

Sustainability and Financing of Water Management: Operations & Maintenance in Coastal Polders

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Economic Research Group (ERG)

B-4, House # 121, Block-F, Road # 01,

Banani, Dhaka - 1213, Bangladesh

Phone: 880-241080205

E-mail: info@ergonline.org,

Web: <http://www.ergonline.org>

Sustainability and Financing of Water Management: Operations & Maintenance in Coastal Polders

Sajjad Zohir

In association with

M.A. Sattar Mandal, Nityananda Chakravorty and Mutasim Billah Mubde

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Dr. Sajjad Zohir, Executive Director of Economic Research Group (ERG), is the principal author of this paper and remains responsible for errors. Mr. Mutasim Billah Mubde, Research Associate at ERG, contributed to literature review and field works. Dr. M.A. Sattar Mandal is a former Member of the General Economic Division of the Planning Commission in Bangladesh and is an Emeritus Professor at Bangladesh Agriculture University. Mr. Nityananda Chakravorty had served the Bangladesh Water Development Board (BWDB) before engaging in consultancies in the water sector. Both Dr. Mandal and Mr. Chakravorty provided important insights into the processes and organizations dealt with in this paper. They had also provided significant inputs in editing the drafts prepared by the principal author.

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Abstract

Historically, large investments, once resources are mobilized, is less of a concern than the difficulties faced in ensuring operation and maintenance (O&M). The adverse implications of poor O&M, of coastal embankments and the smaller infrastructures inside the catchment areas, are very significant. This paper focuses on coastal Polders and identifies the prerequisites for sustainable operations & maintenance (O&M) management of polders and proposes possible ways to finance the associated activities.

The paper draws upon the experiences of coastal polders in the coastal districts in southwest and south-central Bangladesh, and from an extensive review of publicly available reports, documents and articles. The review allowed reconstructing the evolution of organizations dealing with the water and coastal sectors. Field visits to Khulna, Satkhira, Patuakhali and Barguna were made during end 2019 till February 2020, prior to the formal commencement of the Corona pandemic in Bangladesh. The paper goes beyond issues raised in the publicly available literature, and looks into prospects of raising revenue from those benefiting from having well-managed polders. To that end, an operational framework is proposed. The paper also highlights on how risks may be mitigated through cooperation by financial supports across groups and regions. Finally, the paper recognizes the specialized nature of services required for coastal polder management and suggests aligning school-level education to groom local community in the fields of science of water. For the continuity of knowledge and for making room for innovative ideas, such initiatives may reduce present dependence on consultants and external organizers.

The paper is meant to provoke discussion on a neglected area when Bangladesh starts its journey into the Delta Plan, and the authors' efforts will be rewarded if the sector is reorganized taking note of all economic incentive issues, beyond the absolutely necessary engineering aspects.

Acronym

BADC	Bangladesh Agriculture Development Corporation
BAU	Business As Usual
BDP	Bangladesh Delta Plan
BG	Blue Gold
BMDA	Barind Multi-purpose Development Authority
BRDB	Bangladesh Rural Development Board
BWDB	Bangladesh Water Development Board
CAPEX	Capital Expenditure
CBS	Community-based Society
CEIP	Coastal Embankment Improvement Project
CHTDA	Chittagong Hill Tracts Development Authority
CZ	Coastal Zone
DAE	Department of Agriculture Extension
DPHE	Department of Public Health Engineering
EDP	External Development Partner
FCD	Flood Control & Drainage
GoB	Government of Bangladesh
ICZM	Integrated Coastal Zone Management
IOT	Internet of Things
IRDP	Integrated Rural Development Projects
LCS	Local Contracting Society
LGED	Local Government Engineering Department
MoA	Ministry of Agriculture
MoLGRDC	Ministry of Local Government, Rural Development and Cooperative
MoP	Ministry of Planning
MoWR	Ministry of Water Resources
NBR	National Board of Revenue
NGO	Non-Government Organization
OPEX	Operation Expenditure
O&M	Operation and Management
R&M	Repair and Maintenance
WARPO	Water Resources Planning Organization
WRMG	Water Resource Management Group
WMIP	Water Management Improvement Project
WMO	Water Management Organization

Section 1: Introduction

During the post-colonial period, systematic development of coastal polders in the then East Pakistan (Bangladesh) commenced during the 1960's. Until mid-1980's, responsibility of the operation and maintenance of these polders lay with the Water Development Board (BWDB since independence of Bangladesh) and the financing came from the government's revenue budget. Subsequently, for almost three decades, efforts were made to involve local community groups (referred to as Water Management Organizations – WMOs) to undertake operations of regulators, minor repairs and maintenance of regulators and embankments, and attend to minor structures and operations to control water flows inside the polders (including cleaning and dredging of canals)¹. Those efforts were however sustained with external assistance in the form of projects, such as the Water Management Improvement Project (WMIP), Blue Gold (BG), etc., which supported formation of groups, assisted them to identify undertakings, provided training on crop production, and financed major undertakings as well.² In addition, such umbrella projects financed some BWDB undertakings on major embankment repairs, sluice gate repairs or new installations, and acted as conduits between WMOs, BWDB and other agencies within the national and local government. While project staffs are directly engaged in field-level operations under BG program (2012-20), services of NGOs were commissioned under polder-specific projects during the 1990's to supervise WMOs. The latter seems to reappear under recent initiatives of CEIP (in effect since 2016). The journey, characterized by rich and varied experiences, provides the basis for finding ways towards sustainable management of operations & maintenance (O&M) in coastal polders along with financing of associated activities.

With such perspective, this paper focuses on coastal Polders and outlines the factors required for sustainable operations & maintenance (O&M) management of polders and possible ways to finance associated activities. The paper also investigates options and makes recommendations for possible incorporation in Bangladesh Delta Plan (BDP).

