

## Study Operational Of Pelaparado Dam in Pelaparado Cacthment Area of Sumbawa River Basin (Ws)

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### ABSTRACT:

Pelaparado Watershed is one of the watersheds in the Sumbawa River Basin. Pelaparado watershed is one of the watersheds that has fluctuating water availability between the dry season and the rainy season, so a reservoir needs to be built in terms of managing the water. Overall the area of irrigation in the Pelaparado River Basin is 2,893 ha and supplies to the Keli watershed with an irrigation area of 995 ha.

The benefits of pelaparado dam are as irrigation, the supply of raw water and as electricity. The Pelaparado Dam has the following technical data: 1) Total catchment area of 85 km<sup>2</sup>, 2) Area of inundation 104 ha, 3) Maximum storage of 18 million m<sup>3</sup>, 4) Effective storage of 15 million m<sup>3</sup>, and 5) Intake capacity of 3.5 m<sup>3</sup>/s.

The results of this study are: a) The capacity of the Pelaparado Dam at Normal Water Level (TMA) is 18 million with a dead storage capacity of 3 million m<sup>3</sup>, b) The maximum elevation of the dam occurs in Dasarian January III of 2014 with a height of 150.55 masl and minimum elevation occurred in Dasarian January III in 2016 with a height of 132.04 masl, and 3) Vulnerable provision of maximum water occurred in 2015. This is in line with BMKG information that el nino was strong that year. As evidenced by the minimum rainfall data that occurs in vulnerable in 2015

**Keyword:**Dam, Pelaparado, Sumbawa.

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### I. INTRODUCTION

The Sumbawa River Basin (WS) is a national strategic river area with an area of 15,416 km<sup>2</sup> consisting of 555 Watersheds (DAS) which are divided into 103 Utility Watersheds and 452 Non Utilities Watersheds. In an effort to utilize water resources (SDA) the government is developing water buildings consisting of dams, reservoirs and dams. Dams are one of the efforts made to maintain water in the rainy season and drain it in the dry season. Pelaparado Watershed is one of the watersheds in the Sumbawa River Basin. Pelaparado watershed is one of the watersheds that has fluctuating water availability between the dry season and the rainy season, so a reservoir needs to be built in terms of managing the water. Overall the area of irrigation in the Pelaparado River Basin is 2,893 ha and supplies to the Keli watershed with an irrigation area of 995 ha. In this case the author wants to describe information about the operational

pattern of the pelaparado existing reservoir in the Pelaparado Watershed of the Sumbawa River Basin (WS).

### II. STUDY AREA

This research was conducted at the Pelaparado Dam located in the Pelaparado Watershed of Sumbawa River Basin. The Pelaparado Dam is located on the Parado River in Pela Village, Monta Subdistrict, Bima Regency and is ± 45 km southwest of Bima City. Referring to data at the Balai Wilayah Sungai (BWS) - Nusa Tenggara I, the construction of the pelaparado dam is intended to maintain food and support other mainstay commodities in Bima district and provide raw water needs with a capacity of 50 liters / second, fish and shrimp ponds, power plants microhydro power with a capacity of 250 KVA and development of tourist areas.



Figure 2.1 Condition of Pelaparado DAM in Pelaparado Watershed Of Sumbawa River Basin

### III. METHOD

#### 3.1 Benefits and Water Use of Pelaparado Dam

To find out the use of pelaparado dam water, the function of the pelaparado dam will be described previously.

##### 1. Utilization of Dams for Irrigation (Consumtif Use)

Pelaparado Dam irrigates Irrigation Area (DI) covering an area of 3,888 ha, with details as follows:

- Existing area of Irrigation Area (DI) Pelacempaka 528 ha (434 ha right intake, 100 ha intake left).
- Existing area of the Irado Irrigation Area (9) ha (444 ha right intake, 495 left intake)
- Existing area of Irrigation Area (DI) Kalate 991 ha (776 ha right intake, 216 ha left intake)

- Development of new irrigation areas in Pelaria Irrigation Area (DI) 180 ha
  - Existing area of Irrigation Area (DI) Keli 600 ha
  - Existing area of Irrigation Area (DI) Risa 395 ha
  - Existing area of the Parado Irrigation Development Area (DI) 255 ha
- ##### 2. Raw Water Demand (Consumtif Use)
- The Pelaparado Dam is used to provide clean water for Monta, Woha and Belo Subdistricts with an allowable capacity of 50 l / second
- ##### 3. Electric energy needs (Non consumtif ese) Providing electricity in the form of a microhydro power plant with a capacity of 250 KVA.

