gumbel
15	Raksa Jiwa	23	0	2.18	1.14	0.82	**2.81**	**2.81**	**2.81**	Gama-III dan LP-III
16	Cilika	22	0	0.69	1.14	0.10	**1.75**	**1.75**	**1.75**	Gama-III dan LP-III

Figure 7. Recapitulation of the type of distribution of the maxima annual discharge data series from West Sumatra Province based on parametric tests

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No	Nama Stasiun	Jumlah Data	C_s syarat						C_s	Jenis Distribusi
			N	N-L	G	G-II	G-III	LP-III		
1	Sungai ipuh	35	0	1.12	**1.14**	0.26			**1.25**	Gumbel
2	Tanah datar Buo	31	0	0.64	1.14	0.09	**1.84**	**1.84**	**1.84**	Gama-III dan LP-III
3	50 Koto tj Pati	34	0	1.05	1.14	0.23	**0.68**	**0.68**	**0.68**	Gama-III dan LP-III
4	50 Koto Suliki	30	0	1.01	1.14	0.21	**1.86**	**1.86**	**1.86**	Gama-III dan LP-III
5	Agam Gumarang	28	0	1.97	1.14	0.69	**1.73**	**1.73**	**1.73**	Gama-III dan LP-III
6	Agam Maninjau	30	0	0.72	1.14	0.11	**1.87**	**1.87**	**1.87**	Gama-III dan LP-III
7	Batu Busuk	38	0	1.33	1.14	0.35	**0.77**	**0.77**	**0.77**	Gama-III dan LP-III
8	Koto Tuo	40	0	0.81	1.14	0.14	**0.53**	**0.53**	**0.53**	Gama-III dan LP-III
9	Mangopoh	27	0	1.53	1.14	0.45	**3.27**	**3.27**	**3.27**	Gama-III dan LP-III
10	Padang Panjang	35	0	1.04	**1.14**	0.22			**1.29**	Gumbel
11	Pariaman Kandang IV	32	0	0.64	1.14	0.09	**1.60**	**1.60**	**1.60**	Gama-III dan LP-III
12	Pariaman Lubuk Napar	32	0	1.08	1.14	0.24	**2.37**	**2.37**	**2.37**	Gama-III dan LP-III
13	Pariaman Kasang btg anai	30	0	**0.79**	1.14	0.13			**0.72**	Normal-log
14	Solok Air Santok	33	0	**0.84**	1.14	0.15			**0.89**	Normal-log
15	Simpang Alai	39	0	1.29	1.14	0.33	**3.47**	**3.47**	**3.47**	Gama-III dan LP-III
16	Danau diatas	31	0	0.99	1.14	0.20	**1.47**	**1.47**	**1.47**	Gama-III dan LP-III
17	Pasel Surantih	30	0	0.92	1.14	0.18	**0.51**	**0.51**	**0.51**	Gama-III dan LP-III
18	Pasel Tarusan	36	0	1.30	1.14	0.34	**2.03**	**2.03**	**2.03**	Gama-III dan LP-III
19	Sijunjung	31	0	0.99	**1.14**	0.21			**1.12**	Gumbel
20	Solok Sumani	30	**0**	0.22	1.14	0.01			**-0.08**	Normal
21	Muaro labuh	40	0	1.27	**1.14**	0.32			**1.06**	Gumbel
22	Padang Gunung Nago	34	0	**2.93**	1.14	1.29			**2.98**	Normal-log
23	Pdg Pariaman Talang	32	0	0.90	1.14	0.17	**0.73**	**0.73**	**0.73**	Gama-III dan LP-III
24	Pasbar Ujung gading	30	0	0.58	1.14	0.07	**2.06**	**2.06**	**2.06**	Gama-III dan LP-III

Figure 8. Recapitulation of the distribution type of annual exceedances discharge data series from West Sumatera Province based on parametric tests

b. Data Series Matching Test with Chi-Squared Test

Chi-squared tests are applied to data that has been grouped into class intervals. Usman and Akbar (2011) stated that in the Chi-squared test, a distribution is determined based on a significant difference between the observation frequency and the theoretical frequency of a data. The distribution is acceptable if the value of Chi-squared is calculated (x2) < Chi-squared is critical (x2critical). According to Sudjana (2005), the equations used in calculating the value of x2 are:

