IN-12 Indigenous and community governance of fisheries, forests and water today

The quantitative magnitude of indigenous and community natural resource governance reveals that it is not a marginal relic of pre-industrial human history, but a dominant feature of contemporary planetary ecology. Modern geographic information systems and spatial analyses indicate that Indigenous peoples currently hold tenure over approximately 38 million square kilometers, equating to roughly 28.3% of the Earth's land surface[1]. Furthermore, these territories encompass at least 40% of the world's formal protected areas[1]. In the context of Intact Forest Landscapes (IFLs)—defined as unbroken expanses of natural ecosystems free of significant anthropogenic degradation—Fa et al. (2020) demonstrated that at least 36% of the world's remaining IFLs exist within Indigenous lands[3]. Between 2000 and 2016, the global extent of IFLs declined by 9.4%, yet the loss was observably mitigated on Indigenous territories, which experienced an 8.2% reduction compared to a 10% reduction on non-Indigenous lands[3]. As industrial supply chains face permanent disruption and state reach retracts—the central premise of the *Governing after the Fall* framework—understanding how these non-state actors manage common-pool resources (CPRs) becomes an existential necessity. However, analyzing these systems requires stripping away the pervasive anthropological romanticism that frequently clouds the literature.

The Theoretical Baseline: Romanticism vs. Transaction Costs

The empirical reality of community conservation is frequently distorted by the "Ecologically Noble Savage" myth, an anthropological trap effectively dismantled by Kent H. Redford in his seminal 1992 analysis[5]. Redford argued that attributing inherent, transcendent conservationist ideologies to Indigenous peoples represents a fundamental category error and a dangerous naturalistic fallacy. Indigenous populations, according to this critique, are not mystical stewards of ecological stasis; they act as rational economic agents who, given access to industrial market extraction technologies and untethered from traditional institutional restraints, are capable of depleting resources just as rapidly as state or corporate actors.

This anti-romantic perspective is heavily reinforced by the leading critics of community-based conservation, most notably John Terborgh in *Requiem for Nature* (1999)[6]. Terborgh and the "neoprotectionist" school argue that community-based conservation fundamentally fails because it attempts to reconcile incompatible goals: localized poverty alleviation and broad-scale biodiversity preservation[6]. Terborgh contends that genuine ecological protection requires top-down, state-enforced boundaries (the "parks and fences" approach) because local governance is inherently vulnerable to demographic growth, market integration, and internal defection. Modern scholarship infers that the relative ecological health of Indigenous

territories is less a product of mystical ecological harmony and more a consequence of historical geographic isolation, low population densities, and fierce, often violent, territorial defense against external encroachment[8].

To understand how self-governance sustains CPRs without state intervention, one must bypass the rhetoric and disaggregate the specific institutional arrangements. Elinor Ostrom's Nobel-winning Institutional Analysis and Development (IAD) framework provides the analytical architecture for this. Ostrom derived eight "Design Principles" (DPs) for robust CPR institutions. Subsequent statistical meta-analyses, such as Cox et al. (2010), reviewed maximums of 63 cases and confirmed the enduring relevance of these principles[10]. More sophisticated qualitative comparative analyses (QCA) by Baggio et al. (2016) evaluated 69 cases and found that no single principle guarantees success[12]. Rather, success is highly configural. Systems exhibiting robust social and ecological health consistently possessed combinations of at least 8.7 (±2.6) of the 11 sub-divided DPs, with complete success mapping only to cases possessing 10 or 11 DPs[12]. Specifically, the congruence between local conditions and rules, combined with active monitoring by the appropriators themselves, proved statistically vital to avoiding the tragedy of the commons[12].

The following sections evaluate seven distinct governance arrangements across fisheries, forests, and water, mapping their scale viability, testing their vulnerability to dark-triad capture, and separating community narratives from empirical records.

Arrangement 1: Gravity-Fed Irrigation (Nepal)

The foundational quantitative baseline for community water governance lies in the Nepal Irrigation Institutions and Systems (NIIS) database, developed by Elinor Ostrom, Wai Fung Lam, and colleagues[15]. The NIIS database cataloged 231 irrigation systems across 29 of Nepal's 75 districts[17]. The empirical evidence consistently demonstrated that Farmer-Managed Irrigation Systems (FMIS) outperformed Agency-Managed Irrigation Systems (AMIS)—those run by the centralized state—on multiple dimensions, including agricultural yield, equity of water distribution, and the physical maintenance of infrastructure[17].

In the FMIS, labor mobilization was primarily structured around landholding size (proportionality). Because gravity-fed irrigation canals require constant maintenance—desilting, structural repair after monsoon damage, and weed clearing—the community enforced a strict mathematical symmetry between the manual labor extracted from a household and the volume of water that household was permitted to divert onto its fields[16].

Narrative, Record, and Scholarship Separation

The divergence between how these irrigation systems are perceived internally versus how they operate structurally is profound. What the arrangement's own people said it did was maintain ancestral tradition and promote spiritual/communal harmony among villagers. What the historical record shows it did was create a highly rigid, mathematically exact system of labor-to-water ratios, enforced by intense, mutual monitoring and strict penalties (fines or water shutoffs) for free-riding[16]. What modern scholarship infers is that the success of the FMIS relies heavily on the management of transaction costs. Because the group size is relatively

small, the transaction costs of monitoring a neighbor's water usage are near zero; however, when the resource area expands beyond the capacity of walking monitors, free-riding cascades and the system fails[13].