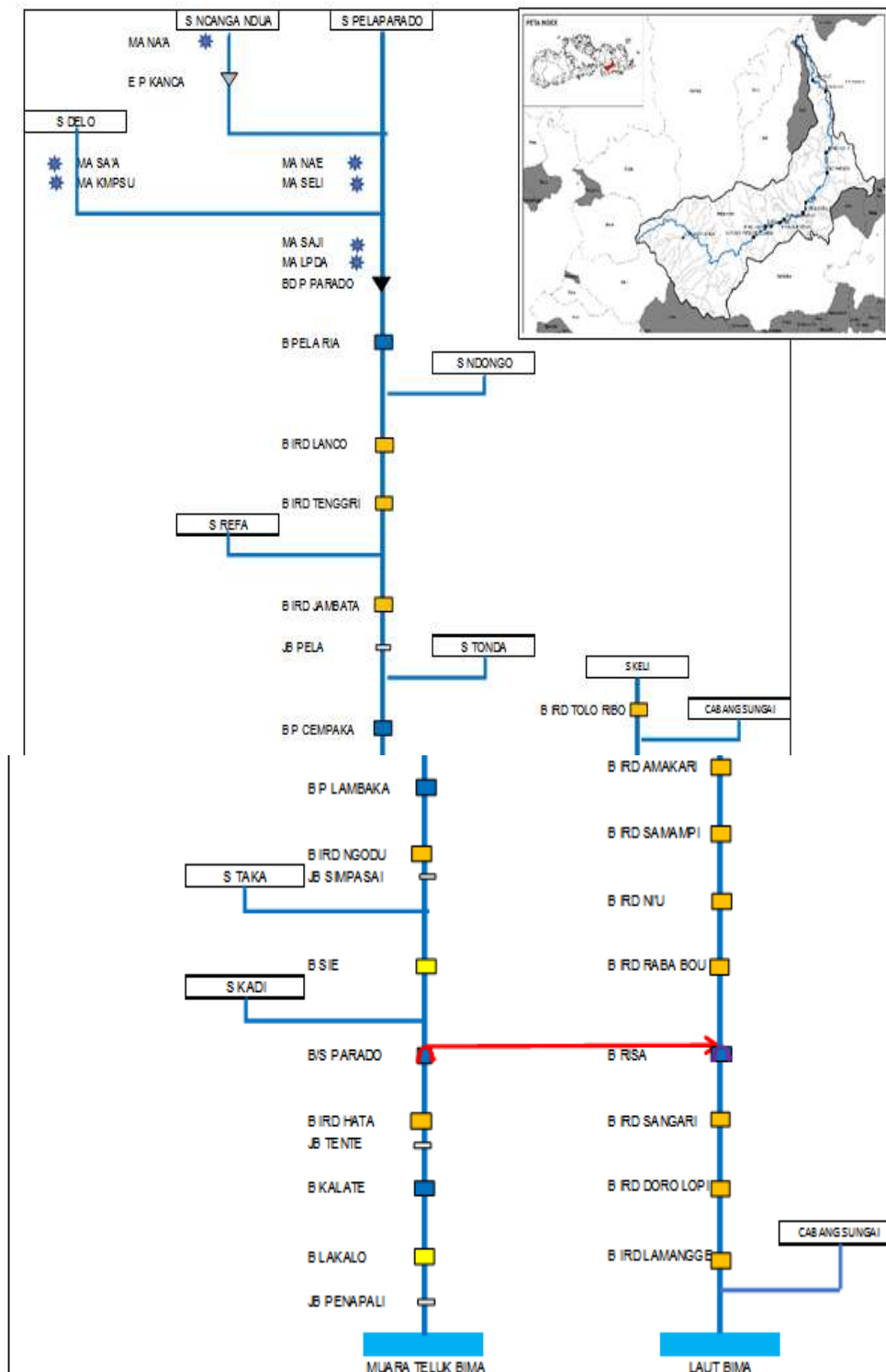


Figure 3.1 Pelaparado Dam River Scheme in Pelaparado and Keli Watersheds of Sumbawa River Basin