¹ During the early years, water user groups were established within cooperative structure around tubewells in northwest and low-lift pumps within Chandpur Irrigation project. Comilla cooperative model of the 1960s, Integrated Rural Development Projects (IRDP) of the 1970's leading to the formation of BRDB in 1982, and the post-Independence Swanirvar (self-reliance) movement contributed towards a culture of group formation with a focus on betterment of agriculture and rural sectors. Those may therefore be considered as precursors to the WMOs initiated under BWDB. It is also important to note that government revenue allocation for O&M was never more than 30% to 40% of what was needed for the purpose. This shortfall persistently aggravated the condition of structures, which eventually forced the government to accept a recommendation to assign minor O&M activities to users in the name of participation.

² The Dutch government also introduced few special projects during the 1980's, with provisions for "3-year's O&M" paid from their fund, which were discontinued later. Subsequently, "EIP-IPSWAM-BGP" journey had been instrumental in accumulating knowledge on multiple vulnerabilities of coastal polders, with increasing emphasis put on participation of stakeholders.

There are several areas of concerns which call for a fresh look into the sustainable management of O&M and financing of O&M. These are,

- The approved Bangladesh Delta Plan envisages public spending of about 5782 million USD for capital investment on 22 projects in coastal areas.³ In addition, about 118 million USD is budgeted for O&M every year, over the first five years. The Plan also mentions of covering “operating and maintenance costs through user charges, and (in case of any shortfall) recurrent government revenues from taxes and other sources” (BDP 2100). This is clearly a departure from the National Water Policy 2013, which did not envisage any recovery for Flood Control & Drainage (FCD) projects, that include most coastal projects. Since government allocations for O&M had historically met hardly one-third of the requirement, there are reasons to dig deep into the issue.
- The present exercise was conceived and undertaken prior to the outbreak of SARS-COR-2 virus, when the optimism around Bangladesh transforming into a middle middle-income country ran high. Under such a setting, grant money could no more be envisaged during the BDP period. The possibility of securing external assistance has further been squeezed as the world prepares to enter an uncertain post-Covid-19 global environment. Thus, a closer look into (and unbundling of) potential user charges, for the purposes of O&M, was imperative.
- Risk of infrastructure investment is intricately linked to risks associated with private investments that are made inside the polders and on how those are mitigated. The BDP document treats the risk issue at a simplistic numeric level, which may overshadow much of the real-world complications. Furthermore, the document appears to have overlooked the mitigation issues.⁴
- Finally, addressing the above-mentioned concerns calls for an organization, which will own and remain accountable to the public authority. The organization is expected to facilitate regularity in operations, mitigation of conflicts and in defining pricing principles to generate revenue for financial sustainability. Some of these are outside the mandate of the BWDB. Moreover, current thinking on future reorganization of BWDB raise concerns with regards to (restructured) BWDB’s ability to address social issues for sustenance of O&M and manage revenue generation for financing of those operations. It is felt that BDP falls short of spelling such organizational issues.

³ Almost an equivalent amount is shown against the Ganges Project, which is not included in the 22 projects considered in the calculation.

⁴ Of the three avenues of risks mentioned in BDP, project-specific risk is relevant for the present discussion. It is assessed on the basis of two criteria: (i) high OPEX/CAPEX ratio requiring higher capacity within management agency, and therefore, a cut-off of 0.05 for the ratio is chosen to distinguish between high risk and acceptable risk projects; (ii) technical risk associated with technical changes related to physical change of situation upon implementation of the project. See, BDP 2100, Vol 2, p. 174. BDP 2100 does not address risk mitigation associated with financing of O&M costs. Only environmental, climate change and risk associated with biodiversity loss is assessed.

Section 2: An Overview of the Canvas

Bangladesh went through a long journey with polder management, though institutional ownership of the knowledge gathered remains largely fragmented. For obvious reasons, BWDB is the principal agency responsible for polder management. With changes in policies and institutional setup, continuity in knowledge build-up often got derailed, as did accountability. BWDB's current narratives appear to be largely shaped by its concerns to ensure that no major damage⁵ occurs to local society due to inadequacy or dysfunctionality of polders. The concerns were perceived to be better addressed by externally funded projects, and the latter may have adversely affected continuity in knowledge within BWDB. This was allegedly accentuated by weakening of planning processes within BWDB and fragmentation of it into several independent components. Presence of project-specific agencies facilitated financing of activities undertaken by multiple grassroots-level agencies -- the process however depended on consultants whose ownership and accountability could hardly be guaranteed. Thus, knowledge accumulated within a cohort of consultants, and among a group of administrative and operation-level workforce who had been migrating between projects without having the obligation to store and safeguard any of those for critical observers.⁶

Other agencies which engage in water management at micro levels are LGED, BADC and BRDB. LGED confines to small scale surface water irrigation projects (less than 1000 ha) and has long experiences with WMOs. Those are however outside the BWDB-managed polders. In contrast, BADC and BRDB address ground water management through tubewell groups (often registered with the Directorate of Cooperatives), and some such initiatives may lie inside polders. The same applies to DPHE, which confines to ensuring availability and access to safe water for drinking and other livelihood purposes. LGED however engages in communication infrastructure inside polders – mostly converting old earthen embankments into paved roads, some of which may come in the way of water management.

The focus of this paper is exclusively on Polders, which are meant to include embankment, regulators (sluice gates, inlets and outlets), canals and tributaries, culverts/bridges, riverbank/slope protections with plantations on the foreshores.⁷ Operation & maintenance (O&M) of the polders imply maintenance⁸ of the above-mentioned physical infrastructure and other assets, as well as operating the regulators to manage water flows between rivers (sources outside the polders) and canals and tributaries in catchment areas (inside the polders). Though inferences with wider

⁵ Viewed differently, under an ideal setting of appropriate designs, perceived damage due to complete destruction is equivalent to the size of benefits generated due to construction of polder.

⁶ It is therefore expected that a new project ends up looking for the knowledge and expertise gathered at individual levels, rather than at an institutional level.

⁷ Small water control structures for private uses are not within the jurisdiction. One may stretch the jurisdiction to zoning for plantations within catchment areas to ensure that carrying logs out of the polders do not damage the polder infrastructures.

