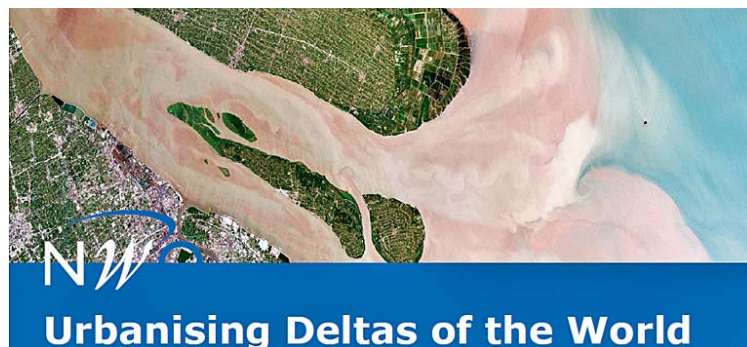




TIDAL RIVER MANAGEMENT (TRM) IN LOWER GANGES DELTA: FROM PEOPLE'S PERCEPTION



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1. Introduction

The prograding delta - the Bengal delta - is formed overtime due to sediment accumulation on the tidal floodplain. Construction of massive flood control structures during 1960s onward prevented silt to deposit on the floodplain rather aggravated sedimentation on the river beds and canals thus obstructing the natural drainage. The consequence is human induced waterlogging, drainage congestion and enhanced salinity in the tidal floodplain. This human generated deposition of sediments on river beds also suffocated the river courses faster and thus river drying ensued. To get rid of waterlogging and drainage congestion in the tidal flood plain tidal river management (TRM) has been considered as an effective approach – a partial return to the age old practice of *temporary overflow irrigation*. TRM involves enabling the natural flow of sediment-loaded tidal river water into the tidal floodplain during high tide that leads to sediment deposition on the tidal floodplain while the outgoing sediment-free water picks up river-bottom sediments by eroding the river bed and increases the drainage capacity of the tidal river. TRM requires periodic cutting and closing of polders to accelerate land accretion for a period of 3-5 years at least. TRM has been capable of elevating the tidal floodplain between 2 m near the cutting point and 0.2 m in the far ends and scouring the tidal river depth 9-12 meters and width 2-8 times.

The emphasis of the TRM approach has changed over time. Initially, the focus was on providing a solution for water logging problems and a means to overcome vested institutional power relations. However, these rationales have now been complemented by representation of TRM as a climate change adaptation measure, eco-engineering innovation and ecosystem valuation instrument. Yet, the TRM approach is accompanied with conflicts among stakeholders.

This brief report explores how the local stakeholders (the grass-root stakeholders) appreciate TRM. We tried to capture the people voice on TRM by Field Observation, Key Informant Interview (KII), Focus Group Discussion (FGD), Community Visioning, Transect Walking, Team Building and Integration and Analysis during October 2017 to March 2018. This sites for such exercise has been selected purposively. We have considered the following locations (Fig. 1) with reference to state of TRM operation such as

- i. TRM is not known to the people (**Beel Mielmara**: several villages in Sadar Union, Batiaghata Upazila, Khulna :river *Kazibacha* on the east and river *Shoalmarree* on the west)
- ii. TRM operation is currently active (**Beel Pakhimara**: Several villages in Jalalpur and Keshhra Unions of Tala Upazila, Satkhira District: river *Kapataksha*)
- iii. TRM partially successful (**Beel Khuksia**: Several villages in Shufalakati Union of Keshabpur Upazila, Jessore District: river *Srihari/Hari river*)
- iv. TRM proposed but not executed (**Beel Kapitalia**: Several villages of *Manaharpur*, *Nehalpur*, *Pyra* and *Khanpur* Unions of Manirampur and Abhoynagar Upazilas, Jessore District) and
- v. TRM apparently successful (**Beel Bhaina**: Several villages of Gaurighona Union, Keshabpur Upazila, Jessore District).

