Final Stakeholder Workshop Shifting Grounds Project India

Kolkata, India

Final Stakeholder Workshop Shifting Grounds Project India

Report of workshop held at the Ramkrishna Mission Conference Hall, Narendrapur, Kolkata, India

Friday 14 September 2018

Workshop report prepared by the Shifting Grounds project team:

Leon Hermans, Sharlene Gomes, Wil Thissen (TU Delft)
Poulomi Banerjee, Vishal Narain (SaciWATERs)
Mashfiqus Salehin, Md. Rezaul Hasan, Shah Alam Khan (BUET)
Remi Kempers (Both ENDS)
Partha Sarathi Banerjee, Binoy Majumdar, Soma Majumdar (The Researcher)
ATM Zakir Hossain, Faisal Islam, Nazmul Hudda (JJS)

Editing: Leon Hermans and Sharlene Gomes
Lay-out and design: SaciWATERs

"Shifting Grounds: Institutional transformation, enhancing knowledge and capacity to manage groundwater security in peri-urban Ganges delta systems." Funded by the Urbanising Deltas of the World Programme of the Netherlands Organization for Scientific Research (NWO) under grant number W 07.69.104

Project website: http://saciwaters.org/shiftinggrounds/

Table of Contents

1. Introduction

The project “Shifting Grounds: Institutional transformation, enhancing knowledge and capacity to manage groundwater security in peri-urban Ganges delta systems” (hereafter: “Shifting Grounds”) is a four year project that combines research, sustainable development and capacity development. The focus is on groundwater security in peri-urban areas in India and Bangladesh. Here, rapid urbanization has resulted in an increasing pressure on groundwater resources in peri-urban areas. Increased climatic variability, degrading surface water sources, land use change, coupled with unequal caste-class-power structures, rules, norms and practices, create pressure on already strenuous groundwater tables and lead to uncoordinated overexploitation of aquifers. The resulting lack of access to groundwater during critical periods affects the livelihood securities of the vulnerable and contributes to the incidence of poverty.

In the Shifting Grounds project, researchers and civil society organizations from Bangladesh, India and the Netherlands cooperated to enhance understanding and build capacity with local stakeholders to support sustainable groundwater management in peri-urban areas. Research and capacity building activities were undertaken in peri-urban villages near Khulna and Kolkata. Researchers conducted local assessments in four villages on groundwater systems, livelihoods and institutions and analysed their interplay. Results were linked to capacity building activities through an intensive process based on the “Negotiated Approach” for two of the four project sites.

Final stakeholder workshops were organized in Kolkata and Khulna towards the end of the project period in September 2018, to report and discuss project results with local stakeholders and international guests, and to obtain stakeholder feedback about project activities and impacts, as well as possibilities and commitment to continuation of initiated processes by local stakeholders. The workshops were chaired by Wil Thissen from TU Delft, former project leader and chair of the Project Advisory Group. During the workshop, translations from Bengali to English and vice versa were provided by the local project team members.

This report covers the workshop proceedings from the Kolkata workshop. A separate report for Khulna is also available.

2. The Theory of Change of Shifting Grounds

The Theory of change of the Shifting Grounds project helps to understand the ambitions and logic of the activities in the project, and subsequently the reason for the structure of activities in this final workshop. A Theory of Change is often used in project planning to articulate how a project is expected to have impacts and can make a difference. Project leader Leon Hermans from TU Delft explained the Theory of Change for the Shifting Grounds project (Figure 1).

Being funded by the Netherlands Organization for Scientific Research (NWO) under its Urbanizing Deltas of the World (UDW) programme, Shifting Grounds is primarily a research project. However, research is combined with a focus on sustainable development and stakeholder capacity development. The research activities in Shifting Grounds look into three interlinked components affecting groundwater management in the four studied peri-urban areas: modelling the groundwater resources in the physical system, investigating the institutions (formal and informal rules) that condition the shared management of these groundwater resources, and the actual uses of groundwater by local stakeholders for livelihoods and domestic use.

The three systems (groundwater, institutional and socio-economic systems) also have important interlinkages, which are studies using more specific approaches such as scenarios, game theory, integrative narrative analysis, and a multi-dimensional groundwater poverty index. The aim is to get a better understanding of these three dimension and how they influence each other.

The ambition for this project is not just for research but also for the benefit of society. Therefore, interactions with community stakeholders have also been an equally important pillar. Close stakeholder involvement was expected to improve research results, by obtaining a better image on the local situation, based on community knowledge and perceptions. Also, it was considered key to ensure that research insights could be used by local stakeholders to address their problems and improve the sustainability of local groundwater resources management.

The stakeholder participation and capacity development activities in Shifting Grounds were done using the “Negotiated Approach”, a stakeholder empowerment and policy influencing approach developed by the Dutch NGO Both ENDS and its different local partners in various parts of the world. The process used for Shifting Grounds identified several steps, based on expected interlinkages with research activities – a novel way of using the Negotiated Approach, tailored to this project. Shared understanding is an important base to build capacity and to increase the willingness among stakeholders within village communities to discuss groundwater problems among each other, to prepare for dialogue between government and village communities, and to subsequently take action and, possibly, influence government policies.

After the project, the project team hopes to leave the villages with an improved basis for further dialogue, an improved understanding of groundwater resources as well as capacity to address other local issues in the village in a similar way.

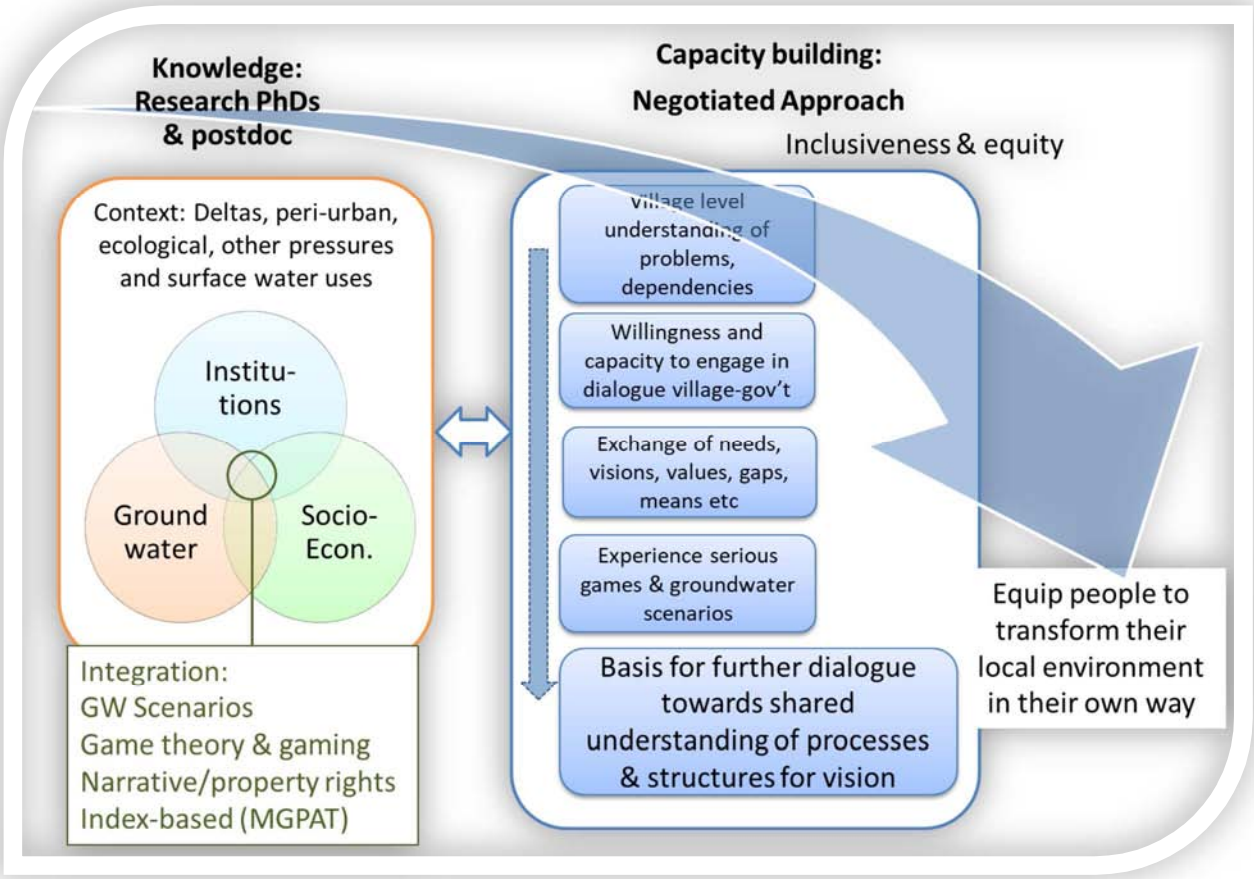


Figure 1 Theory of Change Shifting Grounds Project

3. Research results

3.1 Groundwater system mapping

Presentation on Groundwater System

Groundwater systems research were presented by Rezaul Hasan, a PhD student at BUET in Dhaka who executed the groundwater research within the project. Limitations with data availability, combined with limitations in project resources, have limited the work on the groundwater sites in Kolkata. In Kolkata, groundwater quality research was done in the initial stages, providing some general insights in regional groundwater conditions. The further research in Kolkata was mainly done following the Negotiated Approach process, using additional funds for Arsenic testing, discussed later in the workshop. The presentation by Rezaul Hasan focused on his PhD work, which focused primarily on the sites near Khulna.

The groundwater research aims are to understand:

1. Evolution of peri-urbanization – around Khulna
2. Relation between peri-urbanization and groundwater security
3. Relative role of this relationship in different peri-urban settings

Groundwater security in the research has been conceptualized as: “The availability of water throughout the year with acceptable level of quality, accessible to people of different stakes, with tolerable levels of risks resulting from climatic and socio-economic processes”. Six peri-urban sites around Khulna, in-depth investigation for Hogladanga. A larger area was taken to better look into the groundwater system, beyond the two village sites for Khulna in Shifting Grounds.

The research looked into different characteristics across these six sites near Khulna, important for groundwater security in villages, and illustrating the diversity in peri-urban areas. These include demographic changes, livelihood heterogeneity, distance to city centre, multiplicity of claimants (real estate, industry, agriculture/aquaculture) and land use changes (Figure 2). For instance: 56.6% of Hogladanga population is local and 43.4% are in-migrants from more recent years; build-up areas increase from 15.1% to 25.7% from 1996 to 2016; Real estate and industrial growth visible mainly along the roads; and more recent pollution impacts from Khulna city in Hogladanga due to city waste dumping station nearby and two wastewater canals, carrying city and medical wastes.

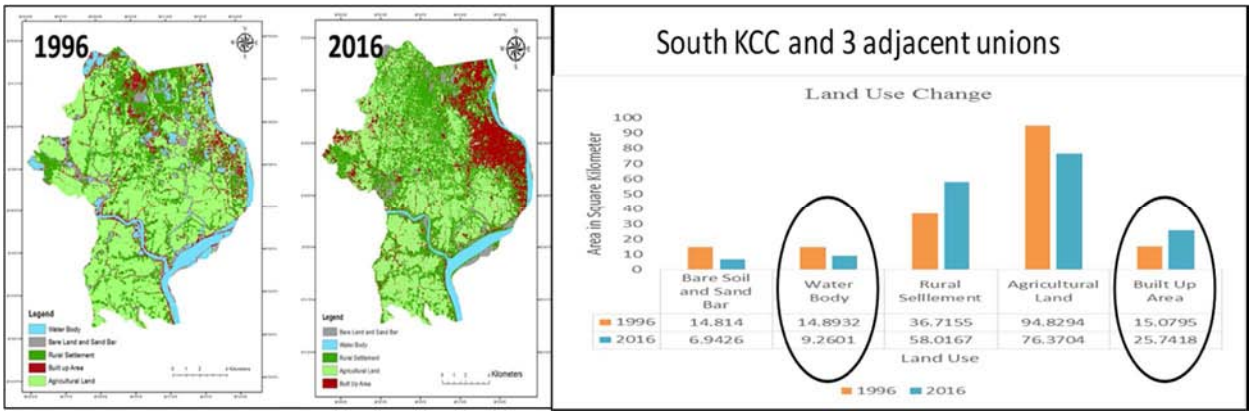


Figure 2 Land use changes Kolkata

Groundwater coastal aquifers have a high degree of spatial variability (Figure 3). Furthermore, the unavailability of suitable aquifers (thickness and quality) limits the number of tube-wells. This also causes differences among the villages around Khulna: In the village of Chak Ahsankhali they suffer a lack of groundwater access, while in Sanchibunia there is no real issue in access.

Shallow aquifers are used in some villages for drinking water or domestic water (such as in Hogladanga). Shallow aquifers nearby rivers or canals suffer increased salinity levels. If quality (salinity mainly for studied Khulna villages) is insufficient in the shallow aquifer, the deep aquifer is tapped (600 – 900 ft), leading to increased pumping costs (for instance in Hogladanga).

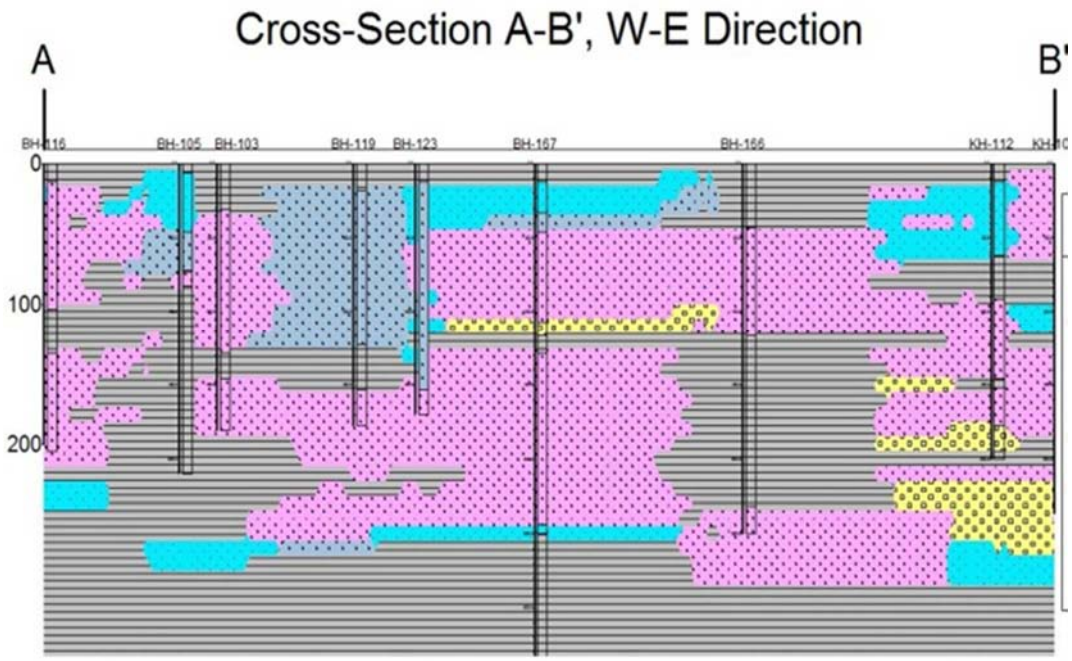


Figure 3 Cross-section showing the complexity of the hydrogeology in the study sites near Khulna

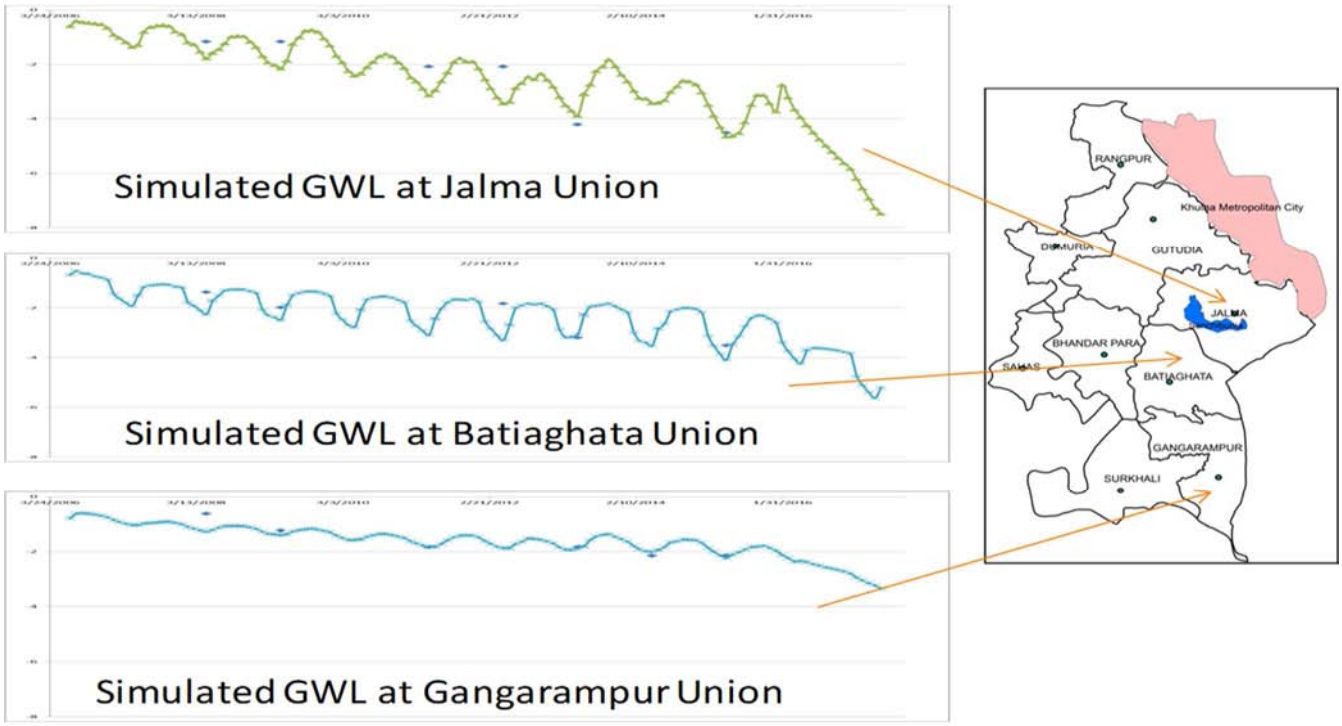


Figure 4 Groundwater model results, showing declining trends in groundwater levels

Survey results obtained from a joint survey show that in Hogladanga, the village in which also the Negotiated Approach were undertaken, households continue to depend on surface water for many domestic uses, but shift to groundwater during the dry season when there are surface water shortages. Dependence on groundwater tube-wells for drinking water increased from less than 6.3% to more than 96.8% in past ten years. While the newly constructed households/buildings have installed tube-wells to meet their demands in villages Sanchibunia, Nijkhamar, S. Labonchara, in the village Chak Ahsnkhale there is only one deep tube well that services about 50-60 households, often with conflicts.

Many of the households covered in the survey and water audits reported perceived water insufficiency, with groundwater table depletion being reported by them as the major cause of perceived water insufficiency by households. Possible causes of groundwater table decline, inferred from groundwater modelling results (Figure 4), are mainly located outside the peri-urban villages. These are different for the deep and shallow aquifers:

- Deep aquifer: extraction from city well fields. KWASA supplies 199 million liters every day to the households in Khulna city, mainly from groundwater. These wells are only 5-7 km away from Sanchibunia.
- Shallow aquifer: irrigation in neighbouring rural areas is expected to have an impact here. Less significant impacts from land use change *within* the peri-urban areas. In addition, the shallow aquifer salinity in the model results is influenced by proximity to rivers and canals that are increasingly carrying saline water.

Finally, some differences between the Kolkata and Khulna sites were highlighted: Impacts of city pollutants higher near Kolkata. Boro rice cultivation still popular in Hogladanga, declined near Kolkata.

3.2 Socio-economic research

Poulomi Banerjee, postdoc researcher at SaciWATERs, presented findings on socio-economic research. The research focused on groundwater management in relation to livelihood choices peri-urban villages.