⁸ O&M may be routine and periodic.

relevance may be drawn, the paper draws upon the experiences of coastal polders only, that also, limited to coastal districts in southwest and south-central.⁹

Historically, elaborate water resource management prevailed in all human settlements which relied on agriculture, particularly on crop production.¹⁰ Responsibility however lay with the authority that claimed rent from land and locals who tilled the land. With proliferation of sources of income and of types of wealth (accumulated savings) in the economy, establishing correspondence between source of tax revenue and its purpose-specific utilization has been increasingly difficult.¹¹ Thus, elaborate institutional arrangements with intermediary agencies emerged with various degrees of success and failures. Further shades in such institutional arrangements surfaced due to influences of global aid/loan flows and projectization of development initiatives at the national level. Amidst all the changes, it is almost universally recognized that grassroot participation in management of water flows in polders, as well as to ensure minor repairs & maintenance of embankments and small infrastructure, is an essential pre-requisite for maintenance of the polders. How such participation may be ensured in a sustained manner however remains elusive. Yet, all the earlier experiments on and experiences in our efforts to sustain efficiency and effectiveness of coastal polders through stakeholder participation, need to be integrated for charting the path ahead. Drawing upon review of publicly available reports, documents and articles, and on the team's findings from consultations, rest of this section outlines the challenges and issues affecting the sustainability and financing of polders. Insights into those issues are facilitated by a brief detour on conceptualizing O&M and alternative approaches in dealing with O&M.

Who are the stakeholders?

The beneficiary groups include all who reside inside the polders, residents as well as non-residents who own assets and/or engage in economic activities that are located within polders. Extent of benefits however depends on the type of polder-services they accrue. Following standard engineering nomenclature, polder infrastructure may be split into several components, and the services, benefits (+) or costs (-), generated by each of those may be listed. Although some of the components are composite in nature¹² and although it is difficult to distribute benefits uniformly

⁹ Bhola and the coasts in Chittagong division are excluded.

¹⁰ The Moghul provincial government maintained an independent body with its own budget to manage and monitor embankments, roads, bridges and river dredging, known as, Pulbandi Daftar, or Pushtabundi. See, Alam, S., M Chadwick, J Sussan (1998). Understanding Water Resources: resource characteristics and water sector planning in Bangladesh, NRSP, mimeo. Similarly, under the colonial period in India, the Commissioner's office would produce Irrigation Settlement reports for different Collectorate, which paid out the general principle of revenue collection tied to benefits accrued on account of irrigation (See Revised Irrigation Settlement of the Mehar Taluka of the Shikarpur Collectorate, Karachi, 2nd July 1892).

¹¹ A note to engineers: When a tax can be associated with an income (benefit)-source, which is the basis for tax imposition, transparency may be established with regards to use of that tax revenue to sustain the (base) source. Thus, accountability is easy to assess. With diverse sources, expenditure out of a general pool of tax revenue is difficult to be tracked.

¹² The obvious example is the embankment, without which no benefit can be accrued from other components of polder infrastructure.

across beneficiary segments, an attempt is made, in Table 1, to map services from components that are distributed across different population segments. The framework proposed is a generic one and is meant to be the basis for identifying groups who obtain various types of ‘polder service’. The last set of rows identify the fallouts of regular repair and maintenance, and organizations attending to those (such as, BWDB and local governments) are covered under ‘other establishment’. Table 2 goes beyond and fleshes out 3-dimensional approach to raise the so-called service charges BDP mentions of. The dimensions are, population segments, services that are likely to be generated from the existence of properly maintained polder, and the likely pricing/taxation scheme to generate the revenue. Possible economic rents from commissioned O&M works (last set of rows in Table 1) arise due to inappropriate pricing and mis-governance; and therefore, has not been included in Table 2. Both the Tables are self-explanatory and are meant to draw attention to the policymakers to a generic approach for finding ways to generate fund for financing O&M. This however will need further fine-tuning and aligned with the rules of business for various government organizations and with policies. Rest of this section gives a brief historical overview of the latter and the specifics are taken up in the section on recommendations.

As a part of the canvas, Figure 1 shows the current institutional setup within the government/public sector that oversee or are related to water management in Bangladesh. The Planning Commission under the Ministry of Planning (MoP) is responsible for preparing the Delta Plan. Since BWDB is responsible for overall management of coastal polders, its link to the MoP is done via WARPO and MoWR. It is also important to recognize, BWDB has no formal lateral links with LGED (under MoLGRDC), nor with DAE (under MoA), both of which are important actors at field levels with regards to water management.

The canvas is made complete in Figure 2 by providing additional information on (i) historical changes in Acts, regulations, policies & guidelines; (ii) evolution of government sponsored organizations dealing with water management, shown on same timeline; and (iii) implementation of the externally sponsored projects that had either fully or partially dealt with coastal polder management. In a way, the canvas identifies all potential sources of information and knowledge on issues and challenges detailed in rest of this section.

Table 1: Mapping of Polder Infrastructure, Benefits and Beneficiaries

Polder Infrastructure	Types of benefits (+) / costs (-)	Non-fish Farmers	Fish & Shrimp Farmers	Fishermen/ Open-water fishing		Merchant/ Entrepreneur (5)	Home-owners	Land-owners	Earthwork/Lab or Contractors	Other Contractor	Other Establishments
				Out-polder	In-polder						
Embankments (including river-bank protection)	Protection from floods, tidal surge & cyclones	+	+			+	+	+			+
	Protection against Salinity Intrusion	+	±				+	+			+
	Communication (roads)	+	+			+	+	+			+
	Roadside Commercial Establishments					+					+
Sluices with functioning canals + Inlets and Outlets (1)	Regulated flow of water from outside to inside of polders	+	+	+	+						
	Drainage (1)	+	±		-	+	+	+			+
	Recharging the in-polder water bodies	+	+			+	+	+			
	Open water fishing				+						
	“Net Pata”/ “Komor”	-	+				-	-			
	Obstruction to waterways/logs						-				
Canals (additional)	Fish farming		+								
	Fresh water storage						+				
	Irrigation (2)	+									
Culverts (3)	Communication (roads)	+	+		+	+	+		+	+	
Construction, Repair & Maintenance of Embankments (4)	Income generation from procurement									+	+
	Income from earthwork								+		
	Compensation for land acquisition							+			+

