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Mapping Erosivity Rain And Spatial Distribution Of Rainfall In Catchment Area Bengkulu River Watershed

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ABSTRACT

Some information from the study of the spatial and temporal distribution of these have significance in the management of water resources, such as drinking water supply, agricultural planning, analysis of flood and erosion hazard rate analysis and the effects of climate change (climate phenomenon) for the purposes of environmental management. The main objective of this study was to produce precipitation variability to spatial and temporal erosivity Catchment Area in Bengkulu River watershed based on rainfall data. The specific objective of this research is to: Produce monthly rainfall erosion by 14 stations rainfall observation post in the Catchment Area Bengkulu River watershed. Spatial interpolation models to map the R-factor values are seen in their spatial distribution. Spatial and temporal distribution of rainfall reviewed to provide basic information on the distribution patterns of rainfall at a rate of rain erosivity (R). This study focuses on the use of Bol's method for calculating the value of erosivity rainfall and calculates the spatial distribution pattern of an average value analysis Rainfall In Monthly and Yearly so be input in applying the method of spatial models IDW interpolation method.Results showed that the spatial distribution pattern as follows (1). Value Erosivity highest in January is 725, which is the highest value, the value of erosivity reached 26 was in August at Station Post observations of rainfall in the area Pagar Jati, this shows the level of erosion is very small, because of the intensity of the fall of rain sanggat rare happen. There are several factors that can affect the rate of erosion in addition to the intensity of the rainfall, Climate, soil, Relief, and Topography. (2). Monthly rainfall distribution Catchment Area Bengkulu River watershed monsoon rainfall pattern shows that there is a maximum peak in November and a minimum peak that occurred in August.

INTRODUCTION

Rainfall variability in Indonesia is very complex (Narulita, 2016). The complexity is influenced by atmospheric circulation on a regional scale is the influence of Asian-Australian monsoon (Aldrian and Susanto, 2003). An archipelago is geographically located on the equator, between Asia and Australia and between the Pacific and the Indian Ocean, located at the confluence of three major tectonic plates world is a territory that is prone to natural disasters (Sulistyo, 2016). In geomorphological have a very diverse topography that leads to local conditions (topography) is very influential in the formation of clouds and rain, which further shape and define the characteristics of rainfall (Bannu, 2003). The ability of rainwater as the cause of erosion is derived from the rate and distribution of raindrops. High rainfall and the slope are generating external force causing erosion in watersheds (Bakthiar et. Al., 2013). Catchment Area Bengkulu River watershed condition is currently the rainfall in the upper watersheds become crucial role the occurrence of surface runoff, which causes the soil becomes saturated so that the soil becomes unstable trigger erosion that triggered the avalanche events (Supriyono, 2016).

Catchment Area Rainfall in Bengkulu River watershed has a high rainfall 3035mm / year (Supriyono et al: 2015). Precipitation that falls within the watershed are inputs that would cause the various processes in the watershed. Rainfall determines the hydrologic conditions and affects the amount of erosion and sediment runoff transported together. The kinetic energy of the rain will break and release aggregate soil surface so that the trigger soil erosion. The driving force for the process of water erosion through the passage of soil particles and the formation of runoff (Nyssen et al., 2005). Prediction of soil erosion is very important for land management and land use (Oliveira et al., 2013). Rainfall is the main driving factors of rainfall soil erosion and sediment erosion results given by the rain (Yang and Yu, 2015). Erosivity rainfall totals are calculated by multiplying the kinetic energy of the rain with a maximum of 30 minutes of rainfall on the intensity of rains (Wischmeier and Smith, 1978).

The soil erosion and soil erosion/rainfall erosion factor factors are considered the most dynamic factors in the year-long change. Changes forest into open land, plantations and coal mining areas in Bengkulu River watershed indicated that influence the characteristics of the rain. To see the effect of the atmospheric circulations to the variability of rain, the rainfall analysis was made in monthly timescales for a year or depending on the availability of data. Rainfall variability affects the hydrology, water management, and ecosystem services (Ballabio et.al 2017). Spatial and temporal distribution of rainfall in the Catchment Area

Bengkulu River watershed studied to provide basic information on water resources management. Some information from the study spatial and temporal distribution is an important means in the management of water resources, such as meeting the needs of drinking water, agriculture planning, flood analysis, analysis of flood disasters, and analysis of the rate of erosion and the effects of climate change (climate phenomenon) for the purposes of other environmental management (Michaelides et al., 2009). The main objective of this study was to visualize the variability in precipitation with spatial and temporal erosivity Catchment Area in Bengkulu River watershed based on rainfall data. The specific objective of this study was to: calculate and generate monthly rainfall erosion by 14 stations rainfall observation post in the Catchment Area Bengkulu River watershed. Applying the model to map the spatial interpolation value of R-factor that is seen in the spatial distribution.

LOCATION CATCHMENT AREA

The Research was conducted during April to August 2017. The location of this research is the Catchment Area astronomically Bengkulu River watershed is located at $102^0$14'47 "east longitude -$102^0$27'47" east longitude and $3^0$40 ' 41 'South latitude -$3^0$50'30 "south latitude. Bengkulu River basin area is 51950.97 ha and is the largest river basin in the province of Bengkulu. Catchment Area Bengkulu River basin covers an area of Central Bengkulu District and Bengkulu City. The DAS thus necessary to pay serious attention to the provincial government in making policies and a watershed contained in the two areas of government. The serious attention in Bengkulu had no study hall on the watersheds that BPDAS (Hall watershed management Ketahun). Bengkulu River watershed is one of the watersheds were monitored and studies on the environmental preservation of watersheds in Indonesia. For more detail below is presented in**(Fig.1**).