Village profiles

For the two sites near Kolkata, Bodai (Figure 5) and Tihuria (Figure 6), an overview of results was presented first. Bodai, located in North 24 Parganas District, has a predominantly Muslim population. For agriculture, groundwater irrigation plays an important role. In recent years, this entirely depends on the use of one deep tubewell. Shallow wells, in the layer of 150-180 ft, have become obsolete due to over-extraction. Furthermore, groundwater quality has been affected by pollution. A pump operator was appointed in 2011, who has now the hegemony of access to these groundwater resources in the village. The rule of first come first served for distribution is often violated, and some tail end farmers pay high prices. Water logging has affected the use of land for agriculture.

Tihuria in the South 24 Parganas District of Kolkata, has a more homogeneous social status than would be expected for a heterogeneous peri-urban community. However, the homogeneity in terms of caste does not affect the presence of significant economic heterogeneity. This is roughly organized in different geographic clusters, each with own economic activities and their own political representation. The presence of a wastewater irrigation system has influenced livelihoods since 1920.

The drainage channels for saline water used to be used for the irrigation of fish ponds, then changed into wastewater channel since 1940s, used for aquaculture. This use as wastewater channel become possible due to the proximity of the East Kolkata Wetland, used for treatment of Kolkata city wastewater (this wetland is now an internationally recognized Ramsar site). But now also in decline and being replaced by shallow tubewells for groundwater irrigation. Recently, much more shallow-based paddy cultivation and shallow aqua-culturalists are active, happening in four of five clusters. Rice cultivation is practiced in the middle area which has sandy soil layers. When we started the project, a new private drinking water bottling plant had just been established in the village. Recently, several more drinking water bottling plants have come up also in this areas. Survey results and Negotiated Approach activities have shown that water quality is affected by Arsenic, posing health threats for drinking water. Also, a short overview of Hogladanga and Matumdanga villages socio-economic situations was presented. In these villages near Khulna, the process of peri-urbanization and city expansion is also manifest, but on a lesser scale than near Kolkata – also due to the relative size of these cities.

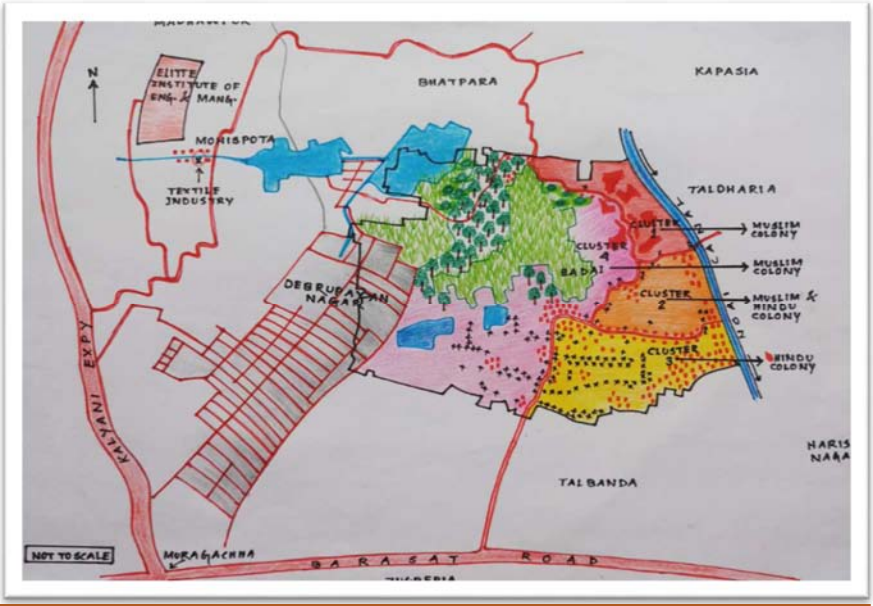


Figure 5 Social map of Bodai village, Kolkata

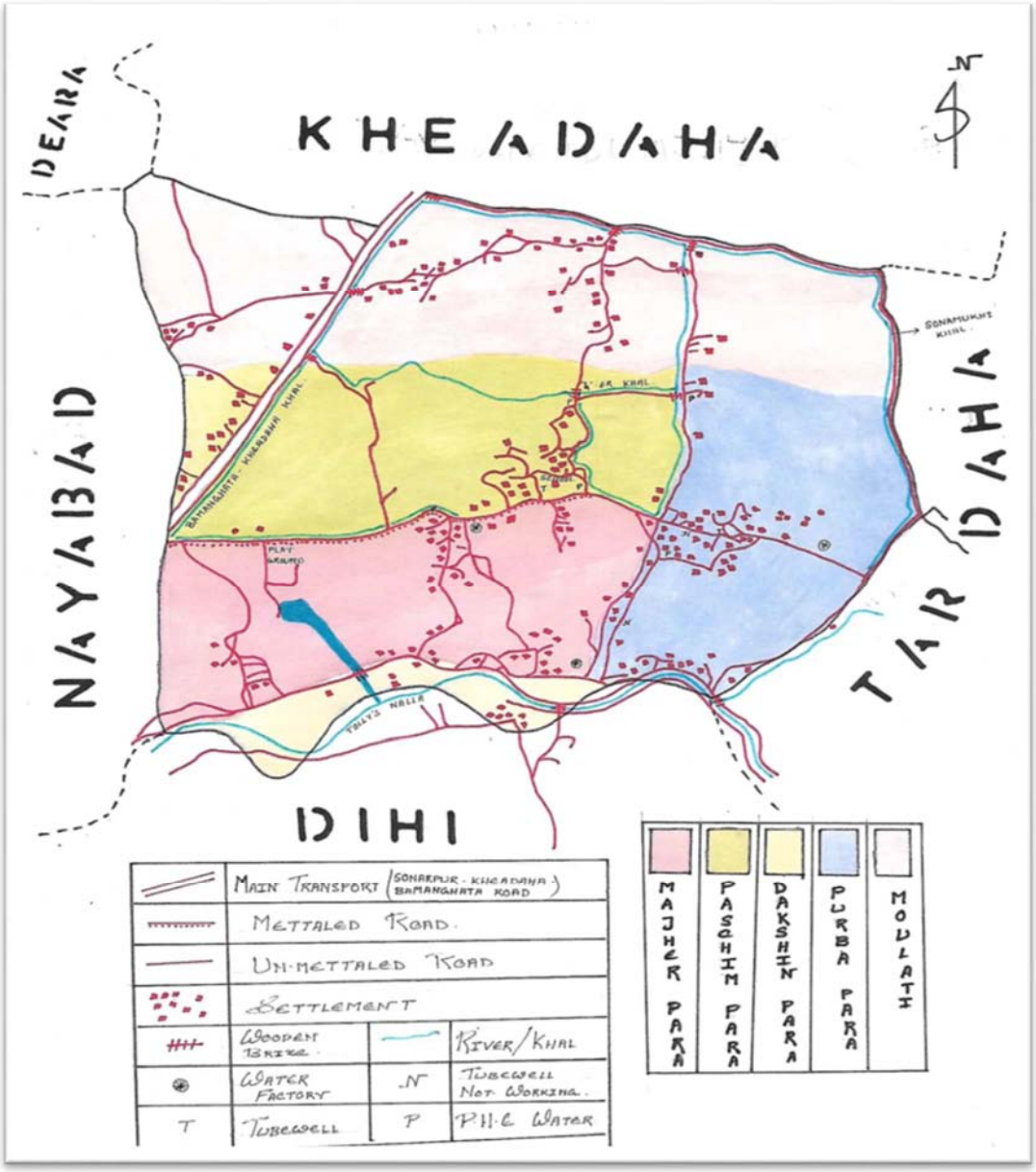


Figure 6 Social map of Tihuria village, Kolkata

Comparative analysis

Domestic water

The dependence on groundwater for domestic water is high across all four villages. However, around Kolkata, drinking water can be also piped water supply through public stand posts provided by the panchayat (local level government) and the Public Health Engineering Department (PHE), and bottled water supply obtained through local small private water industries. Both are drawn from groundwater sources. Villages near Khulna depend more on private wells or shared public wells that are informally managed, lacking a connection to the publicly managed piped public water system and lacking established markets for bottled water.

Reasons for domestic water insufficiency differ among the villages: Depletion of groundwater table due to agriculture practices is reported as main reason for insufficiency in the water sources for the households around Khulna; Around Kolkata, different reasons are cited: pipe leakages in the public system operated by the PHE Department in Tihuria, and extraction by industries in Bodai.

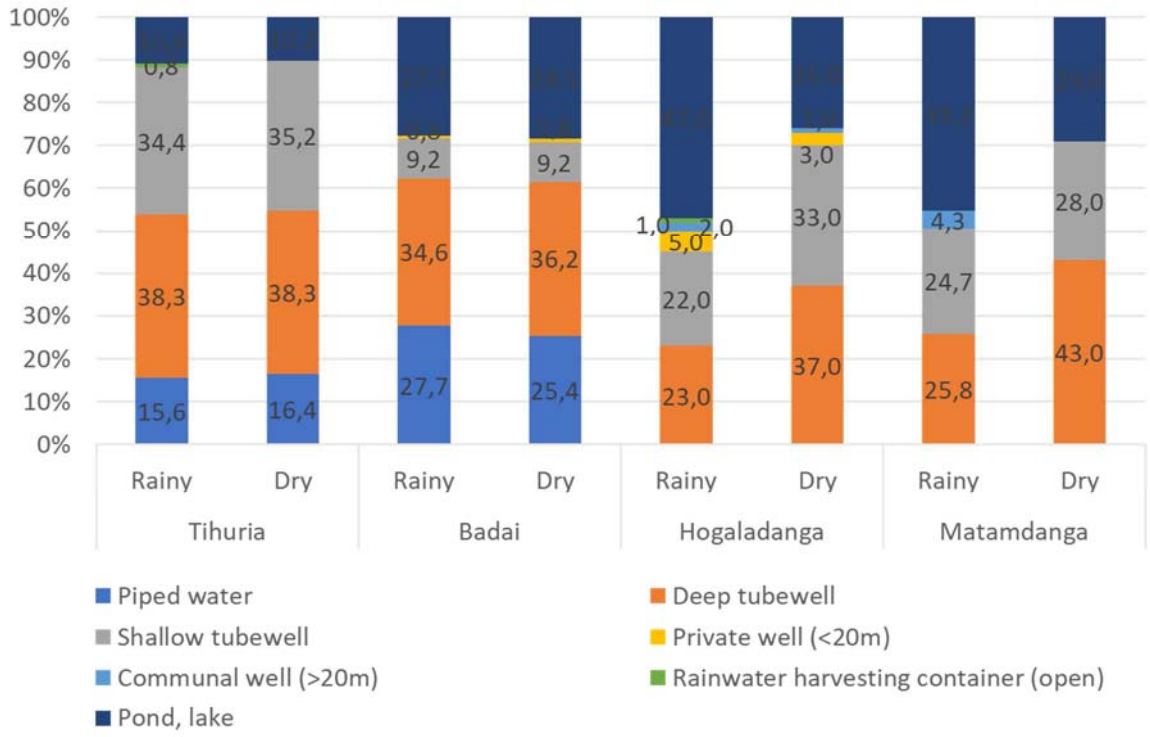


Figure 7 Domestic water sources across the four villages

Livelihoods

Near Bodai, there is mainly textile dying and bleaching industry; 350 small industries were reportedly active, according to interviewed key informants. These industries are very small so mostly informal, difficult to recognize as they are often located inside private houses, and using often non-registered tubewells. Only about 15 – 30 of these will be registered (23, according to an informant from an official industry association as later presented by project researcher Sharlene Gomes; the lack of registration was also confirmed by the Pollution Control Board Chairman also present at the meeting). The unregistered industries are mostly owned by outside owners, and managed by other migrants from other areas. Farmers, around 100, suffer from this and now have court case against industrial dumping. Officially, industries are required to have an Emission Treatment Plant (ETP), but many will lack such facilities.

In Tihuria the usage of shallow tubewells in wastewater aquaculture fields is perceived by key informants to increase the water stress. The effect of this is also visible in a decline in gross irrigated area and increasing pumping hours for boro rice, as practiced by one of the five village community groups.

Groundwater dependence for aquaculture differs between the three villages where it is practiced (Figure 8). Shallow tube wells are used in Hogladanga and Matumdanga, while in Tihuria, this depends mainly on surface water from a nearby wastewater canal connected to the Kolkata Wetland area. For Matumdanga and Hogladanga, also changes in water sources for boro irrigation in the past five years were presented.

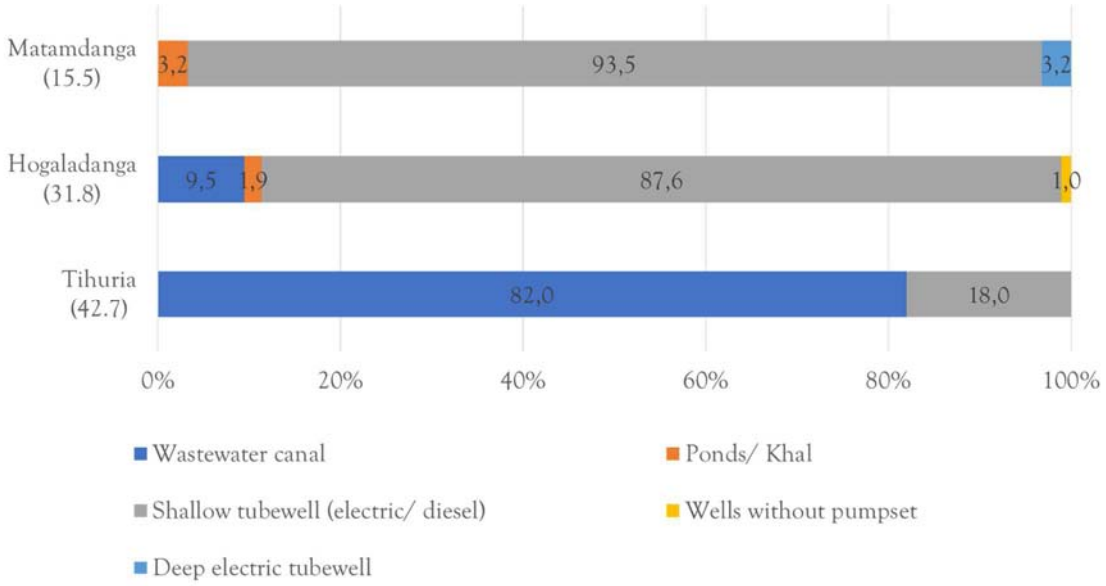


Figure 8 Percentage distribution of irrigated area under aquaculture by primary source of irrigation

Groundwater poverty index

As last research activity, groundwater poverty scores index were presented, based on the results of a household survey combined with additional data. The groundwater poverty index scores were lowest for Tihuria, highest for Bodai. A decline in groundwater status across the four villages is visible though. The groundwater poverty profiles, among the different dimensions, were shown to be similar for Tihuria and Hogladanga villages (Figure 9). Both had a high score on the dimension of "Use", meaning relatively high criticality of groundwater as a water resource, and low scores and "Resource" and "Access", meaning that the groundwater resources themselves and access to them are limited in these villages. This indicates that indeed groundwater management is difficult.

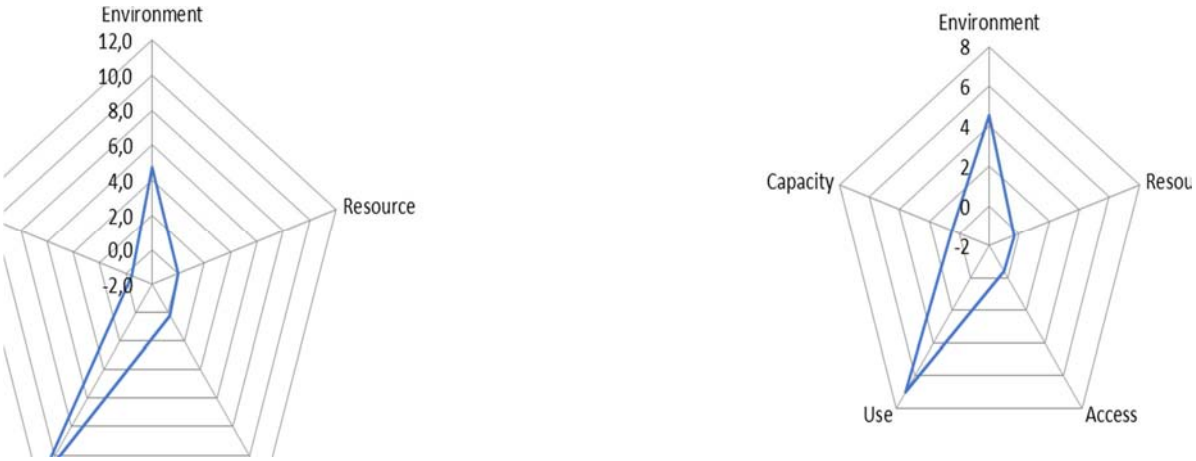


Figure 9 Groundwater poverty dimensions in Hogladanga and Tihuria

In conclusion, inequity and exclusion in groundwater use are not only shaped by an incapacitated institutional framework for peri-urban areas, but also by livelihood choices, household's perceived preferences and the physical characteristics of the environment. Scarcity is created also along the axis of class, also within a single caste. Ideas and suggestions for a way forward across the four villages were made to conclude the presentation. Among others, regulation of deep private tube wells and increase coverage of public drinking water sources were suggested.

3.3 Institutional context of peri-urban water problems

Sharlene Gomes, PhD researcher from TU Delft, presented the results of her research on the institutional component of peri-urban water problems. For the PhD work, the research has developed mostly in the direction for the Khulna cases. For the Kolkata research site, also earlier overviews of the institutional context had been prepared, based on data collected during two field visits in 2014 and 2016. The results of these were presented at this workshop. The results report insights from interviews with representatives of the communities, government agencies and bureaucrats, and some private industry groups. The perceived issues reported below are thus the problems as perceived by interviewees, and the strategies for resolution considered by them.

In Bodai village, a key issue is the regulation of industrial activities (mainly small scale textile industries, dyeing and bleaching – 23 reported by Association of Industries in Bodai, which is significantly lower than the number of industries reported by others in later project research (see earlier section. Many of the industries operate without the proper permits, also because some operate on land that is officially registered as agricultural land, which should be officially converted into industrial land first. In Thiuria village, a key issue is a lack of access to drinking water supply, especially in South Thiuria pada (locality).

Industrial regulation issues in Bodai

For the industrial regulation in Bodai, interviewee perceptions of three further issues were reported:

1. Illegal land conversion
2. Depletion of groundwater resources
3. Release of industrial effluents.

Illegal land conversion

The formal regulatory context is provided by the Land Reforms Act and the Land Reforms Office. The Land Reforms Office can't handle the current application volumes, and approval depends reportedly depends on political interests in developing Micro-Small-Medium-Enterprise Associations (MSME's).

Solution strategies mentioned by interviewees are the formation of MSME Associations by local industries, a reduced processing time for land clearance by government agencies, and the creation of a single online window system at the public District Industrial Centre.

Depletion of local groundwater resources

The local industries in Bodai reportedly use significant groundwater for manufacturing. This groundwater use is officially regulated by the Groundwater Act.

Problems reported by interviewees are the cost and time required to submit proposals for the installation groundwater wells, which deters industries from submitting formal permit requests. Also, given the high density of activity, the official spacing rule, which requires a minimum distance of 200 ft between pumped groundwater wells is difficult to maintain. The State Water Investigation Directorate (SWID) is not equipped to manage the application volume and conduct site inspections.

The solution strategies suggested by the interviewed actor representatives were higher penalties for non-compliance with official groundwater regulations. The installation of such higher penalties, however, requires approval of higher authorities (District Magistrate). (Note that the effectiveness of this perceived solution has not been further reported or studied, but might be limited, as long as not also other bottlenecks are addressed, such as the reportedly limited capacity for regulation and enforcement of the SWID.)

Effluent releases

Uncontrolled releases, absence of Effluent Treatment Plants as required by law, and overseen by the West Bengal State Water Pollution Control Board.

Solution strategies proposed by interviewees: The MSME association in Bodai is interested in setting up an industrial cluster. The West Bengal State government also has funds to help new industries invest in pollution control equipment. By forming a cluster, effluent treatment efforts might be coordinated and improved.

