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INDIGENOUS KNOWLEDGE SYSTEMS VIN URBAN PLANNING: SCIENTIFIC INTEGRATION OF PAPUAN TRADITIONAL WISDOM IN CONTEMPORARY CITY DEVELOPMENT

Lazarus Ramandei[1], Rasi Kasim Samosir[2]
[1] Department of Urban Planning, Universitas Cenderawasih, Jayapura, Papua, Indonesia
[2] Department of Urban Planning, Universitas Cenderawasih, Jayapura, Papua, Indonesia
Email : lazarus_ramandey@ftuncen.ac.id[1], rk.samosir.93@gmail.com[2]

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Abstract :

This study examines the integration of indigenous knowledge systems (IKS) from Papuan communities into contemporary urban planning frameworks in Jayapura, the capital city of Papua Province, Indonesia. Rapid urbanization in Papua has created significant tensions between modern city development paradigms and the deeply rooted traditional wisdom of indigenous Papuan peoples, including the Sentani, Tobati-Enggros, and Ormu communities. Employing a qualitative research methodology with ethnographic and participatory approaches, the study explores how traditional ecological knowledge, spatial cosmologies, and community governance structures can be scientifically operationalized within urban master plans. Data were collected through in-depth interviews with community elders, urban planners, and local government officials, supplemented by field observations and document analysis. Findings reveal that Papuan indigenous knowledge offers robust frameworks for sustainable land use, water management, and social cohesion that are largely overlooked by conventional planning instruments. The study concludes that a decolonizing approach to urban planning, one that systematically incorporates indigenous epistemologies as co-equal knowledge systems, can produce more culturally responsive, ecologically sustainable, and socially just cities in Papua. Policy recommendations for institutional mechanisms to formalize this integration are provided.

Keywords : *Indigenous knowledge, urban planning, Papua, traditional wisdom, sustainable city development*

INTRODUCTION

Papua Province represents one of the most biologically and culturally diverse regions in the world, yet it faces unprecedented pressures from rapid urbanization driven by transmigration, resource extraction, and national development agendas (Upton, 2009). Jayapura, as the provincial capital, has experienced dramatic demographic expansion, growing from approximately 200,000 residents in 2000 to over 400,000 by 2020 (BPS Papua, 2021). This transformation has proceeded largely according to technocratic planning

frameworks inherited from colonial-era governance structures and postcolonial development ideologies that privilege Western scientific knowledge over indigenous epistemologies (Rist, 2008).

Indigenous Papuan communities including the Sentani, Tobati-Enggros, Ormu, and numerous highland groups possess sophisticated, millennia-old systems of ecological knowledge, territorial governance, and spatial organization that have enabled sustainable habitation of Papua's complex environments (Flannery, 1994). The Sentani people's traditional governance of Lake Sentani's resources, for instance, represents an intricate system of customary law (adat) that has maintained ecological balance for generations (Giay & Ballard, 2003). However, mainstream urban planning in Papua systematically excludes these knowledge systems, contributing to environmental degradation, social conflict, and the erosion of cultural identity.

This research gap is significant. While the field of indigenous urban planning has gained traction in settler-colonial contexts such as Australia, Canada, and New Zealand (Peters & Andersen, 2013), its application in Indonesian Papua remains nascent. Existing studies have documented indigenous land rights (Fay & Denduangrudee, 2016) and environmental knowledge in rural Papua (Menzies, 2006), but few have examined how these knowledge systems can be systematically and scientifically integrated into urban development frameworks. This study addresses that gap by investigating how Papuan indigenous knowledge systems (IKS) can be operationalized as legitimate planning instruments in Jayapura's urban governance. The research objectives are: (1) to document and categorize forms of indigenous knowledge relevant to urban planning; (2) to analyze institutional and epistemological barriers to IKS integration in current planning practice; and (3) to propose a scientifically grounded framework for incorporating Papuan traditional wisdom into contemporary city planning.

