

## **Institutions in Transitioning Peri-urban Communities: Spatial Differences in Groundwater Access**

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### **Abstract**

Urbanization brings challenges for the management of water needs in an evolving socio-economic context. This issue is particularly relevant in transitioning peri-urban areas like Khulna, Bangladesh where competing demands has put  
10 pressure on local groundwater resources. Users are unable to sufficiently meet their needs through existing institutions. These institutions exist as guidelines for actors to resolve their social dilemmas, however, the dynamic peri-urban context often results in fragmented institutional arrangements. For example, in Khulna, water service provision is based on urban and rural boundaries, thus presenting a problem for peri-urban communities. The resulting water scarcity has motivated local actors to adopt different approaches to safeguard their groundwater needs. General institutional theories are well developed  
15 in literature, yet little is known about institutions in transitioning peri-urban areas. Institutions that fail to adapt to changing dynamics run the risk of becoming obsolete or counter-productive, hence the need for investigating institutional change mechanisms in this context. This paper examines peri-urban case studies from Khulna using the Institutional Analysis and Development framework to demonstrate how peri-urban institutions have contributed to spatial differences in groundwater access. Over time, these actors are found to invest in formal and informal institutional change as a means of securing  
20 groundwater access.

### **1 Introduction**

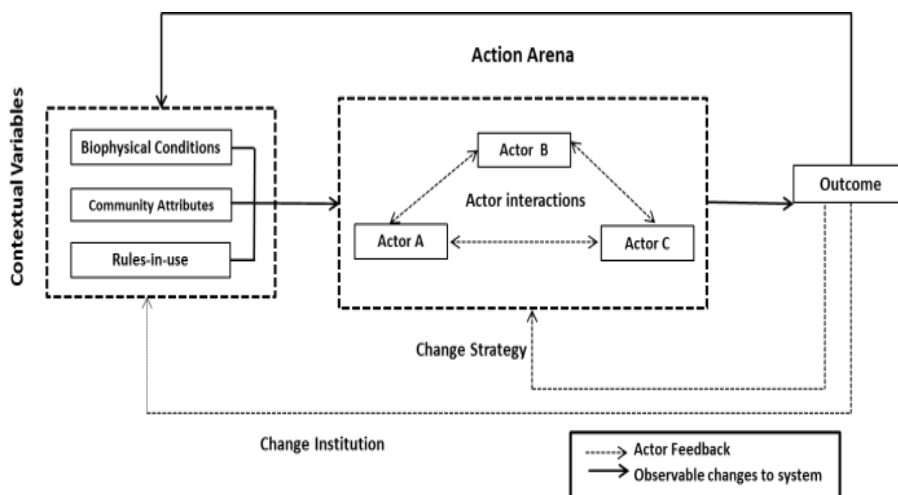
The global south is expected to witness significant levels of urbanization in the coming decades which will have implications for the management of water resources (UN DESA, 2014). We see evidence of this already, in the Ganges delta where rapid and largely uncontrolled urban expansion has brought growing concerns of water scarcity, competition, and  
25 inequity among users (Kumar et al., 2011; Thissen et al., 2013). The situation is particularly severe in peri-urban areas surrounding Khulna city, Bangladesh, where groundwater forms primary critical source for domestic and livelihood purposes. Peri-urban areas are dynamic, representing the transition zones in processes of urban expansion with a heterogeneous composition (Allen, 2003; Narain, 2010).

In such a context, the management of scarce groundwater resources requires a coordinated approach among actors,  
30 based on a shared set of rules. Institutions are defined as formal and informal ‘rules’ that structure interaction and behavior in society (North, 1990). Thus, institutions offer a means for resolving social dilemmas by offering prescriptive guidelines.

However, peri-urban villages in Khulna have witnessed the failure of existing institutions in addressing their groundwater needs (Thissen et al., 2013). Achieving effective institutional arrangements in peri-urban areas is complex. Institutions are expected to evolve with the changing context yet this is not always possible due to various constraints placed upon the actors responsible for achieving institutional change. This results in the creation of a fragmented mix of rural and urban institutions.

- 5 This research explores how peri-urban institutions and institutional change have contributed to spatial differences in groundwater access in peri-urban Khulna.