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \qquad (1)$$

No.	Kelas Interval	Batas Kelas		Faktor Frekuensi		Peluang $F(z)$		$F(z)$ (8-7)	E_i	O_i	χ^2
		x_a	x_b	z_a	z_b	$F(z_a)$	$F(z_b)$				
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1	80 - 126	79.50	126.50	-1.234	-0.720	0.109	0.236	0.127	5.090	10	4.737
2	127 - 173	126.50	173.50	-0.720	-0.205	0.236	0.419	0.183	7.312	7	0.013
3	174 - 220	173.50	220.50	-0.205	0.309	0.419	0.621	0.203	8.108	14	4.282
4	221 - 267	220.50	267.50	0.309	0.823	0.621	0.795	0.174	6.941	5	0.543
5	268 - 314	267.50	314.50	0.823	1.338	0.795	0.909	0.115	4.587	1	2.805
6	315 - 361	314.50	361.50	1.338	1.852	0.909	0.968	0.058	2.340	1	0.767
7	362 - 408	361.50	408.50	1.852	2.366	0.968	0.991	0.023	0.921	0	0.921
8	409 - 455	408.50	455.50	2.366	2.881	0.991	0.998	0.007	0.280	0	0.280
9	456 - 502	455.50	502.50	2.881	3.395	0.998	1.000	0.002	0.066	2	57.008
					Jumlah					**40**	**71.356**

Dari hasil hitungan dapat dilihat bahwa $\chi^2 > \chi^2$kritik, atau : 71.356 > 12.592

maka distribusi ini ***ditolak***

Figure 9. Normal Distribution Chi-square Test of the annual maxima discharge data series of Muaro Labuah, Indonesia

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c. Data Series Compatibility Test with Anderson-Darling Test

The determination of distribution by the A-D test method for the annual maxima and annual exceedances data series in West Sumatra and South Sumatra is the same process. The author will explain the procedure for the annual maxima discharge data series of Muaro Labuah station. The process of determining the value of A2 for the Normal.

d. Recapitulation of the Suitability Test

Recapitulation of the goodness of fit test on the annual maxima discharge data series in West Sumatra and in South Sumatra. While figure 9 is a comparison chart of distribution types in West Sumatra and in South Sumatera. A goodness of fit test against the annual Exsedences data series while Figures 10 and 11 are a comparison chart of distribution types in West Sumatra and in South Sumatra.

No.	Metode Pengujian	Jenis Distribusi						Ditolak
		N	N-L	G	G-II	G-III	LP-III	
I	**Sumatera Barat**							
1	Histogram	-			**23**			1
2	Uji Parametrik	1	3	6	1	**13**		-
3	*Chi-square test*	1	2	3	3	4	**10**	1
4	*Kolmogorov-Smirnov test*	1	**12**	3	3	2	3	-
5	*Anderson-Darling test*	3	**9**	4	2	3	3	-
II	**Sumatera Selatan**							
1	Histogram	-			**16**			
2	Uji Parametrik	1	2	1	1	**11**		-
3	*Chi-square test*	-	-	5	1	1	**6**	3
4	*Kolmogorov-Smirnov test*	4	**6**	4	-	1	1	-
5	*Anderson-Darling test*	3	**7**	2	-	2	2	-

Keterangan:

: Jenis distribusi mayoritas pada masing-masing metode pengujian

Figure 9. Recapitulation of goodness of fit test results based on the Annual maxsima data series of West Sumatra Province and South Sumatera Province

From the picture above, it can be concluded that the results of the research are for the distribution results of the Rain Stations in West Sumatra and South Sumatra Provinces.

