



INTISARI

Permasalahan pengelolaan embung di wilayah Kabupaten Kupang, belum diiringi oleh pendekatan terpadu yang menggabungkan analisis spasial lokasi, karakteristik biofisik dan sosial, serta evaluasi efektivitas aktual embung dalam memenuhi kebutuhan air masyarakat. Ketiadaan integrasi ini menjadi celah penting dalam upaya mewujudkan pemanfaatan embung yang berkelanjutan dan kontekstual. Penelitian ini bertujuan menganalisis pola distribusi spasial embung, analisis karakteristik fisik dan sosial embung, evaluasi fungsi kebermanfaatan embung bagi masyarakat, serta penyusunan rekomendasi pola pemanfaatan air yang kontekstual dan berkelanjutan. Pendekatan yang digunakan bersifat eksploratif dan deskriptif-evaluatif. Eksplorasi awal menggunakan citra penginderaan jauh dan data spasial, pendekatan sensus embung teridentifikasi (107 unit). Analisis lebih pendalaman pada delapan embung terpilih secara purposif. Analisis distribusi spasial dilakukan dengan metode *Kernel Density Estimation* (KDE). Sementara metode *Density-Based Spatial Clustering of Applications with Noise* (DBSCAN) untuk mengidentifikasi pola sebaran dan klasterisasi embung. Analisis karakteristik fisik dan sosial dilakukan melalui integrasi data spasial, pengamatan lapangan, dan wawancara. Evaluasi fungsi embung dilakukan dengan mengkaji aspek hidrologis (curah hujan, indeks potensi runoff, dan kapasitas tampungan), teknis-struktural (stabilitas lereng, tingkat sedimentasi, dan kondisi infrastruktur distribusi), serta sosial-pemanfaatan (akses air, partisipasi masyarakat, dan kelembagaan lokal). Analisis dilakukan secara spasial menggunakan SIG dan temporal berdasarkan perbedaan musim. Hasil sintesis menjadi dasar penyusunan strategi pengelolaan berjenjang (jangka pendek, menengah, panjang) dengan mempertimbangkan aspek teknis, sosial, dan kelembagaan.

Hasil penelitian menunjukkan bahwa distribusi embung di Kabupaten Kupang tidak merata dan cenderung mengelompok di wilayah tengah hingga selatan, mengikuti kondisi biofisik dan kebutuhan masyarakat. Sebagian besar embung berada di wilayah dengan limpasan tinggi akibat kondisi lereng curam dan tekstur tanah yang kurang mampu meresapkan air, sementara akses masyarakat terbatas karena jarak dari permukiman dan minimnya jaringan distribusi. Struktur fisik embung rentan terhadap kerusakan seperti sedimentasi dan rembesan karena berada pada lahan rawan erosi-longsor dengan vegetasi penutup yang rendah serta minimnya pemeliharaan. Walaupun 95% embung masih menyimpan air saat kemarau, pemanfaatannya belum optimal karena distribusi terbatas dan kelembagaan lokal yang belum efektif. Hasil evaluasi menunjukkan bahwa secara umum keberlanjutan embung berada pada kategori sedang. Temuan ini menunjukkan bahwa fungsi dasar embung masih berjalan namun belum sepenuhnya optimal untuk menjamin keberlanjutan jangka panjang. Rekomendasi diarahkan pada perbaikan teknis, penguatan infrastruktur distribusi, pembentukan kelembagaan berbasis komunitas, dan integrasi dalam kebijakan daerah, dengan pendekatan bertahap berdasarkan prioritas spasial dan sosial.

Kata kunci : Embung; Evaluasi lahan; Analisis Spasial; Distribusi spasial; Karakteristik fisik dan sosial; Keberlanjutan air; Kabupaten Kupang

ABSTRACT

The problem of small reservoirs (embung) management in Kupang Regency has not been accompanied by an integrated approach that combines spatial analysis of location, biophysical and social characteristics, as well as evaluation of the actual effectiveness of small reservoirs in meeting community water needs. The absence of such integration leaves a critical gap in efforts to realize sustainable and contextual utilization of small reservoirs. This study aims to analyze the spatial distribution of small reservoirs, the physical and social characteristics of small reservoirs, the evaluation of small reservoir functions for communities, and the formulation of recommendations for contextual and sustainable water utilization strategies. The approach used is exploratory and descriptive-evaluative. Exploration was carried out using remote sensing and spatial data, supported by a census of identified small reservoirs (107 units). More in-depth analysis was conducted on eight selected small reservoirs using purposive sampling. Spatial distribution analysis was performed using the Kernel Density Estimation (KDE) method, while the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) method was applied to identify the distribution patterns and clustering of the small reservoir. Analysis of physical and social characteristics was conducted through the integration of spatial data, field observations, and interviews. The evaluation of small reservoir functions covered hydrological aspects (rainfall, runoff potential index, and storage capacity), technical-structural aspects (slope stability, sedimentation rates, and distribution infrastructure condition), and socio-utilization aspects (water access, community participation, and local institutions). The analysis was carried out spatially using GIS and temporally by considering seasonal variations. The synthesis results served as the basis for developing tiered management strategies (short, medium, and long-term) that take into account technical, social, and institutional aspects.

The findings show that the spatial distribution of small reservoirs in Kupang Regency is uneven and tends to cluster in the central to southern regions, following biophysical conditions and community needs. Most small reservoirs are located in areas with high runoff due to steep slopes and soil textures that poorly absorb water, while community access is limited because of the distance from settlements and the lack of water distribution networks. The physical structures of small reservoirs are vulnerable to damage such as sedimentation and seepage because they are situated in erosion- and landslide-prone areas with low vegetation cover and minimal maintenance. Although approximately 95% of small reservoirs continue to retain water during the dry season, their utilization remains suboptimal due to limited distribution systems and ineffective local institutions. The evaluation results indicate that overall small reservoirs sustainability falls within the moderate category. These findings suggest that the basic functions of small reservoirs are still operating, but not yet sufficiently optimized to ensure long-term sustainability. Accordingly, the recommendations emphasize technical improvements, the strengthening of water distribution infrastructure, the establishment of community-based institutions, and integration into regional policies through a phased approach based on spatial and social priorities.

Keywords: Embung; Land Evaluation; Spatial distribution; Physical and social characteristics; Water sustainability; Kupang Regency