Notes: (1) There may be sluices without functional canals, where drainage is the service generated. Inlets and Outlets provide only a subset of the services. (2) Includes mini ponds to store water for supplementary irrigation. (3) Culverts may also have gates to regulate water flows to secondary or tertiary canals. (4) The last row is not linked to any of the polder components but involves repair & maintenance which generate income for certain groups. (5) Those engaged in rural non-farm activities, such as, petty traders and shop keepers, rural transport service providers, rural resorts, restaurants, computer & machine shops, are presently included in ‘merchant/ entrepreneur’

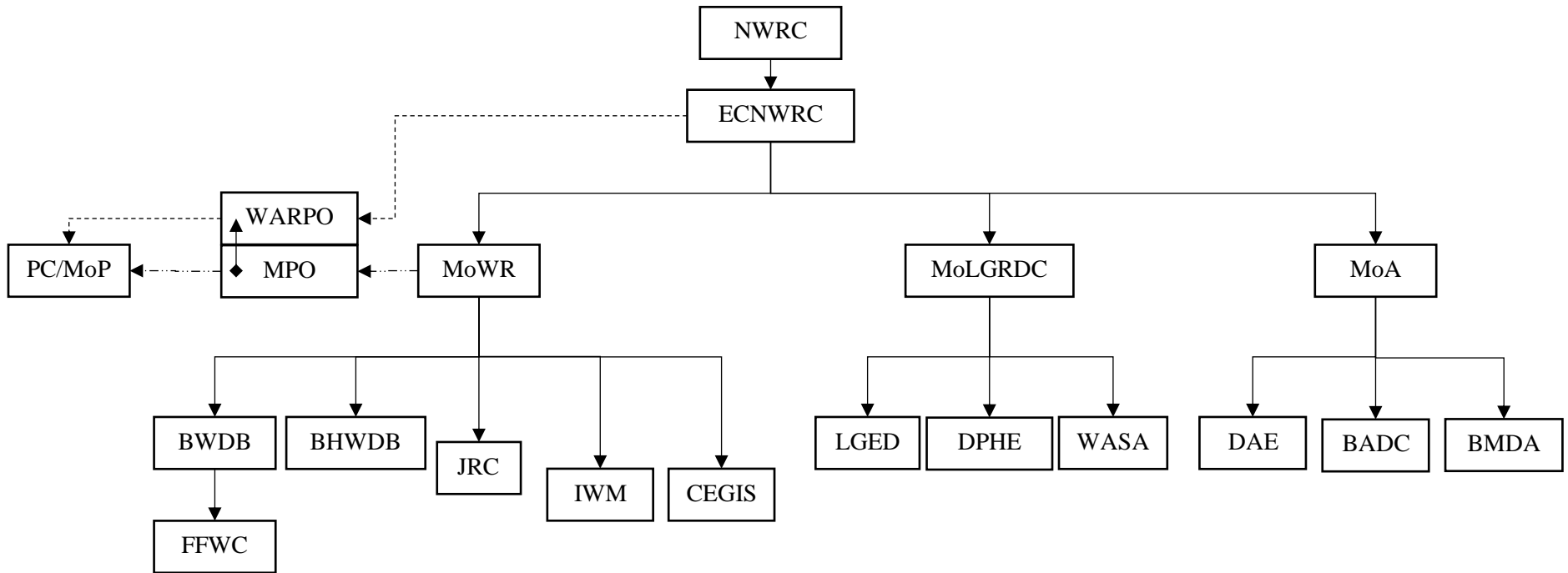
Table 2: Plausible Taxation Schemes by Benefits and Beneficiaries

Beneficiaries	Taxation/Pricing Schemes			
	Flat tax	Variable tax	Tolls	Access Fee/Auction
Non-fish Farmers	✓		✓	
Fish & Shrimp Farmers	✓	✓	✓	
Open-water Fishing	✓			✓
Merchant/ Entrepreneur	✓	✓	✓	
Home-owner	✓			
Land-owner	✓			
Other establishments	✓	✓	✓	
Benefits/Cost covered by each mechanism (Purposes/activities for which taxes imposed)	<ol style="list-style-type: none"> 1. Protection from floods, tidal surge & cyclones 2. Protection against salinity intrusion 3. Communication 4. Regulated flow of water from outside to inside of polders 5. Drainage 6. Recharging the in-polder water bodies 7. Fresh water storage 	<ol style="list-style-type: none"> 1. Protection against salinity intrusion 2. Drainage 3. Communication 	<ol style="list-style-type: none"> 1. Communication (other than pedestrians and non-mechanized vehicles) 	<ol style="list-style-type: none"> 1. Regulated flow of water from outside to inside of polders
Implementation strategy of each mechanism	Impose a flat rate on each member of HH in the polders, to be collected from each HH at regular intervals	Impose tax based on fish/shrimp type and farm area for Fish & Shrimp farmers; based on size of establishment for Merchant/ Entrepreneur and other establishments	Variable toll on types and capacity of heavy vehicles	Impose prior purchasing of access slips on those engaging on open-water fishing

Note: Variable tax to be additional on flat taxes where applicable. A punishment mechanism is needed for those engaged in net pata/komor and for those who are caught fishing on the inside and outside of sluice gates without access slips.

In case of commissioning works for Construction, Repair & Maintenance of Embankments, appropriate and transparent pricing of services as well as non-price instruments for better governance need to be sought. Those are meant to reduce cost to be ensured through building ownership and ensuring accountable governance.

