

Towards a Transformative Cadastre: Integrating Fit-for-Purpose, 3D Spatial Standards, Forensic Approaches, and Operational Efficiency for Sustainable Land Administration in Indonesia.

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SUMMARY

Land administration reform in Indonesia is undergoing a transformative shift, driven by the urgent need to secure tenure, improve efficiency, and resolve disputes within a rapidly urbanizing and economically dynamic context. This paper presents a multidimensional framework that integrates four complementary approaches: Fit-for-Purpose Land Administration (FFP-LA), 3D cadastre, forensic cadastre, and operational efficiency analysis. Together, these pillars offer a comprehensive response to persistent challenges of incomplete registration, vertical land use conflicts, unresolved disputes, and inefficient budget allocation.

The first dimension, FFP-LA, emphasizes inclusivity and scalability in systematic land registration. By adopting adaptive and flexible standards, Indonesia has made significant progress towards achieving complete land coverage, aligning with the UN's Sustainable Development Goals. However, conventional two-dimensional systems cannot adequately represent the complexity of urban growth and underground infrastructure. To address this, the second dimension, 3D cadastre, introduces vertical delineation of rights and responsibilities based on land use/land cover (LU/LC) and surface feature height (SFH), offering a technical and legal foundation for managing multi-level spatial rights.

The third dimension, forensic cadastre, builds on the principles of forensic science—recognition, identification, individualization, and evaluation of evidence—to enhance dispute resolution. By systematically validating land ownership and boundary claims, the forensic cadastre provides objective, transparent, and legally defensible outcomes in cases where mediation fails. This approach not only addresses overlapping land parcels and weak documentation but also strengthens public trust in land governance

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Complementing these legal and technical innovations, the fourth dimension focuses on operational management for cost efficiency. Using data envelopment analysis (DEA), integration of programs such as systematic land registration (PTSL), land value zoning (ZNT), and regional land stewardship (NPTR) reveals significant potential for budget optimization. Contrary to common assumptions, higher efficiency scores were recorded in agricultural rather than urban areas, highlighting the importance of financial governance and resource allocation.

Taken together, this multidimensional framework contributes to a holistic model of transformative cadastre in Indonesia. Beyond national relevance, the findings offer transferable insights for developing countries facing similar land administration challenges. By integrating inclusivity, spatial innovation, scientific dispute resolution, and financial sustainability, the proposed model positions Indonesia as a reference case in advancing sustainable land administration within the Global South. This paper thus contributes not only to policy and practice in Indonesia, but also to the broader discourse of the global strategies for equitable and efficient land governance, which will be at the forefront.

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