Peri-urban drinking water supply issues in Tihuria

The Public Health Engineering Department act as formal drinking water provider for Tihuria. The Sonarpur Block, in which Tihuria is located, has seen a rapidly growing population, which has now exceeded the capacity of provision by the PHE projects, which rely on treated water of the Hugli river for 11 panchayats. Outside the PHED piped network area in Tihuria village, households use hand operated deep tube wells. Some of those wells are supplied by the panchayats. Water quality monitoring of the public sources is done every 2-3 days, in one of 20 accredited water quality labs. The responsibility for Operation & Maintenance has been transferred from PHED to panchayats recently, by the Department of Panchayats and Rural Development. Due to lack of time, given earlier discussions with the audience, further results could not be presented, but are available on slides (see Annex).

3.4 Discussion of presented research results

Following the presentations by researchers, a discussion was held, kicked off by statement of experts from the Project Advisory Group.

Dr. Kalyan Rudra, Chairman of the West Bengal State Pollution Control Board stated that a clear commonality of all four study sites is that they are all located in the very active part of the delta. With relatively high annual rainfall but very skewed in monsoon period. The Kolkata growth size is constrained by the physical presence of a river and a Ramsar protected wetland. This means city expansion needs to be on the north-south axis and groundwater is being overexploited. What he missed in the research presentation, is insight into the sectoral demand of water: Domestic, irrigation, industry, ecological demands. Especially the ecological demands deserve more attention, as currently 1% of water only is allocated to ecosystem services. Salinity increases due to groundwater exploitation, with serious consequences. This needs more balance. Another issue hardly talked about yet, is the recycling of the wastewater. Groundwater, surface water, transboundary (coming in) are the three sources. Sustainability then also means demand side management.

Dr. Priya Sangameswaran of the Centre for Social Science Studies had three points to make. 1) Peri-urban research sites are all in process of urbanization, but show a lot of interesting differences in ways this urbanization is taking place. These could be flagged more and linked to the larger region in which they are located. Why is real estate coming here, to this particular village, and not somewhere else? Urbanization is often being talked about as something inevitable. Why is it seen as such? This is related to the view one has about what constitutes a “good life” – explains also why people go to certain activities and not others. 2) Groundwater security now is defined also in terms of needs – where do you draw the limit, what needs should be considered? Demand side, also mentioned by Dr Rudra, is pertinent here and also needs to be brought up in community interaction. Peri-urban is also seen as site of dumping: if people protest in one area, city will then have to find another area. 3) Institutions

witness in recent years a move towards a greater role of the panchayats, the local level government layer. This is the subject of a whole course of debate: How much power at the local level, how do you divide functions across levels? Does the institutional structure itself need to change? In this debate, and in the research presented here, often legal and illegal activities are distinguished, but this type of binary thinking in legal/illegal may not be the most useful. Rather: What is at stake in that distinction? Or what are the different ways in which it is illegal? For instance, do people themselves also think about it as illegal?

Engineer Sabirul Alam, international PAG member from the Khulna Development Authority in Bangladesh mentioned the similarities between processes in Kolkata and Khulna. He also stated the importance for more regulation in peri-urban areas, as these are now important areas that are urbanizing rapidly and show large changes in land use patterns. He further mentioned to also consider the surface water of areas. People do not only depend on groundwater. The results of this project can help support future projections, using project outcomes as inputs to government policy making on peri-urbanization.

Mr. Jayanta Basu, working as journalist with The Telegraph and affiliated with Calcutta University and the Kolkata Municipal Corporation highlighted the difficulties in transboundary work. Impact on policies to follow is aspired to in these projects. One understanding he gets from the project is that its findings are more vertical than horizontal: More in-depth case studies than regional level assessments. The four villages sketch the paradigm of groundwater management in the community, but cannot be taken as representative samples for the whole region. Next step is to take a more regional approach to understand impact in a bigger way. Groundwater, as a complex issue, has lots of tiers and scales and is not only influenced by activities in the village. He proposes to expand understanding from three areas: the core area of the village, a buffer area around it, and the regional area. This will help make an interface of lessons from this research with wider the regional perspective.

To ensure follow-up of the many important findings in the project, the Negotiated Approach, also a key feature of the Shifting Grounds project, can be used, but also this has to have tiers. So far, it is mainly confined to community. This needs to be complemented with top-down approach as well and link the two along the line. A recommendation therefore is to make the Negotiated Approach into a multi-tier approach. It is a good tool, and needs to be used at wider perspective. 3) Some comments need to be checked and ratified, before being presented as research results. This is especially important for some sweeping comments made by interviewees. For these, one cannot just refer to single interview sources, but rather, additional supporting materials should be used.

Research Discussions: Project Advisory Group

In discussions with the audience, further issues and questions were raised, and some clarifications were given. Among others, professor Salehin (BUET) agreed with the importance to operate over multiple scales in groundwater research. He also highlighted the complexity of delta aquifers, and importance of salinity in the interface coastal and local village aquifers. In upper layer, shallow aquifers, salinity has more to do with riverine salinity and canals. Peri-urbanization makes it harder to study these effects. Dr. Kunalkanthi Majumdar, professor and community health expert at KPC Medical College, working on groundwater toxicity also shared some observations, emphasizing the importance of considering the perception and behaviour of local water users when studying groundwater management at the village level.

The first question of villagers with groundwater problems is: What is the alternative safe source? Groundwater depletion and over-abstraction might be reduced by the use of an alternative safe source in some villages: plenty of PHED piped water supply, but not accessible or not acceptable, although microbiologically that water is safe. Or there might be contamination due to leakage pipes. Needed is a water needs based study, from people's behaviour. Acceptance of e.g. public supply stances. Then comes the Negotiated Approach as motivational approach. On boro cultivation the promotion of arsenic accumulation resistant rice varieties could be considered.

4. Experiences with the Negotiated Approach

4.1 The Negotiated Approach (NA) within the Shifting Grounds project

Remi Kempers from Both ENDS had prepared a video message in which he gave a general introduction of the Negotiated Approach (NA) and the results achieved in the project period. The approach has been developed by Both ENDS with several partner organizations, and has been used in various parts of the world. In the Shifting Grounds project, the NA is implemented by partner organizations JJS and The Researcher.

Presentation on Negotiated Approach

The NA aims to strengthen integrated natural resource management by involving local communities and stimulating and enabling them to improve their environment and livelihoods. It works as a bottom up approach and it sees negotiations as a process of involvement where participants increase their understanding to solve problems of a common interest. This is in contrast to negotiations as a form of bargaining over very specific and predefined positions. The NA works to create flexible and participatory interactions where communities can play their part in finding solutions to challenges faced. It consists of a dialogue where participants identify shared problems and interest on which to reach agreements on collective action.

In Shifting Grounds, the focus is on the three building blocks: empowering local communities, knowledge development and transfer, and developing a level playing field for negotiation:

1. Empowering local communities is ongoing in the two cases, administered in a short time by the local partners. A needs assessments and social maps were created during so-called mango tree meetings – small scale meetings with different smaller groups of village representatives. In Khulna a local negotiation group was developed after this. In Kolkata this process took a longer time as the Researcher had to navigate power dynamics and politics.

2. One objective of the project was to use research to gather knowledge to improve knowledge of local communities. For the researchers it was not an easy task to transfer the knowledge and interact directly with villagers. This was a learning process, and this learning process continuously needs to be improved and intensified further. What has come to the communities has already been well used in the different stages of the NA process.

3. In developing a level playing field, the local project partners The Researcher and JJS were crucial in their positive contacts with other stakeholders outside the community. They explained the project objectives and NA process to stakeholders in different layers and sectors of government and others. On the national, state and regional government levels this larger engagement was initiated as early as the inception workshop. By now, towards the end of the project, also good direct relations and respect have been established between community and government representatives.

Finally, some important aspects for the NA in this project were highlighted. The developed serious gaming tool for Khulna, is considered an important new addition to the NA toolbox, as a tool to facilitate learning and negotiation. The project team has achieved a lot in a very short time. Applying the NA in this project had to be done in 3-3.5 years, which is very short for the NA approach; Experiences elsewhere show that a full NA process there took 10-15 years. Therefore, the results achieved in three years' time by this project are impressive, but also will need continuation, as the NA process cannot yet be finished in just three years.

4.2 Experiences in Kolkata

Partha Sarathi Banerjee, and Ms. Tinku Mondal

Partha Sarathi Banerjee from The Researcher explained the history of the Negotiated Approach as applied in the Shifting Grounds project. It started with a quite elaborate procedure for village selection and initial meetings in Tihuria after the village was selected for NA activities, followed by the first larger project NA workshop in October 2015. At this first workshop, water-related priority problems were identified and discussed: irregular PHE drinking water supply, insufficient deep tube wells installed by panchayat, and concerns about the groundwater quality and the waste water intrusion from the city canal, and finally, the lack of testing the quality of the packaged drinking water bought by many villagers.

Subsequent smaller mango-tree meetings were conducted to increase community involvement and get more information on the local groundwater management situation, such as health problems presumably resulting from hand-pump groundwater use by households. A second NA workshop, with institutional brief prepared by researcher Sharlene Gomes was done with the presence of the Gram Panchayat (GP) leadership, who came to know the villagers problems. This workshop helped to resolve misunderstandings that had arisen between the GP leaders and project works.

Figure 10 Small scale village meeting in Tihuria

During the project mid-term workshop, villagers expressed their needs for more specific actions from the project, now that a platform for discussion had been initiated. Afterwards, a linkage with the Arsenic Network was established and arsenic awareness and detection programmes were started. 40 samples were collected from domestic tube wells and 10 from government sources, and the ones with higher Arsenic levels were sent to the PHE accredited testing lab at the Ram Krishna Mission. 17 of these samples had higher than safe levels, 9 samples were above the permissible limit (as per WHO). With this, an arsenic map of the village was prepared (Figure 11). Results were discussed in a larger workshop with panchayat members, the local PHE official and NGO arsenic experts, as well as the members of the Village Water and Sanitation Committee. Arsenic testing, at request of GP, was extended to 7 villages, not only Tihuria and altogether 200 tube well water samples were tested and arsenic mapping prepared for all the 7 villages. 55% of the domestic tubewells tested were found to be contaminated by arsenic. This was followed by a health camp in Tihuria with a Community Medicine Doctor to check possible arsenic affected members. 10 of the 26 tested people showed arsenicosis symptoms. The arsenic campaign was closed by final arsenic workshop.

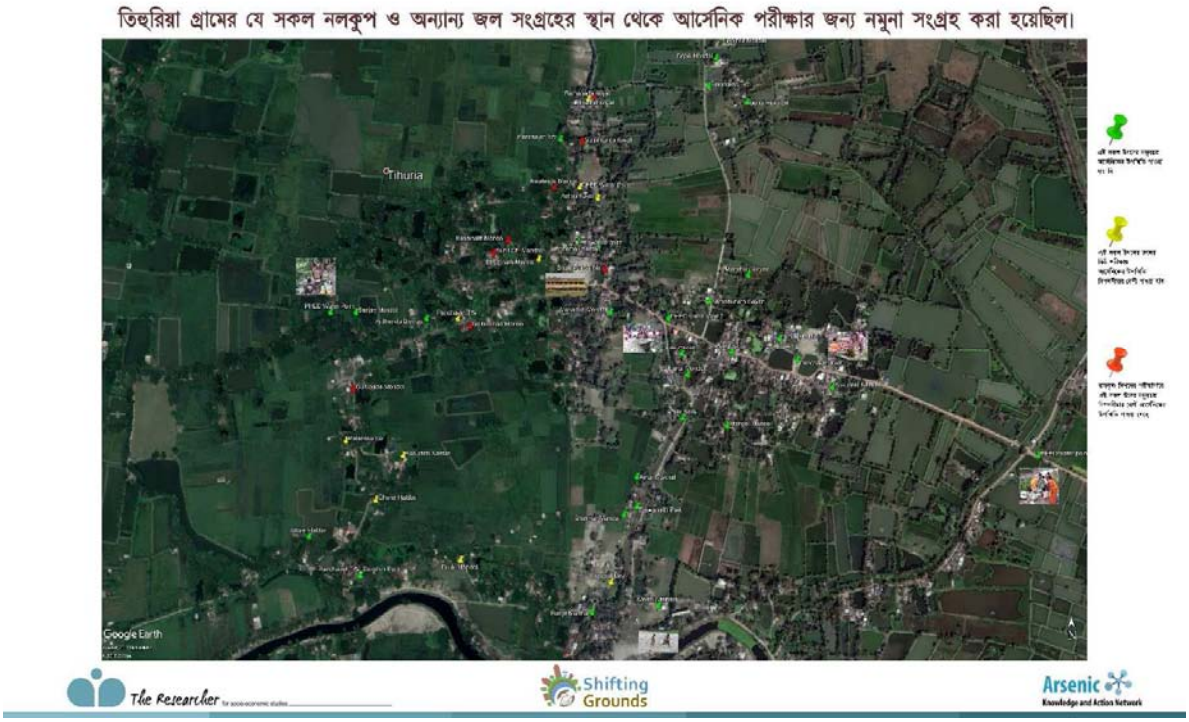


Figure 11 Arsenic map Tihuria

As a result of the activities initiated through Shifting Grounds, groundwater security has been brought into the public discourse and is recognized by GP leadership and block officials as an important issue. Also the Village Water & Sanitation Committee, which appeared to exist only on paper, has been activated, although this is still at an initial stage and will need to be continued in the future. The Researcher, as the local implementing and facilitating partner for the Negotiated Approach in Kolkata, has learned how to apply a structured community engagement and empowerment process through their experience in this project. And the impact of community empowerment will be visible through the successful experience of organizing themselves that was gained in this project. This was achieved without bypassing the official government structures. They have learned to work within official structures and still solve some of their problems.

Ms. Tinku Mondal, representing the villagers participating in the Negotiated Approach in Tihuria gave their perspective of the project. The villagers were initially reluctant to engage with this project. Slowly

they understood that the project team was not here to supply new water wells or pipes, but to inform them more about the situation and the groundwater quality problem and other problems. People already had the idea that the water quality was not good, but could not be certain about their problems. Now that arsenic mapping has been done, it has helped the local people to build up their knowledge. This also came to the panchayat authorities, who are now discussing that something has to be done; They are now approaching Block level and District level government officials to take actions. Block level panchayat members are also present here today. Also, the village community representatives have been talking to District level panchayat members. They assured the village that if the arsenic testing reports are shared with them, they will look after it and take proper actions.

4.3 Experiences in Khulna

ATM Zakir Hossain, executive director of JJS in Khulna shared the process of the Negotiated Approach in Khulna. In the initial stages, a Village Profile and NA process handbook was developed. The community was organized through Water rights groups of communities of farmers and fishermen, and different knowledge development activities were undertaken related to groundwater and institutions. Early on in the process, the village negotiation groups worked on prioritization of issues. Three issues were eventually identified as priority issues: accessible safe drinking water, canal encroachment and water logging, and city corporation waste dumping. Although not all were directly related to groundwater, the NA further continued work on these priority issues. Plans were developed to tackle those, including identifying target organizations based on stakeholder mapping. After this, the

Community Negotiation Group met with government representatives and agreed on a joint plan. This was followed by individual meetings of community representatives with individual departments: BWDB and DPHE. These meetings were also facilitated by JSS. Officials there showed the villagers a way to solve their problems by suggesting them the appropriate procedures.

Figure 12 Presentation of Hogladanga map by village representatives at NA workshop in Khulna

Through this NA process, some very specific results have been reached for Hogladanga village. The Upazilla administration (local level government) took the initiative to remove canal barriers. Peri-urban issues are now being discussed at different levels, at universities and in the local media. PHE is planning to install a test tube well over 1000 ft deep in Hogladanga village, in recognition of the declining water tables and the need for sufficient safe public drinking water supply points. A linkage between community and government stakeholders is developed. Finally, connecting across different projects in the area, a peri-urban water forum is now functional with involvement of several communities, representatives of all related government authorities and civil society. They will stay on issue, also after the project.

Figure 13 Meeting of community group with DPHE and BWDB officials on water logging and drinking water issues

4.4 Group discussions: lessons, outcomes, and continuity

After the plenary presentations and discussions, smaller group discussion were held on three key topics related to the use of the Negotiated Approach in this project.

Group 1: Lessons learned on the implementation of the NA

This group discussed the practical challenges faced and lessons learned in the implementation of the Negotiated Approach in the project. Discussions in this group were chaired by Dr. Priya Sangameswaran. This group reported that more deep knowledge of water problems gained through this project; community members realized there were some issues with their water sources, but now they have a deeper understanding, including specific knowledge about arsenic prevalence in different sites, its impacts, and possible alternatives. After the Arsenic testing campaign, they now realize part of village has a serious problem.

Initially, trust had to be build. Also the project team was initially greeted with some reservations. But the community gradually realized that this team does not have a vested interest, but really was there for the interest of the villagers. This realization was a very important moment – and was occurring around the organization of the arsenic health camp and testing activities. Also, in this campaign and in follow-up, the village level health workers played an important role; they have now been trained, has to increase the trust between health workers and villagers. It was felt that more areas should be brought under this project, upscaling. Finally, the villagers are dependent on panchayat on every issue, but now villagers also can seek help of the relevant government departments, such as DPHE, with the knowledge and results of the research project, without solely relying on panchayat. Something to consider now for future.

Group 2: Outcomes of the NA process.

This group discussed what results were achieved and what results we had hoped for but did not achieve. They also discussed the (longer-term) impacts expected from these results? Discussions in this group were chaired by Dr. Kunal Majumder. The negotiated approach process was considered useful to create awareness among villagers, especially presence of arsenic in groundwater, and that groundwater should not be taken for granted. Further, specific knowledge was developed through the arsenic testing campaign about which supply sources are safe to drink and which are not. The training workshop with information on alternatives then also resulted in an increased use of home domestic filters, which are now used by many people to purify their water. In terms of a more level playing field, the project helped the community to share their problems with government and get more support for their water problems.

Group 3: Continuity of NA activities after project ending

Questions addressed in this group were: How can we sustain the NA process in the future? What are the activities we want to carry forward, and how can this be done after the project? Chair of the group discussion was Mr. Chandi Charan Dey from the Ramkrishna Mission. Several future activities and avenues for continuation were identified in this group:

Create even more awareness and education among the villagers. Training and awareness campaigns have now been held in Tihuria village, and, for some activities, also in other panchayat villages. With this basis, the established contacts and training of for instance village health workers, these activities could be continued and expanded.

The Panchayat Samiti (local government council) expressed their resolve to solve drinking water problems in the village with the help of PHE. For this, the research results and the water quality test results provide useful supporting materials to communicate the problem to the other government authorities, as supporting documents to help them bring solution to the village.

Health workers at village level, and others, in project, can get together to form some sort of multi-stakeholder platform, on how to save the precious groundwater and how to use it. The Village Water and Sanitation Committee, which has been revived through the project, provides a useful formal channel to discuss these issues, supported by, and as part of, the Panchayat structure.

And, finally, media should be involved.

5. Plenary discussion, questions and reflections

Are results of the project representative for a larger group or region? This project can be treated as a pilot, but cannot be claimed to be representative at a larger scale. Such claims are not warranted by the used methodology. Based on just four villages, and for the NA just two, survey results and other project findings cannot be representative for the larger region, especially not because results show the large diversity in peri-urban communities and their water management situations. That is not to say that a larger sample or regional scale would have been more sensible; there are too many Gram Panchayats to cover within the frame of this project. But it is important to be clear that the results are useful, but not representative. Create replicable models, as to how to approach this problem. With a sound methodology. And how other Gram Panchayats can replicate this model.

This project is a pilot, and quite some resources, time, effort have gone into this work. Today, a lot of the groups have asked for expanding and upscaling. Is it possible for the project to produce some guidance or a sort of toolkit to help make future applications more rapidly? With less resources and shorter time. What is the best thing the project as a whole can leave behind, to capture our experience and help future efforts? Toolkit may be difficult, beyond the fairly generic and abstract guidelines that exist already for the Negotiated Approach, because of the diversity in peri-urban settings, each with their own dynamics. Perhaps some principles? JJS has produced Bengali guideline for their process, can be used as a basis there. Fit for water problems, as a planning process, works in Khulna.