Capture Test: The Irrigation Dictator

A dark-triad actor (exhibiting Machiavellianism or narcissism), often a "head-ender" situated physically closest to the water source, seeks to systematically extract more water than permitted. They manipulate aggregation rules by bribing or intimidating the local water monitor (*chaukidar*). Historical cases in the NIIS database show wealthy head-enders using existing caste leverage to defy proportional labor rules, coercing lower-caste "tail-enders" to maintain the canal while simultaneously starving them of their fair share of water[16].

The primary resistance feature that reverses this capture is physical and infrastructural interdependency. Because gravity-fed irrigation requires structural maintenance across the *entire* length of the canal, a head-ender cannot maintain the system alone. If the tail-enders withdraw their labor in protest, the canal silts up, the infrastructure collapses, and the head-ender's water supply is destroyed. This biophysical interdependency acts as a powerful anti-psychopath safeguard, forcing cooperation upon otherwise extractive elites.

Scale Ledger: Farmer-Managed Irrigation

Rung	Scale (Population)	Historical Status & Viability
Household	4 to 10	**Worked.** Optimal for micro-canals; virtually zero transaction costs for monitoring.
Hamlet	30 to 50	**Worked.** Highly robust. Kinship ties reinforce Ostrom's graduated sanctions.
Village	150 to 500	**Worked.** The median successful NIIS case operates here. Requires formal rule codification (e.g., written labor rosters)[16].
Parish/District	1,500 to 5,000	**Failed/Strained.** Mutual monitoring fails due to

		anonymity. Agency management (state intervention) usually subsumes the system due to hydraulic complexity.
Town/Watershed	15,000 to 50,000	**Never tried successfully.** Requires hierarchical state bureaucracy; informal ties snap.
Region/Bioregion	0.5M to 5M	**Failed.** Requires massive state infrastructure (dams) and coercion.
Nation/Continent	50M to 500M	**N/A.** Exceeds the biophysical reality of watershed management.
Planet	8 Billion	**N/A.**

Arrangement 2: Continuous Forest Inventory (The Menominee, USA)

Forest governance presents a vastly different spatial and temporal challenge than water: forests are expansive, slow-growing, and highly legible to external market actors seeking rapid liquidation. The Menominee Indian Tribe of Wisconsin operates what is arguably the most empirically successful community forestry system in modern history. Following a treaty negotiated in 1854 by Chief Oshkosh, the tribe secured a 234,000-acre reservation, nearly 95% of which is forested[19]. Over the subsequent 150-plus years, the Menominee Tribal Enterprises (MTE) harvested over 2.5 billion board feet of timber[19]. Despite this massive industrial-scale extraction, the standing timber volume actually increased from an estimated 1.2 billion board feet in 1854 to over 1.5 billion today[19].

This is achieved through a Continuous Forest Inventory (CFI), operating on strict 15-year cutting cycles governed by a 150-year planning horizon[19]. The Menominee completely subvert the logic of industrial forestry: biophysical silviculture, not immediate market pricing, dictates the annual allowable cut. They selectively harvest the lowest quality wood to allow premium trees to reach old-growth maturity, operating a localized monopoly on high-grade sustainable timber[21].

Narrative, Record, and Scholarship Separation

What the Menominee people say the arrangement does is fulfill a sacred stewardship mandate established by Chief Oshkosh, maintaining spiritual harmony with the forest ecosystem[19]. What the record shows it does is operate an intensely quantified, bureaucratic tracking system (the CFI) that measures biomass regeneration down to the decimal point across 109 separate forest sections, aggressively culling weak trees to maximize the commercial value of the remaining stand[19]. What modern scholarship infers is that this success relies entirely on a legally impregnable boundary (the federal reservation) and a unique institutional design that purposefully isolates forestry science from tribal politics and short-term market pressures[23].

Capture Test: The Timber Baron

A Machiavellian actor within the tribal council could theoretically leverage their charisma to interface with external lumber markets, promising a massive short-term cash dividend to tribal members if the 150-year horizon is abandoned in favor of a 10-year clear-cutting liquidation. Historical cases of this happening abound in post-colonial Africa and Latin America, where communal forests were rapidly sold off by local elites.

The Menominee resisted this capture because their constitution strictly separates the political tribal legislature from the business operations arm (Menominee Tribal Enterprises)[23]. A politician promising liquidation cannot legally order the MTE foresters to alter the biophysical algorithms of the Continuous Forest Inventory. The institutional architecture acts as a firewall against charismatic populism.

Scale Ledger: Menominee Forestry

Rung	Scale (Population)	Historical Status & Viability
Household	4 to 10	**Worked.** Effective for micro-management (e.g., non-timber forest products), but cannot defend perimeters against armed industrial loggers.
Hamlet	30 to 50	**Worked.**
Village	150 to 500	**Worked.**
Parish/District	1,500 to 5,000	**Worked.** The Menominee operate effectively here (~8,000 tribal members) utilizing specialized representative boards[19].

Town/Watershed	15,000 to 50,000	**Strained.** CFEs begin to require highly corporate, hierarchical structures, alienating the base population from the land.
Region/Bioregion	0.5M to 5M	**Failed.** Surpasses the ability of a distinct community to maintain cohesive boundaries and consensus.
Nation/Continent	50M to 500M	**N/A.**
Planet	8 Billion	**N/A.**

Arrangement 3: Community Forestry Enterprises (Mexico's Ejidos)

In Mexico, the violent 1917 Revolution eventually birthed the *ejido* system, a communal land tenure framework designed to redistribute large haciendas to peasant communities. Today, ejidos control roughly two-thirds of Mexico's 64 million hectares of forest[24]. Research led by David Barton Bray highlights how these ejidos evolved from simple agrarian land trusts into sophisticated Community Forestry Enterprises (CFEs)[26].