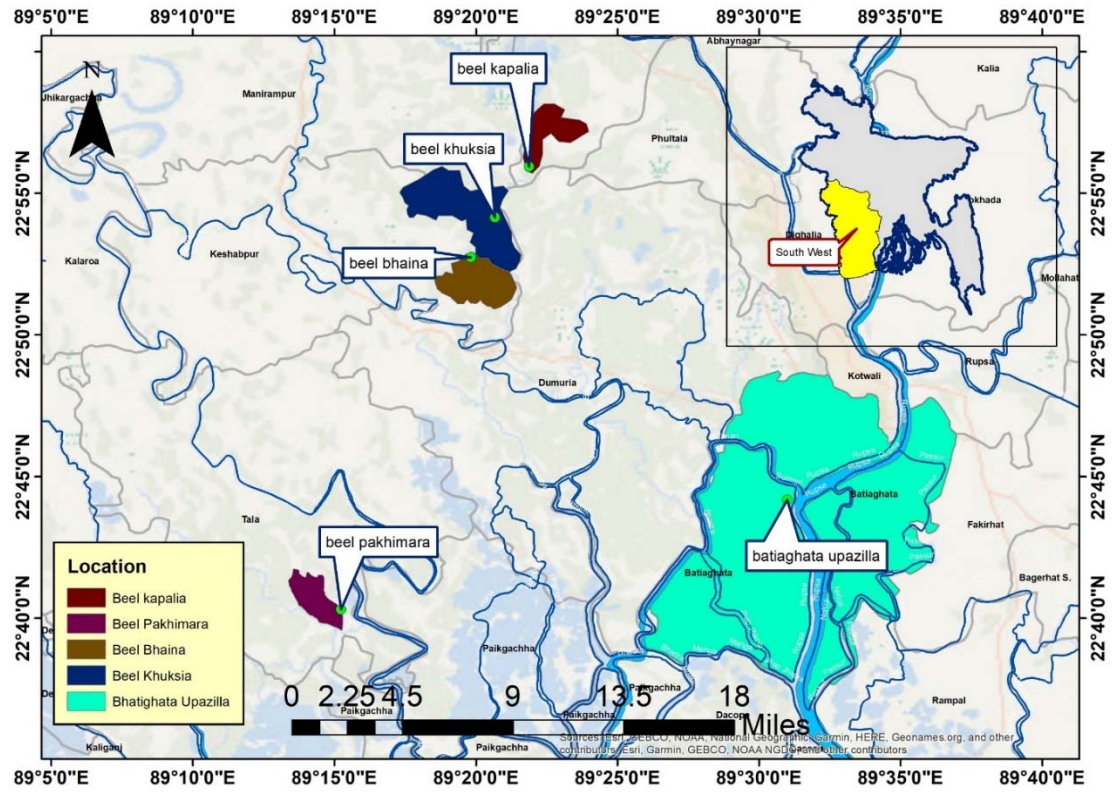


Fig. 01: Location of study sites in the Lower Ganges Delta

2. Beel Mielmara Batiaghata

Batiaghata lies in Polder # 30 with 11 sluices of which four are double spanned and the rest 7 are single spanned. Before the construction of 140 km long WAPDA embankment to create the polder during 1960s this area was single cropped (*Aman rice: Kharif 2*). The wetland was crisscrossed by numerous canals (*kebali*) that provided passage for free water movement to all sides of the *beel* area to rivers as the area is bounded by rivers on all sides. There were earthen embankments constructed temporarily within the wetland as well to control water flow locally to restrict the entry of tidal waters to the floodplains and was managed by a committee usually known as *eight-month water committee*. These embankments were opened during November-March to allow water inside so that the dry land could be good for cultivation by next season. After erection of embankments by WAPDA the water flow was controlled and managed through sluice gates. Such management through *polderization* was promising for at least 20 years after construction because it offered huge rice yield even during all three seasons. But with time the floodplain being devoid of river siltation, lost its fertility and even more mechanized ploughing could not do well. *We lost our traditional cropping pattern and also lost many of our aquatic resources*. This has happened because the span of sluice gates are too narrow for a complete drainage operation, and also most of the sluice gates become ineffective with time because of huge siltation at the sites.

The concept of TRM is nothing new to us rather it was innovated by our community. TRM operation offers a good opportunity to raise the elevation of floodplains. But in our case we would not recommend TRM operation. The TRM operation needs the floodplain to be submerged for long time under water and we would not feel comfortable by abandoning our homestead for such long time. It has already been observed that the floodplain inside the polders are at much lower elevation compared to that of outside the polders and would eventually lead to waterlogging problem within the polder. But we do not have much waterlogging problem in our area, it is the narrow sluice gates that causing drainage congestion. If we want our rivers alive we should go for wide sluice gates.



However many members of the community believes that the span of sluice gates were well calculated and *the increased salinity is the real problem for our current low yield.* The canals inside the wetland are already grabbed and used for fish culture. Such grabbing of link canals restricted the water flow – *whenever its rain heavily, the land besides the link canals are flooded* - and thus distribution of sediments all over the floodplain is very much uneven. *Thus it is not the water but distribution of silt that matters. Aila in 2009 have destroyed away everything in Dacope upazila but later the community finds that the floodplain has elevated several feet because of sediment deposition, and now people are cultivating paddy, vegetables, and many other things there with good yield. Though natural hazards cause life and financial losses but it rejuvenates the ecosystem and subdues the human intervention to the surficial processes.*

Seasonal waterlogging is quite evident in Batiaghata (such as in Maddhyapara). *The flooding is seasonal right now but I am afraid that it may be prolonged in near future.* Dredging of canals in the area has been taken as solution to such problem by the authority. *But this seems to be the less viable option to me.* The dredged materials resettle within the canals in no time because these sediments are not distributed all over the floodplain.

The extent of shrimp farming is a major cause for increased salinity in Batiaghata. *However since this is a coastal region we do expect both salinity and fish farming in this area. But there should be a tolerance limit.* A number of community members suggest that the tolerance limit could be achieved if water and sediment is allowed to enter into the wetland and floodplain, that would elevate the floodplain by sediment deposition and traditional varieties of rice can be grown. During monsoon rainwater irrigation could be an option.

