Institutional Analysis of the Bondar Parhudagar Irrigation System (Indonesia)

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1 Part I: Static Analysis - Collective Action

Bondar Parhudagar Irrigation system is one of the six small irrigation systems located in Lintong ni Huta of The subdistrict of Balige in Indonesia. The key resource appropriated related to the social dilemma is water for irrigation. The water derives from the Dolok Tolong mountain stream and watershed. The original case was reported in 1979 and catalogues an action situation involving less than 10 members that belong to one family (descendants of the founder of the irrigation system).

This case was part of the original CPR database developed in the 1980s by Edella Schlager and Shui Yan Tang at Indiana University. It was deemed a successful implementation of collective action as well as a successful resolution of the commons dilemma.

1.1 The Commons Dilemma

The potential appropriation issues of overappropriation and poor coordination of appropriation are overcome by the community within Lintong ni Huta. Rules are in place within this community to prevent these appropriation dilemmas. For example, the community follows Ostrom's second design principle of proportional equivalence between benefits and costs: member costs for water use from the Bondar Parhudagar canal system are proportional to irrigated land area. Those who do not pay the costs of maintenance and system membership for this canal system cannot use water deriving from it.

Additionally, the irrigation board that oversees the maintenance and use of the Bondar Parhudagar system is composed of community-elected figures with extensive historical and lineage ties to the region. Thus, community members have a substantial say in the management and maintenance of the canals. Monitoring is also primarily conducted by the broader community. The small geographic extent of the system and the lineage ties amongst community members provides a high incentive to follow community rules and enables great visibility (geophysical and social) to identify potential free riders/defectors.

As far as is reported in the original case report, there is no note of conflicts or threats related to rule defection or resource overappropriation.

1.2 Biophysical Context (IAD)

1.2.1 Natural Infrastructure

The Bondar Parhudagar system derives its water from a small stream flowing from the Dolok Tolong mountain. This watershed creates a clearly defined geophysical boundary for the community. Resource (water) scarcity is not discussed or noted as a previous risk within the original document.

1.2.2 Hard Human-Made Infrastructure

The canal system is the primary piece of physical infrastructure in the system. This irrigation structure supports rice agriculture, a central means of subsistence and income within the community.

1.3 Attributes of the Community (IAD)

Correlated to the physical infrastructure above, Bondar Parhudagar canals are supported and maintained through an irrigation board, the primary soft human-made infrastructure of this system. The irrigation board collects levies in rice following rice harvest in proportion to a household's irrigated land area. These levies and this board facilitate canal maintenance, appearing primarily in the form of organizing canal cleaning. Individual households are also responsible for the maintenance and cleaning of feeder and drainage canals within their own paddies.

An additional form of soft human-made infrastructure crucial to the social regulation of the canal system is the adat concept. This term refers to the customary law impacting social behavior, irrigation use, and broader cultural worldview regulating community members in Lintong ni Huta.

1.4 Rules in Use (IAD)

- **Boundary rules.** Membership to the irrigation community requires levy-membership payment (i.e., those who wish to avoid levy payment must exit the system and access irrigation outside of the system).
- **Payoff rules.** Levies are paid in rice rather than labor, and are proportional to a paying household's irrigated land area. There is limited economic sanctioning for those who fail to participate in canal repair or cleaning work (i.e., no coercive or jural sanctionings).
- **Position rules.** Only male heirs of the original irrigation system owner hold proprietary rights to a share of the system, a share of the levies, and to hold office in the irrigation board. The canal chief/supervisor (raja

bondar, panitia) must be an elder of RPS lineage and must be knowledgeable of adat and lineage genealogy. Canal chiefs/supervisors are elected annually at meetings of original lineage and levy-paying members. Members are expected to contribute 2-3 days of labor annually, in the form of canal cleaning and repairs of irrigation weirs.

- **Choice rules.** No information is provided.
- **Aggregation rules.** No information is provided.
- **Scope rules.** No information is provided.
- **Information rules.** "No instances of conflict or water theft were noted in the oral histories of Batak irrigation systems" (Lando 1979:44) → This quote provides a possible information rule, indicating either secrecy regarding past thefts/conflicts, or public promotion of the lack of these events.

1.5 Summary

Original authors deemed the coordination of individual efforts around the Bondar Parhudagar irrigation system a successful instance of common pool resource (CPR) usage and management. Proportional cost-benefit payoff structures, individual household responsibility for feeder and drainage canals, and community involvement within the canal chief/supervisor election process aid in the avoidance of commons dilemmas (i.e., overappropriation and poor appropriation coordination).

2 Part II: Dynamic Analysis - Robustness

2.1 Potential Shocks, Capacities, and Vulnerabilities

2.1.1 Shocks or Vulnerabilities

Destabilizing demographic change represents a possible major shock to or vulnerability of the robustness of the Bondar Parhudagar system. The source document notes that "changing demographic factors have radically altered the descent structure of the village" (Lando 1979:21). Outmigration for alternative social and financial circumstances as well as the significant potential instability of a single-lineage organizational structure provide two notable robustness vulnerabilities.

2.1.2 Capacities for Robustness

A source of robustness for the irrigation system is the highly adaptable adat customary law system. These customary laws are structured in order to adapt to local needs and social variation, and are the primary underlying social regulator of household appropriation of irrigated water. The adat system thus increases

robustness as irrigation management and larger social dynamics can be managed differently given changing circumstances or community needs.

3 Part III: Contributors

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