Communities such as San Juan Nuevo Parangaricutiro established highly capitalized, vertically integrated timber operations, owning their own sawmills, kilns, and furniture workshops[25]. Bray's quantitative assessments demonstrate that these CFEs drastically reduce illegal logging, increase local employment, and often provide better biodiversity outcomes than strict state-managed protected areas in adjacent regions[27].

Narrative, Record, and Scholarship Separation

What the ejidatarios said the arrangement did was fulfill the revolutionary promise of agrarian justice and collective prosperity[28]. What the record shows it did was transition peasant farmers into industrial timber producers who successfully captured the value-added steps of the supply chain, utilizing youth and women to manage complex milling technology[24]. What modern scholarship infers is that their success is not purely indigenous or communal; it is highly fragile and depends intensely on external technical assistance, favorable state taxation policies, and access to international certification markets (like the FSC)[27].

Capture Test: The Ejido Cacique

A dark-triad actor—traditionally known in rural Mexico as a *cacique* (local political boss)—manipulates the ejido general assembly through patronage, vote-buying, and the threat of violence. They secure the position of *comisariado ejidal* (ejido president) and sign

clandestine contracts with illegal logging syndicates, skimming the profits while reporting fabricated inventory numbers to the community.
Historically, many Mexican ejidos collapsed under this exact form of internal capture during the 1970s and 1980s. Resistance to this capture was eventually achieved through institutional reforms that required absolute transparency in CFE accounting, mandated regular rotation of the *comisariado* position (preventing entrenchment), and the creation of separate oversight committees (*consejo de vigilancia*) composed of rival community factions who inherently distrusted the president[27].

Scale Ledger: Mexican Ejidos

Rung	Scale (Population)	Historical Status & Viability
Household	4 to 10	**Strained.** Insufficient capital to purchase sawmills or trucks.
Hamlet	30 to 50	**Strained.** Vulnerable to cartel extortion in modern Mexico.
Village	150 to 500	**Worked.** The optimal scale of the standard Mexican Ejido[24]. High social cohesion prevents internal illegal logging; sufficient labor pool for milling.
Parish/District	1,500 to 5,000	**Worked.** Achieved through unions of ejidos pooling capital.
Town/Watershed	15,000 to 50,000	**Strained.** Becomes a massive industrial conglomerate; communal ethos fades.
Region/Bioregion	0.5M to 5M	**Failed.**
Nation/Continent	50M to 500M	**N/A.**

Planet	8 Billion	**N/A.**

Arrangement 4: Territorial Defense (Bolivian and Brazilian Indigenous Lands)

The vulnerability of Indigenous forest governance to state capture is starkly illustrated by the 2011 TIPNIS conflict in Bolivia. The Isiboro Sécure National Park and Indigenous Territory (TIPNIS) was formalized by the state following intense pressure from the Confederation of Indigenous Peoples of Bolivia (CIDOB)[29]. However, under President Evo Morales—who aggressively weaponized an anti-imperialist, pro-Indigenous rhetoric on the global stage[31]—the state pushed to build a 306-kilometer highway directly through the core of the intact forest[30]. This infrastructure was designed to facilitate hydrocarbon extraction and expand the territory of the *cocaleros* (coca growers), Morales's primary political base[32].

Indigenous leader Fernando Vargas Mosua organized a 600-kilometer, 40-day march of over 1,000 people to the capital of La Paz in resistance[30]. In neighboring Brazil, empirical data generated by Nepstad et al. (2006) proved that Indigenous reserves were the most effective barrier against Amazonian deforestation and fire, often outperforming strictly protected parks[36]. However, the Bolivian case demonstrates that this barrier shatters when the sovereign state decides to liquidate the territory.

Narrative, Record, and Scholarship Separation

What the state said it did was build a highway to ensure "anti-colonial food sovereignty" and bring modern medicine to marginalized peoples; what the indigenous defenders said they did was protect the sacred Mother Earth[32]. What the record shows the state did was forcefully impose extractive infrastructure to satisfy a powerful agricultural union[32]. What modern scholarship infers is that community forestry only survives when the community possesses undisputed, legally defensible, and un-fragmented property rights backed by a monopoly on force. When the central state desires subsurface resources, communal governance collapses without overwhelming external political alliances.

Capture Test: State-Sponsored Wedge Politics

A Machiavellian state executive realizes that attacking an Indigenous group with military force incurs high international reputational costs. Instead, they capture the territory from the inside. In Bolivia, Morales's government bypassed the legitimate CIDOB leadership and directly approached localized, impoverished community factions along the proposed highway route. The state bribed these factions with outboard motors, zinc roofing, and localized development promises[41].

Historically, the Bolivian state signed bilateral agreements with 8 of 13 regional affiliates of CIDOB, effectively isolating Fernando Vargas and the main marchers, splitting the resistance into warring pro-highway and anti-highway camps[42]. Resistance features failed here because the scale of the region was too massive (Region/Bioregion level); the central leadership could not physically prevent state agents from interfacing with and corrupting peripheral hamlets.