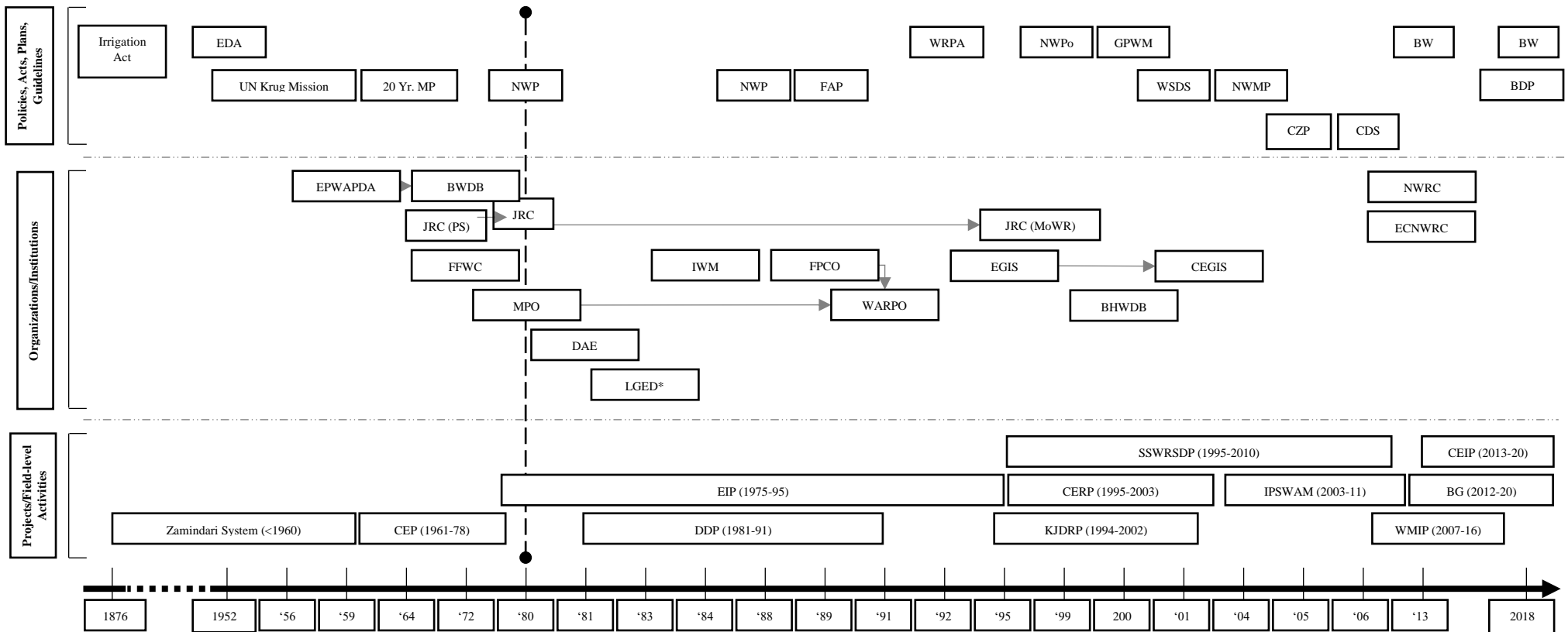
Figure 1: Current Institutional Setup



Note: NWRC=National Water Resource Council; ECNWRC=Executive Committee of NWRC; PC=Planning Commission; MoP=Ministry of Planning; MoWR=Ministry of Water Resources; WARPO=Water Resources Planning Organization; MPO=Master Plan Organization; MoLGRDC=Ministry of Local Government, Rural Development and Cooperatives; MoA=Ministry of Agriculture; BWDB=Bangladesh Water Development Board; BHWDB=Bangladesh Haor and Wetland Development Board; JRC=Joint Rivers Commission; IWM=Institute of Water Modelling; CEGIS=Center for Environmental and Geographic Information Services; FFWC=Flood Forecasting and Warning Center; LGED=Local Government Engineering Department; DPHE=Department of Public Health Engineering; WASA=Water Supply and Sewerage Authority; DAE=Department of Agricultural Extension; BADC=Bangladesh Agricultural Development Corporation; BMDA=Barind Multipurpose Development Authority.

(i) Department of Environment (DoE) and Bangladesh Inland Water Transport Authority (BIWTA) regularly work in the water sector. (ii) Roads and Highways Department's (RHD) activities often infringe upon water related issues which are sorted out through inter-ministerial coordination.

Figure 2: Policy, Institution and Project Timeline



Note: EDA=Embankment and Drainage Act; WRPA=Water Resource Planning Act; NWPo=National Water Policy; GPWM=Guidelines for Participatory Water Management; BWA=Bangladesh Water Act; BWR=Bangladesh Water Rules; MP= Master Plan; NWP=National Water Plan; FAP=Flood Action Plan; WSDS=Water Sector Development Strategy; NWMP=National Water Management Plan; BDP 2100=Bangladesh Delta Plan 2100; CZP=Coastal Zone Policy; CDS=Coastal Development Strategy.

EPWAPDA=East Pakistan Water and Power Development Authority; The rest of the abbreviations are elaborated at the note to Figure 1.

CEP=Coastal Embankment Project; DDP=Delta Development Project; EIP=Early Implementation Project; SSWRSDP=Small Scale Water Resource Sector Development Project; CERP=Coastal Embankment Rehabilitation Project; KJDRP=Khulna-Jessore Drainage Rehabilitation Project; IPSWAM= Integrated Planning for Sustainable Water Management; WMIP=Water Management Improvement Project; BGP=Blue Gold Program; CEIP=Coastal Embankment Improvement Project.

* LGED started formally engaging in the Water Sector in 1983. NWP (1980) first formally introduced participatory water management. All major subsequent projects incorporated participatory water management by forming Water User Groups (WUGs) or Water Management Groups (WMGs).

