

**STUDI DAYA TAMPUNG BEBAN PENCEMARAN AIR  
BENDUNG BETON, KECAMATAN PONJONG,  
KABUPATEN GUNUNGKIDUL SAAT MUSIM PENGHUJAN**

*oleh*

Febby Firizqi

16/393468/GE/08216

**INTISARI**

Proses pelarutan pada bentang alam karst menyebabkan sistem akuifer karst bersifat terbuka, berkembang membentuk pelorongan, dan muncul ke permukaan sebagai mataair. Mataair yang terkoneksi dengan luweng di daerah tangkapan airnya sangat rentan terhadap pencemaran antropogenik, salah satunya kegiatan pertanian. Oleh karena itu, diperlukan analisis daya tampung beban pencemaran air (DTBPA) untuk mengukur kemampuan badan air dalam menerima unsur-unsur pencemaran. Penelitian ini dilakukan di Bendung Beton yang merupakan sistem pengelola debit Mataair Karst Beton dengan tujuan: 1) mengetahui karakteristik parameter morfometri dan kondisi hidrologi bendung saat musim penghujan; 2) menganalisis kualitas air bendung; dan 3) mengidentifikasi besar daya tampung beban pencemaran air bendung saat musim penghujan.

Penentuan DTBPA mengacu pada Peraturan Menteri Negara Lingkungan Hidup Nomor 28 Tahun 2009 dan disesuaikan dengan baku mutu air kelas II Peraturan Gubernur DIY No. 20 Tahun 2008. Morfometri bendung digambarkan melalui pengukuran batimetri secara langsung di lapangan, sedangkan karakteristik hidrologi bendung diwakili oleh pengukuran debit menggunakan *current meter*. Aspek morfometri dan hidrologi lain di luar perhitungan DTBPA ditambahkan untuk melengkapi analisis. Pengambilan sampel kualitas air dilakukan secara purposif dengan pemilihan parameter didasarkan pada aktivitas pertanian di daerah tangkapan air (DTA) Mataair Beton. Dugaan pencemaran yang berasal dari pertanian divalidasi melalui wawancara dengan petani di DTA Mataair Beton.

Hasil pengukuran menunjukkan bahwa Bendung Beton tergolong berukuran sangat kecil dengan besar volume  $22.586,83 \text{ m}^3$ ; luas permukaan  $198,58 \text{ m}^2$ ; dan rata-rata kedalaman 1,21 m. Saat penghujan, Bendung Beton mencapai kondisi optimalnya dan memiliki debit air keluar sebesar  $15.016.478,2 \text{ m}^3/\text{tahun}$  yang mempengaruhi kondisi hidrologi bendung. Kandungan TSS dan DO bendung saat musim penghujan melampaui baku mutu air kelas II Peraturan Gubernur DIY No. 20 Tahun 2008, sedangkan suhu, DHL, TDS, pH, BOD, COD, nitrat, fosfat total, dan coliform total masih memenuhi baku mutu tersebut. Aktivitas pertanian, intensitas hujan, dan karakteristik karst pada wilayah penelitian menjadi faktor yang mempengaruhi kondisi morfologi, hidrologi, dan kualitas air di Bendung Beton. Kondisi tersebut turut mempengaruhi DTBPA, di mana kemampuan Bendung Beton dalam menerima unsur pencemaran telah terlampaui untuk parameter TSS ( $-258.014,7 \text{ kg/tahun}$ ) dan nitrat ( $-87.381,4 \text{ kg/tahun}$ ). Sementara itu, DO, BOD, COD, dan fosfat total masih dapat ditoleransi jumlahnya oleh Bendung Beton.

**Kata kunci:** morfometri, daya tampung beban pencemaran, pencemaran air, karst

**STUDY OF TOTAL MAXIMUM DAILY LOADS  
OF BETON RESERVOIR, PONJONG SUB-DISTRICT,  
GUNUNGKIDUL REGENCY DURING THE RAINY SEASON**

by

Febby Firizqi

16/393468/GE/08216

**ABSTRACT**

*The process of solubility in the karst landscape causes karst to have an opened system aquifer and developed as a conduit, then arise to the surface as a spring. Sinkholes in the catchment area make karst aquifer are very vulnerable to pollution originating from human activities, such as agriculture. Therefore, it is necessary to analyze the total maximum daily loads (TMDLs) to measure the ability of water bodies in receiving contamination. This research was conducted in Beton Reservoir which is the management system of a karst spring discharge with the aims to: 1) understood the characteristics of the reservoir morphometric parameters and hydrological conditions; 2) analyzed the water quality of the reservoir; and 3) identified the total daily load maximum of the reservoir.*

*The determination of TMDLs refers to the Regulation of the Minister of Environment No. 28/2009 adjusted to the Class II water quality according to the Governor Regulation of the Special Region of Yogyakarta No. 20 of 2008. The morphometric parameters were described through bathymetry measurements, while the hydrological characteristics were represented by the current meter measurement. In addition to the parameters used in the TMDLs, advanced morphometrical and hydrological aspects were added to complement the analysis. Water quality samples conducted by purposive sampling and the parameters selected based on agricultural activities in the catchment area of Beton Spring. Allegations of pollution coming from agricultural activities are validated through interviews with farmers in the catchment area.*

*The results showed that Beton Reservoir is classified as a very small-sized reservoir according to the volume of 22,586.83 m<sup>3</sup>; a surface area of 198.58 m<sup>2</sup>; and a depth of averagely 1.21 m. When it rains, the reservoir reaches its optimal condition and released an outflow of 15,016,478.2 m<sup>3</sup>/year which affects the hydrological condition of the reservoir. The content of TSS and DO during the rainy season exceeded class II set in the Governor Regulation No. 20 of 2008 on Water Quality Standards in the Special Region of Yogyakarta, meanwhile water temperature, conductivity, TDS, pH, BOD, COD, nitrate, total phosphate, and total coliform met the mentioned standard. Agricultural activities, rainfall intensity, and karst characteristics in the study area are factors that influence morphological, hydrological, and water quality conditions in Beton Reservoir. These conditions also influence TMDLs, where the ability of Beton Reservoir to receive TSS and nitrates has been exceeded by the calculation of TMDLs valued at -258,014.7 kg/year for TSS and -87,381.4 kg/year for nitrate. On the other side, the amount of DO, BOD, COD, and total phosphate still acceptable by Beton Reservoir.*

**Keywords:** *morphometry, total maximum daily loads, water contamination, karst*