Scale Ledger: Amazonian Territorial Defense

Rung	Scale (Population)	Historical Status & Viability
Household	4 to 10	**Failed.** Easily slaughtered or displaced by illegal loggers/miners.
Hamlet	30 to 50	**Failed.** Cannot mount sufficient resistance to road-building crews.
Village	150 to 500	**Worked.** Can temporarily block localized access roads.
Parish/District	1,500 to 5,000	**Worked.** Can mobilize meaningful physical marches and protests.
Town/Watershed	15,000 to 50,000	**Strained.** Logistical difficulties in maintaining unified political fronts.
Region/Bioregion	0.5M to 5M	**Failed.** CIDOB attempted to govern at this scale in Bolivia but was systematically fractured by state-level wedge politics and bribery[42].
Nation/Continent	50M to 500M	**N/A.**
Planet	8 Billion	**N/A.**

Arrangement 5: Perimeter-Defended Fisheries (Maine Lobster Gangs)

Marine and riverine governance relies heavily on managing extreme mobility and biological

uncertainty. James Acheson's *The Lobster Gangs of Maine* (1988) offers the definitive quantitative and ethnographic account of non-state fishery governance in the United States[43]. Acheson tracked how local lobstermen organically divided the Maine coast into informal territories in the absence of state property rights. These territories were either "nucleated" (loose boundaries where fishing effort diminished toward the edges) or "perimeter-defended" (sharply defined, violently guarded boundaries, typified by offshore communities like Matinicus Island)[44].

By the late 20th century, the fishery transitioned into formal co-management. Due to the lobstermen's hyper-territoriality and their strict, self-imposed enforcement of the "V-notch" conservation rule (marking and releasing breeding females), Maine lobster stocks reached record highs. This occurred simultaneously with the total collapse of the heavily state-managed, scientifically regulated New England groundfish stocks[46].

Narrative, Record, and Scholarship Separation

What the lobstermen said they did was protect their families, their historical way of life, and the island community's survival[44]. What the record shows they did was achieve ecological sustainability through rigid exclusivity, xenophobia against mainlanders, and illegal violence—most notably sabotaging or cutting the trap lines of interlopers, which occasionally escalated to shootings[44]. What modern scholarship infers is that Acheson's work demolishes the romantic view of the commons: the lobster gangs achieved sustainability strictly by manipulating the transaction costs of boundary defense. Violence was an economically rational tool to prevent the tragedy of the commons by artificially creating closed property rights in an open ocean[45].

Capture Test: The Capitalist Fleet

A highly capitalized, psychopathic fleet owner from a mainland city attempts to capture the resource by deploying massive offshore vessels capable of dropping thousands of traps in island waters, ignoring local customs. Because they do not live in the community, they are immune to social shaming.

Historical cases show this happening constantly in open-access fisheries. The Maine harbor gangs resisted this capture through physical sabotage. Because lobster traps must be left unattended on the ocean floor, they are highly vulnerable. If an interloper dropped traps in Matinicus waters, local gangs would covertly cut the buoys, costing the capitalist thousands of dollars in lost gear, making the incursion economically unviable[44]. The system resists capture via asymmetric guerrilla sabotage.

Scale Ledger: Perimeter-Defended Fisheries

Rung	Scale (Population)	Historical Status & Viability
Household	4 to 10	**Worked.** Extended family lobster boats[44].

Hamlet	30 to 50	**Worked.** The classic "harbor gang". Enforces internal norms via reputation and external boundaries via trap-cutting[47].
Village	150 to 500	**Worked.** Outer islands (Matinicus). Extremely tight in-group cohesion capable of mobilizing fleet-wide boundary defense.
Parish/District	1,500 to 5,000	**Strained.** Factions begin to form; internal trap-cutting wars break out between sub-groups.
Town/Watershed	15,000 to 50,000	**Failed.** Requires formal state Coast Guard enforcement; informal sabotage scales poorly and results in anarchy.
Region/Bioregion	0.5M to 5M	**Failed.**
Nation/Continent	50M to 500M	**N/A.**
Planet	8 Billion	**N/A.**

Arrangement 6: State Co-Management Boards (Nunavut and the Pacific Northwest)

Formal Indigenous co-management is frequently championed as the pinnacle of modern resource governance, yet it often masks deep structural disempowerment. In the 1990s, Fikret Berkes published *Sacred Ecology*, conceptualizing Traditional Ecological Knowledge (TEK) as a complex of knowledge, practice, and belief, arguing that Indigenous systems were fundamentally distinct from, yet complementary to, Western scientific management. The state response was to mandate the integration of TEK via co-management boards.

In Canada, the Nunavut Wildlife Management Board (NWMB) was established to share power between the Inuit and the state. Anthropologist Paul Nadasdy, in *Hunters and Bureaucrats*

(2003), delivered the most devastating critique of this arrangement[48]. Nadasdy demonstrated that the state's mandate to "integrate" TEK was essentially a Trojan horse. To participate, Indigenous hunters had to translate their holistic, spiritual understanding of the environment into the state's positivist, quantitative metrics (e.g., "total allowable catch," "maximum sustainable yield," "biomass")[50].

A similar dynamic unfolded in the U.S. Pacific Northwest following the 1974 Boldt Decision (U.S. v. Washington). Judge George Boldt affirmed that Treaty Tribes were entitled to 50% of the harvestable salmon[51]. While heralded as a massive civil rights victory, the practical implementation forced the tribes to build massive bureaucratic infrastructures—such as the Northwest Indian Fisheries Commission (NWIFC)—to co-manage hatcheries and litigate habitat destruction alongside state biologists[51].

Narrative, Record, and Scholarship Separation

What the state and liberal institutions said these boards did was equalize power, reconcile colonial historical grievances, and integrate ancient wisdom into modern policy. What the record shows they did was structurally subordinate Indigenous actors. The federal minister always retains final legal veto power over the NWMB's decisions[49]. Furthermore, Indigenous communities capture only a fraction of the resulting commercial wealth; for example, Nunavut's offshore shrimp quota generated only ~33% Inuit employment on the fishing vessels[53]. What modern scholarship infers is that bureaucracy acts as an epistemic weapon. State actors do not need to use violence to control a resource; they only need to mandate that all resource decisions be made in boardrooms using scientific wildlife management paradigms, neutralizing traditional governance instantly by rendering it illegible[50].