Source: Own compilation

Section 3 Challenges and Issues

The central themes the present exercise addresses are sustainability and financing of operations & maintenance of the coastal polders, where the latter refer to a set of physical infrastructures, as well as human-maintained natural facilities for water flows (such as, canals). Though the interest in the subject, historically, got reduced to the functioning of WMOs, and the study team recognizes the necessity of participation from local people, locating ownership and the difficulty of making one or the other agency accountable, amidst a host of actors and stakeholders, are found to be major challenges. Incoherence in governance structure is manifested in inadequate funding for O&M; poor utilization; predominance of marginalized groups in WMOs who have limited voice in shaping the macro environment of the polders, and absence of any noteworthy effort to take up self-financing of O&M. Many such micro details were identified during literature review and field-level consultations. However, that would get the discourse caught amidst ‘trees’ whereas the ‘beast’ lay in the nature of the forest!

The study team feels strongly the need to revisit the rationale for current institutional arrangements governing the O&M in polders, involving BWDB, other line agencies within the government, project offices managing external funds, and local groups likely to be put in a disarray with the closure of externally funded projects. Clearly, there are multiple interests linked to polders, not all of which are linked to direct users of water, though their livelihoods and economic activities may depend on how the polder system is managed. In addition to the agricultural activities, there are activities that arise due to undertaking of basic activities made possible by the polder system, and there may be interests in new forms of investments, often of foreign origin, which may depend on further investments on existing polders. All these call for an organization which will facilitate regularity in operations, mitigation of conflicts and in defining pricing principles to generate revenue for financial sustainability of the polder system.¹³ Whether the government¹⁴ chooses to make decisions, or delegate those to an authority, there are more than one ways to procure the services to operate and maintain. The options are outlined in the following section, along with the study team’s specific recommendations.

¹³ Establishing and empowering a separate department within BWDB is a hypothetical option, but there may be others. It is however important to ensure that such an institution regularly undertakes research and is delegated adequate independence in decision-making. It also needs to be located appropriately within the current governance structure, noting overlaps of its functions with those of MoWR, MoLGRD and MOA (see Figure 1), along with limited fiscal roles.

¹⁴ In the present context, the reference is to any authority higher than the three line-ministries currently involved with the water management in some significant ways.

Section 4: Recommendations

As noted earlier, sustainability of O&M and financing of those activities critically depend on the macro institutional environment within which these will be addressed under BDP. In the discussion to follow, it is presumed that large scale investments on polders are made externally (i.e., by the government or any external agency having an interest to develop polders). Thus, the first part of this section addresses the macro governance structure, following which, options for undertaking O&M are outlined. Following the discussion in Section 2 (in particular, Table 1), the third theme deals with raising funds to finance O&M. As mentioned in Section 1, risk mitigation in a post-investment setting, to the knowledge of the study team, is missing in the BDP. It is briefly discussed as a fourth theme, before concluding the paper with several specific recommendations under alternative scenarios.

Alternatives with regards to Institutional arrangements and governance structure within which the coastal polders will be managed:

Several alternative governance structures are outlined below. These are meant to draw attention of lawmakers to assess the pros and cons before drawing up long term institutional setup conducive for implementation of Bangladesh Delta Plan (BDP).

- A. *Business as usual*: BWDB plays active role in designing structures, engaging contractors, supervising them and finally defraying its pay master role for all financial matters. However, motivations for good and timely performance exist under externally funded projects. Operation and maintenance activities under such projects¹⁵ have been pursued by BWDB with relatively better care because of the support. But aided projects without post-completion support, or, GoB-funded projects having allocations for O&M under revenue budget in the ADP, which are lot less than BWDB's estimate of historical average, have generally been neglected. External Development Partners (EDP)-supported programs had generally been designed for a period of 4, 6, or 8 years (see Figure 2), and located in BWDB. In future, one may conceive of two alternatives under this: (i) EDP's presence along with its counterpart local contract-agency's presence at field levels remain prominent, as has been for several decades. (ii) Recognizing the decline in passion among recent recruits of development practitioners and ageing of the early field motivators, the latter may be largely replaced by reorganized polder-level agencies (local government or CBS). In the absence of field offices run under separately funded projects, BWDB will need to be professional having adequate capacities in both technical and social dealings.¹⁶
- B. BWDB is empowered sufficiently to house a specialized agency for the coastal polders. BWDB's role may need to be brought under performance indicators in a competitive

¹⁵ These are completed but supports given by EDPs in terms of rehabilitation, enhancement or some other heads.

¹⁶ Several persons the team had consulted with are skeptical about the prospect making a difference with the BAU options unless the institutional culture in the public sector changes drastically.

- mode rather than in a traditional safe and immune mode. This is a modified version of the BAU, with strict mandates as well as initial supports for in-house capacity building.
- C. There appears to be an increasing recognition that the Coastal Zone (CZ) of Bangladesh requires an integrated management to establish mutual interactions among coastal community, policy, environment to achieve sustainable development of CZ.¹⁷ Thus, one may dare to propose an authority to oversee integrated coastal zone management (ICZM), whose exclusive focus will be on development of coastal polders.¹⁸ The idea is akin to that of local area/economy development that surfaced in literature on development practices during the turn of the century. Such an authority may delegate responsibilities and functions based on criteria of efficiency, equity and inclusiveness upon recognizing potential trade-offs involved.¹⁹ Reportedly, the performances of similar autonomous bodies (eg., BMDA for Barind and CHTD for Chottogram Hill Tracts) have not been satisfactory. Thus, most concerned persons do not see much prospect of the option in the real polity of the country.

Generic options for delegating responsibility of Polder-specific O&M Activities

Whichever scenario one posits with regards to having an agency or a governance structure accountable for the management of the polders, there may be several options to operate the sluice gates that regulate water flows and to ensure regular repairs & maintenance of the polder infrastructure. Some of the generic ones are listed below and it is conceivable that several may coexist. The basic question posed is: what is the “best” way to ensure proper maintenance of the structure (polder) and manage the usage of water resources? Posed in this manner, one may identify several ways of getting the jobs done, one or several of which may be put to practice at any point in time.