The issue of compensation against landownership is also important if TRM operation is a definite option to minimize the current problem such as partial waterlogging, the rise in salinity and siltation of river beds in Batiaghata. The community is not sure about the opposing arguments as well as the arguments in favor of TRM operation. However, they have tried to identify the conflicting groups. Members of the water management and/or association (WMG/WMA) perceives that small landholders may agree to TRM operation if they are permitted to use their land along with compensation. However, the sharecroppers and the marginal landless community may oppose totally because they are quite dependent on land-based functionalities for their livelihood. *This may create an uncertainty in livelihood support system.* However the occupational hazards due to TRM is almost zero *because usually land-based activities take place for 3 to 4 months only in a year.* Certainly the large landholders would agree in TRM operation if the compensation is received in a easy and transparent way; but a certain number of the large landowners may not agree in TRM operation who are involved with shrimp aquaculture. The group that are involved directly with crop agriculture are more concerned with sharecropper, if the sharecroppers are taken care of in the compensation process, *certainly we will agree for TRM operation.*

The community agrees that TRM operation could be an option for water management in Batiaghata; however its success would lie on resolving the following issues:

Creating a supportive platform with link to the *Union* level that would counsel the stakeholders (mainly the villagers), participate in technical and budget issues of TRM and channel the field voices to the TRM execution authority. Stakeholders' awareness is a major issue for sustainable water management that would lead to sustainability in land-use. *Unwise decisions of BWDB regarding TRM operation is the major cause of its failure as is seen in other cases. They do not have any practical knowledge of the area and do not rely on the local knowledge. All the doings of BWDB has already destructed our environment and we do not have trust on them.*

Discourse summary from Beel Mielmara, Batighata

- Construction of *Polders* provided short-term benefit; however resulted in incremental rise in salinity and water-log conditions with time due to clogging of link canals; the later is aggravating because of fish farming.
- People perceive that BWDB constructed embankment unnecessarily and LGED's dredging efforts will go in vein because of high sediment load of the canals.
- Landless people, sharecropper, small holders and shrimp *gheer* owners would not take risk due to uncertainties while TRM is in operation and they disagree even if there is any compensation during TRM operation. A common pursuit for land-use practice is lacking
- Local observation is that land elevation within *polders* is much lower than that of outside and continuation of such process would render the villages within enclosures into water logged condition by next few years.

- TRM will be good practice in land reclamation but afraid of taking risk during the process that was not experienced earlier. *Share-cropper's right* and *occupational replacement cost* needs to be considered.
- Width of sluice gates to be much wider (and appropriate), when the link canals will be automatically active and would help in rising the land elevation.
- Recommendations: Existing sluiceways to be widened and more gates to be constructed; Local Government authority to demark *khash* land and canals. The *khash* lands are appropriate place for sediment disposition; village protection embankment to be constructed; sluice gates connecting link canals to river to be appropriate enough for flow management.

3. *Beel* Pakhimara

Tidal River Management (TRM) in *beel* Pakhimara is a component of a four year project (2011-12 to 2014-15) called *Kapatakshaw River Restoration Project* that includes excavation of 90 km of the river Kapatakshaw and the management of sediments. TRM concept was applied in managing the sediments.

Beel Pakhimara is located within the tidal regime of the river Kapatakshaw. The drainage basin of the Kapatakshaw is dotted with numerous wetlands (called *beel*) spatially distributed along the backwaters of the river, and are linked through *khals* (the link canals) to the main channel (the Kapotakshaw). Waters of the Kapotakshaw - - laden with enormous amount of sediments - usually finds its way to the hinterlands as defined by the wetlands and were distributed in the floodplains. The ebb tide drains out the water, while the wetlands and the floodplains holds back the sediments. This process laid the way of incremental rise in elevation of the floor of both the wetlands and the floodplains. Thus although the region is a component of the prograding delta - the Bengal delta - where waterlogging and salinity is obvious but the wetlands and floodplains enjoys enough space for minimizing the hazards of such natural processes by raising its floor and draining out the water. The farmers of the drainage regime usually construct low height earthen embankments during monsoon to protect agro-products (mainly crops/paddy) from invading saline water due to high tide. The floodplain usually produces one crop (*Aman* rice: *Kharif* 2). The second crop (*Aus* rice: *Kharif* 1) and third crop (*Rabi*: mostly vegetables during winter) were rare in this area. However, the floodplain and the wetlands were full with diverse brackish and freshwater fishes during monsoon and the floodplain during winter was a nutritious grazing ground for livestock.