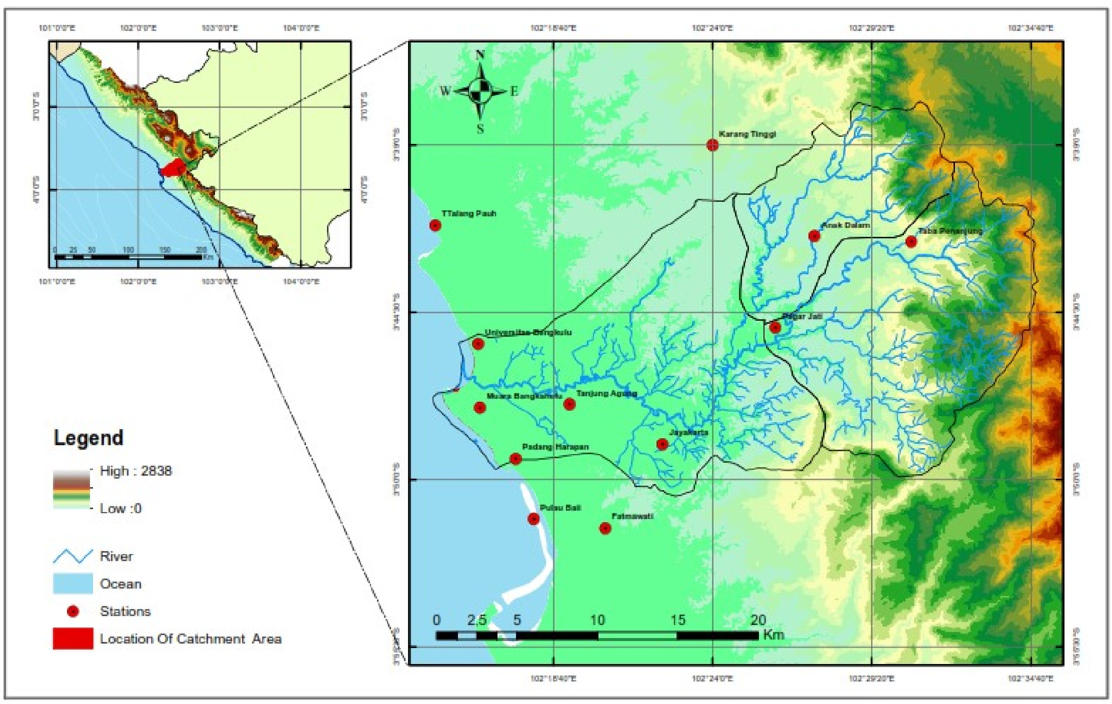


Fig.1 Location of the Catchment Area Of Watershed River Bengkulu

In this study, a serious concern is the catchment area is the area of Bengkulu River watershed upstream areas have an important role to its sustainability and preserving the environmental balance conditions in the Upper and Lower River watershed Bengkulu. Bengkulu River watershed by Supriyono (2016[b]) explains that the physical condition of the watershed should any serious attention to the policies made by the government. The government's attention for this study area is the catchment which provides a major influence on the sustainability of the hydrological elements.

When this thing that happens is the physical condition of land have a fairly high rate of degradation is in Central Bengkulu area which is an area of Bengkulu River watershed upstream. Furthermore, due to the level of degradation in the upstream of the river, then further studies in this research is to analyze and calculate the level of rainfall in the watershed erosivity Bengkulu River. Distribution of the month and annual rainfall with their assessment of the data area capable of providing a thorough rainfall in areas of high value for each bulanya erosivity can be detected. By looking at the physical condition of land that is experiencing the process of coal miners is certainly the study area soil erosion indication with rapid erosion in accordance with fluctuations in rainfall conditions. The study area into an initial calculation to see the extent of the influence of the average rainfall in the area affected by mining. Such conditions so giving out the visual field and the impact of rainfall and the amount of direct flow in the upstream watershed area of Bengkulu on erosion area.

METHODS DATA RAINFALL

Data used are monthly rainfall data from 14 stations rainfall observation posts scattered Catchment Area Bengkulu River watershed. 6 stations located around the city of Bengkulu and 8 stations located in Central Bengkulu District area and 4 stations arriving in the area outside the study. Rain Erosivity calculated using rainfall data contained in BMG (Meteorology and Climatology Station Bengkulu). In writing this article uses data station observation post rainfall in Talbot (Seluma the West), the city of Bengkulu, Bengkulu District Central and District Kepahyang for 10 years from 2006 to 2015 consisting of the number of monthly rain, the maximum rainfall, and the number of the rainy day.