## 2 Conceptual Framework for Peri-urban Institutional Analysis



IAD Framework (Adapted from Ostrom, 2005)

- 10 The Institutional Analysis and Development (IAD) framework, developed by Ostrom, (2005) focuses on key aspects relevant to the study of institutions and institutional change. For one, the analysis centres around the action arena, consisting of interactions between multiple actors with an ability to influence their system of interest. In this case, the action arena is groundwater management at the peri-urban level. Strategic behaviour within this arena and its resulting outcome is based on contextual variables such as the institutional arrangements or 'rules in use', community attributes such as socio-
- 15 economic conditions and biophysical conditions (Ostrom, 2005)

- Institutions include consciously designed, codified formal laws, constitutions, property rights as well as informal, socially constructed norms and values that together comprise a society's culture (North, 1990; Williamson, 1998). Through a set of structural variables, they define the participants, their position, resources, possible actions and the costs as benefits of their associated outcomes within the action arena (Ostrom, 2005). In society, institutions are organized in a nested structure
- 20 from local operational rules to increasingly embedded higher order collective choice, constitutional and meta-constitutional rules (North, 1990; Ostrom, 2005; Williamson, 2000).

- Feedback loops from the outcomes are an important part of this framework offering a means to study institutional change. North (1996) describes institutional change to arise through a process of actor learning through the outcomes of strategic decisions. Here, negative feedback is a signal to change strategies or alter the institutions in order to achieve their
- 25 objectives. Although institutions are expected to evolve with actor's needs in this manner, this is not always the case.

Theories highlight the embeddedness of rules that brings a higher transaction costs for institutional change (North, 1990). As a result, institutions may gradually become eroded over time, replaced, or ignored altogether without purposive action (Scharpf, 1997). Moreover, institutions aren't socially efficient, so the agents of institutional change depends on the bargaining power of the actors involved (North, 1990, 1996). In the modified framework above, feedback in the form of observed changes to the biophysical and socio-economic context is differentiated from actor feedback that results in institutional change, given this is a key research objective.

### 3 Methodology

The adapted IAD framework is used to analyze institutional aspects of groundwater access in peri-urban Khulna. The villages of Hoglandanga and Matumdanga are selected case studies given they depict peri-urban characteristics and face concerns regarding groundwater access. They are formally located outside Khulna city jurisdiction and are currently witnessing urban expansion. Multi-actor interactions concerning peri-urban groundwater access are examined in the context of contextual variables using the above-mentioned framework. Field research revealed three important stages in the evolution of this issue representing the past, present and future scenario of ground water access. In each stage, the framework examines the type of institutional change actors have invested in to address the problem of groundwater access.

Primary data from government websites and published reports is verified and supplemented through field discussions with 18 key actors including government agencies and local groundwater users from both villages (Gomes, 2015). Interviewees were selected through a combination of structured and snowball sampling methods (Harrell & Bradley, 2009). Interview methods included focus group discussions and key informant interviews. Field data gathered during May-June (2015) was subsequently verified either during a de-briefing meeting with local actors or via email communication. Formal and informal institutions relating to groundwater access are analyzed based on their level of operation in the nested structure and the action arena variables they define (Ostrom, 2005).

### 4 Results

#### 4.1 Initial Situation: Rural Service Provision

Both peri-urban villages fall under the jurisdiction of rural service providers such as the Department of Public Health Engineering (DPHE) and the Bangladesh Agricultural Development Corporation (BADC) for domestic and irrigation purposes respectively. Tube wells are provided through water and sanitation (WATSAN) or Irrigation committees at the sub-district level, headed by the sub-district chairman with representatives from local unions, BADC or DPHE (BADC, 1985; Local Government Division, 1998). Villages can apply for a tube-well licences via written applications at their local union after which the committee decides the allocate of available licences among villages. The allocation is supposed to be based on the following selection criteria: aquifer conditions, distance from neighbouring tube wells, beneficial area, effect on existing tube wells and suitability of site (BADC, 1985; Gomes, 2015). However, this quota system does not appear to be operationalized in practice. Both villages stated that this process has failed to supply them with sufficient tube wells in the

last 4-5 years (Gomes, 2015). Public tube wells from DPHE come at a subsidized cost, making this an attractive option for those unable to invest in a private tube well. The resulting outcome is that of water insecurity for both peri-urban villages due to the failure of formal institutions. Discussions gave the impression that the villages' remote location away from the administrative centre gives them limited voice in the sub-district committee (Gomes, 2015)

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#### 4.2 Current Situation: Informal Service Provision

Given these challenges, the villages adopted a new strategy to access groundwater . Here we see the emergence of informal institutions to address the irrigation and domestic water needs of peri-urban villages. Local private tube well owners now sell groundwater to marginalized irrigators. Tariffs are jointly agreed upon by both parties, although it is unclear if there are negotiations involved or if the prices are elastic given the seasonal scarcity issues highlighted in both communities. In Matumdanga, water from shallow aquifers was sold in 2015 at a rate of 35-47 Euro/ 0.5 ha of land per season for unlimited use while in Hoglandanga the shrimp farmers pay a rate of ~0,6 Euro/ hr that covers the costs of fuel and electricity (Gomes, 2015). Meanwhile domestic users, rely on the existing tube wells but have developed informal rules such as a first come first serve and queue system for collecting water. Women in Matumdanga, typically responsible for household water collection need to also respect rules in the Muslim culture by avoiding visits to the shared tube well within their local Mosque during hours of prayer (Gomes, 2015).