Pro-poor and equitable: Do results have the promise of this, especially for those disadvantaged, or the poor? The NA sub-teams in the project have included the poorest very strongly in the process. Process towards improvement has been initiated. E.g. in Khulna government stakeholders had committed to test tubewells; as one milestone towards improving water security. As a whole, peri-urban communities tend to be marginalized from official government decision-making arenas. With peri-urban water forums and negotiation groups now established through this project, the peri-urban communities are more visible. And of course, as with the negotiated approach, which is known to take more time than just 3-4 years, also for pro-poor and more equitable impacts, it is important to review those results in light of realistic targets for the project period and scope.

Replicability; heterogeneity among peri-urban villages poses problems. Sampling: either very big, or not representative. We tried to understand in-depth situations and process in just a few locations. Once you understand diversity, then perhaps you get an opportunity to upscale or replicate. Similarly in another delta research project ongoing at BUET in Bangladesh with Oxford University, where they took one polder for in-depth research in one particular polder. We can think more about the diversity and why the differences are there.

Finally, the workshop was closed with final words from the project leader and the workshop chair. On behalf of the project team, gratitude was expressed to the village stakeholders and the panchayat members, the government and academic experts and the Project Advisory Group members for their support throughout the project. This is what enabled the research and capacity building efforts to be truly linked and achieve real-world results. The team of The Researcher in Kolkata was thanked for their excellent organization and logistics of this final India workshop.

6. Annexes

Workshop Programme

Programme

Introduction

9:30 – 9:45 Opening and welcome. Professor Wil Thissen (Workshop chair, TU Delft)
9:45 – 10:00 Overall project set up, goals and results. Dr. Leon Hermans (Project leader TU Delft)

Morning programme: Research results

10:00 – 11:00 Groundwater research. Md. Rezaul Hasan (BUET)
10:30 – 11:00 Socio-economic and multi-dimensional index research. Dr. Poulomi Banerjee (SaciWATERs)

11:00 - 11:30 Tea break

11:30 – 12:00 Institutional research. Sharlene Gomes (TU Delft)

12:00 – 13:00 Research Panel. Dr. Priya Sangameswaran (CSSS), Mr. Jayanta Basu (CU, Telegraph, KMC), Dr. Kalyan Rudra (Pollution Control Board, West Bengal), Mr. Sabirul Alam (Khulna, KDA) *Discussion initiated by panel and followed by audience, on research results.*

13:00 – 14:00 Lunch

Afternoon programme: Negotiated approach (NA)

14:00 – 14:10 Short introduction to NA and NA results. Remi Kempers (Both ENDS) – by video.
14:10 – 14:40 NA results Kolkata. Partha Sarathi Banerjee (The Researcher) and local NA group.
14:40 – 15:00 NA results Khulna. Zakir Hossain (JJS)

15:00 – 16:00 Discussions in subgroups (with tea).

- Group 1: Implementation. Practical challenges faced and lessons learned in the implementation of the negotiated approach. Chair: Dr. Priya Sangameswaran
- Group 2: Evaluation. Outcomes of the NA process. What results were achieved, what were results we had hoped for but did not achieve? What are the (longer-term) impacts we expect from results? Chair: Dr. Kunal Majumder
- Group 3: Continuity. How can we sustain the NA process in the future? What are the activities we want to carry forward, and how can this be done after the project? Chair: Chandi Charan Dey, Ramkrishna Mission

Plenary closing session.

16:00 – 16:20 Short presentations by group reporters (5 min each).
16:20 – 16:40 Short reactions and reflections by Mr. Naskar, Tihuria Panchayet Samiti Member, Project Advisory Group Member Priya, professors Narain, Salehin and Nabinananda Sen (Calcutta University).
16:40 – 16:50 Final wrap-up and reflection by project leader Leon Hermans
16:50 – 17:00 Closing by workshop chair Wil Thissen.

17:00 – 18:00 Drinks

List of participants

Sl.No.	Name	Surname	Organization
1	Poulomi	Banerjee	Postdoctoral researcher, SaciWATERs
2	Leon	Hermans	Project Leader, TuDelft
3	ATM Zakir	Hossain	Executive Director, JJS
4	Kazi Faisal	Islam	Research Officer, JJS
5	Mashfiqus	Salehin	Professor, IWFM, BUET
6	Sharlene	Gomes	PHD Researcher, TUDelft
7	Wil	Thissen	Professor, TuDelft
8	Vishal	Narain	Professor, MDI, Gurgaon
9	Priya	Sangameswaran	Associate Professor, CSSSC
10	Mousumi	Das	The Researcher staff
11	Partha Sarathi	Banerjee	Director, The Researcher
12	Kalyan	Rudra	Chairman WBPCB
13	Binoy	Majumder	Project Staff, The Researcher
14	Soma	Majumder	Project Staff, The Researcher
15	Md. Rezaul	Hassan	PHD Researcher, TUDelft
16	Biswanath	Naskar	The Researcher staff
17	Susit Kumar	Ghosal	Ex-Panchayet Samity, Kheyadah - I GP
18	Srabanti	Mondol	Village representative, Tihuria
19	Dipali	Mondal	Village representative, Tihuria
20	Amiya	Makal	Village representative, Tihuria
21	Abhay	Adhikari	Village representative, Tihuria
22	Durgabala	Mondal	Village representative, Tihuria
23	Tinku	Mondal	Gram Panchayet Member, Tihuria
24	Shampa	Mondal	Village representative, Tihuria
25	Arabinda	Mondal	Village representative, Tihuria
26	Nabinanda	Sen	Ex-Faculty Dept. of Business Mgt., Univ. Calcutta
27	Ranjit	Guha	The Researcher staff
28	Sk.	Sahadat	Village representative, Badai
29	Muchaul	Uddin	Village representative, Badai
30	Gopal	Saha	Village representative, Tihuria
31	Jayanta	Basu	PAG Member
32	Sourav	Saha	Student, SaciWATERs
33	Subhashish	Das	Student, SaciWATERs
34	Biswajit	Middya	Village representative, Tihuria
35	Abhishek	Naskar	Kheyadah - I Panchayet Samity Member
36	Chandi Charan	Dey	Coordinator Water and Sanitation, Ramakrishna Mission Lokasiksha Parishad
37	Kazi Md Sabirul	Alam	Chief Engineer KDA
38	Dr Debdutta	Halder	Faculty KPC Medical College
39	Dr Kunal	Majumder	Professor KPC Medical College
40	Rachel	Kelders	NWO
41	Jan Joost	Kessler	NWO / Aidenvironment
42	Han Van	Dijk	NWO

Sl.No.	Name	Surname	Organization
43	Daniel Van	Dijk	Netherlands Water Partnership (NWP)
44	Sourish	Ghosh	PHE Sonarpur

Presentations (slides)

Project Introduction and Theory of Change – Leon Hermans

Peri-urban areas:

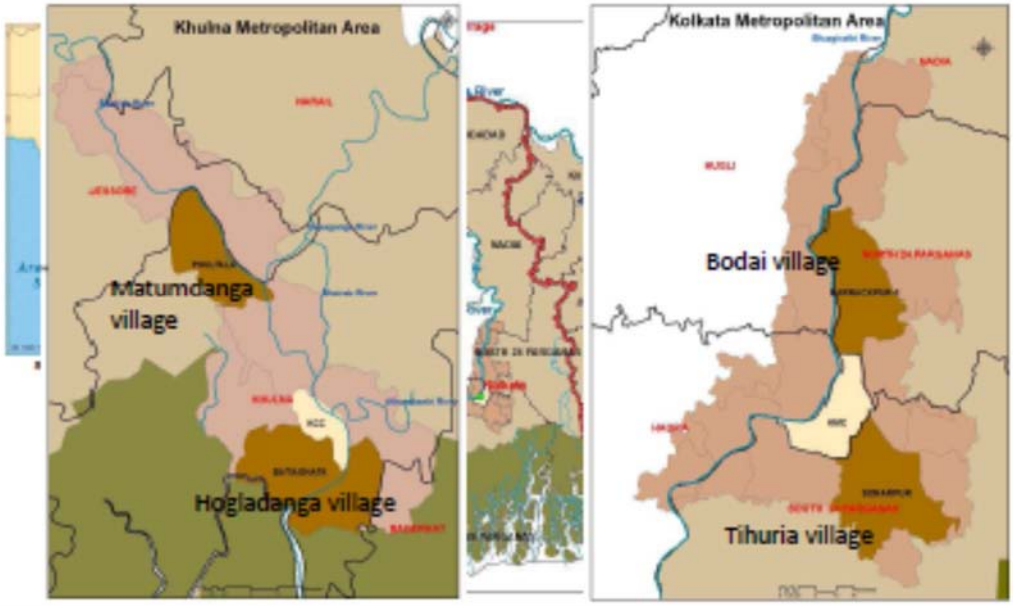
- Transition zones during urbanization
- Dynamic areas
  - social composition and
  - physical change
- Heterogeneous actors
- Institutions outdated, overlapping, difficult to enforce and sustain

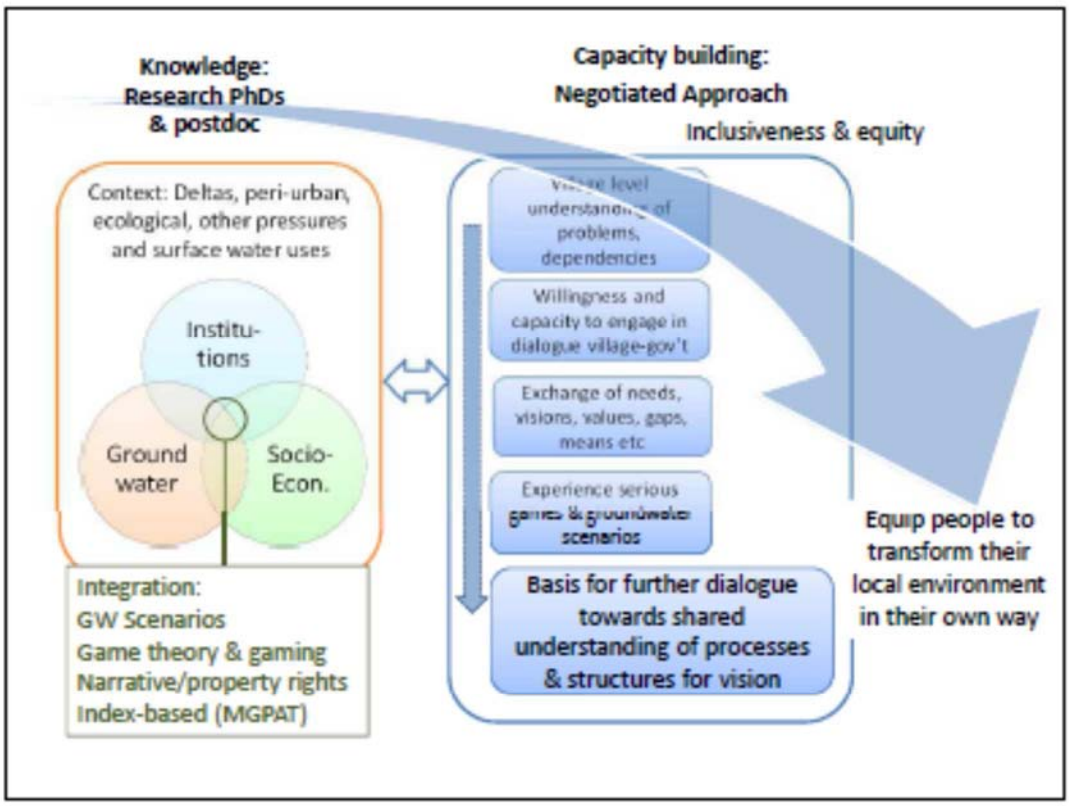
Groundwater management:

- Critical resource for local livelihoods and WASH
- Invisible resource
- Increasing pressures and use
- Visible in conflicts and tensions




Ganges delta: Khulna & Kolkata

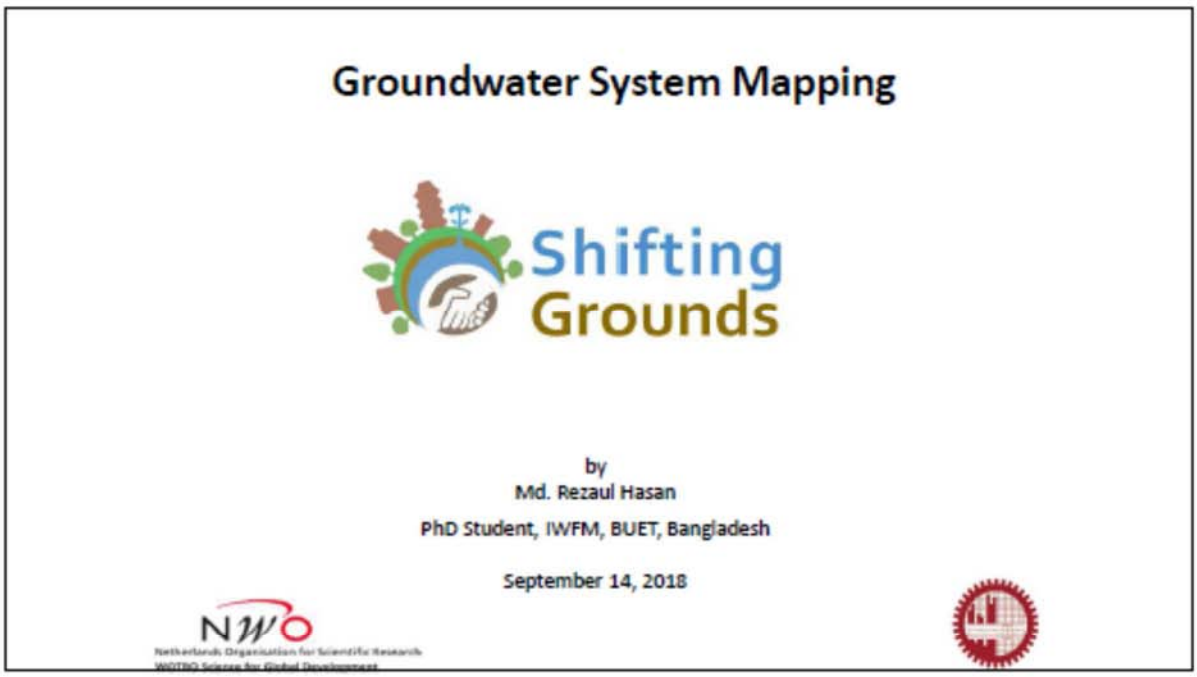


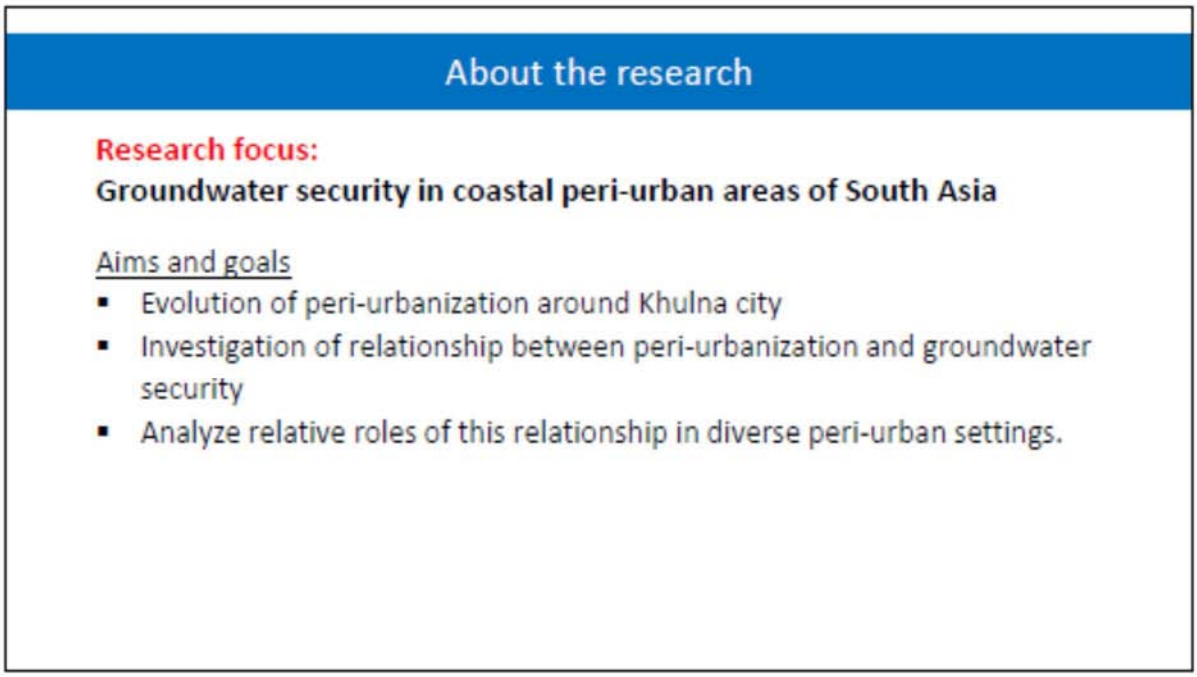


Today: Results, Review, Reflect

- 3 Researchers: Groundwater modelling (BUET), Livelihoods (SaciWATERs), Institutions (TU Delft)
- 3 Capacity building partners: Both ENDS (coord), The Researcher (Kolkata), JJS (Both ENDS)
- What have we achieved? How? And what will future bring?




Groundwater System Mapping
Shifting Grounds
by
Md. Rezaul Hasan
PhD Student, IWFM, BUET, Bangladesh
September 14, 2018
NWO


About the research
Research focus:
Groundwater security in coastal peri-urban areas of South Asia
Aims and goals
Evolution of peri-urbanization around Khulna city
Investigation of relationship between peri-urbanization and groundwater security
Analyze relative roles of this relationship in diverse peri-urban settings.

Peri-urban in South Asia

- Urbanization in coastal Ganges delta has been a continuous process.
- Urbanization accompanied by growth of ***peri-urban areas***

Characterizing peri-urban

- Changing land use
- Multiple claimants
- Flows of goods, services and resources
- Social heterogeneity
- Changing locus of control over natural resources

- Groundwater is often the principal source of water
- And/or an increasing dependency on groundwater
- Increased pressure on groundwater
- Enhancing GW security risk in peri-urban areas

Processes beyond peri-urban areas may be important:

- Huge abstraction in city area to meet increasing demand
- Ever increasing agricultural water abstraction in rural areas

Groundwater security is conceptualized as:
"the availability of water throughout the year with acceptable level of quality, accessible to people of different stakes, with tolerable level of risks resulting from climatic and socio-economic processes".