During 1960s the entire region was separated from the Kapotakshaw drainage channel by constructing embankments along the natural levee of the river; while the link canals (*kbals*) that are crisscrossing the floodplains were connected to the major channel (the river) through sluice gates. The enclosure thus constructed is known as *polder*. At the beginning of such *polderization* agricultural production was huge inside the *polders* because of functional sluice gates that controls entry of saline water during high tide from the rivers (the main channel) and the floodplain was good for at least two crops (*Kharif* 1 and *Kharif* 2). But after few years enormous siltation started at the sluice gate's operational sites depositing the river borne sediments both on-sites and along the river beds. With time the river-bed started to rise incrementally and the link canal (*kbals*) inside the *polders* become ineffective for transfer of water and sediments and consequently choked with sediments. The drainage network within the *polders* thus ineffective and collapsed and water logging is the consequence. Throughout the following years salinity within the *polders* also become incremental. These changes in the physico-chemical attributes of water and soils of the floodplain and wetlands within *polders* barred the farmers from practicing agriculture in the way exercised after *polderization*. As a result the farmers opted for landuse that favors saline environment and thus shrimp find its way into aquaculture practice. The link canals – already ineffective for drainage – are leased out for shrimp aquaculture where farmers segmented the canal into numerous compartments. Such fragmentation completely disrupted the water flow – the remaining flow that was persisting at that time - along the canals. Wide scale shrimp farming resulted as a consequence and a drastic change in landuse pattern has ensued.

The extensive shrimp aquaculture thus started was gainful for sometimes financially but currently is at the verge of failure because of many reasons. The farmers started experiencing salinity both in water and soil along with waterlogged environmental condition for prolong period that has jeopardized their livelihood support system and pattern.

Thus the community endeavored to reverse the situation when the concept of Tidal River Management (TRM) emerged. In operating TRM the wetlands and the floodplain of the drainage basin could be linked to the major drainage channel (in this case the river Kapotakshaw) by one or more of the dilapidated and currently ineffective *kbals* (link canal) – duly excavated – that will invite water flow laden with sediments to the hinterlands (the floodplains and wetland). Such operation will then elevate the floor of wetlands and floodplain by sediment deposition during high tide and the water will drain out during ebb time. At the same time the river will achieve its depth because of scouring and transportation of bed sediments along the link canals into the wetlands and floodplains and would provide shelter and breeding ground for varieties of fish species. This process would as well provide a natural defense against the consequences of rapid changes in the climatic pattern that causes sea level rise among many other upshots.

We have proof that the waterlogging problem can only be solved by TRM. We are confident that TRM will ensure productivity of our land for the next few hundred years. As well we regard TRM as a cure to waterlogging situation and will offer a better environment for our future generation – our children.

The issues emerges while operationalizing the Tidal River Management (TRM) can better be understood if we take into account the conversation in Focus Group Discussions (FGD), Transect walking and our observations as follows:

Selection of space and time is important in TRM operations. *We have failed to exercise TRM in appropriate beel during appropriate time.* The basic physical requirements for TRM is that, the main drainage system should be tidally effective and should carry huge amount of suspended sediments during high tide. The main drainage system should also be linked to wetlands and floodplain, and the gradient should be towards the wetlands and the floodplain. Fortunately all such basic requirements are present in the area.

However the ineffective link canals were already encroached by shrimp farmers (mostly *via* leasing) and a good number of share croppers and landless mass depend on earnings by engaging themselves in *gheers* as laborer. Moreover while the link canal is a necessity for physical set up of TRM operation, most of the canal banks are converted to human settlements. These *gheer* owners, the laborers and canal-side settlers are *totally against* TRM operation because TRM operation will deprive them of their earning options through loss of produces. Erosion of link canals also is foreseen that may threaten the stability of settlements.

Besides, the landowners in the wetlands and floodplains will be deprived of whatever natural resources remaining because of TRM operation. TRM operation needs the land to be submerged for few years (5 to 7 years). But TRM *establishes back the river depth and its navigability and the land productivity increases at least*

ten fold more. If the Bangladesh Water Development Board (BWDB) people have a discussion with villagers (stakeholders) about time, space and technique of TRM they might have practical knowledge on TRM operations. Through mutual discussions, easy compensation mechanism also could be formulized. Such discussion would result in agreement of sacrificing little things for societal wellbeing.

The TRM operation always embraces a community ownership attitude because TRM is *not any Government innovated project nor a plan provided by BWDB, rather it is more a natural system pursued by the indigenous community*. TRM in *beel* Pakhimara is one of such attempt. The link canal that connects the *beel* to the Kapatakshaw (called *Balia* canal) was excavated several times before the full operation of the current TRM. As the water from the Kapatakshaw - laden with huge amount of suspended sediments - started flowing through the *Balia*, the canal widened due to bank erosion, and around 35 households living beside the canal lost their home in to the *khal* but were rehabilitated. *The progress of TRM in beel Pakhimara is tremendous and if proper time is allowed for flow of sediments in to the wetlands and floodplain, then TRM would be a complete success here.*

Resistance against TRM operation at the initial phase mostly generates from shrimp *gheer* owners, small land owners (*we have disagreed because we are having a very poor amount of land which is our only asset, so we have decided to stay on our land - no matter what happens next*), share croppers and day laborers in *beel* Pakhimara *when misinformation regarding TRM floats everywhere*. Misinformation regarding land acquisition/requisition (*that you will lose your tenancy permanently*) and information on compensation mechanisms (*that is mostly true*) are most common. *If the Government arrange 'easy and plain' way to compensate the people for the time period when their land is submerged due to TRM, it would be more than enough for the people. I would share one of my very bad personal experienceThe compensation process involves several offices and if there is a mistake identified by a single office then we have to start the process from the very beginning!* Assistance is of course there through brokers but that needs *speed money*. Most landowners do not apply for compensation just to avoid the hassle that in most cases a very small amount remains after attending all those formalities.

