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Relevance of Ostrom's Institutional Analysis and Development Framework in Managing Community-Based Natural Resource Policies

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ABSTRACT

Natural resource governance in decentralized and community-based contexts remains one of the central challenges in environmental policy. This conceptual article examines the relevance of Elinor Ostrom's Institutional Analysis and Development (IAD) Framework as a theoretical lens for analyzing and improving community-based natural resource management (CBNRM) policies in Indonesia and similar developing contexts. Using a systematic literature review and conceptual analysis methodology, the article explores how IAD's core components—action arena, actors, rules-in-use, and outcomes—map onto the complex realities of local governance, customary institutions (adat), and state-community relations in natural resource sectors. The findings reveal that the IAD Framework provides significant analytical utility, particularly in diagnosing institutional failures, identifying leverage points for policy reform, and recognizing the legitimacy of polycentric governance arrangements. However, the framework also encounters limitations when confronted with deep power asymmetries, the commodification of nature, and the weakening of social capital in contemporary rural communities. The article argues that an adapted IAD approach, integrated with political ecology and social capital perspectives, offers a more robust foundation for designing equitable and sustainable CBNRM policies. Practical implications for policymakers and community practitioners are discussed.

Keywords: *IAD Framework, Ostrom, community-based natural resource management, institutional analysis, polycentric governance, Indonesia.*
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Introduction

Natural resource governance has long been a contested terrain where competing interests of states, markets, and communities collide. In decentralized and developing country contexts, the challenge of managing common-pool resources (CPRs) such as forests, fisheries, watersheds, and community lands becomes particularly acute. The dominant discourse has historically oscillated between two extremes: state-controlled centralized management and market-based privatization. Both approaches have exhibited systemic failures in sustaining resource integrity while simultaneously ensuring the welfare of dependent communities (Ostrom, 1990; Agrawal, 2001).

Against this backdrop, Elinor Ostrom's Institutional Analysis and Development (IAD) Framework emerged as a transformative contribution to governance theory. Awarded the Nobel Prize in Economic Sciences in 2009, Ostrom challenged the Hardinesque paradigm of the 'tragedy of the commons' by demonstrating empirically that communities across the world successfully manage shared resources through locally evolved institutions (Ostrom, 1990; Cox et al., 2010). Her framework offers a systematic lens through which researchers and policymakers can analyze the rules, norms, actors, and physical conditions that shape collective action outcomes in resource management.

In Indonesia, the relevance of the IAD Framework is particularly pronounced. As an archipelagic nation with extraordinary biodiversity and significant dependence of rural communities on natural resource-based livelihoods, Indonesia confronts layered governance challenges. Decentralization reforms initiated in the late 1990s transferred significant authority over natural resources to district governments; however, the institutional infrastructure at the local level often remained fragmented, underfunded, and disconnected from indigenous governance systems (Larson & Soto, 2008; McCarthy, 2004). Community-based natural resource management (CBNRM) programs encompassing village forestry, community fisheries, watershed management, and social forestry have proliferated, yet their effectiveness remains highly variable across regions and resource types.

This article undertakes a conceptual analysis of the IAD Framework's relevance as a theoretical and practical tool for understanding and improving CBNRM policies in Indonesia. The central questions addressed are: What analytical strengths does the IAD Framework bring to the study of community-based natural resource governance? Where are its limitations when applied to highly asymmetric, politically complex, and culturally diverse settings? And how might the framework be adapted or supplemented to better serve contemporary policy needs?

The article is structured as follows: after a review of the IAD Framework's core architecture, it maps IAD components onto Indonesian CBNRM realities, presents a comparative data analysis, examines critical limitations, proposes theoretical extensions, and concludes with policy implications.

Theoretical Foundations: The IAD Framework

Ostrom's IAD Framework, elaborated most comprehensively in Governing the Commons (1990) and Understanding Institutional Diversity (2005), provides a multi-level analytical structure for studying institutional arrangements surrounding collective action. At its core, the framework identifies three layers of governance: constitutional-choice rules (who makes the rules), collective-choice rules (how decisions are made), and operational rules (what behaviors are permitted or required in resource use). This nested structure reflects the complexity of real-world governance systems and allows analysts to examine institutional change at multiple scales simultaneously.

