

ABSTRAK

Badan Pusat Statistik (BPS) Kabupaten Penukal Abab Lematang Ilir (PALI) menghadapi tantangan dalam penyajian data statistik yang masih didominasi format tabular tingkat kecamatan. Pendekatan konvensional ini menyulitkan identifikasi ketimpangan wilayah serta rentan terhadap bias informasi agregat. Penelitian ini bertujuan merancang dan membangun Sistem Informasi Geografis (SIG) berbasis *website* menggunakan *framework* Laravel dan *Leaflet.js* guna mentransformasi data tabular menjadi visualisasi keruangan interaktif. Proses komputasi menggunakan algoritma *Machine Learning K-Means Clustering* dengan inisialisasi deterministik terhadap 8 (delapan) variabel indikator kesejahteraan PODES (listrik PLN, fasilitas ekonomi, fasilitas pendidikan, akses SMA/SMK, faskes desa, akses puskesmas, kualitas sinyal, dan keamanan bencana) pada 73 desa. Hasil klasterisasi tingkat desa diagregasikan secara *Bottom-Up* ke tingkat kecamatan menggunakan metode Rata-Rata Berbobot (*Weighted Average*). Hasil komputasi memetakan 73 desa ke dalam tiga klaster yaitu Sejahtera, Berkembang, dan Perlu Perhatian. Berdasarkan hasil agregasi pembobotan skor, didapatkan hasil bahwa 3 kecamatan berstatus Berkembang dan 2 kecamatan berstatus Perlu Perhatian (rata-rata skor 1.67 – 1.82). Hasil ini secara faktual merepresentasikan ketersediaan infrastruktur dasar yang ada saat ini. Hasil pengujian *Black-Box Testing* menunjukkan tingkat keberhasilan fungsi sebesar 100%. Sistem yang dibangun berhasil mengatasi keterbatasan data tabular, menghasilkan pemetaan wilayah yang objektif, interaktif, dan memfasilitasi proses validasi secara transparan guna mendukung perencanaan pembangunan pemerintah daerah.

Kata Kunci: Sistem Informasi Geografis, *K-Means Clustering*, Kesejahteraan Sosial, Web GIS, Agregasi Spasial.

ABSTRACT

The Central Bureau of Statistics (BPS) of Penukal Abab Lematang Ilir (PALI) Regency faces challenges in presenting statistical data, which is still dominated by tabular formats at the sub-district level. This conventional approach complicates the identification of regional disparities and is prone to aggregate information bias. This study aims to design and build a website-based Geographic Information System (GIS) using the Laravel framework and Leaflet.js to transform tabular data into interactive spatial visualization. The computational process utilizes the Machine Learning K-Means Clustering algorithm with deterministic initialization on 8 (eight) PODES welfare indicator variables (PLN electricity, economic facilities, educational facilities, SMA/SMK access, village health facilities, puskesmas access, signal quality, and disaster safety) across 73 villages. The village-level clustering results are aggregated Bottom-Up to the sub-district level using the Weighted Average method. The computational results mapped 73 villages into three clusters: Prosperous, Developing, and Needs Attention. Based on the weighted score aggregation, the results showed that 3 sub-districts were classified as Developing and 2 sub-districts as Needs Attention (with average scores ranging from 1.67 to 1.82). This result accurately reflects the current availability of basic infrastructure. The Black-Box Testing results showed a 100% functional success rate. The developed system successfully overcomes the limitations of tabular data, produces objective and interactive regional mapping, and facilitates a transparent validation process to support local government development planning.

Keywords: *Geographic Information System, K-Means Clustering, Social Welfare, Web GIS, Spatial Aggregation.*