RESEARCH METHOD

This study employed a qualitative research design with an ethnographic and participatory action research orientation (Creswell, 2014). The research was conducted in Jayapura, Papua Province, Indonesia, with field work spanning eighteen months from January 2023 to June 2024. The research sites included three indigenous villages adjacent to the urban core: Tobati, Enggros, and Skow Sae, as well as the Badan Perencanaan Pembangunan Daerah (BAPPEDA) offices of Jayapura City and the Regional Spatial Planning Division of Jayapura Regency.

FINDINGS AND DISCUSSION

Research subjects were selected through purposive sampling. Key informants included twelve community elders (ondoafi and kepala suku) who are recognized custodians of traditional ecological and spatial knowledge; eight professional urban planners employed by the City Planning Office; four officials from the Regional Development Planning Agency; and six academics from Universitas Cenderawasih specializing in urban studies, anthropology, and environmental science. A total of thirty informants participated in the study. Data collection employed in-depth semi-structured interviews, participant observation during community gatherings and planning consultation meetings, and document analysis examining local spatial plans (Rencana Tata Ruang Wilayah), customary law documents (aturan adat), historical maps, and colonial-era administrative records. Data analysis followed thematic analysis procedures (Braun & Clarke, 2006), conducted through deductive and inductive coding using NVivo software. Credibility was ensured through member checking, triangulation, and prolonged engagement. Ethical clearance was obtained from the Universitas Cenderawasih Research Ethics Committee.

Table 1. Domains of Papuan Indigenous Knowledge and Their Urban Planning Applications

Knowledge Domain	Traditional Practice	Urban Planning Application
Ecological Knowledge (Bou System)	Seasonal fishing calendars, lake territory stewardship	Green infrastructure, biodiversity corridors, watershed management
Spatial Cosmology & Sacred Sites (Nit)	Sacred grove designation, territorial clan boundaries, settlement orientation	Cultural heritage zoning, land use mapping, flood risk management
Water Governance (Customary Lake Law)	Clan-based lake zone management, seasonal water harvesting, taboo on overfishing	Urban watershed management, stormwater planning, riparian buffer zones

Social Organization & Community Governance	Ondoafi council decision-making, clan-based resource allocation, reciprocal exchange	Community participation frameworks, co-production of urban plans, conflict resolution

The research identified four principal domains of Papuan indigenous knowledge directly applicable to urban planning practice, as presented in Table 1. The most robust body of indigenous knowledge was found in ecological management. Sentani elders described a sophisticated traditional system called bou a customary authority over specific water territories of Lake Sentani that functions as a traditional marine spatial plan. Under the bou system, each clan (marga) holds hereditary stewardship rights over designated lake zones, regulating fishing seasons, species protection, and water use through a council of ondoafi (paramount chiefs). This system has maintained the ecological productivity of Lake Sentani for an estimated five hundred years. Tobati-Enggros informants described nit sacred groves and coastal areas designated as off-limits by customary law which function ecologically as biodiversity reserves and erosion buffering zones. When mapped, nit sites were found to correspond closely with scientifically identified critical habitat areas, demonstrating the empirical validity of traditional ecological knowledge.