Table1.Rainfall Observation Post Station

Area	Post Station	Latitude	longitude	Elevasi
Bengkulu Tengah	Anak Dalam	102.457	-3.6997	149 m
	Jayakarta	102.376	-3.8114	39 m
	Karang Tinggi	102.433	-3.7471	84 m
	Pagar Jati	102.401	-3.6503	136 m
	Taba Penanjung	102.511	-3.7031	149 m
	Talang Pauh	102.245	-3.6942	24 m
Kota Bengkulu	Muara Bangkahulu	102.295	-3.7622	
	Padang Harapan	102.29	-3.822	30 m
	Pulau Baai	102.312	-3.8652	20 m
	Tanjung Agung	102.32	-3.7922	29 m
	Unib	102.269	-3.759	8.5 m
Seluma	Sukaraja	102.418	-3.9695	24 m
Kepahyang	Seberang Musi	102.612	-3.7050	149 m

Data Analysis

Erosivity calculation method is basically a statistical calculation method, that means counting on a place or a particular point. Spatial counting can be done by considering the causes erosivity local rainfall. Spatial calculations need to be done so that efforts can be used with data-based spatial mapping input determines the level of danger of soil erosion resulting in the conservation is done in accordance with local requirements. The purpose of this study was to calculate the spatial scale rain erosivity region and then used as input for the consideration of the conservation (Widiatmaka and Soeka, True D. G, 2012).

Rain Erosivity calculated using rainfall data. Erosivity rain is the amount of rain ability to erode the soil. The higher the value erosivity rain an area, the greater the likelihood of erosion that occurs in the area. To create a map erosivity needed rain rainfall data from rainfall observation post stations across the study area and its surroundings along with the geographical coordinates of the station. Rainfall data were taken over a period of 10 years then its value is averaged to obtain annual rainfall pattern data that can be assessed to determine the level of erosivity rain. Rainfall data required are monthly rainfall, number of rainy days in a month, and the maximum amount of rainfall in the month. Erosivity monthly rainfall calculated with the formula Bols (Sulistyo, 2016):

$$\mathbf{R_m = 6{,}119\ (Rain)^{1{,}21}\ x\ (Days)^{-0{,}47}\ x\ (max\ P_m)^{0{,}53}} \quad \text{...} \ 1$$

Where $\mathbf{R_m}$ is the index erosivity monthly rainfall, **Rain** is the average rainfall in cm monthly, days is the number of average rainfall in one month, and max Pm is the average rainfall in the month maximum in centimeters.

Rainfall distribution spatially arranged with rainfall data interpolation method. Later analysis erosivity average rainfall will be made of spatial data. To process and analyze spatial data, Geographic Information Systems (GIS) are usually used. In the spatial analysis both in vector and raster format, required data covering the entire study area. Therefore, the interpolation process should be carried out to obtain a value between rainfall stain rainfall observation post located in the area of study. There are several methods that can be used to interpolate such as Trend, Spline, Inverse Distance Weighted (IDW) and cringing (Purnomo, 2008).

Each of these methods will yield different interpolation. Will be easy and beneficial for the next user if there is a study of the results of different interpolation methods so that the proper method can be selected. Usage trends and spline method has been described in Pramod (2005). This study focuses on the use of methods of IDW. Interpolation is a method to get the data based on some of the data that has been known (Wikipedia, 2008). In mapping, interpolation is a process estimated value in areas not sampled or measured, so made map or distribution of values in the entire region (Gamma Design Software, 2005). Interpolate, it is definitely produced. The error generated prior to interpolating be because of errors determine the data sampling method, errors in measurement and an error in the analysis in the laboratory.

RESULTS AND DISCUSSION

Erosivity Rain

If calculated by Bols, it was found that the value of the index erosivity that occurred in the Catchment Area of the Bengkulu River watershed at intervals during the approximately 10 years. Based on calculations that have been done, found different results adrift far enough between the results using the method of Bols. In general, the more data that is collected, the higher the level of detail. These differences occur because of the specifications of the different formulas where the application. The difference occurs because of several factors that influence it. The first level of accuracy or precision of each method and the similarities between the other formulas with different formulas. This meticulousness will greatly affect the results of the calculation.

At the time this method is applied in the area of Sumatra, Bengkulu in particular, it will lead to a different perception. This is because the climate is a little different with Java. If the climate is long and wide is different, so will the nature of the weather there is, in this case, rainfall is different. The method created by Bols has been widely and commonly used in areas in Indonesia for determining the level of erosion hazard analysis. This means that during this period no rain that can cause the amount of rain erosivity index. So that the actions erosion caused by rainwater. In the observational data are figures indicating that no rain at that time.

In addition, Bol's method has not previously been done research for use in areas in Bengkulu region. Thus it is not surprising if you find the differences in the results of each rainfall observation station at erosivity calculation. This is supported by the results of Mujiharjo (2001), which states that the formula or equation to calculate the level of rain erosivity between one region and another can vary according to the geographic nature, the weather and the rainy season in the area. Besides, between the methods with other methods have different levels of precision-annual bed.Erosivity used in the calculation of erosion is obtained from the sum of the monthly erosivity. Erosivity value calculation results at each annual rainfall stations are presented in the table below. Of rainfall data in the same month the large calculated monthly erosivity (Rm) on average. Rm value was calculated from equation 1. Obtained value Rm as follows:

