

**ARAHAN PENGELOLAAN MANIFESTASI PANAS BUMI BERDASARKAN
HASIL SIMULASI PEMODELAN QUAL2Kw TERHADAP KUALITAS AIR
SUNGAI ELO DI DESA KARTOHARJO, KECAMATAN GRABAG,
KABUPATEN MAGELANG, PROVINSI JAWA TENGAH**

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INTISARI

Pemandian air panas Candi Umbul Telomoyo sumber panasnya berasal dari sisa aktivitas Gunung Telomoyo yang terdahulu. Kegiatan pemandian air panas Candi Umbul Telomoyo menghasilkan zat buang berupa air sisa pemandian yang dibuatng langsung ke dalam badan Sungai Elo yang apabila tidak dikelola dengan baik dapat mengakibatkan penurunan kualitas air sungai. Penelitian dilakukan untuk mengetahui kondisi kualitas air sungai, mengetahui perubahan kualitas air sungai berdasarkan skenario yang dilakukan, dan mengetahui arahan pengelolaan dalam pengendalian pencemaran air sungai akibat pemandian air panas Candi Umbul Telomoyo.

Metode yang digunakan yaitu metode kuantitatif dan metode kualitatif. Metode kuantitatif berupa pemodelan QUAL2Kw yang meliputi segmentasi, kalibrasi model, verifikasi model, serta perhitungan matematis beban pencemaran dan daya tampung beban pencemaran. Metode kualitatif berupa deskriptif untuk menganalisis hasil yang telah didapatkan. Aplikasi pemodelan QUAL2Kw dilakukan dengan menggunakan 3 skenario yang akan dihitung beban pencemaran serta daya tampung beban pencemarannya. Skenario 1 yang dilakukan sebagai penggambaran kondisi eksisting sungai, skenario 2 yang dilakukan menghasilkan perubahan penggambaran kualitas air sungai akibat dari *trial and error* konsentrasi sumber pencemar yang melebihi batas baku mutu, dan skenario 3 yang dilakukan menghasilkan perubahan kualitas air sungai akibat dari perubahan data kondisi sungai di bagian hulu dibuat melebihi baku mutu namun dengan kondisi sumber pencemar sama seperti kondisi eksisting.

Hasil yang didapatkan dari penelitian tersebut adalah Kualitas air sungai Elo sebagai tempat buangan hasil aktivitas pemandian air panas Candi Umbul Telomoyo berdasarkan observasi di lapangan serta hasil analisis laboratorium terkait konsentrasi parameter yang digunakan adalah TSS, alkalinitas, total phospat, NO₃N, konduktivitas elektrik, pH, dan suhu masih memenuhi baku mutu sungai kelas II sesuai dengan PP Nomor 22 Tahun 2021. Secara eksisting kondisi sungai tidak perlu dilakukan pengelolaan kualitas air karena konsentrasi masih memenuhi baku mutu, namun pengelolaan perlu dilakukan apabila asumsi skenario 2 digunakan yaitu dengan asumsi sumber pencemar yang masuk melebihi baku mutu, sehingga pengendalian yang diperlukan adalah dengan melakukan kontrol debit air sumber pencemar yang mulanya 0,54 m³/s menjadi 0,024 m³/s untuk tetap menjaga kualitas air sungai.

Kata Kunci: Beban Pencemaran; Pemodelan, Daya Tampung Beban Pencemaran; QUAL2Kw ; Panas Bumi; Pemandian Air Panas

***DIRECTION MANAGEMENT OF GEOTHERMAL MANIFESTATION BASED
ON THE RESULT OF QUAL2Kw MODELING SIMULATION FOR
DETERMINING WATER QUALITY OF ELO RIVER IN KARTOHARJO
VILLAGE GRABAG DISTRICT, MAGELANG REGENCY, JAWA TENGAH
PROVINCE***

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ABSTRACT

The geothermal manifestation of Candi Umbul Telomoyo is used as a place for recreation and hot water bath therapy. The hot springs of the Candi Umbul Telomoyo are derived from the heat of the remnant Telomoyo Mountain. The hot water bathing activity of Candi Umbul Telomoyo produces waste in the form of bath water which is discharged directly into the body of the Elo River. The study was conducted to determine the condition of river water quality, to determine changes in river water quality based on the scenario carried out, and to find out management directions in controlling river water pollution due to the hot springs of Candi Umbul Telomoyo.

The methods used are quantitative methods and qualitative methods. The quantitative method is in the form of QUAL2Kw modeling which includes segmentation, model calibration, model verification, and mathematical calculation of pollution load and pollution load capacity. The qualitative method is descriptive to analyze the results that have been obtained. The QUAL2Kw modeling application is carried out using 3 scenarios which will calculate the pollution load and the pollution load capacity. Scenario 1 which is carried out as a description of the existing condition of the river, scenario 2 which is carried out results in a change in the description of river water quality as a result of trial and error the concentration of pollutant sources that exceeds the quality standard limit, and scenario 3 that was carried out resulted in changes in river water quality as a result of changes in data on river conditions in the upstream area that were made to exceed the quality standard but with the same pollutant source conditions as the existing conditions.

The results obtained from this study are the water quality of the Elo river as a dumping ground for the hot water bathing activity of the Candi Umbul Telomoyo based on field observations and the results of laboratory analysis related to the concentration of the parameters used are TSS, alkalinity, total phosphate, NO₃N, electrical conductivity, pH, and the temperatur still in range the class II river quality standard in accordance with PP No. 22 Tahun 2021. Existing river conditions do not need to be managed water quality because the concentration still qualifying as the quality standard, but management needs to be done if scenario 2 assumptions are used, namely assuming the incoming pollutant source exceeds the quality standard, so that the necessary control is to control the discharge of the pollutant source water. initially 0.54 m³/s to 0.024 m³/s to maintain river water quality.

Keyword: *Geothermal; Hot Springs; Modeling; QUAL2Kw ; Pollution Load; Pollution Load Capacity*