

Daerah Istimewa Yogyakarta (DIY) memiliki keistimewaan tata ruang yang berlandaskan nilai filosofis budaya Jawa, salah satunya diwujudkan melalui Sumbu Filosofi Yogyakarta yang telah diakui sebagai Warisan Dunia UNESCO. Pembangunan Jalan Tol Solo–Jogja–NYIA Kulonprogo sebagai Proyek Strategis Nasional melintasi kawasan dengan tingkat sensitivitas ruang dan lingkungan yang tinggi, termasuk Simpang Monjali yang berada pada jalur garis imajiner tersebut. Perubahan desain simpang akibat pembangunan jalan tol berpotensi menimbulkan dampak terhadap kinerja lalu lintas, kualitas lingkungan, dan tata guna lahan, sehingga perlu dikaji secara komprehensif.

Penelitian ini bertujuan untuk menganalisis pengaruh perubahan desain Simpang Monjali terhadap emisi kendaraan, tingkat kebisingan, dan perubahan tata guna lahan dengan membandingkan kondisi eksisting dan pasca-operasional jalan tol. Analisis dilakukan menggunakan pendekatan kuantitatif dan spasial, di mana perhitungan emisi dilakukan dengan pendekatan tingkat aktivitas menggunakan metode LAPI ITB, EMEP(*European Monitoring and Evaluation Programme*)/EEA(*European Environment Agency*), dan IPCC (*Intergovernmental Panel on Climate Change*) untuk mengestimasi konsumsi bahan bakar serta emisi gas buang, analisis kebisingan menggunakan pedoman Pd T-10-2004-B yang mengacu pada *Calculation of Road Traffic Noise* (CoRTN), dan perubahan tata guna lahan dianalisis melalui teknik *clip* dan *overlay*.

Hasil penelitian menunjukkan bahwa operasional jalan tol pada tahun 2027 meningkatkan beban emisi gas buang dan konsumsi bahan bakar, serta menyebabkan kenaikan tingkat kebisingan sebesar 13,6% dibandingkan kondisi eksisting. Selain itu, pembangunan jalan tol juga memicu perubahan tata guna lahan di sekitar trase yang ditandai dengan berkurangnya luas permukiman dan jumlah bangunan, sehingga memberikan tekanan terhadap kualitas lingkungan dan struktur ruang kawasan.

Kesimpulan penelitian ini menegaskan bahwa pembangunan jalan tol pada kawasan sensitif memerlukan integrasi strategi pengendalian dampak lingkungan. Penanaman pohon Trembesi (*Samanea saman*) mampu mereduksi emisi hingga 1.163,87 kg CO₂/jam, penerapan vegetasi kakaretan efektif menurunkan kebisingan hingga di bawah ambang batas 70 dBA, dan penerapan *Land Readjustment* dapat mengoptimalkan kembali tata guna lahan. Integrasi strategi tersebut mendukung pembangunan jalan tol yang berkelanjutan dan selaras dengan keistimewaan tata ruang DIY.

Kata kunci: jalan tol, emisi kendaraan, kebisingan, tata guna lahan, Sumbu Filosofi

ABSTRACT

The Special Region of Yogyakarta (DIY) possesses a distinctive spatial planning system grounded in Javanese philosophical values, manifested through the Yogyakarta Philosophical Axis, an imaginary line connecting Mount Merapi, the Keraton, and the Southern Coast that has been recognized as a UNESCO World Heritage Site. The development of the Solo–Yogyakarta–NYIA Kulonprogo Toll Road, designated as a National Strategic Project, traverses areas with high spatial and environmental sensitivity, including the Monjali Intersection located along this imaginary axis. Changes in intersection design resulting from toll road development have the potential to affect traffic performance, environmental quality, and surrounding land use, thereby necessitating a comprehensive assessment.

This study aims to analyze the impacts of design changes at the Monjali Intersection on vehicle emissions, noise levels, and land use by comparing existing conditions with post-toll road operation conditions. The analysis employs quantitative and spatial approaches, including activity-based emission calculations using the LAPI ITB, EMEP(European Monitoring and Evaluation Programme)/EEA(European Environment Agency), and IPCC(Intergovernmental Panel on Climate Change) methods to estimate fuel consumption and exhaust emissions, noise analysis based on the Pd T-10-2004-B Calculation of Road Traffic Noise (CoRTN) guideline, and land use change assessment through spatial clip and overlay techniques.

The results indicate that toll road operation in 2027 increases exhaust emission loads, fuel consumption, and noise levels by 13.6% compared to existing conditions. Furthermore, toll road development triggers land use changes along the corridor, characterized by reductions in residential areas and the number of buildings, thereby exerting pressure on environmental quality and spatial structure.

*The study concludes that toll road development in sensitive areas requires integrated environmental impact control strategies. The planting of Trembesi (*Samanea saman*) trees can reduce emissions by up to 1,163.87 kg CO₂/hour, the application of kakaretan vegetation effectively lowers noise levels below the 70 dBA threshold, and the implementation of land readjustment optimizes surrounding land use. The integration of these measures supports sustainable toll road development aligned with the special spatial characteristics of DIY.*

Keywords: toll road, vehicle emissions, traffic noise, land use, Yogyakarta Philosophical Axis