A good number of deserving households also left to be compensated because they dejected the TRM operation at its initial stage. *They (the BWDB) did not heed any notice to our voices – rather compelled us to leave the space using institutional forces – rendered us homeless, not even enlisting us for compensation. We are not against TRM operation but we want our basic right to live with TRM operations.* The commotion to sacrifice a bit for TRM operational disturbances is there with the community *because we see a better future for our children.*

The major causes of failure of TRM operation are *ignoring community voices and gap in knowledge of onsite hydrologic attributes and faulty operational planning and design*. The community has the prudence in assisting the TRM operational management both technically and financially. *The TRM operational engineers excavated a wide canal along wrong site then is required and that has devoured all our assets and home for which we have not received a single penny as compensation as was promised (by the local chairman and the TRM authority) before the operation initiates. The TRM engineers should have enough knowledge on river dynamics.*

Both land acquisition and land requisition are necessary for TRM operation. Land requisition is mostly needed for developing link canal. Community involvement is inherent to both the processes but *they were not consulted during decision and allocation*. Moreover *the TRM operation was not even started before June 30, 2015* because of interference of few powerful and corrupt elite of the community who have *instigated the landless and day-laborers to move against the operation because TRM operation would deprive them of aquaculture and daily wages.*

However with community and political pressure the link canal (*Balia*) was opened defying the elite's control; but the same powerful and corrupt elites again started agitation for land resource compensation in terms of money. The situation become that the same lobby who were against TRM operation are now trying to showcase an unsuccessful TRM. To manage this disorder the community constructed four committees in and around the *beel* to solve different water management related issues of the locality. Since then *the committees are involved with contemplation of people's right, livelihood, settlement and compensation during TRM operation.*

Natural resource management from the *beel* and canals during TRM operation is very important. Usually the powerful and corrupt elites of the locality take control over the aquatic resources (such as fish) during the TRM operation and the landowners and landless mass people left behind. *The land owners inside the beel should be allowed to have a kind of permit for fishing.* The local people should also be permitted to collect resources from the *beel* when the TRM is in operation.

The authority dealing with water management is BWDB, *a body do not have any accountability to anybody as per see.* They do not have *any concern for integrated approach to save the environment such the river, land and water of the*

locality. Already a great number of population has migrated from here because of absence of livable environment. A huge amount of budget every year is allocated for river management in the country and BWDB keeps hold on the total amount. They try always to linger with the project so that more allocation granted ! Please publish in the global knowledge arena that how a vibrant river system dies out of negligence and corruption.

Discourse summary from *Beel Pakhimara*:

- The *polders* provided short term benefit; but with time water log condition and irreversible salinity persists. To get rid of such conditions villagers breached embankment to connect the river with the *beel*. Later BWDB engaged themselves with the process.
- The *Pani* Committee and the *Beel* committee (backed by *Uttaran*) acting as negotiator among the actors such as BWDB and LGED, the Landless people, share-cropper, land owners and shrimp *gher* owners including villagers on the impact zone of TRM.
- Land and water based resources primarily support share-cropper, landless-, small- and medium landholders. In many cases the actual landholders are deprived of water based resources.
- Collection of land ownership documents pose a difficulty in receiving compensation.
- Location of link canal is not proper because of knowledge gap and lack of transparency.
- An one-stop service centre headed by an independent body with able and diverse composition for selection of *beel* for TRM, location of link canal, disbursing compensation, resolving conflict, dealing with rehabilitation (if needed), creation of alternative employment opportunities is needed;
- Prior knowledge on the impact of TRM on livelihood support system during its implementation and necessary precautionary measures to be taken well in advance.

4. Beel Khukshia

Beel Khukshia – a wetland - is located in Keshabpur upazila of Jessore district and is connected by link canal named *Dhahar Khal* with the river Hari/Shree – the main channel. The total area is generally referred as *Bhabodaho*. Waterlog condition was the major problem before TRM operation was proposed in the area. A farmers' association of the village *Krishok Kollayan Samitee* initiated breaching at a point of the Hari/Shree river that solved the waterlogged problem of the *beel* soon. The floodplain near the breached embankment raised enough due to silt deposition as well.

Such example has been taken into account by the government (through BWDB) and encouraged to start TRM operation during April, 2006 in *beel Khukshia*. TRM operation in *beel Khukshia* was opposed at its initial phase by certain corners of the community but soon such opposition was softened and the operation was functioning up-till February 2013 - after 7 years of its initiation - when the authority officially closed the operation. Outcome of this TRM operation has mixed opinion as to its success. In general the community was convinced with the fact that the land inside the *beel* has been elevated enough but expressed their dissatisfaction with the compensation both in term of process and amount.