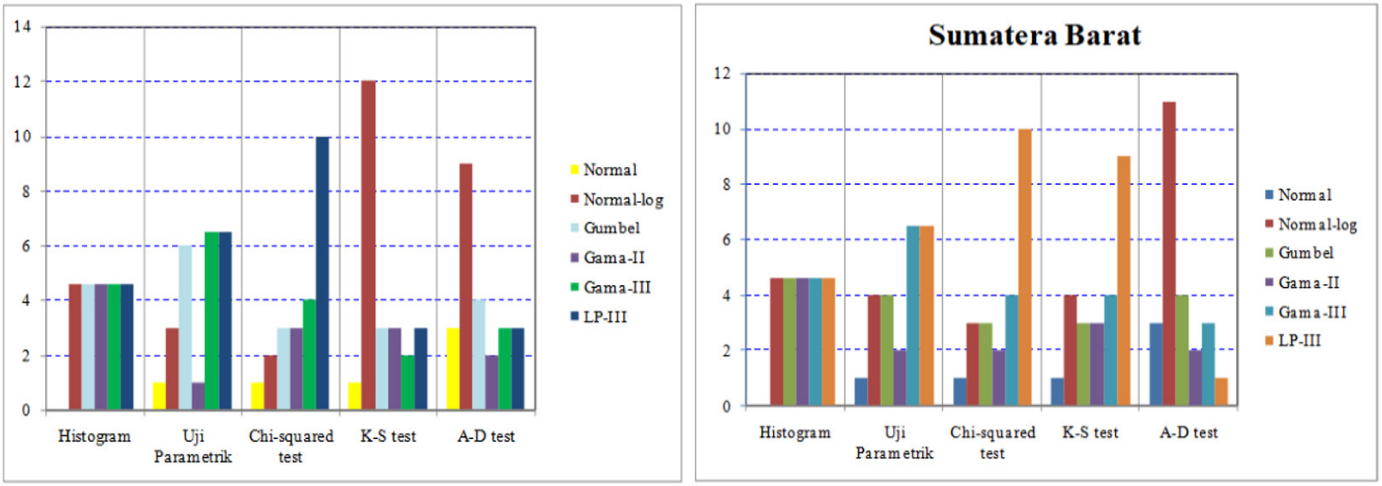

Figure 10. Comparison graph of the distribution type of goodness of fit test against the Maxsima annual data series in West Sumatera

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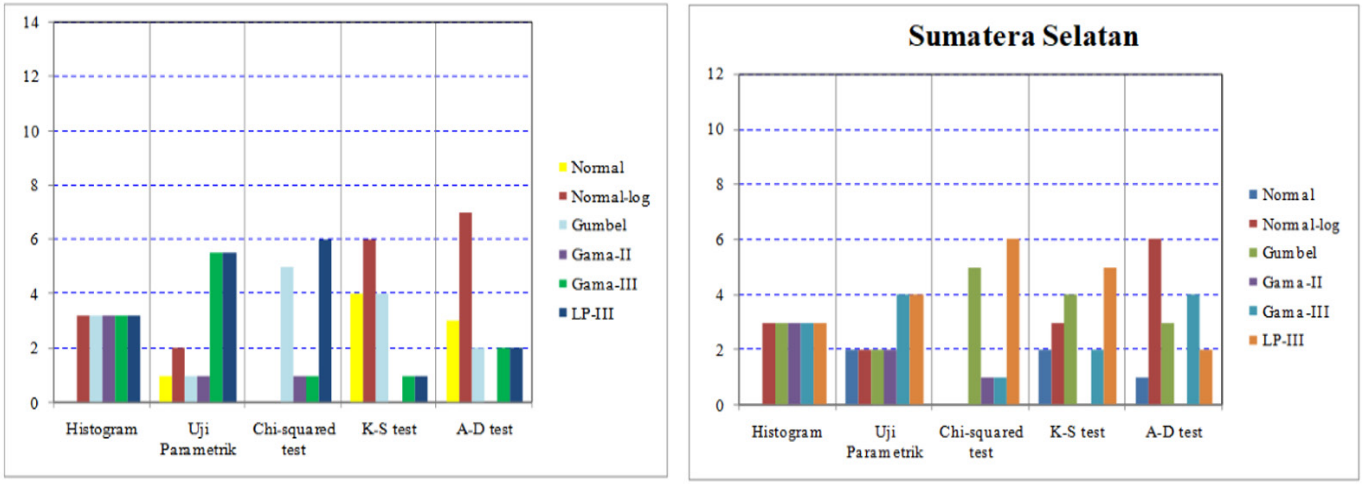

Figure 11. Comparison graph of the distribution type of goodness of fit test against the Maxsima annual data series in South Sumatera

The above is a recapitulation of the goodness of fit test of the annual maxima discharge data series in West Sumatra and South Sumatra. While figures 10 and 11 are a comparison chart of distribution types in West Sumatra and in South Sumatra.

CONCLUSION

Visually, the histogram shape of the annual maxima and annual exceedances data series in South Sumatra Province and in West Sumatra Province has a right-leaning pattern. This means that the data follows the distribution of Normal-log, Gumbel, Gama II, Gama III and LP-III distribution. Based on parametric tests in South Sumatra and in West Sumatra, the majority of data follows the Normal-Log and LP-III distributions. Based on the Chi-square test, the annual maxima data series for South Sumatra Province follows the Gamma III and LP-III distributions, and for the annual exceeded data series follows LP III, and for West Sumatra Province the annual maxima data series follows the distribution of Gumbel, Gamma-III and Log-Person Type III (LP-III), and for the annual exceeded data series follows the Normal Log.

Meanwhile, the majority of the annual exceedances data series in South Sumatra followed the LP-III distribution and in West Sumatra Province for the maxima annual data series, the majority followed the Normal-log distribution, and for the annual exceeded followed the Gama-III and LP-III distributions. Meanwhile, in West Sumatra Province, there is no representative distribution of all of these data.

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CONFLICT OF INTEREST

No conflicts of interest are disclosed by the writers.

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