Capture Test: The Bureaucratic Interloper

A Machiavellian Indigenous actor realizes they do not need to be a skilled hunter or fisher to control the resource; they only need to master the bureaucratic language of the state. They get elected to the co-management board, monopolize travel per diems, align with federal biologists, and sign off on commercial quotas that benefit their immediate faction while claiming to speak for "the community."

Historical cases of this are heavily documented by Nadasdy in the Yukon and Nunavut, where the requirement to attend endless board meetings conducted in bureaucratic English effectively filtered out active, traditional hunters. They were replaced by a distinct class of Indigenous bureaucrats whose power derived entirely from their fluency in state administrative mechanisms[48]. There are few resistance features to this capture, as the state legally mandates the bureaucratic interface.

Scale Ledger: Co-Management Boards

Rung	Scale (Population)	Historical Status & Viability

Household	4 to 10	**Failed.** Ignored by the state.
Hamlet	30 to 50	**Failed.** Lacks the capacity to field administrative delegates.
Village	150 to 500	**Strained.** Can send a delegate, but they are often outmatched by state lawyers.
Parish/District	1,500 to 5,000	**Worked/Strained.** Nunavut community hunting associations operate here, but succumb to internal bureaucratic stratification[49].
Town/Watershed	15,000 to 50,000	**Worked.** The scale of the Northwest Indian Fisheries Commission. Highly effective at lobbying, but entirely assimilated into state methodology[51].
Region/Bioregion	0.5M to 5M	**Failed.** Becomes indistinguishable from the federal state.
Nation/Continent	50M to 500M	**N/A.**
Planet	8 Billion	**N/A.**

Arrangement 7: Internally Stratified Commons (Nepal's CFUGs)

Community governance is not inherently egalitarian; old does not mean good, and small does not mean fair. Bina Agarwal's exhaustive quantitative analysis of Community Forest User Groups (CFUGs) in Nepal—specifically analyzing 31 CFUGs and 310 households in the Baglung district—exposes the phenomenon of "participatory exclusion"[54].

Nepal's state forestry department handed over 1.2 million hectares of land to 14,439 CFUGs,

ostensibly decentralizing power to the village level[57]. The Federation of Community Forestry Users Nepal (FECOFUN) acted as the national umbrella body to support these groups[58]. However, Agarwal's surveys revealed that the actual governance apparatus was routinely captured by wealthy, higher-caste men[55]. While formal quotas required female or Dalit (lower caste) presence on executive committees, their participation was strictly instrumental[55]. Women were assigned trivial supportive roles, like record-keeping, but systematically excluded from strategic decisions such as timber pricing, fund allocation, and rule enforcement[55].

Narrative, Record, and Scholarship Separation

What FECOFUN and international NGOs said the arrangement did was empower marginalized rural communities and democratize forest management[57]. What the record shows it did was replicate deep-seated patriarchal and caste-based hierarchies within a new legal framework, resulting in severe material consequences. Agarwal quantified the stakes: 49% of property-less women faced spousal violence, compared to only 7% of those owning property[54]. What modern scholarship infers is that traditional community governance, left unperturbed, naturally defaults to the baseline power dynamics of the culture. Equitable governance requires engineered, structural quotas and external monitoring[55].

Capture Test: The Caste Oligarch

A high-caste, wealthy landowner (a narcissistic actor) uses historical social conditioning to dominate the CFUG executive committee. They mandate strict forest closure rules that prevent poor, landless Dalits from gathering daily firewood, forcing the poor to buy fuel from the landowner, while the landowner secretly extracts premium timber for personal profit. Agarwal's research found that this form of capture was nearly ubiquitous in the early years of the CFUG program[55]. The capture was only reversed through engineered demographic thresholds. Agarwal proved that when women were empowered to constitute 25% to 33% of the executive committee—a "critical mass"—conservation outcomes improved drastically, with a 51% higher likelihood of forest improvement in female-dominated groups relative to male-dominated ones[54].

Scale Ledger: Community Forest User Groups

Rung	Scale (Population)	Historical Status & Viability
Household	4 to 10	**N/A.**
Hamlet	30 to 50	**Worked.**
Village	150 to 500	**Worked.** The standard scale of a Nepalese CFUG. Highly effective for forest

		regeneration, but highly vulnerable to caste/gender capture[60].
Parish/District	1,500 to 5,000	**Strained.**
Town/Watershed	15,000 to 50,000	**Worked.** FECOFUN operates at this level to aggregate political power against the central state[58].
Region/Bioregion	0.5M to 5M	**Failed.**
Nation/Continent	50M to 500M	**N/A.**
Planet	8 Billion	**N/A.**