- (i) *Owners remain responsible for maintenance:* The responsible agency does the work with in-house manpower. One may draw analogy with early years of polders, until possibly mid-1970’s, when gate *khalashis* (as well as embankment *Khalashis*) were appointees of BWDB and the young BWDB engineers and/or staffs went around motivating people to form groups.

¹⁷ Often this is packaged under Ocean governance framework, which apparently deals with too many sectors (fisheries, shipping, water transport, forest environment, energy, mining, land, water resources, education, science and technology, defense, law enforcement, finance, law, foreign affairs, information technology, etc.). The need for coordination with many functions and agencies are inherent in current development perspectives. However, polders and polder economy and governance have unique attributes requiring exclusive attention from a single agency. Once such an agency is empowered sufficiently, it may liaison with others.

¹⁸ See, Hafez Ahmad, Bangladesh Coastal Zone Management Status and Future Trends, *Journal of Coastal Zone Management*, Volume 22, Issue 1, 2019. Ahmad has a wider focus as mentioned in the previous footnote, and those may be further fine-tuned to distinguish water surface bounded on sides by land surface and issues related to open sea and oceans.

¹⁹ The proposal for independent ICZM may open a Pandora’s box. On books, WARPO is mandated with the function under the Coastal Zone Policy (2005) to plan for and oversee the coastal zone at large. Master Plans exist, yet, no real authority delegated during about two decades, resulting in lack of effectiveness of such Plans.

- (ii) *Contractor who did a job remains responsible for maintenance*: This may apply in some instances of major infrastructure (such as, segments of embankments and the base platforms for sluice gates).²⁰
- (iii) *Commissioning services of third-party*: The works of repair & maintenance are commissioned out to a third party: The responsible agency commissions the services of a third-party agency (private or private-public partnership). The third party may include an NGO, or a private agency, or a consortium of those.
- (iv) *Commission services of local government institutions (LGIs)*: alone or in collaboration with others, such as, NGOs and private service agencies; and
- (v) *Commission services of beneficiary groups*: The agency may contract services of groups or coalition of groups who are beneficiaries of the polder services, either independently, or in collaboration with others (government and/or non-government agencies). The discussion specific to WMOs under participatory water management ideally falls under this category.²¹

Options to raise funds for financing O&M

There is a third dimension in the discussion on institutions that takes one to fiscal space. How will all the activities pertaining to operation & maintenance be financed? Several routes may be identified, which will have close correspondence with the governance structure to be adopted, and several of which may need to be pursued simultaneously.

- a. The government allocates resources in annual budget, to be channeled through organizations (BWDB) relevant for the chosen governance structure.
- b. Beneficiaries in each polder pay, in the form of unit tax, to a common fund meant exclusively for use in O&M of that polder.²²
- c. Beneficiaries of a given service generated from a (large) polder infrastructure (say, embankment used for road communication used by mechanized vehicle) pay according to use, and efficacy of alternative collection procedures may be weighed.²³

²⁰ The team has been informed that BWDB has experiences in staggered payment, including maintenance contracts. Unfortunately, no assessment of such practices was brought to the team's notice. It is speculated that BWDB officials may not have been sufficiently empowered to withstand non-cooperation from contractors.

²¹ There are similarities between option (iii), (iv) and (v); and one may allow for provisions for the responsible agency (say, BWDB) to choose any one or a mix of options taking into account of the local context and composition of the WMOs.

²² See Table 2 for the details on linking revenue with benefits from polder service. One may include taxes in capital gains that come in the form of enhanced asset value due to polders.

²³ Brick fields were found to be major users in some polders that are alleged to have damaged the embankment roads. While the owners contribute occasionally, shown more of a philanthropic gesture, introduction of user fees will empower local agencies and will help in financial planning.

A note on Risk

For durable goods and capital investments, there are two elements that ought to be accounted for, servicing of the assets and guarding against risk. Where the need for repair & maintenance (R&M) depends on the extent of use, and not on any external factor, defining a service contract is relatively easy²⁴. Uncertainty with regards to the R&M needs arises due to host of external factors, both human and natural, particularly arising from the upstream. With no elaboration on the cause of physical changes, the BDP mentions of ‘technical risk’ as an ex ante consideration for evaluation of project proposals. With evidence-based modelling, such uncertainties may be partially reduced, and sources of negative externality may be identified to distribute the burden.²⁵ Beyond such uncertainty and sources of negative externality, there is risk in committing services to ensure functionality of polder infrastructure, primarily arising due to natural disasters. Presence of risks makes it difficult to define enforceable service contracts. A textbook prescription would be to spread such risks among those who do not face disasters at the same time (i.e., whose risks are uncorrelated). While introducing customized insurance is an option, people inside coastal polders were found to avail one or both of the two following options: (i) informal insurance based on trust between groups, where other groups in the locality provide grants, or, lend funds to the affected group, which are returned later in same manner; (ii) Beneficiaries who do not regularly pay for the services they receive from polder infrastructure, come forward with lumpsum payments in order to ensure that repairs are done quickly to allow their business of profit to continue.

Assumptions on Future Scenario and Recommendation on Broader Governance

Though broad options have been laid out, this paper refrains from specific recommendation with regards to the choice of principal agency responsible for overseeing management of coastal polders. However, for the purpose of specific recommendations, it is presumed that there will be one principal agency within national governance which will spearhead decision-making on a routine basis, remain accountable for those decisions, and be the center for knowledge and information-gathering on the sector and for processing information to suggest viable and desirable actions for policymakers to choose from. In this regard, some of the specific suggestions are stated below.

- The study team recognizes the central role that BWDB may have to play in the immediate future. It also recognizes the importance of an integrated approach to coastal zone management, and the need for a proper blend of engineering professionals with multiple forms of social engagements in O&M of coastal polders and their financing. It is therefore pertinent that the desired long-term institutional governance of the sector is revisited during

²⁴ There may still be problems in enforcing a contract, which is common in service-sectors.