Methodology

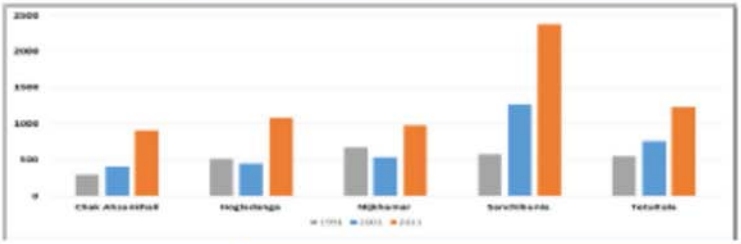
- Review of secondary literature/reports
- Scoping visits to field sites
- Direct observation
- Focus group discussions
- In-depth interviews
- Questionnaire survey at households
- Water audit
- Satellite based image analysis
- Data collection (GWL and salinity)
- Analytical works
- Developing mathematical model

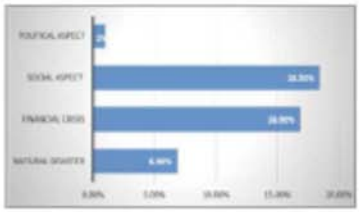
Studied peri-urban sites in Khulna

Six peri-urban sites around Khulna city. In-depth investigation for Hogladanga

Diversity of peri-urbanization characteristics

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Demographic changes	++++	+++++	+++	++++	+++	+++
Mixed Land use (LUC)	++	+++	++	+++	++++	++
Multiple claimants	+	+++++	++	+++	++++	+++
Livelihood heterogeneity	+	+++	++	++++	+++++	++
City pollutant imparts	+++++	++++	+	++	+++	++++
Near to city center	+++++	++++	++++	+++	++	+

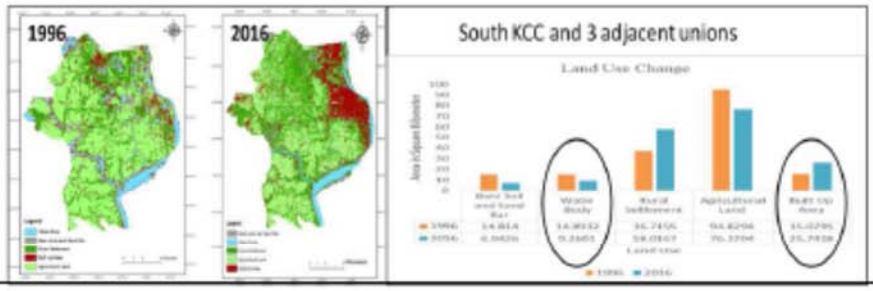




- About 56.6% are local inhabitants and remaining 43.4% HH are in-migrants (Hogladanga)
- In-migrants are form Morelganj (Bagerhat), Khulna city and upazilas of Koyra, Dumuria and Shymnagar

Diversity of peri-urbanization characteristics

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Senchibunia	S. Labonchara	Tetultala
Demographic changes	++++	+++++	+++	++++	+++	+++
Mixed Land use (LUC)	++	+++	++	+++	++++	++
Multiple claimants	+	+++++	++	+++	++++	+++
Livelihood heterogeneity	+	+++	++	++++	+++++	++
City pollutant impacts	+++++	++++	+	++	+++	++++
Near to city center	+++++	++++	++++	+++	++	+



Significant increase in built-up areas in and around Khulna city (15.07% in 1996 to 25.74% in 2016); Water bodies reduced by 5%. (satellite image analysis)

Diversity of peri-urbanization characteristics

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Senchibunia	S. Labonchara	Tetultala
Demographic changes	++++	+++++	+++	++++	+++	+++
Mixed Lnaduse (LUC)	++	+++	++	+++	++++	++
Multiple claimants	+	+++++	++	+++	++++	+++
Livelihood heterogeneity	+	+++	++	++++	+++++	++
City pollutant impacts	+++++	++++	+	++	+++	++++
Near to city center	+++++	++++	++++	+++	++	+

Real estate boom and industrial growth along roads

1. Captain Food Industry, 2. RR Cable Industry, 3. RR Cables Industries Ltd, 4. Power Grid Station, 5. Rice Mill

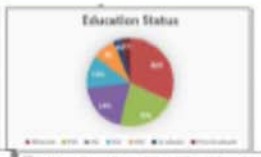
Power grid station – started in 2000. Also has seen commercial and industrial activities at some extent like rice mill, RR Cables, Captain Food industry, RRR cables.

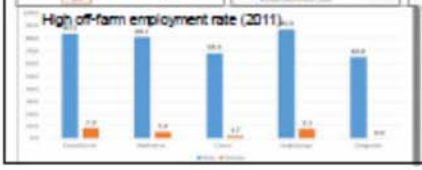
More or less similar growth in other peri-urban sites

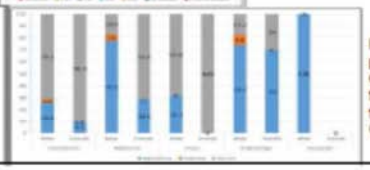
- Use of groundwater has increased substantially for other uses
- Industries are progressively extracting groundwater
- Shrimp ghers has grown using groundwater
- Integrated farming (fish and poultry)

Diversity of peri-urbanization characteristics

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Demographic changes	++++	+++++	+++	++++	+++	+++
Mixed Land use (LUC)	++	+++	++	+++	++++	++
Multiple claimants	+	+++++	++	+++	++++	+++
Livelihood heterogeneity	**+**	**+++**	**++**	**++++**	**+++++**	**++**
City pollutant impacts	+++++	++++	+	++	+++	++++
Near to city center	+++++	++++	++++	+++	++	+







High percentage of non-farm families (2011)

Inhabitants with urban resources dependent are being increased; exists heterogeneous livelihoods.

Diversity of peri-urbanization characteristics

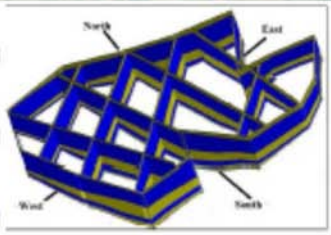
Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Demographic changes	++++	+++++	+++	++++	+++	+++
Mixed Land use (LUC)	++	+++	++	+++	++++	++
Multiple claimants	+	+++++	++	+++	++++	+++
Livelihood heterogeneity	+	+++	++	++++	+++++	++
City pollutant impacts	**+++++**	**++++**	**+**	**++**	**+++**	**++++**
Near to city center	+++++	++++	++++			

- City waste dumping station just besides Hogladanga.
- Two canals, carrying city and medical wastes, passes through Chak Ahsankhali.

Groundwater security risks

Hydrogeologic constraints

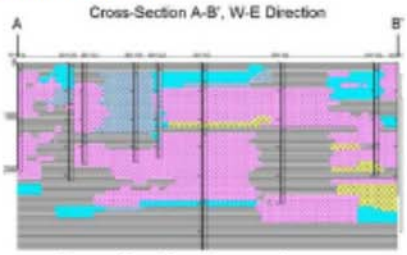
- Coastal aquifers are hydro-geologically very complex, with high degree of spatial variability.
- Unavailability of suitable aquifers (thickness and quality). It limits the number of tubewell sunk.
  - Chak Ahsankhali (suffers in access to GW) & Sanchibunia (not a issue in access).
- The shallow aquifer (~ 350 ft) taps for drinking water (i.e. Nijkhamar).
  Otherwise tapped for domestic purpose (i.e. Hogladanga)
- Shallow aquifers are saline where nearby tidal rivers/canals, like Chak Ahsankhali, Tetultala, Sanchibunia, South Labonchara.



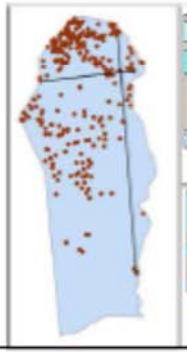
Groundwater security risks

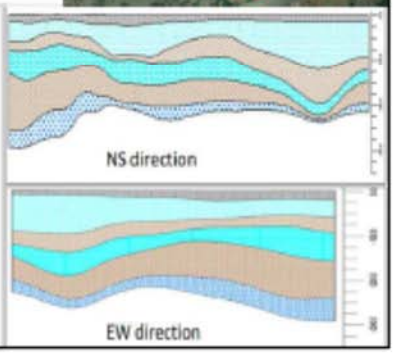
Hydrogeologic constraints

- Where water is not found at acceptable quality in shallow aquifer, the second aquifer is tapped ranging from 600 to 900 ft.
  Pumping cost increases substantially with depth, which conflicts with affordability.
  For example, in Hogladanga, Chak Ahsankhali, Tetultala and South Labonchara



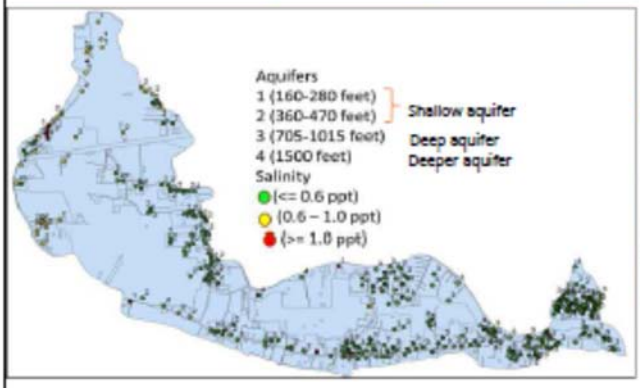
Complex hydrogeology





Dimensions of groundwater (in)security

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Good quality of water (1st aquifer)	+	++	+++++	++	++	++
Proximity to tidal river/canal	+++++	++	+	+++	++++	+++
Salinity in GW (functional tubewell)	+++++	+++	+	+++	+++	++++



Dimensions of groundwater (in)security

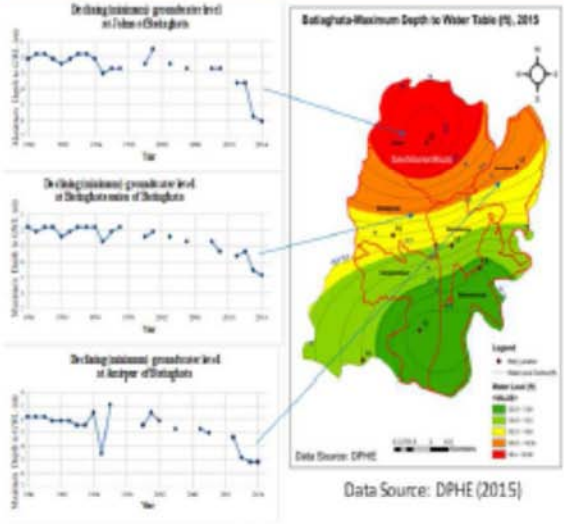
Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Increased dependency on GW (drinking)	+++++	+++++	++++	+++	+++++	++
GW irrigation	+	+++++	+++++	+	+	++
GW for commercial / industries	++	+++++	++	++++	+++++	+++++
Dependence on deep aquifer	+++++	+++	+	++++	++++	+++

- Almost absolute dependency upon groundwater
- Dependency upon surface water is relatively high for domestic use
- HHs shift to GW from SW during dry season because of shortage of SW

Drinking water use has increased manifolds
(Hogladanga village in Sanchibunia)

Dimensions of groundwater (in)security

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Seasonal declination of GWT	+++	++++	+	+++	+++++	++



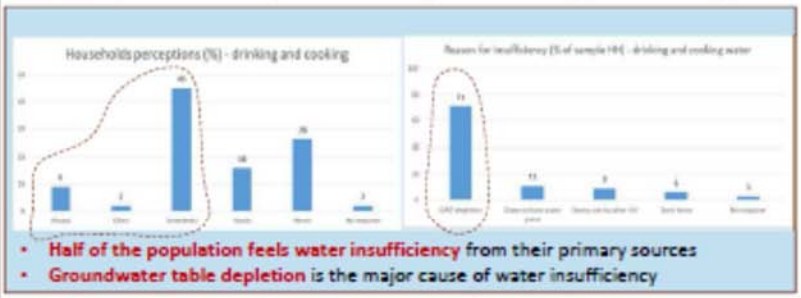
Data Source: DPHE (2015)

- Declining trend of GWT of 3 unions.
- Surface of maximum depth to GWT (Source: DPHE)

Primary data collection (by Author)

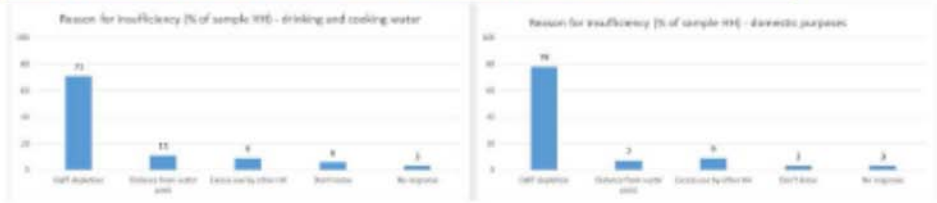
Dimensions of groundwater (in)security

Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Emerging water insufficiency in dry season	+++	+++++	++	++++	++++	+++



- **Half of the population feels water insufficiency** from their primary sources
- **Groundwater table depletion** is the major cause of water insufficiency

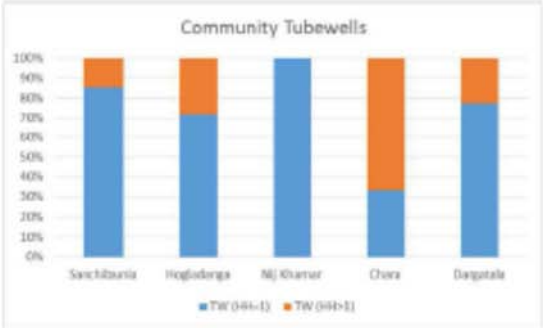
Groundwater table depletion is the major cause of water insufficiency



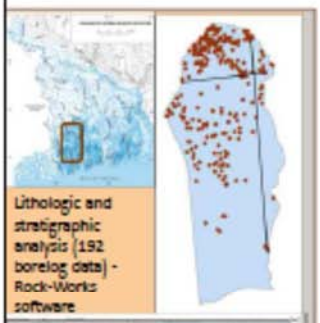
Dimensions of groundwater (in)security

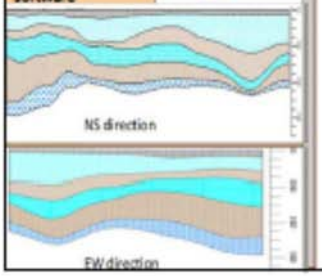
Attributes	Chak Ahsankhali	Hogladanga	Nijkhamar	Sanchibunia	S. Labonchara	Tetultala
Sufferings in access to GW (health, distance & time)	+++++	+++	+	++	++	++

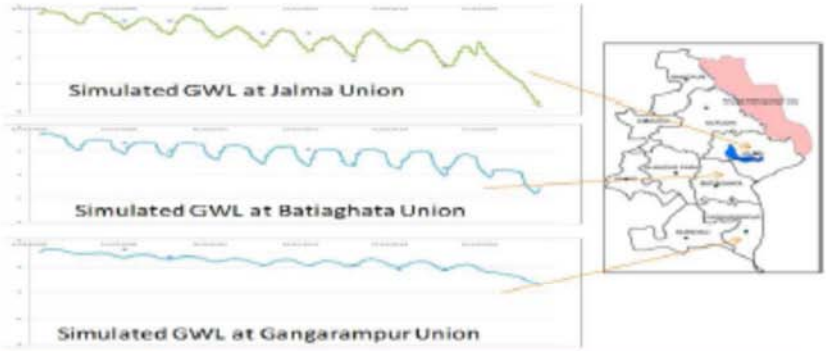
- All the newly constructed houses/buildings, people have installed tubewells to meet their water demand. This has been in case in Sanchibunia, Nijkhamar, S. Labonchara.
- At ChakAhsankhali where deep tube-wells have been limited, one deep tube-well serves about 50 to 60 households and often there is a conflict.
- Besides, there is no conflict at Tetultala whereas found few tubewells.



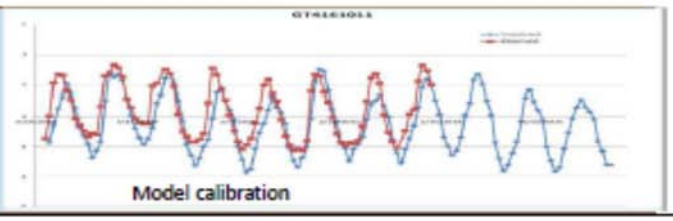
Hydro-geologic analysis and modelling





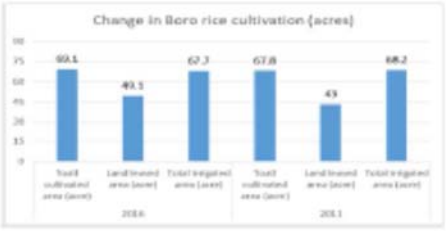


Model area- about 6,645 sqkm; covers 25 upazilas; includes 66 rivers (MODFLOW software)



Heavy withdrawals at peri-urban areas

GW irrigation	+	+++++	+++++	+	+	++
GW for commercial / industries	++	+++++	++	++++	+++++	+++++

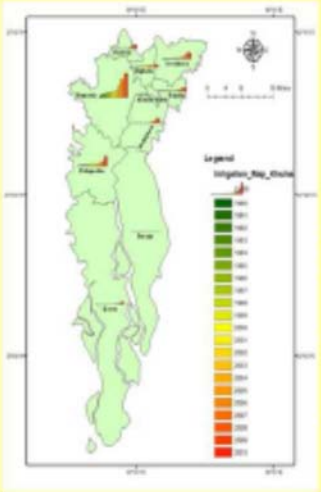


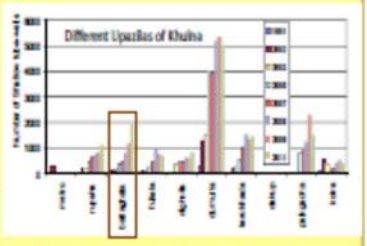
- Total cropped area for Aman has declined significantly in last 5 years
- More or less unchanged Boro cultivation (slight increase!)
- Land leased increased from 63.5 percent to 71.1 percent for Boro

- Heavy local point withdrawals may impact groundwater level locally especially for the shallow aquifer.
- Irrigation pumping within peri-urban area, if persistent in considerable volume, may lower the groundwater level locally, impacting nearby hand tube-wells sunk in the shallow aquifers.

Processes beyond peri-urban areas

Regional GW irrigation





- Increasing irrigation demand regionally as well as locally (Batiaghata)
- Lowering trend of GW table more prominent in pre-monsoon in SW reason
- May have impacts on GW in Khulna peri-urban areas (Hogladanga).

GW extraction from city well fields

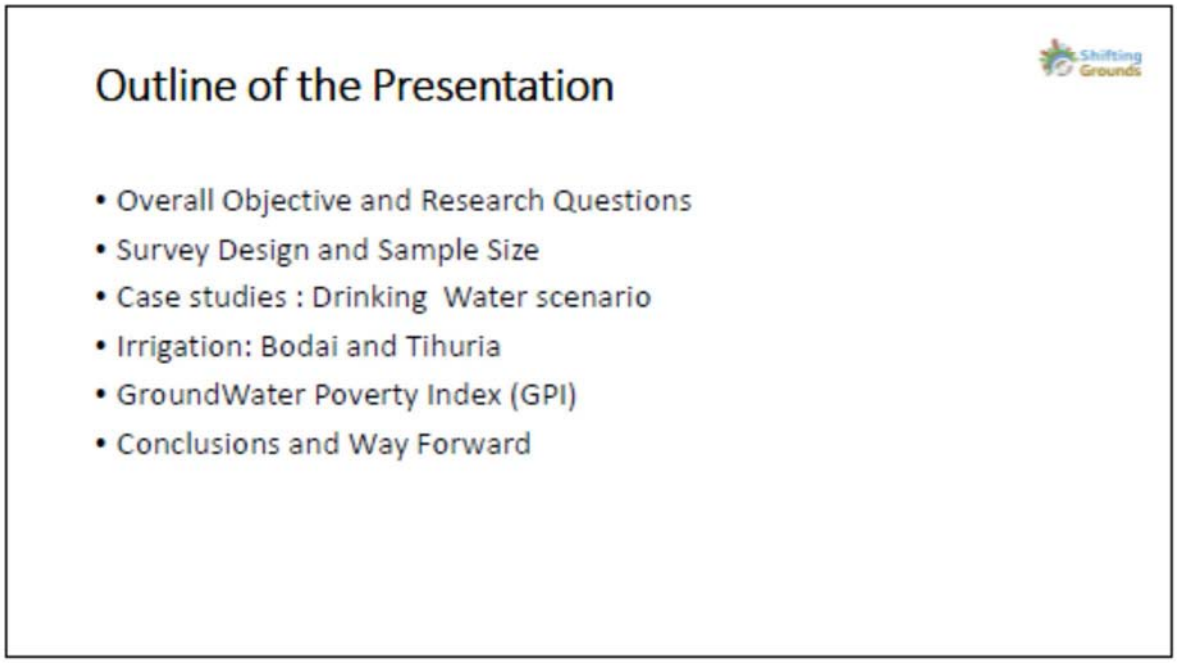
- KWASA supplies 119 million liters (mainly GW) every day against demand is 240 million
- Peri-urban Sanchibunia is only 5-7 km away from these production tubewells (~86 nos).
- Additionally, about 10,000 HTWs mostly located at slum areas and road sides
- Impact may extend to peri-urban areas (Chak Ahsankhali, Sanchibunia , S Labonchara)