The central analytical unit in the IAD Framework is the Action Arena, which consists of two components: (1) the Action Situation, characterized by participants, positions, actions, outcomes, information, control, and payoffs; and (2) the Actors themselves, defined by their resources, values, preferences, and cognitive frames. The Action Arena is shaped by three sets of exogenous variables: biophysical and material conditions of the resource, attributes of the community, and rules-in-use. Outcomes generated from the Action Arena flow back to affect all three exogenous variables through a feedback loop, making the framework inherently dynamic (Ostrom, 2005).

Central to Ostrom's theory is her set of eight design principles for long-enduring institutions governing common-pool resources. These principles including clearly defined boundaries, congruence between rules and local conditions, collective-choice arrangements, monitoring, graduated sanctions, conflict-resolution mechanisms, minimal recognition of rights to organize, and nested enterprises have

been extensively tested across diverse empirical settings (Cox et al., 2010; Baggio et al., 2016). They remain the most widely cited institutional criteria for evaluating governance quality in CBNRM contexts.

The IAD Framework differs fundamentally from rational choice and market-based approaches by foregrounding institutional context and social norms as determinants of behavior. It acknowledges that actors are not fully rational but are bounded-rational decision-makers operating within institutional structures that shape information availability, trust, and the feasibility of cooperation. This ontological position aligns well with the social and cultural embeddedness of natural resource governance in community contexts (Cleaver, 2012; Ostrom & Cox, 2010).

Mapping the IAD Framework onto Indonesian CBNRM Realities

Applying the IAD Framework to the Indonesian CBNRM context requires careful attention to the country's institutional heterogeneity, historical legacies of centralization, and the resilience of customary governance systems. Indonesia's social forestry program (Perhutanan Sosial), which as of 2023 has distributed approximately 5.2 million hectares of forest access rights to communities, represents one of the most ambitious CBNRM experiments in the developing world (Ministry of Environment and Forestry of Indonesia, 2023). Examining this and related programs through the IAD lens reveals both the framework's strengths and its areas of friction.

Action Arena and Collective Decision-Making

The primary action arenas for CBNRM in Indonesia are found in village-level governance structures: the Village Consultative Assembly (Badan Permusyawaratan Desa / BPD), the Village Community Institution (Lembaga Kemasyarakatan Desa), and adat councils (lembaga adat) where they still operate. These forums constitute the spaces where rules regarding resource access, benefit distribution, and management obligations are deliberated and enforced (Suharjito et al., 2016). The IAD Framework's attention to the structure of Action Situations particularly information flows, exit options, and the distribution of decision-making authority is highly applicable to understanding why some village forests thrive while others deteriorate.

Research by Purnomo et al. (2020) in Kalimantan, for instance, demonstrates that village forest committees (Gabungan Kelompok Tani Hutan) that exhibit clear role differentiation, transparent information about resource conditions, and inclusive decision-making produce significantly better conservation and livelihood outcomes than those lacking these features. This aligns directly with IAD's prediction that Action Arenas with better information, more equitable participation, and clearer rule structures tend to generate more cooperative and sustainable outcomes.

Rules-in-Use and Legal Pluralism

One of the most analytically productive applications of the IAD Framework in the Indonesian context concerns its treatment of rules-in-use the actual norms governing behavior, as distinct from formal-on-paper regulations. Indonesia's legal landscape is characterized by deep pluralism: national forestry law (Law No. 41/1999 and its successor regulations), regional regulations (Peraturan Daerah), village regulations (Perdes), and customary adat law co-exist, often in tension, in the governance of the same resource systems (Bedner & Van Huis, 2008).

The IAD Framework's three-tier hierarchy of rules offers a productive schema for mapping these conflicts. Constitutional-level rules (national law, regional law) define who has legitimate authority to govern resources. Collective-choice rules (village-level agreements, customary protocols) determine

how specific resource management decisions are made. Operational rules (day-to-day practices regarding who may harvest, when, and how much) regulate actual behaviors on the ground. When these levels misalign as frequently occurs when state-issued social forestry permits override locally recognized adat boundaries collective action problems are exacerbated (Galudra et al., 2014).