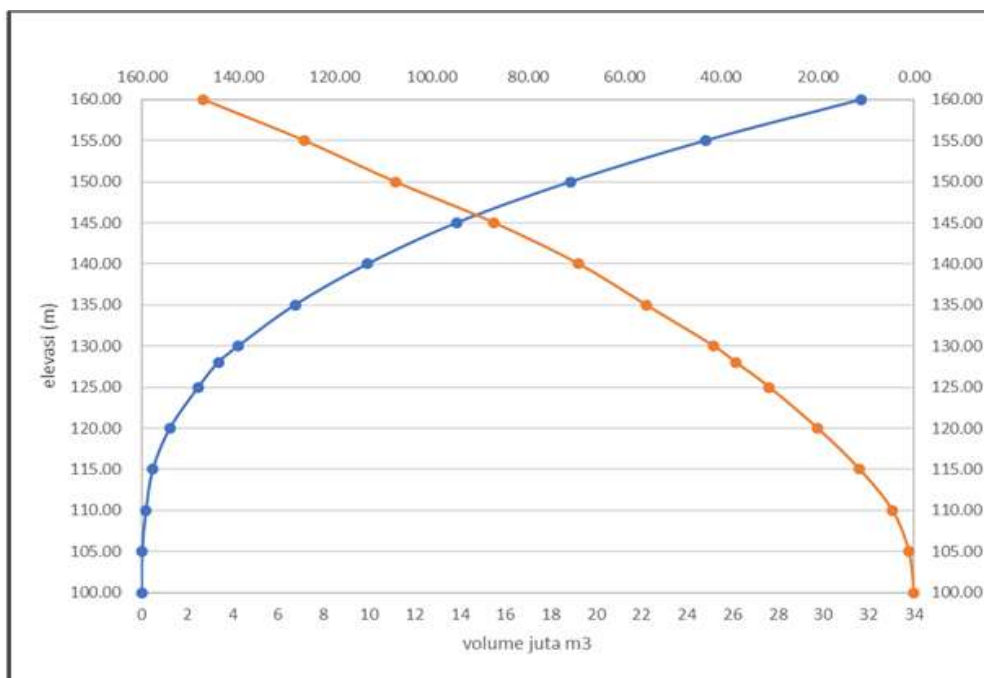
**Pelaparado Dam Technical Data**

Pelaparado Dam has technical data as follows:

- Catchment area: 85.00 km<sup>2</sup>
- Puddle Area: 104.00 ha
- Maximum Storage: 18.00 million m<sup>3</sup>
- Effective Storage: 15.00 million m<sup>3</sup>
- Dead storage: 3.00 million m<sup>3</sup>
- Flood water level elevation: + 153.87 m
- Normal water level elevation: + 150.00 m
- Minimum water level elevation: + 128.00 m
- Base Intake Elevation: + 125.00 m
- Maximum Intake Capacity: 3.50 m<sup>3</sup>/s

**Table 3.1** Curve Capacity of Pelaparado Watershed Pelaparado Dam

Water Level (m)	Puddle Area (ha)	Volume (Juta m <sup>3</sup> )
100.00	-	-
105.00	1.10	0.03
110.00	4.50	0.20
115.00	11.30	0.50
120.00	20.00	1.25
125.00	30.00	2.50
128.00	36.90	3.37
130.00	41.50	4.26
135.00	55.50	6.75
140.00	69.50	9.95
145.00	87.00	13.88
150.00	107.50	18.89
155.00	126.30	24.82
160.00	147.30	31.69