Before the construction of coastal embankments (before 1965 ?) we did not experience any environmental and drainage problems. Water stagnation problem started only after polderization – although it was very promising for few years after construction. The sluice gates were narrow and huge siltation had taken place at the sites of the sluice gates that blocked the water flow into the beel, and the result was waterlogging.

We were accustomed with water transportation system but construction of embankments and roads across huge water bodies in the name of controlling inundation of paddy fields - although was good for massive crop production for 10 to 15 years initially – the community almost forgot the presence of natural system. Sooner the repercussion started.

The example of TRM operation at beel Bhaina was there for beel Khukshia community when they breached a point at the Hari/Shree embankment and the result was quite satisfactory. The government authority took note of this temporary success that minimizes stress of waterlogged situation and soon came forward to operationalize TRM with official recommendation. TRM operation requires the land to be submerged for 5 to 7 years, and the authority promised the community to compensate for their land and settlement by a regular amount of money. The TRM operation started but the authority could not keep its promise. *Just after receiving two installments we never received any more although the operation was continued for seven years.*

However currently the farmers are happy that they are having good amount of crops from their land that has been elevated due to TRM operation. *But we still want for a longer period of TRM operation as we understand that such operation will increase fertility of our land and the river also will get back its navigability that would be promising for more fish in the river.*

TRM is a concept discovered by the community for managing rivers and drainage network. We are very much clear about the benefits of TRM operation; however we should also need to appreciate the social and political conflicts that arises due to TRM operation.

One can identify at least four groups in the community allied to TRM in beel Khukshia who's interests are very different. They are

Shrimp farmer/Gheer owners: *Gheers* restricts even distribution of sediments in beel areas.

Brickfield owners: They do not have any interest for TRM rather they are more interested in river dredged materials for their bricks. This is the only business in this area located by the bank of the rivers.

Crop farmer: The major group that support TRM operation but currently they are not willing to give up their land for 3 to 5 years for the purpose of TRM operation. This group also prescribe other beels for TRM but their one.

Landless/Laborer: They are the only group who wants TRM with no doubt. They understand that TRM operation only expands their diverse and wide scope of earnings.

We can perceive the land related problems clearly but the authority never listen to us. The narrow sluices, the cross dams and absence of any coordination among the implementing authorities of TRM are the major problems.

The major benefit from TRM operation at *beel* Khukshia is that the river stretch became much wider between the cut point for *beel* Khukshia to river Bhadra and the stretch attained much of its navigability. Moreover the land elevation within the operational site raised enough for the people to cultivate different crops. However, *a portion of the wetland still did not gain enough elevation and experiencing waterlogged condition.*

On closure of TRM operation at *beel* Khukshia, again the loss of navigability of the main channel is observed, that is intensifying day by day. This requires continuation of TRM operation *but not now in this basin (beel Khukshia)*. A rotational TRM operation is needed because a basin when under TRM operation requires a long time the land to be submerged thus depriving the community from extracting any natural resources. *A basin may be prescribed for TRM continuation somewhere located near the beel Khukshia such as where the benefits of TRM would be the same.*

The merits of TRM operation is always greater in this case. However, during the period when TRM is in operation, we are deprived of our livelihood support systems. We could not grow Now our proposal is that anyhow TRM could be planned nearby, that would repair those lands as well as help our land to raise.

The community do not have confidence on the authority who are involved with TRM operation. *They do not have practical knowledge on the region, so decision taken for TRM operation often fails.* Most of the local community are small landholders, who do not want their land to be submerged for prolonged period for TRM operation. A major resistance come from the shrimp *gheer* owners. Thus building confidence on executive authority for TRM operation and compensation for land to be under TRM operation are the two major issues for successful TRM operation.

The issue of intra-community conflict is also important when TRM operation in progress for 2 to 3 years as is evident in *beel* Khukshia case. For the initial 2 to 3 years enough silt was settled on the floodplain good for cultivation, *and soon the community was divided in to two groups. One group who's land raised enough good for cultivation wanted to stop the TRM operation and the other group who's land is still starving for silt opposes. Now we understand that instead of closing the TRM altogether, the flow could have been diverted to other nearby beels.*

A little change in physical (as well as chemical) attributes of land generates a change in its use pattern. *I would go definitely for crop cultivation because shrimp farming creates water logging and is suffering from market uncertainties now a days. But for crop cultivation land needs to be raised by TRM operation.*

TRM operation is essential for the region. However, community is skeptic on its operational success because of the inexperienced implementing authority. The promise for compensation is also illusive. *Rules for easy compensation can be a solution.*

The best TRM operation could be achieved by consultation with the community because TRM operation should take a holistic consideration of livelihood support system. *People's voice should be listened and affected people should be rehabilitated and properly compensated.*