Community Attributes and Social Capital

The IAD component of community attributes encompasses the social capital, historical experiences, homogeneity, and shared norms that facilitate or obstruct collective action. In Indonesia, the tradition of gotong royong (mutual cooperation) represents a significant reservoir of social capital that has historically supported collective management of rice irrigation systems (subak in Bali) and community forests across Java and Sumatra (Ostrom, 1990; Coward, 1977). However, contemporary research consistently documents the erosion of these traditions under pressures of commodification, rural-urban migration, and the monetization of social relationships (Li, 2002; Peluso, 1992).

The IAD Framework's attention to community attributes thus draws attention to a critical empirical question: under what conditions is existing social capital sufficient to support effective collective action, and when must external institutional support legal recognition, financial mechanisms, technical assistance be provided to compensate for diminished social cohesion? This question has direct implications for the design of CBNRM policies in Indonesia's highly diverse social landscape.

Table 1. IAD Framework Components: Definitions, Indonesian CBNRM Applications, and Key Challenges

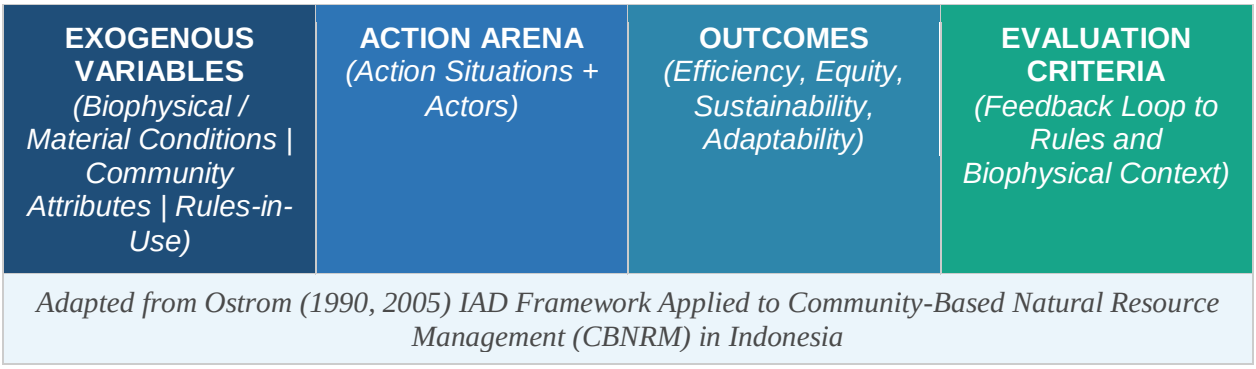
IAD Component	Definition	Application in CBNRM Indonesia	Key Challenge
Action Arena	The space where actors interact, make decisions, and affect outcomes related to resource use	Village-level deliberative forums (musyawarah desa) for forest and fisheries management	Restricted access for marginalized groups, dominated by local elites
Actors / Participants	Individuals or groups with specific roles, preferences, and information in the governance system	Local communities, adat leaders, BUMDes (village enterprises), government extension workers	Fragmentation of actor coalitions due to land tenure conflicts
Rules-in-Use	Formal and informal norms governing behavior—constitutional, collective-choice, and operational levels	Adat regulations (hukum adat), village regulations (Perdes), national forestry law	Misalignment between customary rules and state regulations (legal pluralism)
Biophysical Conditions	The nature and attributes of the resource system and its ecological dynamics	Peat forests, mangroves, community fisheries zones in coastal and inland Indonesia	Rapid environmental change accelerated by climate variability
Community Attributes	Social capital, shared norms, trust, and network structures among participants	Collective farming traditions (gotong royong), indigenous ecological knowledge	Erosion of social cohesion due to migration and economic transformation

Outcomes	The evaluative criteria: efficiency, equity, sustainability, and adaptability of governance	Reduced deforestation rates, equitable benefit-sharing, conflict resolution	Weak monitoring and enforcement capacity at local government level

Source: Adapted from Ostrom (1990, 2005); Ministry of Environment and Forestry of Indonesia (2023); Purnomo et al. (2020); Galudra et al. (2014).

The IAD Framework Structure Applied to CBNRM Policy

Figure 1. Adapted IAD Framework for Community-Based Natural Resource Management in Indonesia



Source: Authors' adaptation of Ostrom (1990, 2005), with integration of Indonesian policy context.