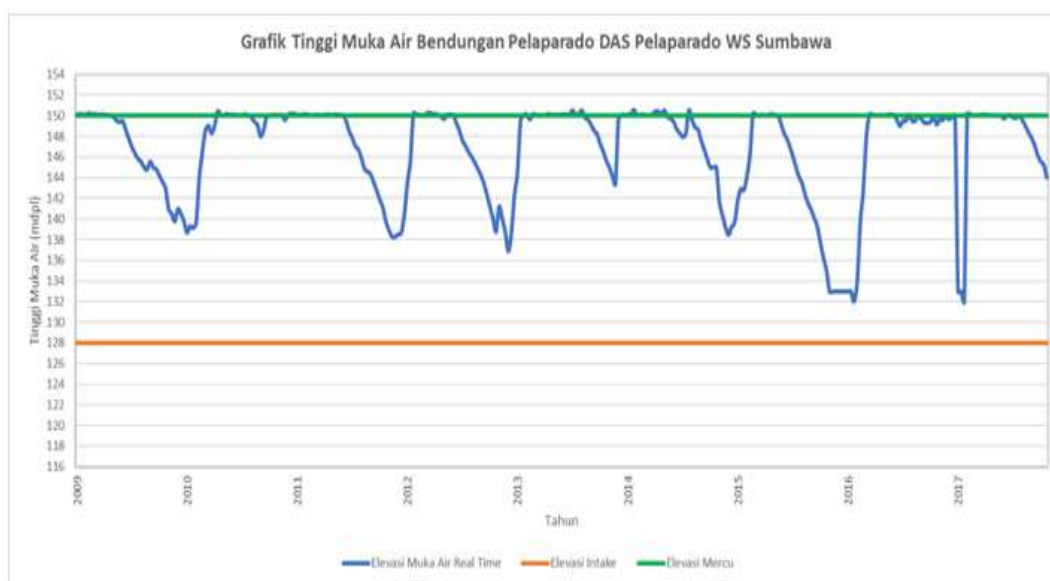
**Figure 3.2** Curve Capacity of Pelaparado Dam

#### IV. RESULT AND DISCUSSION

The following is the water level in the Pelaparado Dam during operations from January 2009 to October 2017. From these data it was found that the maximum dam elevation occurred in Dasarian January III in 2014 with a height of

#### 4.1 Pelaparado Dam Operational Data

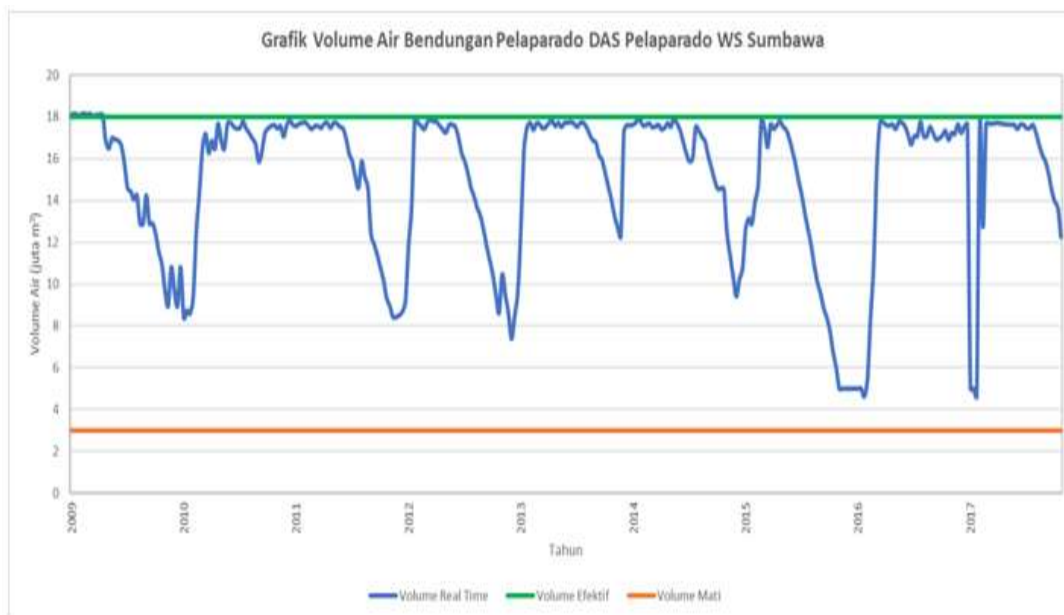
150.55 mdpl and the minimum elevation occurred in Dasarian January III in 2016 with a high 132.04 mdpl.