The TRM operation at *beel* Khukshia is closed now. However, many post TRM operation issues are now coming forward. The demarcation lines for land area have wiped out because of TRM operation. The absence of such demarcation line is inflicting social violence regarding land ownership. The peripheral embankments created during TRM operation around the villages is now dilapidated and obstructing water flow from the villages. *A proper decision regarding existence of these embankments should be taken in consultation with the community.* Maintenance of link canal after closure of TRM operation should be *continued on regular basis.*

The river Hari/Shree is just the mother of all channels around the beel, and so our mother should live to ensure a lively generation. The river supply us fertile sediments for our land where we can grow many crops and vegetables, plenty of fishes and easy our movement. We may get a self-dependent future generation if we go for TRM. We surely need TRM operation, but such operation has many issues that to be taken care-of with consultation with the community. The TRM operation techniques also to be modified, upgraded and strategic.

Discourse summary from *Beel Khukhsia*

- Polders helped in protecting this low land from encroaching salinity and provided higher rice yield but after 10/15 years water logged condition and salinity became permanent. Having experience from *Beel Bhaina*, the BWDB tried implementing TRM in *Beel Khukhsia* between April 2006 and February 2013.
- The TRM does not worked here as has been proposed by BWDB – different actors are having conflicting landuse interest
- People's participation to the TRM process was lacking because in most cases the local people disagreed with BWDB propositions.
- The compensation distribution was complex
- The stakeholders proposes many techniques for TRM operation but the BWDB not listened to them. Knowledge and suggestions of the villagers should be recognized in TRM operations.

5. Beel Kapalia

The initial phase of *polderization* - created during 1960s - was promising with unprecedented crop yield during all three seasons of the year; but on 1980s onward the area become waterlogged when the sluices were ineffective in transferring water and huge siltation has taken place on river bed (the Hari/Shree river) and the link canals were choked. The river was excavated several times but in vein because the silts settled back to the river bed again within no time, and *also corruption and improper management of the whole system was involved. The whole beel was turned into a shaggy garden of stagnant water.* Under such condition the community agreed to breach part of the embankment along the Hari/Shree to allow water inside the *beel*.





The question of compensation for land under TRM operation, the time period when the land would be submerged and sediment management surfaced then.

The location of the cut point and its management during and after TRM operation has not been foreseen yet. There are as many as 26 beels around and a regional consideration is needed for TRM operation. The link canals should be excavated first..... so that sediments should be distributed all the beel uniformly....but should start from upstream. I very politely disagree with bhai in that if the TRM operation starts from the upstream then link canal will be choked by sediments ... the hinterlands will be sediment starved.

TRM operation is the only option currently and is badly needed to save our rivers is the general agreement and it is also believed that so long the river will live, the community will live safely. However, the community was against TRM operation here at beel Kapalia (that was somewhat violent at the beginning) because the authority did not consider the community perception of TRM operation. They need to be consulted with the community before execution of TRM operation initiates here at beel Kapalia.

The narrow sluice gates (for example 21 feet wide sluice gate for a river having more than 260 feet width) compared to river width is technically the most important issue that is aggravating siltation on river bed. It was envisaged during construction of the polders by engineers even that these narrow sluices will chock the total river course with sediments soon. Thus TRM operation could be a natural solution to these sediment deposition problems. We disagreed TRM operation here because they (the authority) forcefully tried to implement TRM here without the budget for proper compensation for our land.

Almost all the link canals (khalis) within the beel - although khal government land - are occupied illegally by shrimp farmers. These huge amount of grabbed land needs to be cleared off for easy water flow in to the floodplain. However, huge amount of money yearly are channeled from government side to dredge the water ways but they spend very little for the purpose. Also a wide gap between local perception and engineer's plan exists regarding TRM operation, and is a potential reason for unsuccessful TRM in this region.

We are seven sisters and very poorhave no alternative but to go for shrimp farming. The total area is dotted with shrimp gheers. It is the only option here but all our gheers are flooded due to lack of drainage facilities. But TRM operation needs the land to be submerged for 5 to 7 years. We are day labourer..... the land is supporting neither paddy nor fish we are passing hard times. But an elevated floodplain will offer many alternatives that would contribute to livelihood support system.

The success of TRM operation significantly lies on even distribution of sediments. This needs in-depth investigation of local water flow and its linkage to the regional flow regime. All sites for TRM operation are having their inherent differences from one another that to be taken into account for TRM operation and will govern the site for cut points on the embankment as well as the distribution of sediments with in the beel. Representation of local community in TRM decision and implementation process is thus very important in operational management strategy.