Table 2. Calculation Results Using Bols

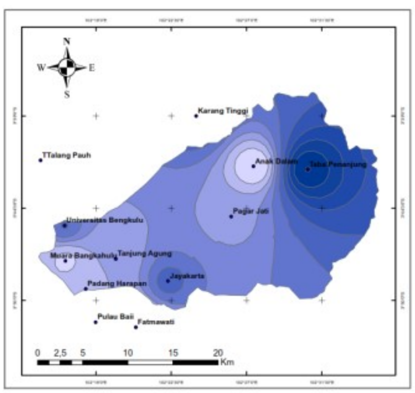
Post Station	Month												Σ
	1	2	3	4	5	6	7	8	9	10	11	12	
Anak Dalam	210	177	188	210	171	125	119	155	179	123	169	274	2100
Jayakarta	340	215	388	334	278		195	324	123	153	445	334	3271
Karang Tinggi	376	289	240	503	175	264	86	258	253	143	725	317	3628
Pagar Jati	276	89	141	160	114	81	56	26	88	128	220	113	1492
Taba Penanjung	463	314	497	410	338	209	207	185	202	185	536	388	3934
Talang Pauh	257	136	170	364	298	109	189	144	132	194	379	198	2571
M. Bangkahulu	235	193	187	217	198	86	144	114	68	82	288	180	1990
Padang Harapan	260	193	250	312	166	134	114	168	126	100	461	337	2621
Pulau Baai	303	247	316	304	148	228	145	121	125	144	406	373	2860
Tanjung Agung	270	233	209	357	191	114	173	236	113	209	416	324	2844
Unib	328	250	157	402	250	196	151	204	143	124	373	285	2863
Sukaraja	374	310	434	333	242	294	220	305	281	210	385	302	3690
Average	308	221	165	326	214	167	150	187	153	150	400	285	

Note: Units Average Units Rain Erosivity Index / Month

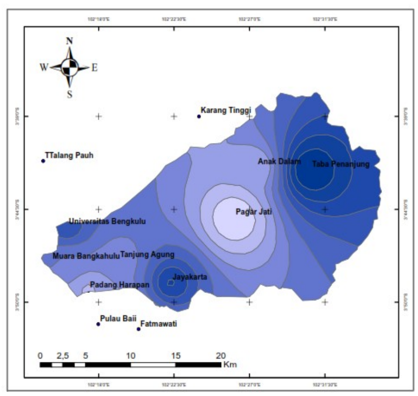
In January erosivity value reached 725 which is the highest value, so that means the highest rate of erosion on appeal in other months. An estimated value of erosivity occurred in the area in November Reef High intensity, high rainfall erosivity. It is estimated that in November and December is the peak month of rain, in the following months there was an increase and a decrease in the volatile, in June, July, August, September, and October are impaired, whereas in November, January and April the value increases, this possibility of rain intensity increased. Impaired erosivity significantly starting in July, August, September, and October with an average below 180 this happens because, in July, August, September, and October have entered the dry season, which means that the intensity of rainfall has been significantly reduced. Furthermore, erosivity value increases and decreases are not so volatile.

Erosivity value reached 26 was in August at the observation post-Stations Rainfall in the area Pagar Jati, this shows the level of erosion is very small, because of the intensity of the rain is very rare. In the following months an increasing rate of erosivity which means erosion rates have started to rise, it is in line with the increased intensity of rain, and have started entering the rainy season. Great climate factors influence on erosion are rainfall and temperature. Rain through its kinetic energy can release granules of soil particles and partly through its contribution to the runoff. Rainfall characteristics affecting soil erosion that is the amount of rainfall or the depth, intensity, and duration of rainfall (Sulistyo, 2013).

Of exposure data table that shows measurements of Units Average Rain Erosivity Index Unit/month in the year 2006-2015 in the area of Bengkulu River basin Catchment Area. On rainy days the highest amount achieved in January is 26 days, showed that this month is the peak of the rain. And D the lowest value that is in 0.6 which means gentleness of this month at the height of the dry season. The measurement results show that the greatest R-value occurred in January which is 725 cm, while in August the value of R is equal to 26 cm which indicates the number of lowest rainfall. In it is not raining or in the dry season, the R-value tends to be smaller for the month. The R-value occurs because of the rainfall in November, January, and April.



January



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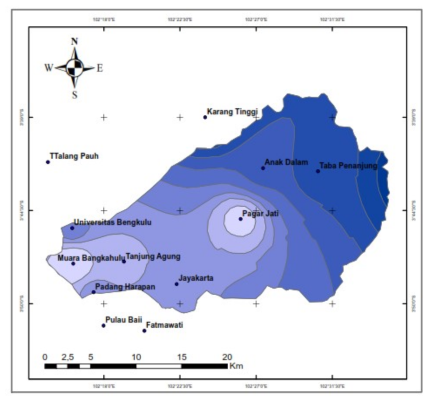

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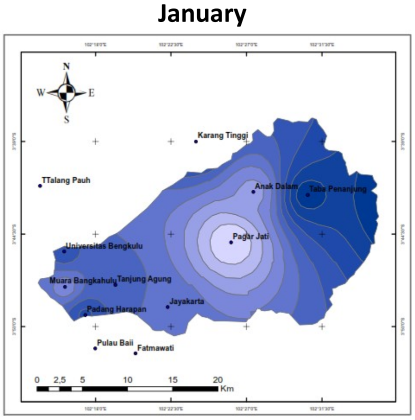

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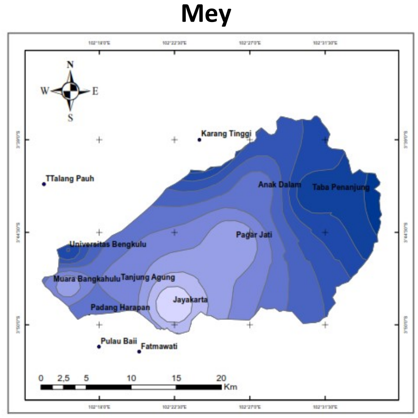