**Figure 4.1** Graph of the Water Level of the Pelaparado Dam in the Pelaparado Watershed of Sumbawa River Basin

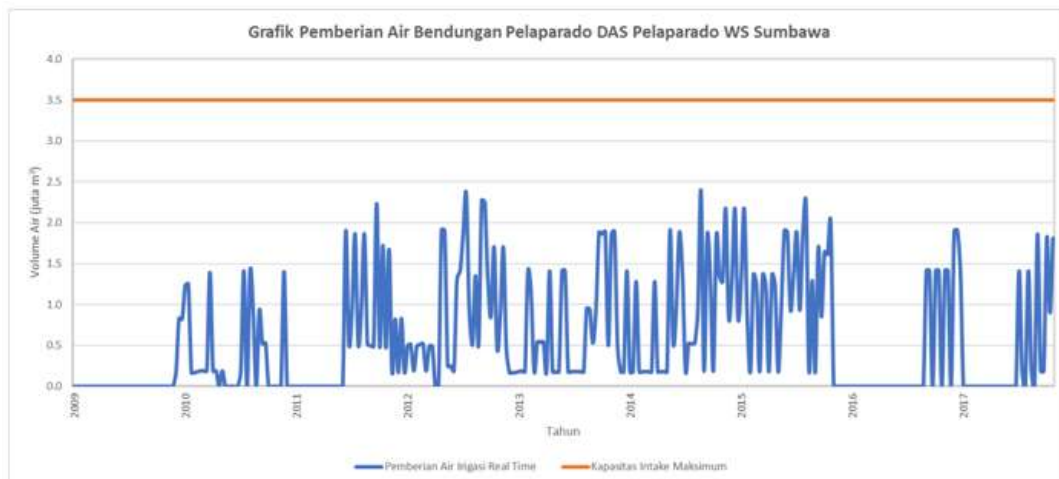
The following is the water level in the Pelaparado Dam during operations from January 2009 to October 2017. From these data it was found that the maximum elevation of the dam

occurred in Dasarian January III of 2014 with a height of 18.18 million m<sup>3</sup> and a minimum elevation occurred in Dasarian January III of 2016 with height of 4.62 million m<sup>3</sup>.



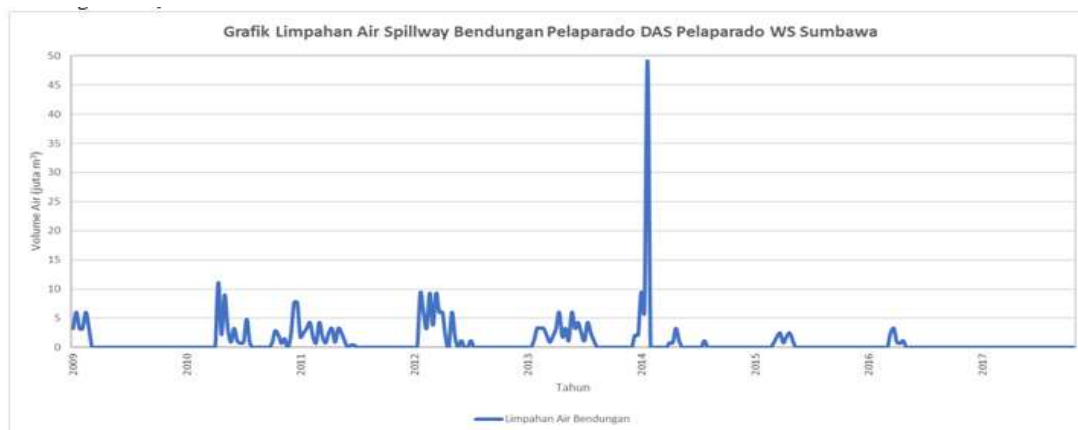
**Figure 4.2** Graph of Water Volume in Pelaparado Dam of Sumbawa River Basin

The maximum water supply occurred in 2015. The following is a graph of the Pelaparado dam water supply from 2009 to 2017.