Summary of Robust Findings

1. Indigenous lands constitute roughly a quarter of Earth's surface and hold over a third of remaining intact forests, demonstrating deep-time durability[1].
2. Sustaining a common-pool resource requires rigid boundary defense and stringent exclusion of outsiders, often maintained through informal violence or strict legal sovereignty[19].
3. Ostrom's design principles are highly configural; systems fail unless nearly all principles (specifically local rule congruence and mutual monitoring) are simultaneously active[12].
4. State-mandated "co-management" routinely disenfranchises traditional users by weaponizing bureaucratic procedures and scientific language, elevating a new administrative elite[49].
5. Left to their own devices, local communities frequently replicate deep structural inequalities (caste, gender), requiring engineered interventions to achieve equity[55].
6. Community conservation is highly vulnerable to dark-triad actors who leverage external state or market resources to bypass traditional consensus, bribing factions to shatter communal tenure[42].
7. Resource systems scale poorly; informal mutual monitoring collapses beyond a few thousand participants due to anonymity[16].
8. Labor-to-resource proportionality is paramount; failure to symmetrically align physical effort with resource extraction rapidly leads to system defection[16].
9. Industrial silviculture can be subverted by community design (e.g., Menominee 150-year horizons) yielding both high economic output and increasing biomass[19].
10. The naturalistic fallacy fails: Indigenous and community success is born of strict

institutional architecture, threat of violence, and transaction cost management, not inherent ecological nobility[5].

Contested or Open Questions

The primary open question in the literature concerns *climate non-stationarity*. Ostrom's design principles, particularly the congruence between rules and local conditions, rely on deep historical knowledge of a localized, stable ecosystem. It remains contested whether traditional, slow-moving governance can adapt rapidly enough to shifting baselines; for example, the Menominee forestry system lost 12 million board-feet to a completely novel, extreme windstorm in 2022, challenging their 150-year algorithmic models[61]. Secondly, the *scale threshold* remains an open debate: at exactly what demographic or spatial threshold does informal mutual monitoring inevitably give way to bureaucratic hierarchy, and can digital or decentralized ledger technology artificially extend this threshold post-collapse? Finally, the *violence paradox* haunts community governance: if robust local conservation (like the Maine lobster gangs) historically requires physical violence or the threat thereof to maintain boundaries in the absence of a state, is the concept of a peaceful, egalitarian CPR management system a utopian myth?

Sources to Read in Full

Author(s) & Year	Title & Publication	Relevance
Acheson, J. M. (1988)	*The Lobster Gangs of Maine*. University Press of New England.[43]	Definitive ethnography of perimeter defense and violence in fisheries.
Ostrom, E. (1990)	*Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge.[62]	Foundation of CPR theory and the 8 Design Principles.
Nadasdy, P. (2003)	*Hunters and Bureaucrats: Power, Knowledge, and Aboriginal-State Relations*... UBC Press.[48]	Devastating critique of co-management and state bureaucracy.
Agarwal, B. (2010)	*Gender and Green Governance*. Oxford University Press.[54]	Quantitative proof of participatory exclusion and gender thresholds.
Bray, D. B. (2020)	*Mexico's Community Forest Enterprises*... University of	Exhaustive review of the Ejido system and enterprise

	Arizona Press.[27]	scaling.
Terborgh, J. (1999)	*Requiem for Nature*. Island Press.[63]	The primary neoprotectionist argument against community conservation.
Redford, K. H. (1992)	"The Ecologically Noble Savage." *Orion*.[5]	Deconstruction of the naturalistic fallacy in anthropology.
Cox, M., et al. (2010)	"A review of design principles for community-based NRM." *Ecology and Society*.[10]	Statistical meta-analysis proving Ostrom's principles hold globally.

Implementability after the Fall

Household (4 to 10 people):

- *Minimum Viable Version:* Absolute territorial claim over a specific micro-resource (e.g., a specific spring, a small foraging patch, or a fishing eddy). Relies entirely on kin-based trust and immediate proximity.
- *Needs:* Physical presence on the resource, basic tools for extraction, and physical defensive implements.
- *First Failure:* Exhaustion of the micro-resource due to survival panic; inability to defend the perimeter against a starving, larger neighboring household.

Village (300 people):

- *Minimum Viable Version:* An Ostrom-compliant irrigation or localized forestry board resembling the Nepal FMIS. Uses strict proportional rules (e.g., 1 day of clearing brush equals 1 cord of firewood allocation).
- *Needs:* A shared physical meeting space (the commons), a physical ledger/book (literacy required for at least a few trusted record-keepers), and a synchronized calendar to coordinate planting, harvesting, and rotational guard duty.
- *First Failure:* Elite capture by a charismatic narcissist who convinces the terrified village to suspend proportional rules in exchange for physical "protection" from outsiders, transitioning the village from a commons to a feudal fiefdom.

District (3,000 people):

- *Minimum Viable Version:* A Menominee-style nested representative council. The district is divided into 10 villages of 300. Each village sends a revocable, heavily instructed delegate to the district council to manage macro-resources (a watershed or large forest tract).
- *Needs:* Written constitutions to legally bind delegates, a highly precise inventory mechanism (e.g., analog timber cruising to measure biomass mathematically), and

rotating, impartial monitors drawn from outside the immediate village they are inspecting.

- *First Failure:* Information asymmetry and the bureaucratic weapon. The delegates sent to the district council learn the true extent of the resources, collude with one another, and rewrite the rules using complex terminology to extract wealth from the villages without their knowledge, inadvertently creating a new oppressive "state."

Principles

Governance Principle	Testable Sentence
The Principle of Rigid Boundaries	A common-pool resource will inevitably be depleted unless the community possesses the absolute physical or legal capacity to exclude outsiders and strictly limit internal membership.
The Principle of Proportional Liability	Governance systems collapse when the cost of maintaining a resource (labor, time, capital) is severed from the allocation of its benefits.
The Principle of Bureaucratic Capture	The introduction of technocratic, written procedures for resource management invariably transfers power from traditional local users to an administrative, literate elite.
The Principle of Interdependent Sanctions	Enforcement against dark-triad defectors only succeeds when the physical infrastructure (e.g., an irrigation canal) requires the continuous, cooperative labor of the entire group to function.
The Principle of Configural Survival	No single institutional rule guarantees sustainability; systems survive only through the simultaneous, overlapping presence of local congruence, mutual monitoring, and graduated sanctions.