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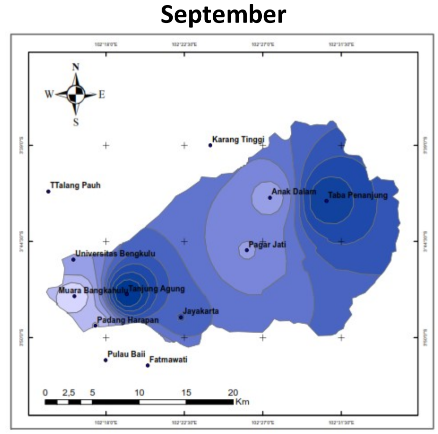

October

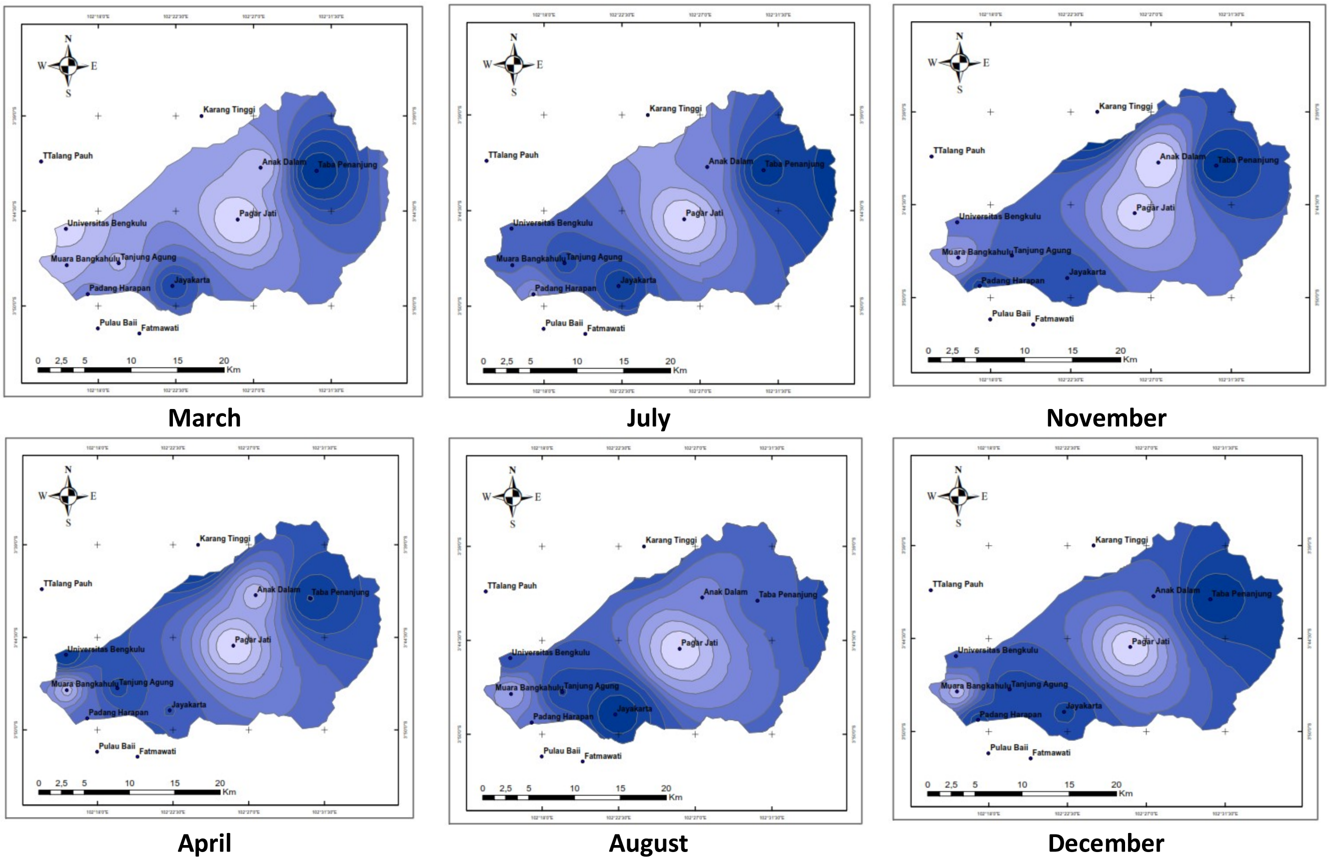

Fig 2. Average index Erosivity Rain Unit / Month

Big erosivity rain is closely related to kinetic energy or momentum, the parameters associated with the rate of precipitation or rainfall volume. Factors erosivity rain are the result of multiplying the kinetic energy (E) of the rain events with a maximum 30-minute rainfall intensity (I30).(Asdak, 2007: 357-358) Soil erosion is closely connected with the rain through the release force of raindrops on the soil surface and partly through contributions rainwater to flow (run-off). This resulted in the erosion of overland flow and erosion grooves that are generally obtained from the characteristics of the rain. (Morgan, 2005: 45) The expression most appropriate of rain erosivity is an index-based kinetic energy from rain, thus erosivity of heavy rains is a function of the intensity and the duration and period of raindrop speed diameter. (Morgan, 2005: 47) Bols (1978) in Asdak (2007: 358) use monthly precipitation at 14 stations observation rain in Bengkulu.