**Figure 4.3** Graph of Water Supply for Pelaparado Dam in Pelaparado Watershed of Sumbawa River Basin

The maximum spillway runoff at the Pelaparado dam occurred in Dasarian January III in 2014, with a maximum discharge of 49,110 m<sup>3</sup> / sec.

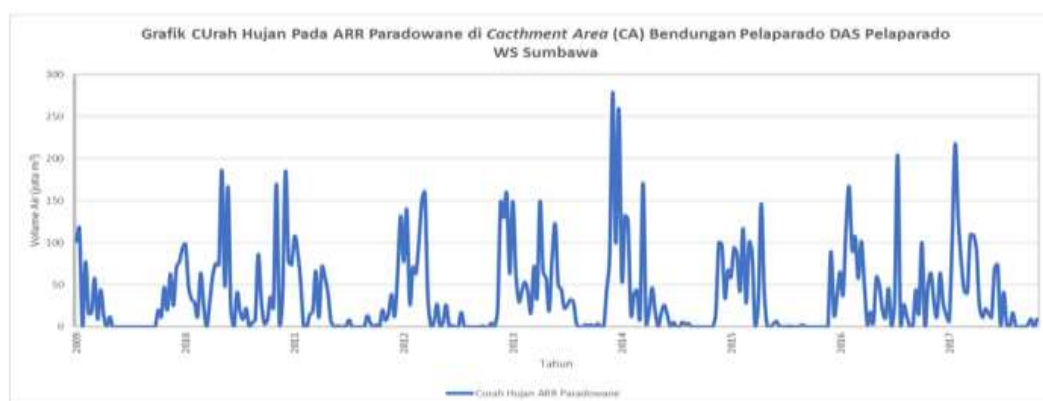


**Figure 4.4** Graph of Water Overflow for Pelaparado Dam in Pelaparado Watershed of Sumbawa River Basin

#### 4.2 Rainfall in the Catchment Area of the Pelaparado Dam

The Pelaparado Dam has a Catchment Area (CA) of 93,093 km<sup>2</sup>. Inside the area there is

an automatic rainfall recorder (ARR) paradowane. Based on the ARR, it was found that maximum rainfall of 279 mm occurred on the dasarian Dec. 2013.



**Figure 4.5** Graph of Rainfall on the ARR Paradowane at catchment area in Pelaparado Dam in Pelaparado Watershed of Sumbawa River Basin



### 4.3 Reservoir Operational Study

In 2009 the minimum reservoir water elevation at 139.79 mdpl with a reservoir volume of 8.95 million m<sup>3</sup>, in 2010 the minimum reservoir water elevation at 138.70 mdpl with a reservoir volume of 8.39 million m<sup>3</sup>, in 2011 the reservoir water minimum elevation at 138.30 mdpl with a reservoir volume of 8.42 million m<sup>3</sup>, year 2012 minimum water reservoir elevation at 136.90 mdpl with reservoir volume 7.38 million m<sup>3</sup>, 2013 minimum reservoir water elevation at 143.40 mdpl with reservoir volume 12.28 million m<sup>3</sup>, 2014 minimum reservoir water elevation at 138.49 mdpl with reservoir volume 9.41 million m<sup>3</sup>, 2015 elevation minimum water reservoir at 133.00 mdpl with a reservoir volume of 5 million m<sup>3</sup>, 2016 and 2017 reservoir water minimum elevation at 132.04 mdpl with a reservoir volume of 4.62 million m<sup>3</sup>.

Pelaparado Dam has decreased performance in providing water for irrigation needs. This can be seen from the water level which decreases from year to year. Because of this, a further study is needed regarding the operational pattern of the appropriate pelaparado reservoir.

### V. CONCLUSION

From the analysis and discussion, some conclusions can be drawn as follows:

1. The capacity of the Normal Pelaparado Dam at Normal Water Level (TMA) is 15 million with a dead storage capacity of 3 million m<sup>3</sup>.
2. The maximum elevation of the dam occurred in Dasarian January III of 2014 with a height of 150.55 masl and the minimum elevation occurred on Dasarian January III in 2016 with a height of 132.04 masl.
3. Vulnerable provision of maximum water occurs in 2015. This is in line with BMKG information that in that year there was a strong el nino. As evidenced by the minimum rainfall data that occurs in vulnerable in 2015.

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