Discourse summary from Beel Kapalia

- The villagers want a planned TRM. They do not have confidence on BWDB and the current Water Management Committee; they rely on knowledge and wisdom of different local representative and their participation in all steps of TRM operations needs to be confirmed.
- Compensation and duration for TRM operations are the two most important issues.
- There is no alternative to TRM for minimizing water logging and salinity in the area
- Conflicts in TRM operations to be solved first

6. Beel Bhaina

Polderization was very promising at its initial stage, and *there were bumper production of rice during the initial few (around 10-15 years) years*. But the community living within and around *beel* started experiencing hard pressed prolong water logging as a result of *polderization*. As a consequence TRM operation in *beel* Bhaina was initiated during 1996 without any institutional support. The community breached a portion of the embankment separating the river Hari/Shree from their own conviction. Water flow through the breaching point along the link canal drawn huge amount of sediments to the inland – that elevated the land and natural dredging taken place in the main channel (Hari/Shree). Thus *minimizes their agony from waterlogging* and as well the river Hari/Shree has been *saved from dying by acquiring its depth*.

TRM operation prevents the deposition of sediments on river bed and ensures drainage and navigation along the river channel. The WAPDA was built (the polders were built ...) to protect both homestead and croplands as well as to increase crop production but TRM (operation) was the result of the circumstances that ensued from polderization. Land elevation is important because it governs the extent of waterlogging, our livelihood strategy and our settlement structure

However, the cut point was closed (from 2000 onwards) because *TRM obstructed to address our livelihood issues for few years that results in unavailability of resources supporting livelihood*. Cultivation of raised land continues after the closure of the cut-point that was supported by government authority (BWDB). The floodplain thus currently being used for fish culture along cultivation of paddy and vegetables. *The far hinterlands were always waterlogged even before polderization and still they are in waterlogged condition after TRM operation and beyond.*

The period during TRM operation is painstaking for livelihood support because of the absence of income opportunities. TRM requires submergence of floodplain and wetland for few years (usually 5 to 7 years). Erosion may occur along the link canals that may devour most homestead along the bank of the canal. Fishing was restricted inside the TRM operational site. However with the rise in land elevation most sufferings minimizes. A group of local elite (having large land ownership) when observed that most of their land is already elevated because of TRM operation, they move to close the breach point. But *we think that it would have been better if the TRM operation was continuing for 2/3 more years*. The TRM operation in this case *has not taken into consideration two major issue: one is the uniform distribution of sediments throughout the floodplain and the other one is there was no compensation mechanism for the land under TRM operation.*

The compensation mechanism is the most complex one and have not been applied to this TRM site (Beel Bhaina). However, people are eager to put forward their opinion regarding how easily the compensation money can be distributed!

Absence of any firm decision and concrete management options for TRM operation is a reason for its operational discontinuation in *beel* Bhaina. *This should be always bottom up*. There should be a regional planning for TRM operation that would facilitate a holistic approach. *Everyone wants TRM operation but one by*



one and if the government wants more sites for TRM operation, they have to meet compensation issue, sediment distribution (management) issue and issues regarding peripheral settlements.



A wide knowledge gap exists regarding sediment source and its distribution in the floodplain among the common people of the area. Such ignorance is utilized cleverly by local corrupt elites in their favor when requires.

If the consideration for compensation and uniform sediment distribution were taken care-off properly by the authority, TRM operation at beel Bhaina would have been a complete success.

Discourse summary from *Beel Bhaina*

- Drainage congestion during late 1980s was severe; and to get rid of such waterlogged condition villagers themselves made breaches in the embankment.
- The villagers has decided the closure of the breaches when they realized that sufficient sediment has been deposited for the purposes.

7. Conclusion

The discourses above suggest that there are many key challenges to be addressed for execution of TRM operation. Such challenges may be categorized in to three episodes such as issues before, during and after TRM operation.

The issues *before* the TRM operation:

The issues before TRM operation concerns with foreseeing the benefits of TRM, foreseeing the operational hazards of TRM and ways for minimizing the sufferings.

The issues before TRM operations can be summarized as

- i. building societal consciousness in appreciating TRM
- ii. selection and delineation of operational regime
- iii. demarcation of land ownership within the operational site
- iv. selection of breach points
- v. process of compensation and allied activities
- vi. functional negotiation of local voices to the executive authority and *vice versa*

Setting-up a negotiating platform with able personalities and institutional empowerment with explicit terms of references for TRM operation may take-care of these issues. Terms of Reference (ToR) may include well planned consultation with all categories of stakeholders for every aspects of TRM operation and providing decision and suggestions while TRM in operation. This platform will be responsible for communication, site selection, encouragement and building sense of ownership etc.

The issues *during* TRM operation:

The issues during TRM operation centers around monitoring and evaluation of the operation and measures for tackling operational hazards.

Thus the issues may be summarized as

- i. monitoring and evaluation of TRM operation
- ii. immediate response to any inadvertent deviation of TRM operation
- iii. regulating land use during TRM operation

Setting-up a negotiating platform with able personalities and institutional empowerment with explicit terms of references for TRM operation may take-care of these issues.

The issues *after* TRM operation:

After TRM operation monitoring and evaluation of operational results are important to provide and practicing knowledge on anticipated benefits.

Thus the issues are

- i. remarking the land for landowners
- ii. zoning of land with conflicting use pattern
- iii. counselling for best land-use

Setting-up a negotiating platform with able personalities and institutional empowerment with explicit terms of references for TRM operation may take-care of these issues.