Key messages

- Rapid peri-urbanization takes place in south and western parts of KCC over the last decade.
- There is diversity in Khulna peri-urban areas in terms of the extent of dominant characteristics peri-urbanization viz. changing demography, heterogeneous livelihood, changing land use and multiple claimants of water.
- Peri-urban community faces groundwater security risks in terms of availability, quality and access.
- Coastal aquifers are hydro-geologically very complex, with high degree of spatial variability. It limits the number of tubewell sunk, in turns access to GW.
- Proximity to the rivers and/or canals carrying saline water is one important factor for groundwater salinity in the shallow aquifer. Otherwise, deep aquifer is tapped for all purposes.
- Increased pressure on groundwater because of increase in population and emergence of multiple claimants on water (industries, aquaculture, etc.).
- Land use change within the peri-urban areas appears to be a less significant in affecting groundwater.
- Huge irrigation abstraction from the shallow aquifers in adjacent rural area impacts lowering of GWT in peri-urban areas. But the most plausible reason for deep aquifer is the huge abstraction of groundwater in the city area. Groundwater model also indicated this phenomenon.
- Peri-urban areas of Kolkata are also facing same kind of problems

Thank you

Socio-economic research – Poulomi Baneree



Overall Objective and Research Questions

- *An improved understanding of the impact of the urbanization process on groundwater security and identify areas of prioritization and interventions for its effective management in peri-urban Kolkata and Khulna*
- Research Questions:
- *To what extent urbanization process, infused by social differentiation, economic status and engineering principles have transformed household's choices of drinking, domestic and irrigational sources in selected peri-urban villages?*
- *What are the areas of priority for negotiation and interventions in order to improve the groundwater status of the peri-urban households?*

Methods

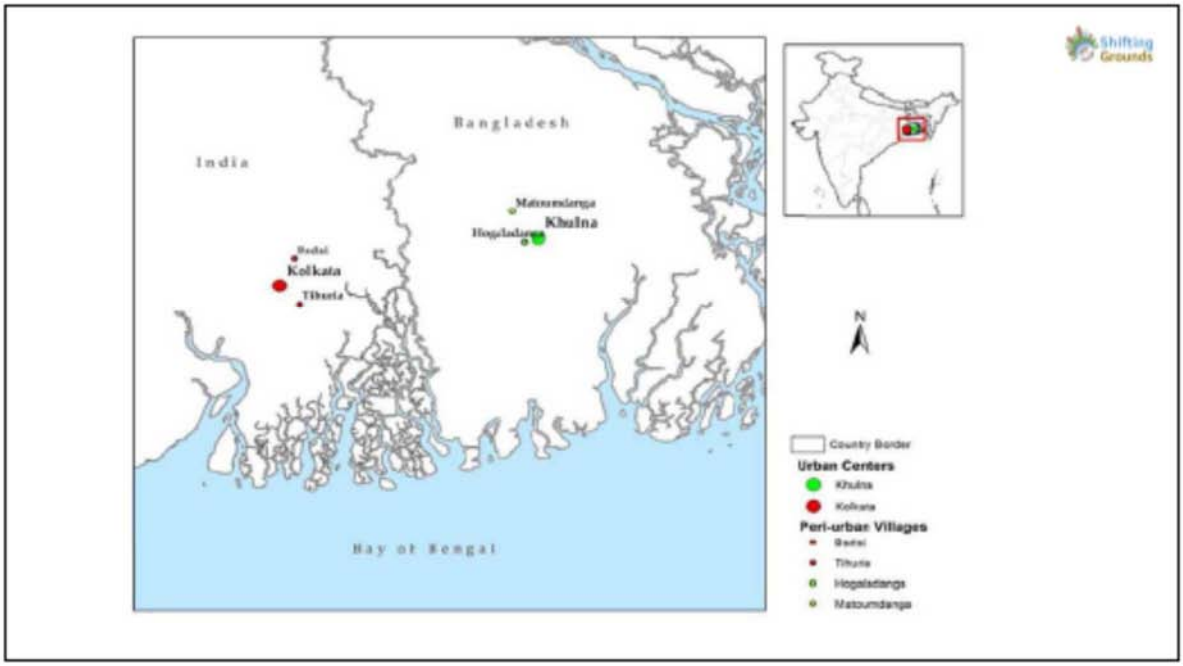
- Qualitative : RRAs, Participatory Mapping and Visual Observations, Key Interviews and Group Discussions
- Quantitative: Household Survey *(Descriptive Statics, GIS mapping and composite index)*
- Survey Design (Quantitative): Livelihood choices (Stratification criteria)
- Sample size is the exact proportion of all identified groups in actual total population
- Qualitative survey design: Sources of Irrigation, Types of Tenancy

Sample Size (Household Survey)

Tihuria	Bodai	Hogladanga	Matomdanga
563	641	461	421
128	130	100	93

Sample design

	KPI	GD
Tihuria	10	5
Bodai	16	7

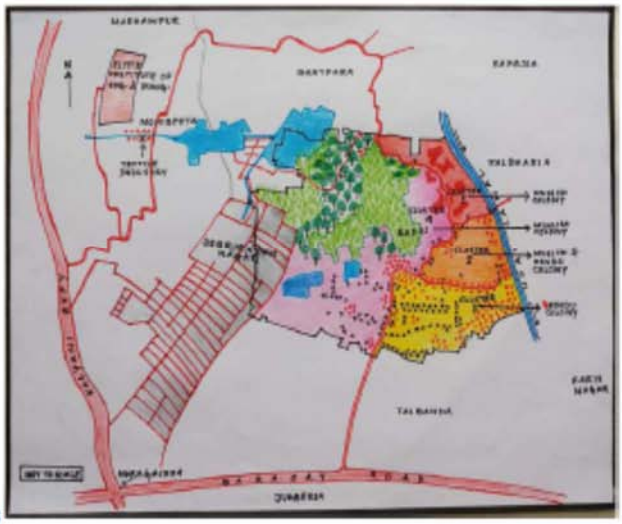


Bodai: Some Facts

- N24 Pargana, Barrackpore II, Bodai GP, 25 Kms from KMC through Kalyani expressways, Jessore road
- 4 Clusters with Muslims (80%), Hindus (15%) and migrants (5%)

Source: SaciWATERs, 2018

Social Map of Bodai



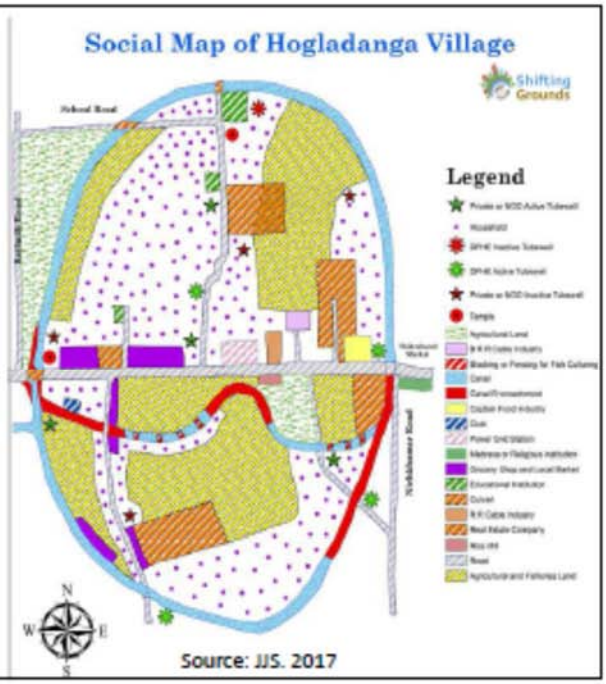
Tihuria: Some Facts

- S 24 Pargana, Sonarpur Block, Kheyadaha GP,
- Unique socio-economic composition
- 5 clusters: Majher Para, Pashim Para, Purbo Para, Dakhin Para and Maulali
- 300 years of urbanization processes
- Metro rail at Garia is about 7 km from the village

Source: SaciWATERs, 2018

Hogladanga: Some Facts

- Jalma Union and Batiaghata Upazila
- Considerable migrant population since 2005 from
- Favored destination of real estate agents and land appropriation by private bodies
- 3 DPH active tubewells



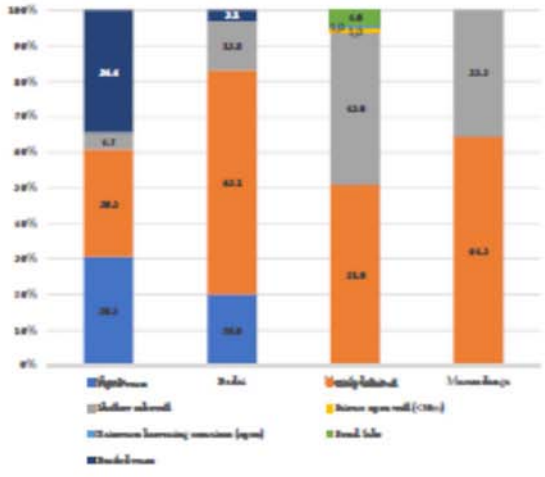
Source: JJS. 2017

Matomdanga: Some Facts

- Attra-Gilatola Union and Phultala Upazila
- Haphazard industrialization and public appropriation of resources
- Extensive usage of groundwater by cantonment board and industries
- Higher dependence on private tube wells

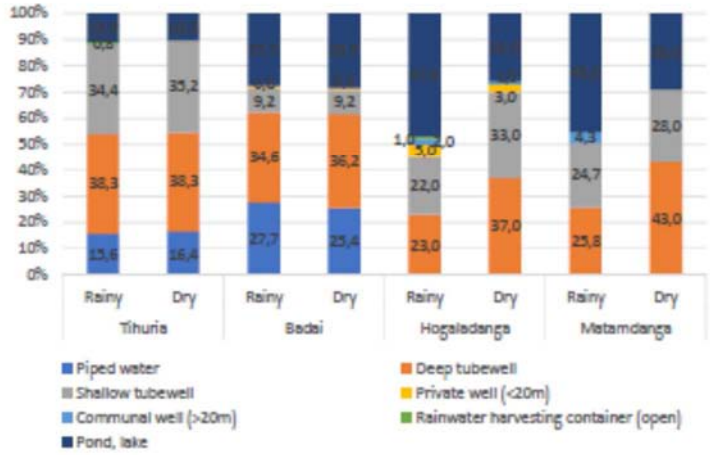
Source: JJS. 2018

The Percentage Distribution of Primary Drinking Water sources



- Piped water supply has GW
- No direct household connect
- DTWs are significant sources for all the four villages
- DTWs for PU Kolkata are publicly managed, while it is not always the case for Khulna
- Strong presence of private water markets in PU Kolkata
- Dependence on vulnerable sources are high for Hogladanga

The Percentage Distribution of Domestic Water sources across seasons



Dependence on common sources are relatively high for Hogladanga

Dependence on ponds and other common sources are lowest in Tihuria and absent in lean period

Class wise insufficiency of drinking water from primary source (%), 2016

Class	Village	Rarely	Often	Always	No response	Total
Lower class	Tihuria (41)	2.4	24.4	47.9	12.2	100
	Bodai (13)	0	61.5	38.5	0	100
	Hogladanga (41)	7.3	19.6	70.7	2.4	100
	Matamdanga (32)	9.4	34.3	56.3	0	100
Middle class	Tihuria (64)	20.3	31.5	18.8	29.4	100
	Bodai (72)	16.9	50	15.3	17.8	100
	Hogladanga (50)	20	78	2	0	100
	Matamdanga (40)	15	77.5	2.5	5	100
Upper class	Tihuria (23)	82.67	4.3	0.3	13	100
	Bodai (45)	85.6	3.3	0	11.1	100
	Hogladanga (9)	66.6	33.3	0	11.1	100
	Matamdanga (21)	76	22	2	0	100

Source: Primary survey. Number of sample households in parentheses.

Class wise insufficiency of domestic source (%), 2016

Class	Village	Never	Very often	Always
Lower class	Tihuria (41)	19.5	42	29.3
	Badai (13)	0	40	61.5
	Hogaladanga (41)	14.6	68.3	2.4
	Matamdanga (32)	44.4	56.3	9.4
Middle class	Tihuria (64)	46.8	34.4	15.6
	Badai (72)	34.8	31.9	23.6
	Hogaladanga (50)	56	36	0
	Matamdanga (40)	62.5	32.5	0
Upper class	Tihuria (23)	95.7	0	0
	Badai (45)	68.3	22.2	0
	Hogaladanga (9)	33.3	55.6	0
	Matamdanga (21)	77.2	23.8	0

Source: Primary survey. Number of sample households in parentheses.

Economic status wise percentage distribution of sample households by primary source of drinking water, Tihuria, 2016

Source	Most of the year				Peak Season				Lean Season			
PHED water supply (Common stand-post)	lower	middle	upper	Total	lower	middle	upper	Total	lower	middle	upper	Total
	24.4	35.9	26.1	30.5	22	31.3	21.7	26.6	24.4	31.1	26.1	32
Deep tube well	34.1	26.6	34.8	30.5	34.1	25	34.8	29.7	34.1	23.4	30.4	28.1
Shallow tube well	4.9	4.7	4.3	4.7	2.4	3.1	4.3	3.1	2.4	3.1	4.3	3.1
Bottled water	36.6	32.8	34.8	34.4	41.5	40.6	39.1	40.6	39	34.4	31.1	36.7
Total (%)	100	100	100	100	100	100	100	100	100	100	100	100
Total Households	41	64	23	128	41	64	23	128	41	64	23	128

Reason for insufficiency in drinking water source (%), 2016

Reason	Tihuria	Badai	Hogaladanga	Matamdanga
Erratic supply from public source	19.5	10	11	10.8
Location of the house on an elevated terrain	0	2.3	1	0
House situated in the rear side of the village where the water does not reach	5.5	0	10	0
Extraction by industries	0.8	44.6	8	2.2
Leakages in the pipe and lack of repairing	36.7	6.2	1	0
Do not know	11	1.5	6	6.5
No response	1.6	2.3	1	5.4
Depletion of ground water table due to agri practices	0	0	60	49.5
Not applicable	25	33.1	2	25.8
Total (%)	100	100	100	100
Total households	128	130	100	93
Source: Primary survey.				

Quality of household's drinking and cooking water before treatment (%), 2016

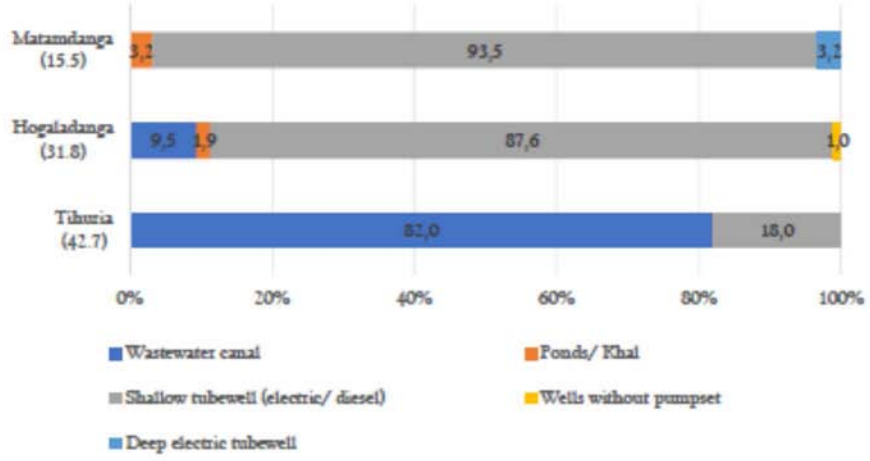
Quality	Tihuria	Badai	Hogaladanga	Matamdanga
No response	0.8	0	1	0
Do not know	3.9	0	5	1.1
Very bad	15.7	7.7	0	8.6
Poor	35.82	17.7	61	55.9
Good	44.5	73.8	26	28
Very good	0	0.8	7	6.5
Total (%)	100	100	100	100
Total households	128	130	100	93
Source: Primary survey.				

Pumping hours (%) in Boro cultivation by source of irrigation, 2016

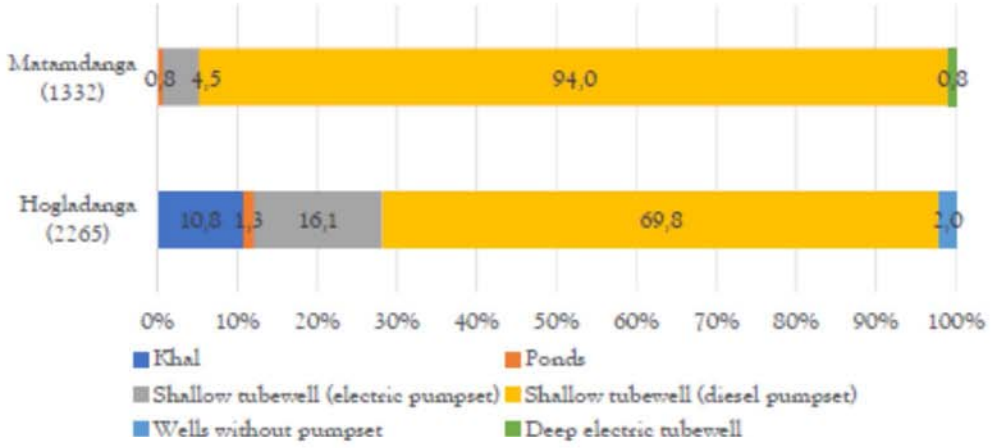
Source	Tihuria		Badai		Hogaladanga		Matamdanga	
	Last year	5 years ago	Last year	5 years ago	Last year	5 years ago	Last year	5 years ago
Khal	3.3	16.6	0.0	0.0	20.5	20.8	0.0	0.0
Ponds	0.0	0.0	0.0	1.0	5.8	6.8	0.0	0.6
Shallow tubewells with electric pumpset	0.0	0.0	27.3	15.4	21.5	22.7	5.4	5.1
Shallow tubewells with diesel pumpset	91.2	74.2	0.6	0.0	48.7	42.1	83.7	76.1
Wells without pumpset	0.0	0.0	0.0	0.0	0.8	5.3	3.5	11.2
Deep electric tubewell	0.0	0.0	72.1	83.6	2.7	2.4	7.4	6.9
Wastewater	5.5	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Total pumping hours (%)	100	100	100	100	100	100	100	100
Total pumping hours (numbers)	1095	566	5029	4135	5511	3325	4295	3113

Source: Primary source.