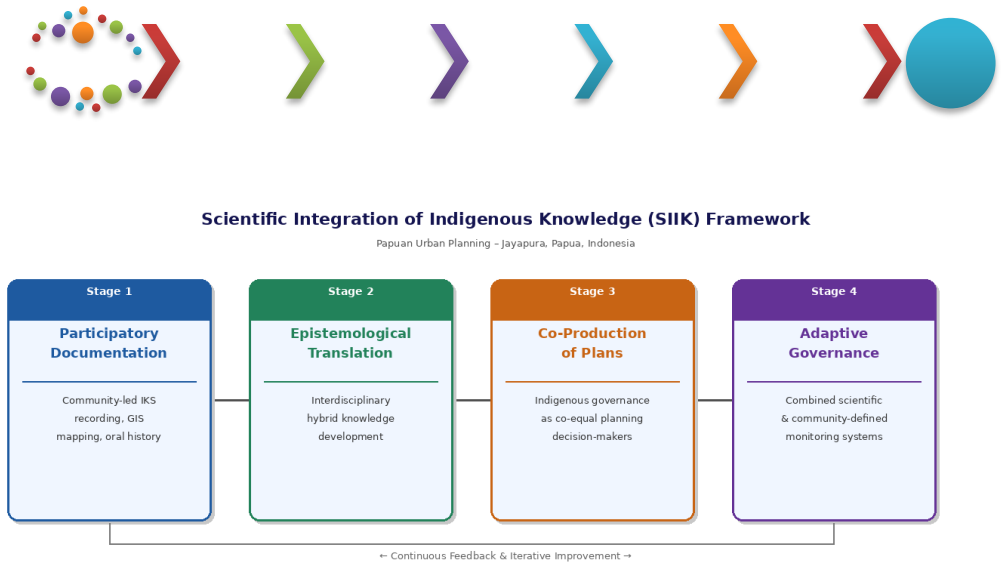

Figure 1. Scientific Integration of Indigenous Knowledge (SIIK) Framework for Papuan Urban Planning

Urban planners interviewed consistently acknowledged awareness of indigenous land rights but described significant structural barriers to incorporating IKS into formal planning documents. The most frequently cited barriers were epistemological: planning professionals trained in technocratic traditions expressed uncertainty about how to translate oral, relational, and place-based knowledge into the quantitative metrics and spatial data formats required by Indonesia's spatial planning law (UU No. 26 Tahun 2007). Traditional knowledge is treated as kearifan lokal rhetorically valorized but institutionally marginalized as cultural heritage for conservation rather than as functional knowledge for planning decision-making. This finding aligns with broader critiques of tokenistic indigenous consultation in planning processes (Porter, 2010). Community elders expressed deep frustration with consultation processes they perceived as extractive: their knowledge was solicited for public participation requirements but rarely influenced planning outcomes. This dynamic of epistemic injustice, wherein indigenous knowledge producers are denied authority to validate their own knowledge claims, represents a fundamental barrier to genuine IKS integration (Fricker, 2007). Based on the findings, this study proposes a four-stage Scientific Integration of Indigenous Knowledge (SIIK) framework. Stage one, Participatory Documentation, involves systematic recording of IKS through community-led processes including participatory GIS mapping and ethnobiological surveys governed by community data sovereignty protocols. Stage two, Epistemological Translation, involves interdisciplinary teams developing hybrid knowledge forms for example, mapping the bou system's territorial zones as customary use zones in spatial plans. Stage three, Co-Production of Plans, requires restructuring planning authority to include indigenous governance bodies as co-equal decision-makers, potentially requiring amendments to local planning regulations (Peraturan Daerah) to formally recognize ondoafi councils as statutory planning bodies. Stage four, Adaptive Governance, establishes monitoring mechanisms combining scientific indicators with community-defined measures of well-being and ecological health. This framework adapts established models of two-eyed seeing (Etuaptmumk) developed in Indigenous Canadian contexts (Reid et al., 2021) and post-colonial planning theory (Watson, 2006) to the specific institutional context of Papua, Indonesia.

CONCLUSION

This study demonstrates that Papuan indigenous knowledge systems represent scientifically valid, practically applicable, and culturally essential resources for urban planning in Jayapura and across Papua Province. The

traditional ecological knowledge, spatial cosmologies, and governance systems of the Sentani, Tobati-Enggros, and Ormu peoples embody centuries of adaptive environmental management directly applicable to sustainable city development. Current planning practice is characterized by epistemological exclusion, wherein indigenous knowledge is acknowledged rhetorically but marginalized institutionally, producing plans that are ecologically fragile and socially contested.

The proposed Scientific Integration of Indigenous Knowledge (SIIK) framework offers a structured, replicable pathway for urban planners, policymakers, and indigenous communities to collaboratively embed traditional wisdom within formal planning instruments. Implementation requires both institutional reform including legal recognition of indigenous planning authority through local regulations and pedagogical transformation in urban planning education to develop culturally competent planning professionals. Future research should examine the application of the SIIK framework in other Papuan cities, including Sorong and Merauke, as well as comparative analysis with indigenous urban planning models in Melanesian nations such as Papua New Guinea and Vanuatu.

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