

## INTISARI

Air tanah merupakan salah satu sumber utama penyedia air bersih bagi masyarakat. Namun, kelestariannya terancam oleh berbagai aktivitas antropogenik, termasuk industri *laundry*. Limbah cair *laundry* yang tidak dikelola dengan baik berpotensi mencemari air tanah, khususnya melalui kandungan surfaktan (deterjen) yang bersifat persisten dan berbahaya bagi lingkungan. Penelitian ini bertujuan untuk (1) menganalisis kualitas air limbah *laundry* berdasarkan baku mutu, (2) mengevaluasi kualitas dan status mutu air tanah, dan (3) menganalisis pengaruh limbah *laundry* terhadap kualitas air tanah di Kalurahan Sinduadi, Kabupaten Sleman.

Tujuan pertama dilakukan melalui survei lapangan dan uji laboratorium sampel air limbah *laundry* dengan parameter BOD, COD, TSS, TDS, deterjen, pH, dan suhu. Hasil pengujian dibandingkan dengan baku mutu Perda DIY No. 7 Tahun 2016 tentang air limbah, lalu dianalisis dengan *Kernel Density* dan *Average Nearest Neighbor*. Tujuan kedua dilakukan dengan menganalisis sampel air sumur berdasarkan parameter yang sama, mengacu pada baku mutu PP No. 22 Tahun 2021 tentang air tanah, dan menghitung *Weighted Arithmetic Water Quality Index* untuk menentukan status mutu air. Hasil uji diinterpolasi menggunakan *Inverse Distance Weighted* dan divalidasi melalui *cross validation*. Tujuan ketiga dilakukan dengan teknik *weighted overlay* untuk menilai pengaruh limbah *laundry* terhadap kualitas air tanah di Kalurahan Sinduadi, Kabupaten Sleman.

Hasil penelitian pertama menunjukkan bahwa seluruh sampel limbah *laundry* tidak memenuhi baku mutu yang ditetapkan, khususnya untuk parameter deterjen. Namun, konsentrasi deterjen pada seluruh sampel air sumur memenuhi baku mutu 0,2 mg/L, dengan rentang nilai sebesar 0,02–0,12 mg/L. Hasil penelitian kedua menunjukkan bahwa beberapa sumur memiliki nilai BOD dan COD tinggi yang menandakan adanya kontaminasi organik dari sumber lain. Nilai Indeks Kualitas Air (WAWQI) pada 19 sumur berkisar antara 11,27 yang terklasifikasi sangat baik hingga 67,99 terklasifikasi buruk, karena dipengaruhi oleh 1–2 parameter yang tidak memenuhi baku mutu. Hasil penelitian ketiga menunjukkan bahwa pengaruh limbah *laundry* terhadap pencemaran air tanah di Kalurahan Sinduadi tergolong rendah. Hal ini menandakan bahwa meskipun aktivitas *laundry* menghasilkan limbah mengandung deterjen, tanah regosol vulkanik muda di Sinduadi mampu secara alami mereduksi dan mendegradasi zat pencemar. Kompleksitas proses alami tersebut menjadikan tanah berperan sebagai penyangga ekologis efektif di wilayah *peri-urban* yang menghadapi tekanan aktivitas domestik.

**Kata Kunci:** Air tanah, kualitas air, limbah *laundry*, WAWQI.

## ABSTRACT

*Groundwater is one of the main sources of clean water for communities. However, its sustainability is threatened by various anthropogenic activities, including the laundry industry. Laundry wastewater that is not properly managed has the potential to contaminate groundwater, particularly through the content of surfactants (detergents) that are persistent and harmful to the environment. This study aims to (1) analyse the quality of laundry wastewater based on quality standards, (2) evaluate the quality and status of groundwater, and (3) analyse the effect of laundry wastewater on groundwater quality in Sinduadi Village, Sleman Regency.*

*The first objective was carried out through field surveys and laboratory tests of laundry wastewater samples with parameters of BOD, COD, TSS, TDS, detergent, pH, and temperature. The test results were compared with the quality standards of DIY Regional Regulation No. 7 of 2016 concerning wastewater, then analysed using Kernel Density and Average Nearest Neighbor. The second objective was carried out by analysing well water samples based on the same parameters, referring to the quality standards of Government Regulation No. 22 of 2021 concerning groundwater, and calculating the Weighted Arithmetic Water Quality Index to determine water quality status. The test results were interpolated using Inverse Distance Weighted and validated through cross validation. The third objective was carried out using the weighted overlay technique to assess the impact of laundry waste on groundwater quality in Sinduadi Village, Sleman Regency.*

*The first study showed that all laundry waste samples did not meet the established quality standards, particularly for detergent parameters. However, the detergent concentration in all well water samples met the quality standard of 0.2 mg/L, with a range of 0.02–0.12 mg/L. The second study showed that several wells had high BOD and COD values, indicating organic contamination from other sources. The Water Quality Index (WAWQI) values for 19 wells ranged from 11.27, which was classified as very good, to 67.99, which was classified as poor, due to the influence of one or two parameters that did not meet quality standards. The third study showed that the impact of laundry waste on groundwater pollution in Kalurahan Sinduadi was relatively low. This indicates that although laundry activities produce detergent-containing waste, the young volcanic regosol soil in Sinduadi is able to naturally reduce and degrade pollutants. The complexity of this natural process makes the soil an effective ecological buffer in peri-urban areas facing pressure from domestic activities.*

**Keywords:** *Groundwater, water quality, laundry waste, WAWQI.*