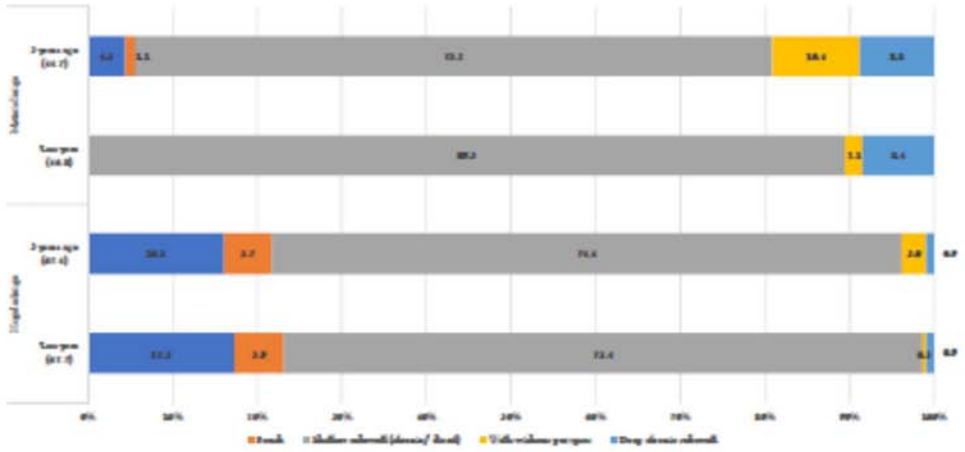
Percentage distribution of irrigated area under aquaculture by primary source of irrigation, 2016



Pumping hours (%) in aquaculture by primary source of irrigation, Khulna,



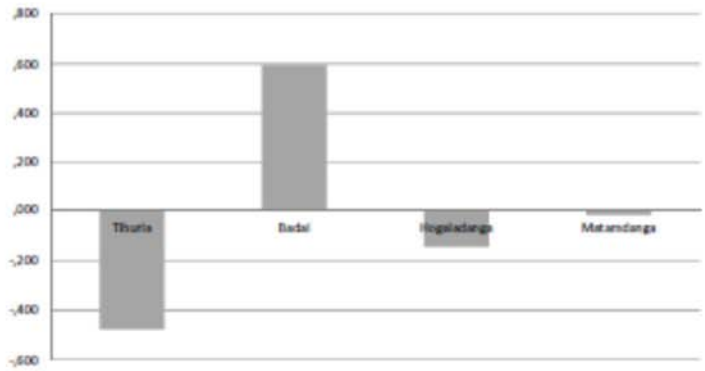
Percentage change in distribution of irrigated area under Boro cultivation by primary source of irrigation, Khulna, 2016



Indicators for Measuring Ground Water Poverty (GWP)

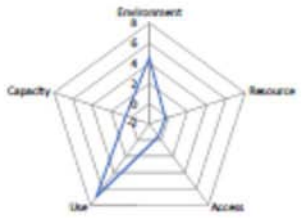
Components	Sub-components
Resource: Physical availability of both surface and GW (Quantity, variability and quality)	1) Number of Months (in Last 1 Year) Main Water Source Sufficient to Meet Household's Drinking, Cooking, Bathing and Cleaning Needs 2) Quality of Household's Drinking and Cooking Water (Before Treatment)
Access:	1. Total Pumping Hours per unit of operated area All Crops 2) % Gross Irrigated Area
Use:	Per capita water collected (Ltr per capital)
Capacity and storage	1) Highest Level of Education among Household Members 2) Can household head read newspaper 3)Highest level of schooling that female children in the household are likely achieve 4)Asset Index (PCA with source of drinking water, construction material, toilet, kitchen)
Environment:	Quality of Household's Non-Potable Water Source

Village wise Groundwater poverty

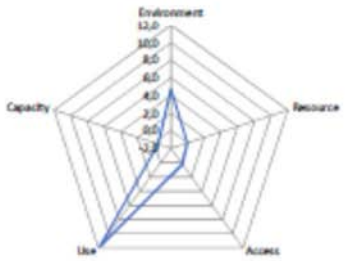


Position of Hogladanga and Tihuria in terms of Groundwater Poverty: Components

Tihuria



Hogaldanga



Conclusions

- There is a decline in the groundwater status in all the four cases where Tihuria emerged to be the most groundwater poor
- *Decline in the gross irrigated area and increasing pumping hours for boro depicts such declining trend*
- Usage of shallow tubewells in wastewater aquaculture ponds manifolds the stress in Tihuria
- Insufficiency attributed to physical coverage and poor maintenance is strongly reported by Tihuria
- Capacity of the households measured in his awareness and educational level, economic status plays critically for Hogladanga
- **Inequity and exclusion is not only shaped by the incapacitated institutional framework but household's preference towards 'a perceived urban lifestyle'**
- **Scarcity is created along the axes of class**
- **Political alliances exacerbates inequalities, shape exclusions and collective action**

Way Forward

- Increase coverage of the public drinking water sources across four villages
- Regulation for private deep tube wells in peri-urban Khulna
- Interventions in education and awareness building in Tihuria and Hogladanga
- Reclamation of the subsidiary wastewater channels in Tihuria
- Wastewater paddy cultivation can be explored in Tihuria

Thank you

Institutional research – Sharlene Gomes

TUDelft

INSTITUTIONAL CONTEXT OF PERI-URBAN PROBLEMS

Results from peri-urban Kolkata

Sharlene L. Gomes
PhD Candidate, Delft University of Technology

TUDelft

01. SHIFTING GROUNDS

Institutional Context

- 4 project locations (2 sites for NA activities)
- Institutional research and support for on-going NA process
- Share research findings from peri-urban Kolkata
  - Bodai village (N24 parganas)
  - Thiuria village (S24 parganas)

02. DEFINING PERI-URBAN

TUDelft

Peri-urban areas

- Close to urban centre (city)
- Two way exchange of population, good & services
- Urban transition is visible in land use, economic activities, and population changes

Kolkata, India

- Experiencing rapid and uncontrolled urban expansion into surrounding peri-urban areas
- Pressure on water resources, especially groundwater
- Creates problems in peri-urban villages

TUDelft

03. RESEARCH IN PERI-URBAN KOLKATA

Purpose

- Examine the institutional context underlying the key issues in Thiruia and Bodai villages
- Provide inputs to support capacity building of Thiuria community
- Build local network and support for project activities

Methods

- Field visits conducted in Oct 2014 and Feb 2016
- Community, Govt representatives (state, district, block, panchayat level), Bureaucrats, Industries
- Qualitative analysis

Key Informant Interviews

Focus Group Discussions

Site visits

Secondary Research

TUDelft

PROJECT SITES: PERI-URBAN KOLKATA

Bodai village

North of Kolkata city in Barrackpore II block
Village is in an industrial region. Major industries are dyeing & bleaching (23 in Bodai). Inndustries employ ~ 3000 locals.
Problem : Regulation of industrial activies

Thiuria Village

South of Kolkata city in Sonarpur block
Under developed village with limited road infrastructure. Bottling companies active in this village
Problem : Lack of access to drinking water supply, especially in South Thiuria pada (locality)

TUDelft

04. INDUSTRIAL REGULATION IN BODAI

Industries have impacted the village in several ways
1. Illegal land conversion
2. Depletion of groundwater resources
3. Release of industrial effluents

1. **Illegal land conversion**
   - Institutions: Land Reforms Act (1955)
     - Land conversion certificate from Land Reforms Office (LRO)
   - Problem:
     - Lack of capacity to manage application volumes at LRO
     - Certificate approval depends on political interest in developing MSME's
   - Solution Strategies:
     - Industries form MSME associationns to coordinate with government among other things
     - Govt incentives:
       - Reduce processing time for land clearance certificate (<21 days)
       - Create single window system at District Industrial Center (DIC), online submission portal for license applications

TUDelft

04. INDUSTRIAL REGULATION IN BODAI

2. **Depletion of local groundwater resources**
   - 25-30 industries use groundwater for manufacturing
   - Eg. Large factories withdraw 1.2-1.300,000 litres of groundwater/ day
   - Institutions: Groundwater Act (2005)
     - Tube-well installation and groundwater abstraction regulated by State Water investigation department (SWID)

   - Problem:
     - Costs & time involved to submit a proposal deters industries
     - Spacing rule (200ft minimum between pumps used by industries) is difficult to maintain
     - SWID not equipped to manage application volume and conduct site inspections
   - Solution Strategy:
     - Higher penalties (Eg. Rs 5000 to Rs 75,000) for non-compliance have previously proved effective in reducing illegal abstraction
     - Requires approval from higher authorities (Eg. DM)

TUDelft

04. INDUSTRIAL REGULATION IN BODAI

3. Effluent release from industries
   - Small industries without ETP release untreated effluents into drains
   - Contaminated with chemicals that enter local water bodies or directly into nearby fields

- Problems
  - Reduces fish population in Nosi Khal (canal)
  - Skin reations when people enter polluted canals
  - Agricultural loss if effluents enter nearby plots
- Solution Strategies
  - Farmer protests in 2009-2010. No assurance that problem would be addressed
  - State govt. fund to set up common waste mgmt facility (solid waste, ETP and drainage channels). But requires industries to provide land.
  - MSME association in Bodai has interest in setting up industrial cluster
  - WB government also has funds to help new industries invest in pollution control equipment

4. ETP IN DYEING FACTORY, BODAI

TUDelft

- ETP capacity of 400,000litres/day
- Cost Rs 2 crore or ~€239,000 and takes up 2 bighas of land (~0.3 ha)
- Automated dyeing processes has reduced the water ratio needed for chemical treatment of fabrics
- Plan to transition to zero discharge facility to further reduce groundwater useage

5. PERI-URBAN DRINKING WATER SUPPLY

TUDelft

- Formal drinking water provider is the Public Health Engineering Department (PHED)
  - Operate at State, district, block level
  - Role: Drinking water supply and water quality monitoring

1. Drinking water Supply:
   - 2 water supply projects in Sonarpur block
   - Treated surface water from Hugli river to 11 panchayats
   - Population has exceeded the projects capacity
   - 2nd mega project planned in 2016 to increase piped network and pumping capacity
   - Areas outside PHED network use hand operated deep tube wells (800-1000ft)

- Institutions:
  - Applications submitted to superyo samiti (block level) evaluated for piped supply feasibility, if not then public standpost is provided
  - Schedule and guidelines of piped water supply schemes as per Vision 2020 (PHED)
    - Eg. PHED guidelines states that 1 standpost for 200-250 people
      Household connections recieve a minimum of 70lpcd

5. PERI-URBAN DRINKING WATER SUPPLY

- Drinking water quality
  - 20 water quality laboratories in 524 paraganas (PHED and NGO Ram Krishna mission)
  - Water monitoring done every 2-3 days
  - Water quality in PHED tested at the time of installation

- Management of Drinking water supply
  - Stand post users do not pay any charges
  - Piped connections play a flat rate of Rs 30/month (€ 0.36)
  - Revenue collection is by Supeyo Samiti
  - O&M was the responsibility of PHED
  - In 2016, Dept of Panchayats and Rural Development issued order to transfer O&M of all drinking water infrastructure over to panchayats
  - Institution: As per National rural drinking water program (2009)

5.FORMAL DRINKING WATER SUPPLY IN THIURIA

PHED water supply connection in North Thiuria pada
- Outlet connected to distribution tank in Kheyada I panchayat
- Combination of surface and groundwater
- Standpost supply is 2 hours per day (morning and evening)

Secondary connections taken to other parts of the village by PHED and locals
- Seasonal scarcity
- Submerged in monsoon season (low lying area)

Tube-wells installed by PHE, MLA, locals
- Private shallow tube-wells <100ft depth
- Non functional, Iron contamination, Seasonal scarcity

Local impact
- Women especially in South Thiuria pada
- Distance and time spent collecting water everyday
- Roads to get to North pada are very poor

5. INFORMAL DRINKING WATER SUPPLY IN THIURIA

Bottle Water Companies

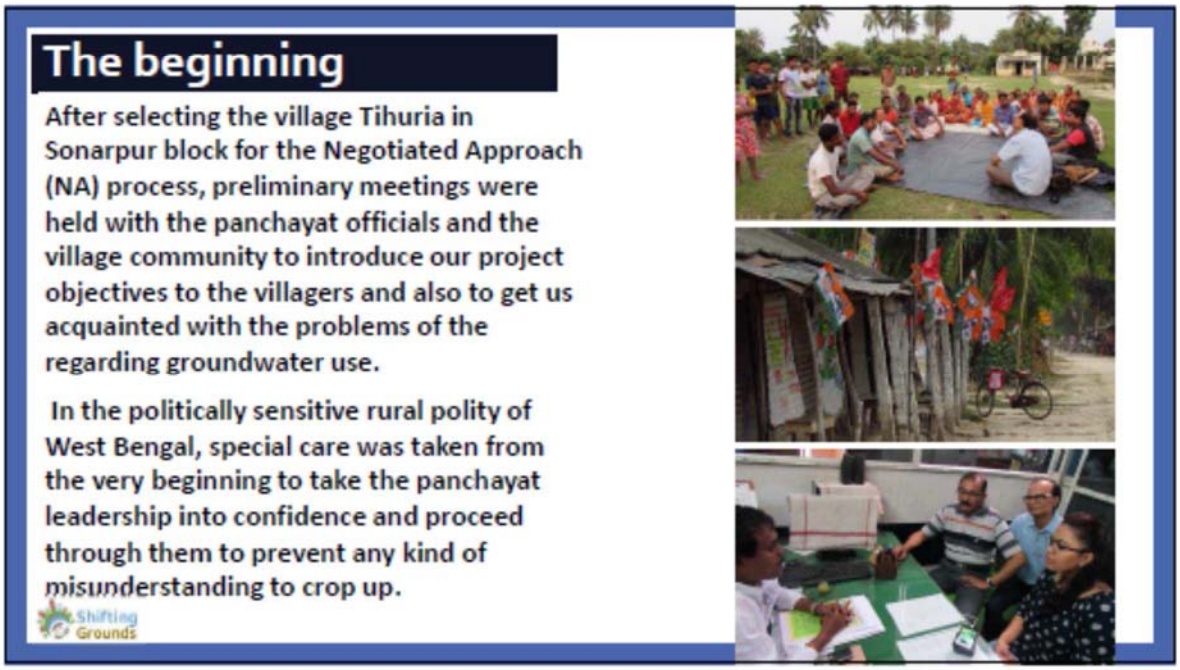
- Local bottling companies
- Started emerging since 2012
- Operate illegally without permits for groundwater abstraction or water quality standards
- Cost: Rs15-20 per jar (€0.18- 0.24)
- 2 types of sources: stream or groundwater
- Unknown quality of water

CAPACITY BUILDING INPUT

- Institutions brief shared via The Researcher
  - Formal institutions related to drinking water supply
  - Ownership, govt actors in local water management, water rights, institutions for pollution control and groundwater monitoring
  - Discussed with the community at NA meeting on June 27, 2016


TUDelft
THANK YOU
Shifting Grounds

Negotiated approach Kolkata – Partha Sarathi Banerjee



First NA workshop

The initial process was culminated in the first NA workshop held in October 2015, which enabled interaction between the community and the whole project team to understand each other. The community got better acquainted with the project objectives and the project team gained better knowledge about lack of groundwater security in the village.
Workshop outcomes:

- Irregular and inadequate supply of drinking water from the PHE overhead tank is the main problem.
- Number of deep tube wells installed by panchayat is also not sufficient to cater the whole village population.
- Villagers are scared about the quality of groundwater, but not aware about the status of the same.
- Surface water pollution caused by waste water intrusion from the canal linked with the city.
- A large number of villagers have to buy packaged water though its quality is not ensured by any kind of testing.

Mango Tree meetings

Then a series of Mango Tree meetings were held in different localities (paras) of the village that helped up to reach out to the larger community and involve them in expressing their apprehensions about the quality of groundwater they were using.

Outcomes of Mango tree meetings confirmed that:

- Access to safe drinking water is the key issue in this village.
- Most of the households have their own hand pumps extracting water from the shallow aquifer, water from which are used for different household works, including drinking and cooking in many cases.
- Villagers are having digestion problems and children having skin diseases presumably as a result of using groundwater from the hand pumps.
- PHE supply outlets are very few and not covering the whole village. The supply is also inadequate, and sometimes has turbidity due to piling of groundwater in the same.
- A large number of households buy packaged water, plants for which have come in large numbers in the block.
- Even for the packaged water, no monitoring system exists.


দক্ষিন তিহরিয়া পাড়ার আলোচনা সভাতে উঠে
আসা স্থানীয় জল সংক্রান্ত সমস্যা


১নং সাহেবেরাবাদ পাড়ার আলোচনা সভাতে উঠে
আসা স্থানীয় জল সংক্রান্ত সমস্যা


মহিলা স্বনির্ভর গোষ্ঠীর সাথে আলোচনায় উঠে
আসা স্থানীয় জল সংক্রান্ত সমস্যা
○ স্কুল সহ পাড়ার মধ্যে অনেকগুলি PHE-র মুখ রয়েছে। কিন্তু তাদের কোনোটিতেই জল আসে না।
○ পানীয় জলের জন্য এই পাড়ার মহিলাদের প্রায়শই সমস্যার সম্মুখীন হতে হয়।
○ গরম কালে PHE-এর সরবরাহ কমে যায়।
○ অনেক পরিবারে ব্যক্তিগত অগভীর নলকূপ রয়েছে।
○ অগভীর নলকূপের জলে লোহার প্রচুরতা রয়েছে।
○ জলে গন্ধ রয়েছে।
○ জলনিকাশী ব্যবস্থা ভালো নয়। বর্ষাকাল যথাসময়ে জল আটকে গিয়ে চাষ ব্যাহত হয়। রবিচাষ বন্ধ হয়।
○ অনেক চাষী পরিবার একই জমিতে ধান ও মাছ চাষ করছে।
○ চাষের সমস্যার কারণে অনেকেই এখন বিভিন্ন ধরনের বিকল্প পেশায় যুক্ত হচ্ছেন।


১০নং সাহেবেরাবাদ পাড়ার আলোচনা সভাতে উঠে
আসা স্থানীয় জল সংক্রান্ত সমস্যা
○ পাড়ার মধ্যে একটি পঞ্চায়েত নলকূপ রয়েছে।
○ এই পাড়ার পরিবারগুলি এবং আশপাশের পাড়ার অনেক পরিবারই এই নলকূপের উপরে নির্ভরশীল।
○ নলকূপের জলে হালকা লোহার প্রচুরতা রয়েছে। জল রেখে দিলে হালকা হলুদাভ হয়ে যায়।
○ PHE-এর জলের পাড়া থেকে অনেক দূরে।
○ অনেক পরিবারের ব্যক্তিগত অগভীর নলকূপ রয়েছে।
○ এই সকল নলকূপের জল ঘর-গৃহস্থালীর কাজে ব্যবহার করা হয়।
○ জলে লোহার প্রচুরতা অনেক বেশী।
○ এই জল পান করলে পেটের রোগ দেখা দেয়।
○ রান্নার কাজে ব্যবহার করা যায় না। মাছি বা ছাল সিদ্ধ হয়না।
○ আয়রনমুক্ত করলে জলে চুনের দাগ পরে যায়।
○ পাড়ার মধ্যে জল নিকাশী ব্যবস্থার অভাব রয়েছে।
○ অনেকগুলি পুকুর আছে। কিন্তু পুকুরের জল দূষিত হয়ে গেছে।

The second NA workshop

Subsequent to the MT meetings, the second NA workshop held in June 2016, where the outcomes of the MT meetings were discussed and the problems were projected before the panchayat officials present, thus opening the channel of negotiation between the villagers and the panchayat officials.

Outcomes of the 2nd NA workshop:

- An institutional brief prepared by one of our researchers (Sharlene) with pictorial presentation of the groundwater situation, narration of the rules and acts governing its usage and the departments responsible for implementing the same was presented and discussed.
- The issue of people's right to access safe water was brought to the community's knowledge for the first time.
- The GP leadership present in the workshop came to know the problems faced by the community regarding access to safe water and acknowledged the project's efforts to bring the issues in discussion.
- Apprehensions of misunderstanding between the GP leaders and the project works seemed to be over for the time being.

Policy brief booklet

Policy brief booklet

Policy brief booklet

'শিক্ষিটির প্রতিবেদন' প্রকল্প সম্পর্কে কিছু কথা

Mid-term review workshop

- Held in September 2016, this workshop gave the community to share their perceptions and expectations about the project works.
- The community representatives expressed positive opinions about the project, but wanted something concrete to be done to help them to improve the situation.
- The workshop also gave the community and the project team an opportunity to more closely interact with the GP leaders.
- Subsequently, arsenic program was taken up with the support from Arsenic Knowledge and Network.

Arsenic awareness and detection programme

Then a series of arsenic awareness and detection programmes were taken up by organizing a workshop, followed by spreading IEC material regarding health impact of arsenic contamination and testing of drinking water samples with arsenic detection kit.

Outcome of Arsenic Awareness and Training Workshop

- Arsenic experts disseminated the knowledge regarding arsenic contamination in groundwater and the severity of its impact on human body.
- A number of panchayat members and health workers along with community representatives received basic knowledge about the threat of arsenic.
- It was agreed upon that as a first step groundwater samples would be tested to check the presence of arsenic and the extent of it.

Arsenic tests and arsenic mapping of Tihuria village

- 40 samples collected from domestic tube wells were tested with the help a Arsenic Kit, and the samples found to have arsenic more than the permissible limit were further tested in the Ramkrishna Mission lab.
- 17 samples found in the kit tests to have arsenic above the safe limit, while 9 samples were confirmed to have arsenic above permissible limit in the lab tests.
- With the results of arsenic tests, arsenic mapping of the village was prepared.