#### 4.3 Future Situation : Urban Service Providers

A potential future scenario of institutional change results as a by-product of the urbanization process. Khulna Water Supply and Sewerage Authority (KWSA) caters to the water and sanitation needs of Khulna city. Currently, 95% of the water supply currently comes from groundwater resources through private and shared tube-wells, however, they have plan to extend coverage through surface water project funded by donor agencies (Gomes, 2015). Urban administration is managed by the Khulna City Corporation (KCC) who in 2007 and later 2014 submitted an proposal extending city boundaries from 45 km<sup>2</sup> to 114 km<sup>2</sup> based on the Khulna master plan (Gomes, 2015). Once approved, this plan would bring Matumdanga and Hogladanga villages under KCC jurisdiction, making water supply the responsibility of KWSA. However, KWSA currently faces a supply gap with unserved areas presently relying on private tube wells (Gomes, 2015). Thus, it is unclear if groundwater access could improve in these villages under urban administration in the future.

#### 4 Discussion

The above case is testament to how groundwater access in peri-urban areas is influenced by the institutional structure. Formal institutions in the initial stage produced spatial differences in groundwater access between those with and without tube well license approvals. Although, policies specify rules for allocation, lack of adequate enforcing and monitoring mechanisms is a deterrent to its functioning at the local level. Monitoring and enforcement of rules prevents opportunistic behavior by placing a higher risk for those actors considering defecting (Ostrom, 2005). The enforcement of

rules, depends on whether there is a known willingness for local committees to deviate from them. There appear to be payoffs for some elected members within the committee that support this deviation. One could be internal reciprocal norms to appease the constituencies that elect them which influences this decision. Or it could be a result of conflicting rules such as the Bangladesh Water Act (2013) promoting the right to water and those stating that communities should play a greater role in managing the costs for water services (Local Government Division, 1998; Ministry of Law, Justice and Parliamentary Affairs, 2013; Ministry of Water Resources, 1999). Greif's, (2006) theory on legal pluralism highlights that rules may be complementing, reinforcing or conflicting to one another. Furthermore, limited understanding of the context in the design of rules or combination of rules can produce unintended or disastrous outcomes (Ostrom, 2005).

Feedback from this inequitable outcome led local actors to invest in institutional change to address their needs. In the current situation, we find that institutional change depends one's resources. The location of both villages, away from rural decision centers, gives them limited bargaining power to seek a more equitable distribution of licenses. Thus, actors chose to invest in informal change given these transaction costs. We also see that groundwater access was dealt differently by irrigators and domestic users. While irrigators opted to invest in a market system for the purchase of groundwater, domestic users rely on sharing existing tube wells. The latter has less financial implications but bears costs in terms of time spent, distance travelled and convenience. Thus, even in the informal mechanisms created we find differences in the alternatives between peri-urban users.

In the future, constitutional level rules may influence groundwater access through urbanization. Formal change by replacing rural with urban service providers will create some uncertainties for users in these villages. For domestic users there is the risk that existing gaps in urban water supply will continue, once again causing spatial difference in groundwater access within urban areas. For irrigators, future groundwater dependency is uncertain given the existing changes in land use (Gomes, 2015). When peri-urban villages come under KCC jurisdiction, the fate of peri-urban land will depend upon the master plans. So it is likely that livelihood uncertainty will play a bigger role than the water access uncertainty.

## 5 Conclusion

Problems in peri-urban Khulna shows that institutions fail to address groundwater access equitably during urban transitions. It also highlights the challenges of designing effective institutions in this context. The dynamics of peri-urban areas results in formal institutions becoming ineffective over time and creating spatial differences in water access. Addressing inefficient rules needs to stem from an understanding of how these rules are applied in practice. Understanding actors motivations and objectives can help in this regard. In Khulna, there was a shift from formal to informal institutions with the future bringing yet another formal change. Theories suggest that institutions work if they are stable in the long term but this is not possible given the dynamics of peri-urban areas. Thus peri-urban areas are challenged with balancing functionality with stability, the former often achieved through informal means. This research signals that improving water management during urban transitions requires focusing on the institutional system, for which the IAD framework offers a means to operationalize key concepts in the peri-urban context.

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