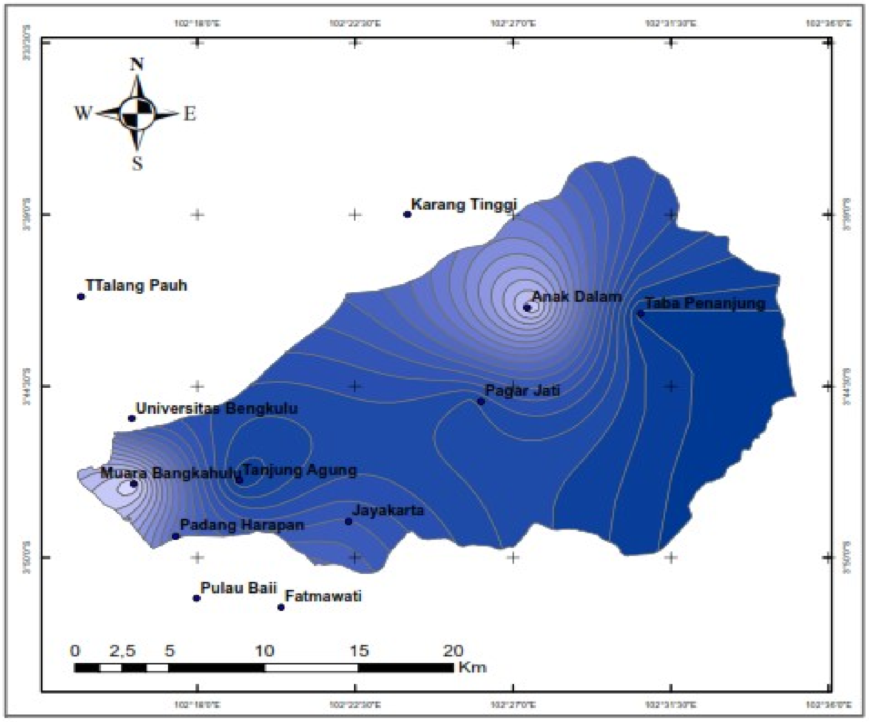

Fig 3. Annual Rain Erosivity index

Distribute Spatial and Temporal Precipitation

Based on the rain that falls in the erosion that occurs in tropical areas are generally caused due to rain. This happens because of the intensity of the rainfall in tropical regions is higher than other areas. Thick rain, rainfall intensity and distribution of rain affecting the increase in erosion. The strength of a rain to cause an erosion called erosivity. Erosivity index is a measure of the ability of rain to cause an erosion. Erosivity index can be known through heavy rainfall. Increasingly heavy rain occurs when the value will also be high erosivity which means that the ability of rain to cause erosion is very large.

Erosion that occurs in tropical areas is generally caused due to rain. This happens because of the intensity of the rainfall in tropical regions is higher than other areas. Thick rain, rainfall intensity and distribution of rain affecting the increase in erosion. The ability of rain to cause an erosion called erosivity. Erosivity index is a measure of the ability of rain to cause an erosion. Erosivity index can be known through heavy rainfall. Increasingly heavy rain occurs when the value will also be high erosivity which means that the ability of rain to cause erosion is very large. Heavy rain in the area of data was obtained through the automatic recording device of Sermo and Kokap rain station. Rainfall data is used daily rainfall data for 10 days were obtained from 4 to 13. During the 10 days of rain events occurred 8 times and 2 times no rain. Daily rainfall data is used land unit

Table 3. Average Rainfall in the Moon

Post Station	Month												Σ
	1	2	3	4	5	6	7	8	9	10	11	12	
Anak Dalam	239	232	242	271	239	160	171	179	218	185	218	325	2678
Jayakarta	322	241	310	292	234	156	172	220	135	173	418	348	3020
Karang Tinggi	324	262	217	395	192	187	123	212	202	164	554	298	3131
Pagar Jati	154	127	152	205	153	102	85	51	111	175	281	176	1771
Taba Penanjung	389	287	386	354	278	210	196	164	198	207	455	409	3533
Talang Pauh	312	183	215	394	296	139	215	195	192	231	392	293	3056
M. Bangkahulu	164	123	128	145	140	84	110	76	55	93	200	137	1455
Padang Harapan	276	204	253	287	159	137	132	152	129	133	372	364	2597
Pulau Baai	355	285	319	322	185	230	175	158	162	194	410	428	3223
Tanjung Agung	274	229	192	287	183	134	167	172	126	205	356	335	2662
Unib	349	239	197	320	231	161	155	175	144	162	369	307	2809
Sukaraja	345	258	338	269	216	232	201	227	232	212	347	326	3201
Seberang Musi	317	263	283	326	186	103	71	60	113	176	105	321	2324
Rata-Rata	294	225	248	297	207	156	152	157	155	178	344	313	2728

Under the rain that falls on the Catchment Area Bengkulu River watershed area lowest monthly rainfall of 51 mm/month in August rainfall observation post station in Pagar Jati. And Ferengi of 554 mm/month in November rainfall observation post station in the Coral High. Pursuant to the classification of Catchment Area Oldeman rain in Bengkulu River watershed has a period of 100-200 mm rainfall (humid months) five months of the month of June to October. Rain with periods of rainfall > 200 mm (in the wet) occurs as much as 7 months are November to May, while there is no period where rainfall <100 mm (dry months) Catchment Area in Bengkulu River watershed. Based on the analysis of monthly rainfall, Catchment Area Climate Bengkulu River watershed is a climate type B1.