Works cited

1. Indigenous languages as commons for environmental governance, https://paris.pias.science/article/indigenous-languages-as-commons-for-environmental-governance
2. The importance of Indigenous Peoples' lands for the conservation of, https://pmc.ncbi.nlm.nih.gov/articles/PMC8247428/
3. (PDF) Importance of Indigenous Peoples' lands for the conservation, https://www.researchgate.net/publication/338412873_Importance_of_Indigenous_Peoples'_lands_for_the_conservation_of_Intact_Forest_Landscapes
4. Importance of Indigenous Peoples' lands for the conservation of, https://acervo.socioambiental.org/sites/default/files/documents/m9d00067.pdf
5. Adivasis as Ecological Warriors: Colonial Laws and Post ... - MDPI, https://www.mdpi.com/2313-5778/8/4/130
6. Cost-Effective Conservation; A Review of What Works to Preserve, https://www.resources.org/archives/cost-effective-conservation-a-review-of-what-works-to-preserve-biodiversity/
7. The great conservation tragedy? A critical reflection of (neo, https://www.tandfonline.com/doi/full/10.1080/03066150.2024.2397373
8. What Counts as Local Knowledge in Global Environmental, https://www.millenniumassessment.org/documents/bridging/bridging.07.pdf
9. Emerging geographies of conservation and Indigenous land in, https://ro.uow.edu.au/ndownloader/files/50494911
10. Sustaining Collective Action in Urban Community Gardens - JASSS, https://www.jasss.org/24/3/3.html
11. Identifying Topics and Trends in the Study of Common-Pool, https://pdfs.semanticscholar.org/5bd5/fe02f6465c64f74e3dfed2e0eab17de7063d.pdf
12. the configural nature of Ostrom's institutional design principles, https://www.researchgate.net/publication/307918402_Explaining_success_and_failure_in_the_commons_The_configural_nature_of_Ostrom's_institutional_design_principles
13. Assessing the institutional foundations of adaptive water ... - NSF PAR, https://par.nsf.gov/servlets/purl/10318605
14. Challenges and Opportunities in Coding the Commons, https://dlc.dlib.indiana.edu/dlc/bitstreams/4bba4c56-c463-4745-bea1-b381b2ce862d/download
15. Elinor Ostrom | Kelembagaan DAS, https://kelembagaandas.wordpress.com/aksi-kolektif-collective-action/elinor-ostrom/
16. Factors Affecting Collective Actions in Farmer-Managed Irrigation, https://www.mdpi.com/2077-0472/8/6/77
17. the-mahesh-chandra-regmi-lecture-2010.pdf - Social Science Baha, https://soscbaha.org/wp-content/uploads/2019/11/the-mahesh-chandra-regmi-lecture-2010.pdf
18. Crafting analytical tools to study institutional change, https://www.cambridge.org/core/journals/journal-of-institutional-economics/artic

le/crafting-analytical-tools-to-study-institutional-change/41867B82336261695C4AAEDE65088932
19. Menominee Sustainable Forestry Practices | PDF - Scribd, https://www.scribd.com/document/403254865/CASE-STUDY-9-1
20. Forest Management, the Menominee Tribe, Culture, and Traditional, https://www.fs.usda.gov/nrs/pubs/gtr/gtr-nrs-p-211papers/02-miller-p-211.pdf
21. Menominee Indians Harvest Sustainable Forests - Living on Earth, https://www.loe.org/shows/segments.html?programID=94-P13-00021&segmentID=1
22. TIL the Menominee Tribe's forest in Wisconsin has been sustainably, https://www.reddit.com/r/todayilearned/comments/1vfrgl2/til_the_menominee_tribes_forest_in_wisconsin_has/
23. Branching out - Insight on Business, https://insightonbusiness.com/branching-out-1/
24. Mexico's ejidos are finding greater sustainability by involving youth, https://news.mongabay.com/2018/06/mexicos-ejidos-are-finding-greater-sustainability-by-involving-youth-and-women/
25. Political Landscapes: Forests, Conservation, and Community in, https://dokumen.pub/political-landscapes-forests-conservation-and-community-in-mexico-9780822375876.html
26. Community-based Forest Enterprises in Tropical Forest Countries, https://rightsandresources.org/wp-content/uploads/exported-pdf/cfescopingitto62207final.pdf
27. Community Forestry Enterprises in Mexico: Sustainability and, https://www.researchgate.net/publication/281271827_Community_Forestry_Enterprises_in_Mexico_Sustainability_and_Competitiveness
28. Community Forest Management and the Emergence of Multi-Scale, https://www.mdpi.com/1999-4907/2/2/451
29. Sovereignty, Development, and Indigenous Resistance in Bolivia, https://digitalcommons.cwu.edu/cgi/viewcontent.cgi?article=1009&context=polisci
30. Bolivians march against development plan - Al Jazeera, https://www.aljazeera.com/news/2011/8/16/bolivians-march-against-development-plan
31. Indigeneity and Socialism in the Foreign Policy of Bolivian President, https://works.swarthmore.edu/cgi/viewcontent.cgi?article=1170&context=suhj
32. Bolivia: indigenous groups mobilise against highway, https://lab.org.uk/bolivia-indigenous-groups-mobilise-against-highway/
33. Revolution against "Progress": Neo-Extractivism, the Compensatory, https://www.academia.edu/9962654/Revolution_against_Progress_Neo_Extractivism_the_Compensatory_State_and_the_TIPNIS_Conflict_in_Bolivia
34. Indigenous activists gain momentum in Bolivia - Al Jazeera, https://www.aljazeera.com/opinions/2011/8/29/indigenous-activists-gain-momentum-in-bolivia
35. Fernando Vargas Mosua - Wikipedia,