As illustrated in Figure 1, the adapted IAD Framework for Indonesian CBNRM situates the Action Arena encompassing both the specific action situations and the participating actors at the center of the analytical structure. The three exogenous variables (biophysical/material conditions, community attributes, and rules-in-use) feed into the Action Arena from the left, while outcomes flow from the right. Crucially, the evaluation criteria on the far right assessed against the quadrant of efficiency, equity, sustainability, and adaptability generate a feedback loop that modifies both the operational rules and the biophysical conditions over time. This dynamic circularity captures how governance decisions today shape resource conditions and institutional arrangements tomorrow.

In the Indonesian context, the biophysical conditions column captures the heterogeneity of ecosystems under CBNRM from lowland peat forests in Riau, to community fisheries in Raja Ampat, to watershed management areas in Java. Community attributes encompass the critical variation in social capital intensity, adat institutional strength, and livelihood dependency ratios across these areas. Rules-in-use reflect the pluralistic legal landscape described above. The framework thus provides a coherent structure for comparative analysis across these diverse settings while remaining sensitive to local specificity.

Analytical Strengths of the IAD Framework for CBNRM Policy

The IAD Framework offers several distinctive analytical contributions that make it particularly valuable for both researchers and policymakers working on CBNRM in Indonesia and comparable developing contexts.

Diagnostic Precision

The framework's disaggregated analytical vocabulary distinguishing, for instance, between rules-in-use and rules-in-form, or between action situations and actors provides policy analysts with a precise diagnostic toolkit. Rather than attributing governance failures to vague notions of 'corruption' or 'lack of community participation,' IAD analysis compels specificity: Which rule level is malfunctioning? Is the problem one of information asymmetry, inadequate sanctions, or illegitimate boundary definitions? This diagnostic precision is invaluable for designing targeted policy interventions rather than generic institutional reforms (Pahl-Wostl, 2009).

In Indonesia's social forestry program, for instance, IAD-informed analyses have revealed that the bottleneck in many cases is not at the operational rule level (communities generally know how to manage their forests) but at the collective-choice and constitutional levels: communities lack effective voice in determining the terms of their forest access permits, and national-level regulations override locally-crafted agreements (Sahide et al., 2016). This finding has direct implications for advocacy strategies and legislative reform efforts.

Recognition of Polycentric Governance

Ostrom's parallel contribution to polycentric governance theory provides the IAD Framework with a normative orientation that values diversity and redundancy in governance systems. Polycentricity the coexistence of multiple overlapping governance centers operating at different scales is presented not as an institutional disorder but as a functional advantage in complex adaptive systems (Ostrom, 2010). This perspective directly challenges top-down technocratic approaches to CBNRM that seek uniformity and hierarchical control.

In Indonesia, polycentric governance is an empirical reality, not merely a theoretical ideal. Village institutions, adat councils, watershed management forums, and district government agencies all exercise overlapping authority over the same resource systems. Rather than treating this overlap as a problem to be rationalized away, an IAD-polycentric approach would design coordination mechanisms that leverage the monitoring capacity of local institutions, the legitimacy of adat law, and the technical resources of government extension services in complementary ways (Carlisle & Gruby, 2019).

Bridging Theory and Empirical Reality

The IAD Framework's grounding in empirical case studies from irrigation systems in Spain and the Philippines to fishing communities in Maine and Norway gives it credibility and traction in applied policy settings that purely abstract frameworks lack. The design principles derived from these studies provide actionable benchmarks against which existing CBNRM arrangements can be evaluated and improved. Indonesian researchers have productively used these principles to assess the institutional quality of social forestry groups, watershed cooperatives, and marine protected area committees (Purnomo et al., 2020; Suharjito et al., 2016).

Critical Limitations and Theoretical Challenges

Despite its considerable strengths, the IAD Framework encounters significant limitations when applied to the politically charged, power-laden realities of natural resource governance in developing countries. These limitations have been documented in the political ecology and critical institutionalism literature and deserve serious attention in any application of the framework to Indonesian CBNRM.