²⁵ If a brickfield or sand-extraction from riverbed is found to cause undue damage (i.e., negative externality) to an embankment, one can design rules to force the perpetrators pay for the damage. The study team recognizes the difficulties of enforcing laws in Bangladesh, and yet, chooses to lay out all possible options.

the early stage of BDP implementation. Furthermore, if more concrete ideas emerge on organization, or a reconfigured existing organization with entitlement and accountability, it is suggested that a roadmap to make the transition with finite timelines be planned.

- Collection of information, relevant for O&M, to feed into informed decision-making appears to be absent within BWDB²⁶. Ideally, with wide use of mobiles in the coastal areas, there can be less expensive ways to collect and store information. Relevant segment of the information set may be accessible to all for transparency and for assessing performance of responsible authorities.
- In the broad spectrum with several stakeholders – BWDB at different tiers, MoWR, Project team with external consultants, subject-specialists and field staffs, local government of several shades, beneficiary groups (such as, WMOs), etc. – there is a need to reconfigure relative standings of various groups over the BDP period. First, CBS (such as, WMOs) need to be strengthened to replace elaborate network of field workers within a finite time period. This ought to be implemented gradually, but within finite period, possibly with the provision to accommodate selected development practitioners, with passion and ability to improve upon the knowledge of coastal polder dynamics acquired earlier. Mechanisms should also be in place to allow the aged practitioners to see through the transition to a new regime.
- Looking into a longer horizon, it is urgent to put in place programs that will breed new generation of field experts/service providers who will have to be drawn from the coastal communities and who will have the social motivation to serve the communities. One way to initiate the process is to introduce contents in the course curricula for secondary and higher secondary levels that introduce science of water management, dynamics of rivers in delta region and social history of polders²⁷. Many of the current field staffs, upon scrutiny, may be meaningfully engaged in such activities to start up the process. Initiatives to collect information for monitoring and research, to be undertaken by BWDB or any other national agency, may be tied to learning exercises in schools and colleges located inside the polders. In addition, there is a need to develop technologies and make use of IOTs in several spheres of polder management.
- Revenue to be raised from polder beneficiaries to create funds at polder-levels, should be spent exclusively for the purpose of O&M of respective polder²⁸. Several sources of finance had been noted earlier that relate to benefits accrued from polder services. A valid question may be raised as to why the people in the polders, who are relatively poorer than an average Bangladeshi citizen, pay for something that are otherwise considered as government's responsibility. The study team is aware that Water Management Groups, formally included in a project, are expected to pay Routine Maintenance Charges, and not all O&M Costs. The team is also aware that practices of such payments were made possible

²⁶ The reasons were briefly mentioned in Section 1.

²⁷ Details on the design are beyond the scope of the current assignment. It is possible that some of the subjects will be mandatory for schools and colleges in the coastal areas, while some of the general aspects may apply to nation-wide curricula.

²⁸ Needless to mention that the investments on polders are presumed to be the responsibility of the government. In addition, there may be budgetary supports to bear part of O&M expenses, tied to government priorities and performance of polder-level management.

due to contributions made from project to group account under various heads. In spite all such evidences, there are several reasons for tabling the proposal. First, making contribution from one's own pocket empowers the contributor provided the fund is used for the betterment of the community where she/he lives. The latter encourages the contributors to monitor and oversee fund utilization. Second, contributions may be better linked with the benefits a household (or, user of a polder service) receives, thus ensuring some degree of equity (in taxation). Finally, a group-level fund allows mitigating risk (discussed earlier) by negotiating contracts with other groups whose risks may not be correlated.

Specific Recommendations

1. Change the composition of existing WMOs (WMG and WMA): Water management organizations (WMO) are often seen to be tied to labor contracting societies (LCS) and savings & credit activities. WMGs captured by landless/marginal farmers, had interests in securing remunerative engagements in earthwork, and interest of contractors therefore shape the activities of many WMGs. There are others where savings and credit functions bind the group members under people with knowledge on accounting and having social clout. In both cases, the members are relatively poor lacking the voice to make a difference and was relatively an easy target for group formation. If adequate representations from all groups of people are not ensured, local level water managements are difficult to be sustained with independence. More importantly, those will remain ineffective in ensuring that O&M are done properly by BWDB officials and/or by contractors assigned by BWDB or any other agency. To form effective groups, one needs to identify feasible areas of social contracts and design appropriate mode of communication among people of different strata in terms of wealth, education and living practices.
2. The reconstituted catchment-level groups are expected to act under a Water Resource Management Group (WRMG), and there is a need to shift towards considering water as a resource having multiple uses. At the operational level, contracts will need to be renegotiated with sluice gate operators, and contracts may have to be reached with new set of service providers (such as, embankment monitoring & maintenance workforce).
3. Till a separate polder-specific fund for O&M under the control of WRMG is established and revenue starts to flow-in, there is a need to provide fund (outside revenue budget) to each WRMG, and make its proper use legally binding on the key actors of the group. In this context, revisions in National Water Policy and Act need to empower the WRMGs as a legal entity so that the latter can collect taxes from beneficiaries.
4. Several sources of revenue have been identified in Table 2, along with the likely modes of assessment. If the basic principle is approved, various wings of the government may be

mobilized to work on bills for long term solution. Preliminary steps may however be initiated through executive orders, in cooperation with the fiscal authority (NBR).²⁹

5. Long term goals under BDP will be to reverse the roles of BWDB and other government agencies providing services for polder management, including the water resources. Since easy money, either from grants & loans, or from budgetary supports, is expected to dry out, playing the pretentious role of (benevolent) service providers ought to be abandoned. In its place, the services will have to respond to demands and BWDB and similar other agencies need to prepare accordingly.
6. Develop measures to introduce taxation for creating negative externalities. For example, if a city in the upstream pollutes water and imposes higher costs to downstream polders, the national government may think of introducing taxes on the local authority of that city.
7. The larger physical environment however remains the responsibility of the national government and the central agency it makes responsible for coastal polder management.

²⁹ Delegating the responsibility to WRMGs lead to local power politics, favouritism and non-collection. Delegating to LGIs lead to corruption, mismanagement, misallocation and non-collection if public satisfaction is low.