Monthly rainfall distribution Catchment Area Bengkulu River watershed monsoon rainfall pattern which there is a maximum peak in November and a minimum peak that occurred in September. From Table 3 above human characteristics that are influenced by the monsoon. Munson wind is gusting winds periodically and the period one to period formed the opposite pattern, as in the distribution patterns formed on the average amount of annual rainfall during 2006-2015 Catchment Area in accordance Bengkulu River watershed Fig 4. Below. Spatial distribution of annual precipitation average Catchment Area in Bengkulu River watershed can be seen in Fig 4.The annual rainfall average in the Catchment Area spatial Bengkulu River watershed is around 3320 mm. Figure 4 shows that the annual rainfall distribution patterns Catchment Area in Bengkulu River watershed, also influenced by topography. Value annual rainfall average positively correlated with altitude. At a higher topography receive more rainfall (Bannu, 2003; Berliana, 1995 in Herman, 2010).

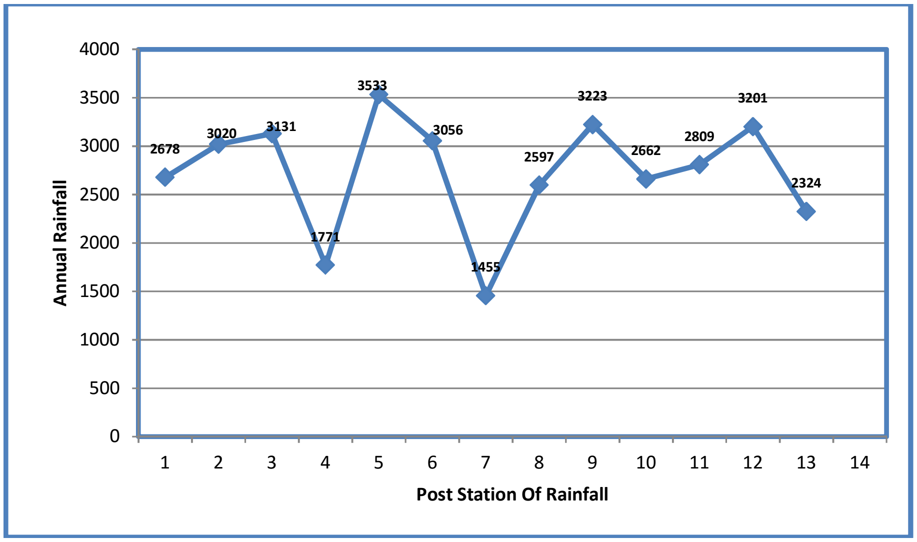

Fig 4. Distribution of Annual Rainfall

Annual rainfall is highest on Rainfall Observation Post Station 5 that rainfall observation post in the area of Central Bengkulu Regency Taba Penanjung in Figure 4 above for 3533. The indications are this area has upstream watershed erosion detected Bengkulu this is consistent with the analysis of soilNDVI_.slope soil erosion detected 0.46, 0.58 becomes 0.72 in line with the increase in surface runoff coefficient 0:48 to 0.49 and (3) Area of land cover changes on open land area is 1990 to 240.824 ha or equal 8.384%, in 2005 to 306.202 ha or at 10.661%, in 2015 to 1114.189 ha or by 38.791% and in 2016 to 1211.084 ha or by 42.164% of the total area of 2872.299 ha accelerate the rate of soil erosion and experience (Supriyono, 2017) then the current conditions based on the study appears problems downstream watershed of Bengkulu, which is based on the results of the study showed Influence coastal areas Reviews their physical shape changes occur in the vast river, Meanders and estuaries Bengkulu River watershed are the caused by the erosion and deposition rate as a result of coal mining upstream part of the river and waste coal mining activities along the riverbanks (Supriyono, 2016b). Then the data are the lowest rainfall occurred at Observation Post rainfall in Muara Bangkahulu rated the lowest annual amount of rainfall is 1455mm / year. The distribution of the amount of annual rainfall when it is done with spatial methods to determine the value of the surrounding area do spatial analysis IDW then spreading method shown in Figure 5 below. The distribution shows that the rainfall observation stations in the area of Taba Penanjung have concentrated color obtained from the calculation of the value of the rainfall distribution. Then the lowest score will reveal whitish color fading, indicated that the rainfall in the area is low, the area of the observation post stations rainfall in Muara Jati Bangkahulu and fence area.