Power Asymmetry and Elite Capture

The IAD Framework's treatment of actors and institutions tends toward methodological egalitarianism: it analyzes the rules and payoffs facing participants without systematically theorizing structural power asymmetries. In practice, however, CBNRM governance in Indonesia is deeply shaped by the political economy of resource extraction the interests of timber concessionaires, palm oil corporations, and district government elites frequently override community interests regardless of the formal rules-in-use (McCarthy, 2004; Peluso & Watts, 2001). The IAD Framework provides limited analytical purchase on these structural dynamics, and its design principles implicitly assume a relatively level playing field among participants.

Critical institutionalists (Cleaver, 2012; Hall et al., 2014) have argued that Ostrom's framework under-theorizes the ways in which social inequalities based on gender, ethnicity, class, and political connection are reproduced within collective action arrangements rather than resolved by them. Village forest committees in Kalimantan have been found to replicate existing social hierarchies, with women, indigenous minorities, and migrant households systematically excluded from benefit-sharing despite formal rules of inclusion (Purnomo et al., 2020). Addressing this gap requires integration of the IAD Framework with political ecology perspectives that center power analysis.

Commodification of Nature and Market Integration

Ostrom developed the IAD Framework primarily in contexts where communities interact with resources as use values for subsistence livelihoods and local ecological services. Contemporary CBNRM in Indonesia, however, increasingly occurs within market-integrated economies where natural resources function simultaneously as exchange values embedded in global commodity chains (Li, 2002). The carbon credit markets, ecotourism revenues, and timber certification schemes associated with Indonesian social forestry introduce actor incentives and governance dynamics that the original IAD architecture does not fully capture.

Market integration tends to individualize incentives, weaken collective identities, and introduce new categories of external actors certification bodies, carbon brokers, NGO intermediaries whose interests and information asymmetries complicate the Action Arena in ways that require analytical frameworks sensitive to market power and global value chains (Tsing, 2005). A CBNRM-relevant IAD Framework must be extended to accommodate these dynamics.

Cultural Embeddedness and Institutional Bricolage

Frances Cleaver's (2012) concept of institutional bricolage the way in which actors pragmatically combine, adapt, and improvise institutional elements from multiple sources highlights a limitation of the IAD Framework's relatively systematic and orderly conception of rule systems. In practice, the governance institutions that communities use to manage natural resources in Indonesia are rarely the clean, purposefully designed arrangements that Ostrom's design principles envision. They are layered, contradictory, and dynamically evolving hybrids of adat tradition, state regulation, religious practice, and new organizational forms introduced by NGOs and government programs (Cleaver, 2012; Bedner & Van Huis, 2008).

Recognizing institutional bricolage does not invalidate the IAD Framework but calls for greater analytical humility about the coherence and intentionality of the institutions being analyzed. It also suggests that effective CBNRM policy cannot simply 'design' institutions from scratch but must work with and through existing institutional repertoires, however messy.

Theoretical Extensions: Towards an Adapted IAD for Indonesian CBNRM

In response to the identified limitations, this article argues for three complementary theoretical extensions that would strengthen the IAD Framework's analytical and policy utility in the Indonesian CBNRM context.

Integration with Political Ecology

Political ecology's analysis of power, scale, and the political economy of resource access provides an essential complement to the IAD Framework's institutional focus. Specifically, incorporating Harvey's (2003) concept of 'accumulation by dispossession' and Peluso and Watts' (2001) framework of resource access would enable IAD-based analyses to systematically examine how extra-local political and economic forces constrain the 'rules-in-use' that communities can realistically implement. This integration would allow researchers to distinguish between cases of institutional failure (inadequate collective action arrangements) and cases of structural dispossession (institutionally sound communities overwhelmed by external power).

Social Capital and Network Analysis

Putnam's (2000) framework of bridging, bonding, and linking social capital offers a more differentiated treatment of community attributes than the IAD Framework currently provides. In Indonesian CBNRM contexts, the distinction between bonding social capital (internal community cohesion), bridging social capital (cross-community linkages), and linking social capital (vertical ties to government and market actors) is crucial for understanding which communities can effectively translate collective governance into improved resource and livelihood outcomes. Network analysis methods can quantify these social capital dimensions and integrate them into IAD-based assessments (Bodin & Crona, 2009).