Shifting Grounds

Arsenic workshop

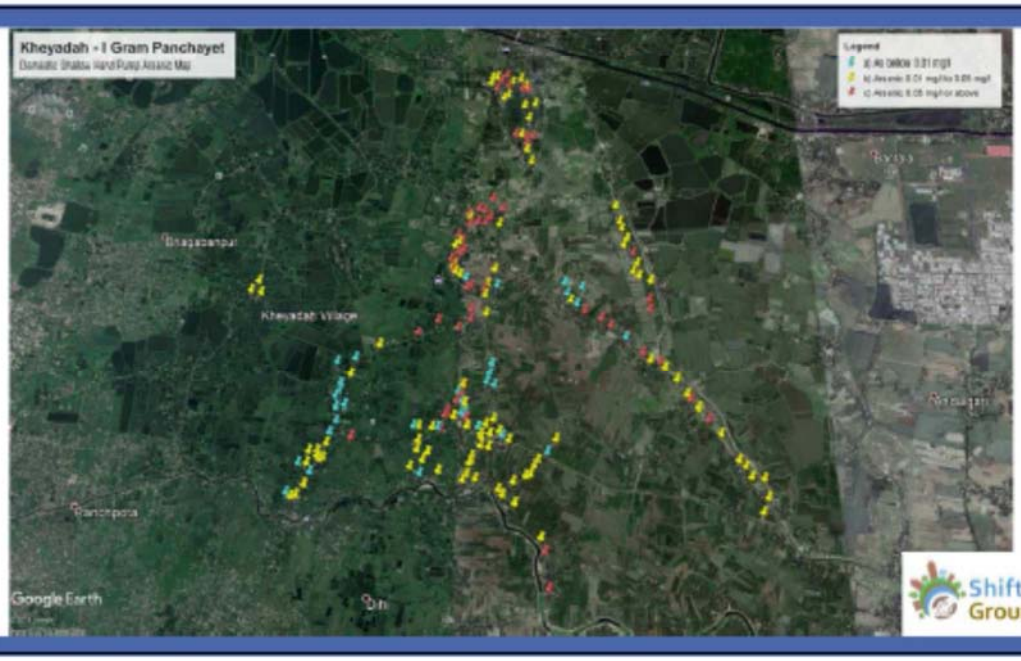
Shifting Grounds

- The results of arsenic tests were discussed in a workshop participated by panchayat members, health workers, community members, PHE official and NGO and medical experts.
- Village Water and Sanitation Committee members attended the workshop and expected to take up the issue.
- As the threat of arsenic proved to be real in the region, panchayat members from other villages of the gram panchayat also requested to test groundwater in their villages.
- The GP leadership also wanted our project activities be extended to other villages under the GP.

Arsenic Mapping of the entire GP area

- Subsequently water samples from all the 7 villages under the panchayat were tested by the kit and arsenic mapping done for all the villages.

Outcome of the arsenic tests in 7 villages	
Total sample tested	150 nos.
Domestic TW	150 nos
Arsenic found above 0.01 mg/l	125 nos
Depth of domestic TWs	Min - 20 ft, Max - 340 ft.
General use of domestic TWs Drinking and cooking	55%
Cooking only -	45%



Health camp

To check the impact of arsenic contamination, a health camp was organized in Tihuria, in which Community Medicine Doctor Kunal Majumdar checked the probable patients of arsenic.

Arsenic health camp outcome	
Village name	Tihuria
Total no of patients checked	26
No of patients diagnosed with suspected arsenicosis manifestation	10

The final arsenic workshop

The almost year-long arsenic programme was culminated in a workshop. The workshop urged -

- every participant to spread awareness regarding arsenic to the large community,
- the health workers to undertake health scanning to detect probable cases of arsenic impact on human body and
- The panchayat staff to facilities testing of water from each and every tube wells used for human consumption.
- The workshop inferred that monitoring of water quality is of utmost importance for the community health and should be given priority and require concerted efforts by all the stakeholders.
- A bio-sand filter was introduced in the workshop by one NGO.

What could be achieved through the NA

- ✓Through the NA process in Tihuria, the issue of groundwater security, of universal access to safe groundwater, for human intake could be brought into the public discourse and recognized by the GP leadership and block officials as one of immediate concern.
- ✓The VWSC has been activated to some extent and negotiation started though at it is still at the initial stage.
- ✓The Researcher have learned how to apply a structured community empowerment and engagement process through their experience with the Negotiated Approach.

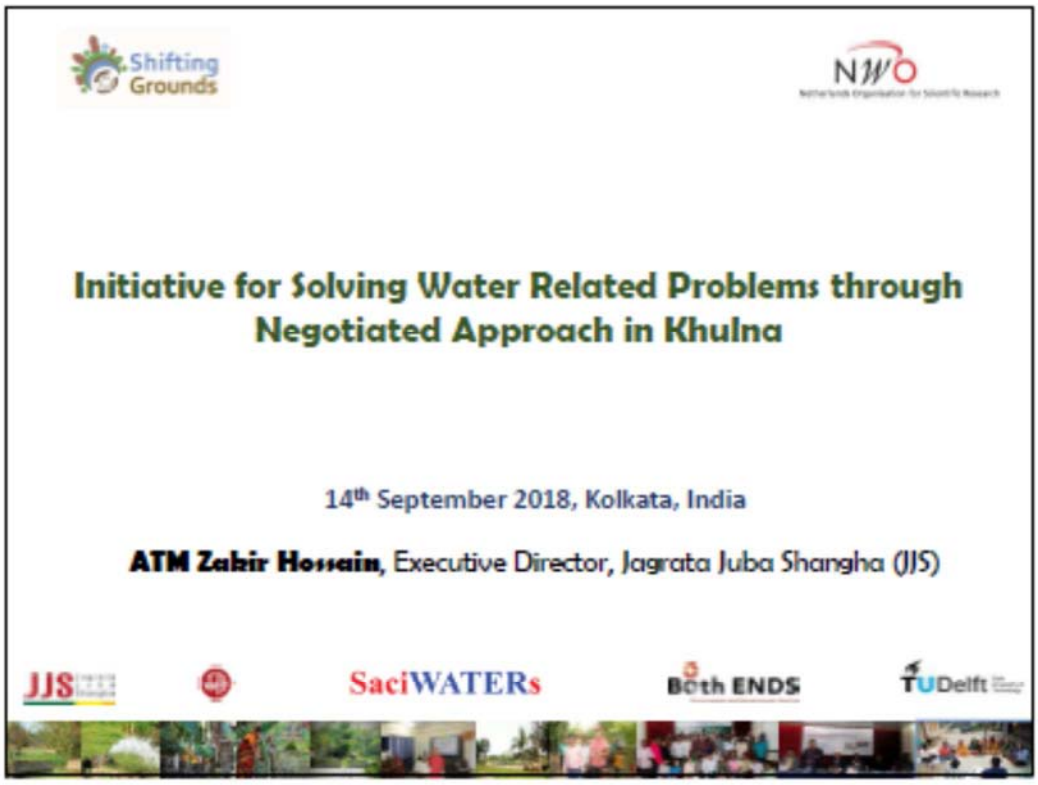
Final workshop in Kolkata and way forward

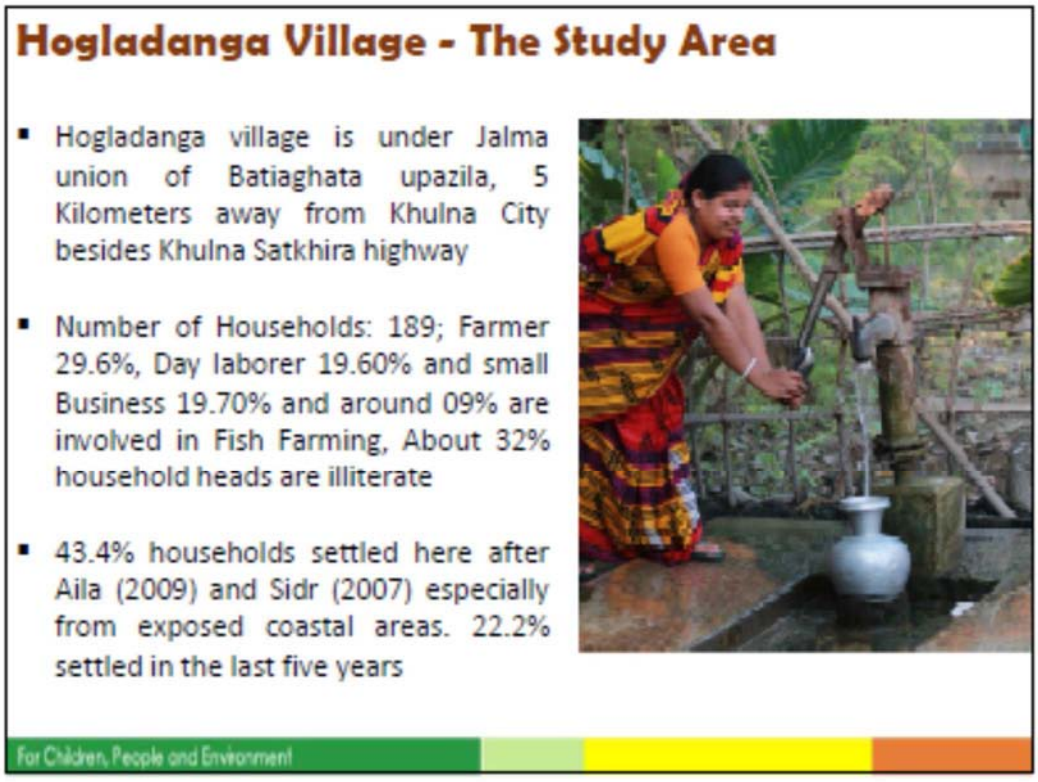
The Final workshop was held on 14 September 2018. In this workshop, the community and the panchayat leaders came up with valuable insights and words on way forward.

- ✓Community representatives said that in the initial meetings of the project, villagers participated, but still had apprehensions about our project objectives. What we wanted to do and with what interests?
- ✓It required some time and only after the arsenic detection and awareness generation programme, the community understood clearly that the project was working in their interest only.
- ✓The link between the community and the panchayat leadership to resolve the drinking water problem seems to have finally cemented as the panchayat leaders promised to take forward the project findings to the upper administrative bodies and seek their intervention to resolve the problem.
- ✓The 3-year long negotiated approach activities seems to have been able to finally create the necessary atmosphere to connect the project findings with the community and panchayat leadership that might go a long way to resolve the perpetual groundwater issues.


আসুন, আমরা আলাপ-আলোচনার মাধ্যমে সমস্যা সমাধানের পথে এগিয়ে চলি।
ধন্যবাদ
ThankYOU
Shifting Grounds
The Researcher

Negotiated Approach in Khulna – ATM Zakir Hossain





Agriculture

29.6% families depend on agriculture for their livelihood among which 18.5% are tenant farmers and 11.1% own land. Rice, Vegetables are major crops, Pulse and Sesame are also produced. In the last 10 years underground water use for irrigation increased from 13.5% to 65.5%

Because of new settlements of new comers, crop lands are decreasing fast

Source of Irrigation

Source	Before 10 Years	Present
Ground Water	13.5%	65.5%
Tube wells	13.5%	65.5%
Surface Water	86.5%	34.5%
Pond	11.5%	11.5%
Canal	57.7%	23%
River	17.30%	0%

Source: Baseline Survey, JJS, 2016

For Children, People and Environment

Fisheries

- 9% households involved in fish farming. 4% are engaged in shrimp Cultivation and rest 5% are engaged in white fish cultivation(Rui, Katla)
- Some powerful villagers fence canal for fish cultivation that is responsible for water logging

For Children, People and Environment

Safe Water

- Currently 96.8% people use tube-well water for drinking and households use purposes, before 10 years which was only 6.3%
- About half of the households spend more than 1 hour in a day to collect fresh water from their targeted deep tube-wells

Safe Water Sources

Source of Water	Before 10 Years	Present
Ground Water	6.3%	96.8%
Tube-well	6.3%	96.8%
Surface Water	93.6	3.2
Pond	56.1%	1.6%
River	6.3%	-
Canal	31.2%	1.6%

Source: Baseline Survey, IIS, 2016

For Children, People and Environment

Water Related Problems

Drinking Water Scarcity

- During summer season, water level go down, ponds and canals are being dried out
- Quality of ground water is not good because of excessive iron and presence of arsenic in shallow aquifer
- Currently people get water from (400-450) feet deep tube-well but they are not satisfied with the water quality, they demand to get water from deeper aquifer over 1000 feet

Water logging Problem

- Only canal is encroached and grabbed by powerful people, disrupted free flow of water and causing water logging in the village
- Fishermen, blocking the canal with fence that reduces water flow
- Improper Sluice gate management is responsible for not getting enough water in the canal
- Real Estate business buying land here and there, filling land by sand and interrupting the process of aquifer recharge and creating water logging

For Children, People and Environment

Negotiated Approach Process in Khulna

10 Steps Negotiated Approach for Solving Water Related Problems

- Engaging Community in Situation Analysis Process
- Social Mapping
- Prioritization of Issues
- Stakeholder Mapping
- Issue Based Negotiation Plan
- Small Scale Participatory Water Management Plan
- Community Negotiation Group Development
- Negotiation and Advocacy Skill Development
- Finalization of Water Management Plan with Stakeholders Suggestions
- Individual Meeting with authorities

For Children, People and Environment

Engaging Community in Situation Analysis Process

Village Profile/Handbook Development

Organizing Community

- Water Rights farmers Group
- Water Rights Fishermen Group

Knowledge development

- Negotiated Approach
- Citizen right
- Water Policy & Law
- Water Policy and Practices
- Ground Water Layer & Water Cycle
- Ground Water Pumping and Consequences of over Pumping
- Saline Intrusion & Arsenic Contamination in Ground Water

For Children, People and Environment

Social mapping

- Villagers develop a social map identifying households, roads, river and canal, school, college, religious institutions and others
- They also identified their water related problems within this map

For Children, People and Environment

Prioritization of Issues

- Accessibility to safe drinking water
- Canal Encroachment and Water Logging
- City Corporation Waste Dumping

For Children, People and Environment

Stakeholder Mapping

- Union Parishad
- Upazila Parishad
- Department of Public Health and Engineering (DPHE)
- Bangladesh Water Development Board (BWDB)
- Department of Agriculture
- Department of Fisheries
- Khulna City Corporation (KCC)
- Khulna Development Authority (KDA)
- KWASA
- Department of Environment (DoE)

For Children, People and Environment

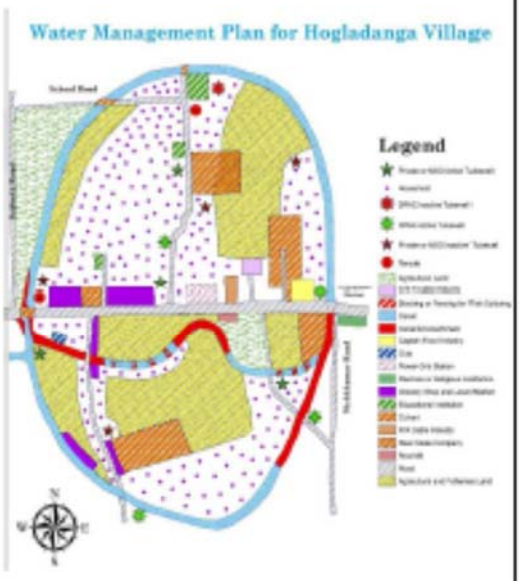
Issue Based Negotiation Plan

Priority Issues	Target Organization	How	Expected Outcomes
Accessibility to Safe Drinking Water	• DPHE • DoE • Upazila Parishad • Union Parishad	• Capacity building workshop with community participants • Organizing workshop with government authorities and stakeholders • Media Mobilization	• Ensure sufficient drinking water • Government Authorities will provide more focus on this issue • Print media will provide more attention on this issue
Canal Encroachment and Water Logging	• Deputy Commissioner • KCC • KDA • DoE • BWDB • Upazila Parishad • Union Parisha	• Capacity building workshop with community participants • Organizing workshop with government authorities and stakeholders • Media Mobilization • Discussion with other initiators – Blue Gold • Individual meeting with departments	• Adequate water drainage system • Canal re-excavation • Repair and maintenance of Ramdia sluice gate • Government Authorities will provide more focus on this issue • Print media will provide more attention on this issue
City Corporation waste dumping	• Deputy Commissioner • DoE • KCC • KDA • Upazila Parishad • Union Parishad	• Capacity building workshop with community participants • Organizing workshop with government authorities and stakeholders • Media Mobilization	• Stop City Corporation Waste Dumping/Modernizing the dumping system • Ensure Safe and Sustainable Environment • Print media will provide more attention on this issue

For Children, People and Environment

Small Scale Participatory Water Management Plan

Villagers developed a participatory Water Management plan indicating Existing water points, Required water points, efficient drainage system, proper maintenance of sluice gates and Illegal canal encroachment



For Children, People and Environment

Community Negotiation Group Development

Hogladanga Farmers and Fishermen Group formed a negotiation group along with the coordination of JJS. The selected group members are in the followings:

- Ashok Kumar Ray
- Nivanan Kumar Ray
- Utpal Ray
- Subroto Roy
- Birupoma Ray
- Mithu Ray

For Children, People and Environment

Negotiation and Advocacy Skill Development

- Prioritization of water related problems
- Advocacy Strategy Development
- Action Plan Development
- Update Participatory Water Management Plan
- Continuous follow-up and linkage with related department and authorities

For Children, People and Environment

Finalization of Water Management Plan with Stakeholders Suggestions

- Community Negotiation Group present small scale participatory water management plan
- Water related authorities provide suggestions for solving peri-urban water related problems:

- ✓ Need development of polder 28/1 and 28/2
- ✓ List out the illegal grabbed canal and government will take proper initiatives
- ✓ Repair and Maintenance of Ramdiah sluice Gate
- ✓ Mass media should take pro-active role for solving peri-urban water related Problems
- ✓ Peri-urban water related problems should solve through small small scale planning

For Children, People and Environment

Individual Meeting with authorities

Community Negotiation Group conduct meeting with BWDB and DPHE for solving their drinking water problems and water logging problems

For Children, People and Environment

Results

- Upazila Administration took initiative to remove canal barriers
- Peri-urban issues are now in discussion at different level
- Initiative to install taste tube-well over 1000 feet for identifying suitable aquifer at Hogladanga village is taken by DPHE
- Linkage between community and government stakeholders is developed
- Peri-Urban Water Forum is functional with involvement of communities, all related government authorities and civil society

For Children, People and Environment

Sustainability: Peri-urban water Forum

SL	Name	Designation and Organization
01	Md. Kamal Uddin Ahmed	DMD, Khulna WASA
02	Dr. Dilip Kumar Dutta	Professor, Environmental Science, Khulna University
03	Kazi Md. Sabirul Alam	Executive Engineer, KDA
04	Dr. Mustafa Saroar	Professor, Urban and Regional Planning, KUET
05	Mahmud Elias	Executive Engineer, BWDB, Khulna
06	Engr. Zahid Parvez	Executive Engineer, DPHE, Khulna
07	Md. Tasaduzzaman	Education Officer, KCC
08	Md. Abdul Latif	Deputy Director, DAE, Khulna
09	HM Alauddin	Staff Reporter, The Daily Purbanchol, Khulna
10	Samsuzzaman Shahin	Bureau Chief, Bangladesh Protidin
11	Md. Babul Reza	Executive Director, Tarango
12	Nivanon Kumar Roy	Community People, Hogladanga Village
13	Omar Ali Sheikh	Community People, Tentultola Village
14	Kulsum Bibi	Community People, Tentultola Village
15	ATM Zakir Hossain	Executive Director, JJS


দৈনিক পূর্বাঞ্চল

খুলনা কল

Media Coverage: Peri-urban water Forum Meeting

For Children, People and Environment


Negotiation is a continuous process----------

Shifting Grounds: Institutional transformation, enhancing knowledge and capacity to manage groundwater security in peri-urban Ganges delta systems

Shifting Grounds aims to build knowledge and capacity among local actors to support a transformation process in peri-urban delta communities in Bangladesh and India for a pro-poor, sustainable and equitable management of groundwater resources across caste/class and gender. This is to be based on an improved understanding of the dynamic interplay between local livelihoods, the groundwater resource base, formal and informal institutions and links with nearby urban centres in Khulna and Kolkata. These two cities provide a good basis for comparison, being part of the same Ganges delta system, yet located in different countries.

Funded by the Netherlands Organisation for Scientific Research (NWO), the Shifting Grounds project is executed by a group of academicians, researchers and civil society organisations. Delft University of Technology (TU Delft) leads the consortium that consists of SaciWATERs, Bangladesh University of Engineering and Technology (BUET), Jagrata Juba Shangha (JJS), The Researcher and Both ENDS.

Website: http://saciwaters.org/shiftinggrounds/

Shifting Grounds

Netherlands Organisation for Scientific Research
WOTRO Science for Global Development