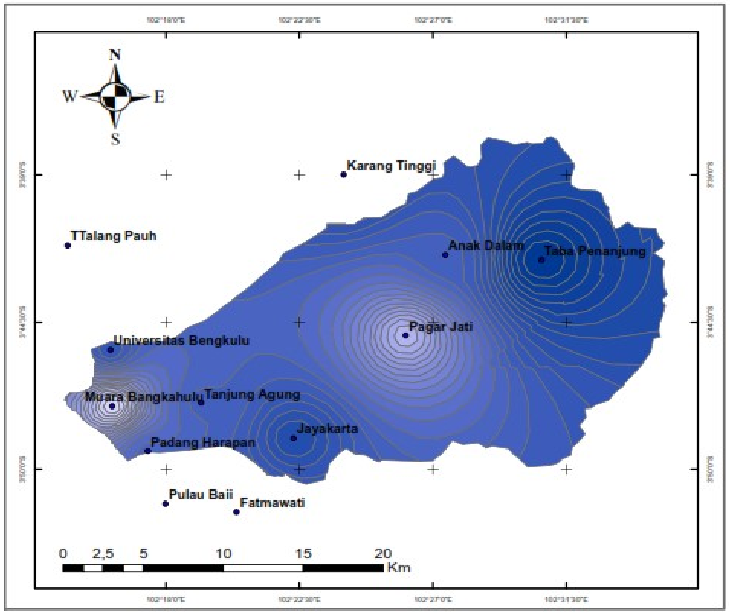

Fig 5. Distribution of Annual Rainfall

Distribution of monthly rainfall average spatial (rainfall region) Catchment Area Bengkulu River watershed in 2015 (Fig.5) and the circulation of two years of monthly rainfall average observation period 2006-2015 postal station Rainfall rain Catchment Area located in Bengkulu River watershed. Peak rainy season in November, December, and April. The first peak rainfall occurs in transitional seasons of January, April, November, and December this season saw a shift from Asia into Munson Munson Australia. In the season from March to May-June-July-Sep-Barata this October winds coming from the Indian Ocean blows over the island of Sumatra to Borneo past Belitung Island to Bengkulu (Mulyana, 2002). The shift to the north and to the south of the Inter-tropical convergence zone (ITCZ) caused a peak rainfall in April in Bengkulu River basin Catchment Area (Aldrian and Susanto, 2003). The second peak that occurred in November as a result of an increasingly strong Asian monsoon into Indonesia. At that moment the wind from Asia through the South China Sea entrance to Sumatra and West Kalimantan, near the equator, turn into the wind west after passing through the equator (Mulyana, 2002). These westerly winds through the study area Bengkulu carrying water vapor which resulted in the peak rainfall in November, December, January, and April.

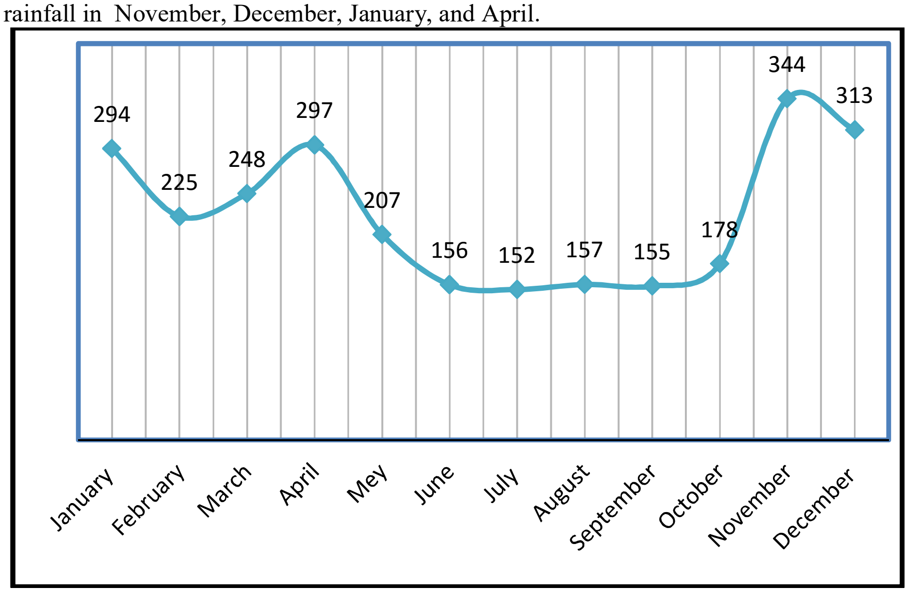

Fig 6. Average Rainfall month/year

The spatial distribution of rainfall monthly averages have been prepared using the method of average rainfall months calculated from the years 2006-2015, the results can be seen in Figure below. Figure 6 shows the spatial distribution of rainfall monthly average. In general, the monthly rainfall distribution Catchment Area in Bengkulu River watershed influenced by topography. Areas that have higher elevations will receive more rainfall than the area of lower elevation. Only in June, July, August, and September reduced the effects of topography influence. Average rainfall monthly fall in the Catchment Area Bengkulu River watershed ranged between 155 mm - 344 mm, with the average value is 277 mm per month. Lowest rainfall occurs in September with the number of monthly rainfall average of about 155 mm (Fig 6). The highest rainfall occurs in November (344 mm) and December (313mm).

CONCLUSIONS

From the results of research and discussion above it can be concluded that: Erosivity value was highest in January is 725, which is the highest value, so that means that in that month was the highest rate of erosion compared to the other months. Erosivity value reached 26 was in August at the observation post stations of rainfall in Pagar Jati area, it shows the level of erosion is very small, because of the intensity of the rain is very rare. In the following months an increasing rate of erosivity which means erosion rates have started to rise, it is in line with the increased intensity of rain, and have started entering the rainy season. There are several factors that can affect the rate of erosion in addition to the intensity of the rainfall is Climate, soil, Relief, and Topography.

Distribution of Rainfall in November and December is the peak month of rain, in the following months there was an increase and a decrease in the volatile, in June, July, August, September, and October are impaired, whereas in November, January and April's worth experiencing hike, this is the possibility of increased rainfall intensity. There was a decline began erosivity significantly starting in July, August, September, and October with an average below 180mm / month this is happening because, in July, August, September, and October have entered the dry season, which means that the intensity of the rain has been very reduced. Furthermore, erosivity value increases and decreases are not so volatile.

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