Adaptive Governance and Social-Ecological Systems Theory

Ostrom's (2009) Social-Ecological System (SES) Framework represents an evolution of the IAD concept toward complex adaptive systems thinking. Integrating SES theory with its attention to emergent properties, non-linearities, and the cross-scale dynamics of social-ecological change into CBNRM policy analysis would significantly strengthen the IAD Framework's capacity to address the challenges of climate change adaptation and ecosystem dynamics that contemporary resource governance must confront (Folke et al., 2005; Berkes et al., 2003).

Policy Implications and Practical Recommendations

The foregoing analysis generates a set of actionable policy implications for Indonesian CBNRM governance that build on the IAD Framework's analytical strengths while addressing its limitations.

First, CBNRM policy design should systematically apply IAD-informed institutional diagnostics before implementing new programs. Rather than assuming that legal recognition of community rights automatically translates into effective governance, policymakers should assess the existing action arenas, rules-in-use, and actor configurations that communities already employ. Social forestry permit processes, for instance, should be preceded by participatory institutional mapping that documents existing collective choice arrangements and identifies gaps relative to Ostrom's design principles.

Second, legal pluralism must be managed strategically rather than resolved by fiat. Indonesia's current approach to CBNRM embedding community rights within national forestry law while often

disregarding adat territorial claims creates systematic tension between the constitutional, collective-choice, and operational rule levels. An IAD-informed approach would advocate for legal bridge mechanisms that formally recognize and align customary rules with state regulatory frameworks, as successfully implemented in some watershed management and marine protected area contexts (Bedner & Van Huis, 2008).

Third, CBNRM programs should incorporate gender and equity audits grounded in IAD analysis of actor differentiation within action arenas. The systematic exclusion of women and marginalized groups from collective-choice arrangements represents not only a social justice failure but an institutional efficiency failure: governance systems that exclude significant segments of resource users from rule-making produce less legitimate, less enforceable, and ultimately less sustainable outcomes (Agarwal, 2001; Purnomo et al., 2020).

Fourth, capacity building for CBNRM should prioritize the strengthening of monitoring and enforcement systems at the operational rule level. Ostrom's design principles consistently identify monitoring as a critical determinant of institutional success. In Indonesia, weak enforcement capacity at the community and district government levels due to inadequate resources, conflicting loyalties, and political interference represents one of the most commonly cited causes of CBNRM failure (Sahide et al., 2016). Investments in community-based monitoring systems, complemented by appropriate use of digital technologies and remote sensing, represent high-return institutional investments.

Fifth, national CBNRM policy frameworks should explicitly embrace polycentric governance principles, providing legal and financial support for coordination mechanisms that link community-level governance with sub-district, district, and provincial management systems. The nested enterprise principle one of Ostrom's eight design criteria is rarely operationalized in Indonesian CBNRM policy, which tends to treat communities as the sole governance unit rather than as one level within a larger institutional ecosystem.

Conclusion

This article has examined the relevance of Ostrom's Institutional Analysis and Development Framework for understanding and improving community-based natural resource management policies in Indonesia. The analysis demonstrates that the IAD Framework remains a theoretically productive and practically applicable tool for diagnosing institutional arrangements, identifying leverage points for governance reform, and legitimizing the complexity of polycentric governance that characterizes effective CBNRM systems.

At the same time, the framework's limitations particularly its under-theorization of power asymmetries, its insufficient attention to market integration dynamics, and its idealized conception of institutional design require that it be supplemented with complementary perspectives from political ecology, social capital theory, and social-ecological systems science. The adapted IAD approach proposed in this article integrating structural power analysis, network-based social capital assessment, and adaptive governance principles provides a more robust analytical foundation for the complex governance challenges that Indonesian CBNRM confronts in the twenty-first century.

The stakes could not be higher: Indonesia's forests, fisheries, and community lands sustain the livelihoods of tens of millions of rural households while providing ecological services of global significance. Getting the institutional architecture right drawing on the best available theoretical frameworks while remaining sensitive to local realities, power dynamics, and cultural diversity is one of the most important contributions that social science can make to the sustainability challenge of our

time. Ostrom's IAD Framework, appropriately adapted, remains an indispensable part of this intellectual toolkit.

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