

RAW WATER SOURCE RESEARCH IN UPPER PROGO RIVER BASIN IN ORDER TO DRINKING WATER SUPPLY SYSTEM DEVELOPMENT IN YOGYAKARTA SPECIAL REGION

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INTRODUCTION

Accomplishment of water required at 20 year in coming is instructed to use surface water sources. Considering such requirement, a qualified scenario of raw water supply should be arranged for surface water, based on historical data series and availability [Griffin, 2000]. Study of water source reliability is a vital factor to fulfilled requirement of drinking water service specially at continuity aspect [Babel, 2005].

Region study of Upper Progo River Basin is located in Province of Central Java and Provinsi of Special Region Yogyakarta. The area of Progo River Basin \pm 3.238,89 km², with river long is \pm 138 km. Exploiting water in Progo River are most for irrigation. The water source plan for the development of SPAM D. I. Yogyakarta come from a base flow of river of Upper Progo which is located in 500 m up-stream of Barrage Kalibawang. River water allocation guidance for irrigation and domestic uses is based on the water allocation criterion for irrigation and domestic uses from Dep. PU.

The aim from this research is studying precisely development of water resources in Upper Progo River Basin in order to improve multisector water source (drinking water and irrigation) Yogyakarta Special Province. Whereas targets of this research particularly are: study of water resources potency in Upper Progo River Basin by undertaking research to precipitation and discharge river, determine reliability of water discharge quantity for the future bases criterion of water allocation for various of needs, compile strategy and action plan of water allocation accomplishment for drinking water and irrigation till the coming year 10-20 and searching of optimal management way Upper Progo River Basin to care of water in the forthcoming.

METHODOLOGY

Data processing is conducted by fulfill empty content of rain data with simple linear regression method and generate discharge data by using continue method that assume rain posts and discharge post with big correlation have a discharge opportunity that can be traced with linear relation/link. Then interpretation is conducted with hydrology data probabilistic approach to count/calculate daily extreme discharge and monthly. Whereas base flow analysis is preceded

with interpretation of population variable distribution, namely minimum daily extreme discharge that conducted by goodness-of-fit test to some function of theoretical opportunity distributions that representatf to variable distribution. Analysis is conducted to reliability discharge for appropriate allocation namely amount of drinking water required and irrigation.

RESULT AND ANALYSIS

Minimum daily data of water discharge in Kalibawang Post Progo River is presented at **Figure 1.**, show that minimum water discharge in the years perception at drought seasons indicate that occurrence of minimum water discharge is not homogen. This condition indicates that occurrence of minimum water discharge is has the behavior of random like in general hydrology cycle variable. Statistical test result is selected theoretical distribution for water minimum discharge is predominated by Log-Normal distribution. This distribution will be used for specify plan water discharge (dry) for Upper Progo River Basin reliability curve.

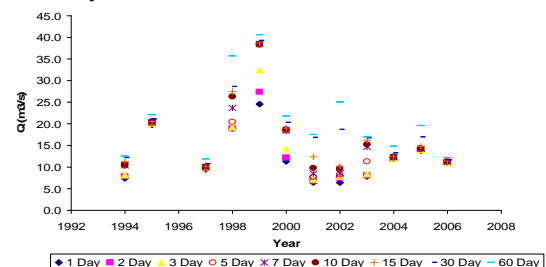


Figure 1. Daily Data of Minimum Discharge in Kalibawang Post Progo River (1994-2006)

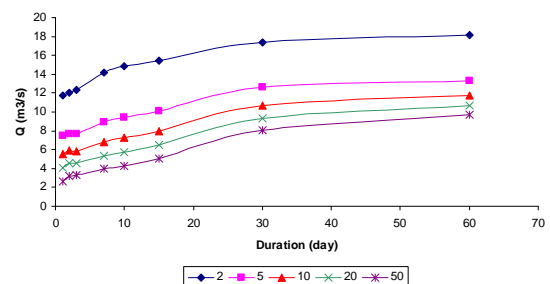


Figure 2. Raw Water Reliability Curve in Kalibawang Post Progo River

Value of reliability discharge at Progo River will be used as base amount of drinking water required calculation that can be fulfilled in period

of drinking water service Yogyakarta Special Province at the future. The reliability discharge criterion for drinking water supply that is allocated according to design criterion with return period of 20 year and one day duration. Look at assessment result of dry daily discharge in Progo River, then an insurable discharge (RP 20 year, 1 day duration) is as big as 4100 lps that evaluated from Kalibawang Post if use historical data in 1994-2006. And then this reliability discharge becomes foundation to make the guidance (irrigation and domestic).