https://en.wikipedia.org/wiki/Fernando_Vargas_Mosua
36. Reducing Carbon Emissions from Deforestation: the Role of ARPA's, https://d3nehc6yl9qzo4.cloudfront.net/downloads/arpas_role_in_reducing_emissions_from_deforestation__ipam_wwf_et_alii_2008.pdf
37. Amazon Forest maintenance as a source of environmental services, https://www.scielo.br/j/aabc/a/kwcg5pMksNQZ3J8yDXKYpXm/?lang=en
38. Land-use/land-cover change among rubber tappers in the Chico, https://www.tandfonline.com/doi/full/10.1080/17474230903222499
39. Brazilian Amazon gold: indigenous land rights under risk | Elementa, https://online.ucpress.edu/elementa/article/doi/10.1525/elementa.427/114461/Brazilian-Amazon-gold-indigenous-land-rights-under
40. Bolivia's Morales pushes controversial TIPNIS highway forward, again, https://infoamazonia.org/en/2015/08/20/bolivias-morales-pushes-controversial-tipnis-highway-forward/
41. Criminal Charges Against Indigenous Leaders ... - Equipo Nizkor, https://www.derechos.org/nizkor/bolivia/doc/tipnis664.html
42. Bolivia's TIPNIS March in a Changing Political Environment - NACLA, https://nacla.org/2012-5-23-bolivia%25e2%2580%2599s-tipnis-march-changing-political-environment/
43. Combining the IAD and SES Frameworks, https://www.repository.law.indiana.edu/cgi/viewcontent.cgi?article=3741&context=facpub
44. A Sea Change off the Coast of Maine: Common Pool Resources as, https://scholarlycommons.law.emory.edu/cgi/viewcontent.cgi?article=1331&context=elj
45. Economic Impact of Maine Lobster Gangs | PDF - Scribd, https://www.scribd.com/document/540277939/The-Lobster-Fiefs-Economic-and-Ecological-Effects
46. James M. Acheson PhD University of Maine - ResearchGate, https://www.researchgate.net/profile/James-Acheson
47. Adaptive capacity of the Maine lobster fishery - Facets Journal, https://www.facetsjournal.com/doi/full/10.1139/facets-2023-0193
48. Draft – Please Do Not Cite 1 Rethinking Reconciliation, https://cpsa-acsp.ca/papers-2011/Honkanen.pdf
49. Realizing Indigenous Law in Co-Management, https://gordonfoundation.ca/wp-content/uploads/2020/04/JGNF_2018-2019_Realizing-Indigenous-Law-in-Co-Management.pdf
50. Hunters and Bureaucrats: Power, Knowledge and Aboriginal-State, https://journalhosting.ucalgary.ca/index.php/arctic/article/download/63610/47546
51. Boldt Decision Explained - Northwest Treaty Tribes, https://nwtreatytribes.org/boldt-decision-explained/
52. Tribal Treaty Rights and Salmon: The Legacy of the Boldt Decision, https://pugetsoundkeeper.org/2024/07/15/tribal-treaty-rights-and-salmon-the-legacy-of-the-boldt-decision/
53. Commercial fishing, Inuit rights, and internal colonialism in Nunavut,

https://www.cambridge.org/core/services/aop-cambridge-core/content/view/9B73DFB3465893052652FE6562161491/S0032247421000747a.pdf/div-class-title-commercial-fishing-inuit-rights-and-internal-colonialism-in-nunavut-div.pdf
54. (PDF) The challenge of gender inequality - ResearchGate, https://www.researchgate.net/publication/323210628_The_challenge_of_gender_inequality
55. Community Forestry, Power and Inequality in Nepal - ResearchGate, https://www.researchgate.net/publication/403116084_Community_Forestry_Power_and_Inequality_in_Nepal
56. Who are clutching on Community Forestry User Groups in Nepal, https://ageconsearch.umn.edu/record/96666/files/2008_14_Who%20are%20Controlling%20Community%20Forestry%20User%20Groups_1_.pdf
57. Community Forestry in Nepal: A Policy Innovation for Local Livelihood, https://cgspace.cgiar.org/bitstreams/cfb4ef4d-e771-46e8-b941-b95643c8d1a8/download
58. Federation of Community Forestry Users Nepal, https://www.iied.org/sites/default/files/pdfs/2024-04/22351g.pdf
59. Rural Dev 422 CFUG Report Bharat BC-2 | PDF | Dalit | Social, https://www.scribd.com/document/1060258799/Rural-Dev-422-CFUG-Report-Bharat-BC-2
60. Evaluating Community Forest User Groups (CFUGs)' Performance in, https://www.mdpi.com/2071-1050/16/11/4471
61. Tree Keepers: Where Sustaining the Forest Is a Tribal Tradition, https://e360.yale.edu/features/menominee-forest-management-logging
62. Ostrom's Design Principles as Steering Principles for Contractual, https://www.researchgate.net/publication/358089412_Ostrom's_Design_Principles_as_Steering_Principles_for_Contractual_Governance_in_Hotbeds
63. Paying for environmental services: can we afford to lose a cultural, https://www.tandfonline.com/doi/full/10.1080/15693430701878240