A water allocation guidance uses a discharge data half month calendar. This condition are relied on Directorate Cipta Karya general rule for irrigation that its operation of half monthly. Discharge data half month calendar in Kalibawang Post Progo River is presented at **Figure 3.**, show that occurrence of water discharge is have the behavior of random like in general hydrology cycle variable. Statistical test result is selected theoretical distribution is predominated by Log-Pearson III distribution. This distribution then used to specify dry plan discharge for guidance of river water source allocation Upper Progo River Basin.

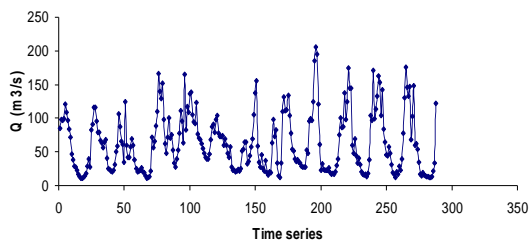


Figure 3. Half Monthly Discharge in Kalibawang Post Progo River (1978-2007)

Value of plan discharge (dry) at Progo River later will be used as base calculation of irrigation amount of water required that can be fulfilled Progo River for Yogyakarta Special Province at the future. Discharge criterion for irrigation water supply are allocated from dry plan discharge according to design criterion of return period 5 year and duration 15 day that already less the discharge that will be taken for domestic (SPAM). Following is the guidance of water allocation for irrigation and domestic in Kalibawang Post Progo River:

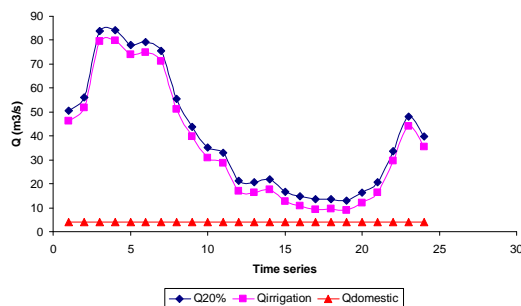


Figure 4. Water Allocation Guidance for Irrigation and Domestic Uses

Discharge that gauged at this dry extreme calculation result, have not yet lessened intake eksisting in Kalibawang Barrage (7000 lps) and Karangtalun Barrage (25000 lps) laid at successively 1 km and 1,5 km downstream of Kalibawang Post. If evaluated from water availability, raw water intake to add eksisting reserve have not yet conducted directly, whereas stream condition that still critical.

SUMMARY

Look at an assessment result to daily dry discharge Progo River, then insurable and available discharge (RP 20 year,1 day duration) for development SPAM Yogyakarta Special Region is gyrates 4100 lps that evaluated from Kalibawang Post if use historical data in 1994-2006. Whereas guidance of water allocation for irrigation relied on dry plan discharge according to design criterion of return period 5 year and duration 15 day that already less the discharge that will be taken for domestic (SPAM).

If this value are compared to historical discharge in Kalibawang Post, this allocation guidance can be weared well because only 3 month in span of 12 year discharge have experience of deficit. The value of discharge that gauged at this dry extreme calculation result, have not yet lessened intake eksisting in Kalibawang Baricade (0-7000 lps) and Karangtalun Baricade (7500-25000 lpses) laid at successively 1 km and 1,5 km downstream of Kalibawang Post. It is evaluated from water availability, standard water intake to add eksisting reserve have not yet conducted directly, whereas stream condition that still critical.

REFERENCES

- Arwin & Y. Mukmin.2006. "Study of River Water Reliability Cisadane to fulfill PDAM raw water request Bogor City. Jurnal Perencanaan Wilayah and Kota, Vol.17/No.2, August 2006, hlm. 53-74
- Soewarno.1995. Hydrology: Statistical Method Application for Data Analysis, 1st and 2nd Volume, Nova, Bandung,
- Sosrodarsono, Suyono & Kensaku Takeda.1980. Hydrology for Irrigation.Jakarta; PT Pradnya Paramita.
- Wisuda, Maulina G..2005. Study of Water Resources Potency and Amount of Multisector Water Required in Citanduy Hulu River Basin. Thesis TL ITB.
- UU No. 7 Tahun 2004 tentang Sumber Daya Air