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Kingdom of the Netherlands



Department of Agricultural Extension (DAE)



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Polder 47/3

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Contents

Chapter	Title	Page No.
1.	Introduction	1
1.1	Blue Gold Program Context _____	1
1.2	Definition and Objective of a Polder Development Plan _____	1
2.	Present Situation and its Challenges	2
2.1	Physical Features and Demography _____	2
2.2	Water Resource Management and Infrastructure _____	3
2.3	Institutional Framework for Participatory Water Management _____	5
2.4	Agricultural and Marketing Services _____	6
2.5	Environmental Sustainability and Disaster Risk Reduction _____	10
3.	Development Action Plan	11
3.1	Water Resources Management and Infrastructure _____	11
3.1.1	Summary of Rehabilitation Works _____	11
3.1.2	Operation and Maintenance and Internal Polder Water Management _____	13
3.2	Institutional Framework for Participatory Water Management _____	14
3.3	Agricultural and Marketing Services _____	15
3.4	Environmental Sustainability and Disaster Risk Reduction _____	16
4.	Planning Timeline	18
5.	Polder Budget	19

Appendix

Appendix 1. PDP Formulation Process	20
Appendix 2: Water Management Infrastructure of polder 47/3	22

List of Tables

Table 1: Main Physical and Demographic Characteristics of Polder 47/3	2
Table 2: Main Water Resource Management and Infrastructure characteristics of Polder 47/3	3
Table 3: Main characteristics of the Institutional Framework of PWM in Polder 47/3	5
Table 4: Main characteristics of Agricultural and Marketing Services in Polder 47/3	6
Table 5: Main environmental and DRR characteristics of Polder 47/3	10
Table 6: Polder Budget	19

List of Figures

Figure 1: Location of Polder 47/3 in Kalapara Upazila	2
Figure 2: Map of Polder 47/3 showing the Existing Khals and Water Management Infrastructure	4
Figure 3: Proposed WMGs and its areas in Polder 47/3	6
Figure 4: Markets and Union Headquarters in Polder 47/3	9
Figure 5: Proposed Rehabilitation Plan	11
Figure 6: Polder Completion Timeline	18
Figure 7: The steps of the PDP Formulation Process	20

List of Abbreviations

BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau of Statistics
BRRRI	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
CAHW	Community Animal Health Worker
CAWM	Community Agricultural Water Management
CBO	Community-Based Organisation
CDMP	Comprehensive Disaster Management Program
CDF	Community Development Facilitator
DAE	Department of Agricultural Extension
DLS	Department of Livestock Services
DOC	Day Old Chicks
DPP	Development Project Proforma
DoC	Department of Cooperatives
DoE	Department of Environment
DoF	Department of Fisheries
DP III	Director of Planning III of BWDB
DPHE	Department of Public Health Engineering
DRR	Disaster Risk Reduction
DTL	Deputy Team Leader
EIA	Environmental Impact Assessment
EKN	Embassy of the Kingdom of the Netherlands
FCD	Flood Control and Drainage
FCDI	Flood Control, Drainage and Irrigation
FFS	Farmers Field School
FGD	Focus Group Discussion
FT	Farmer Trainers
GAP	Gender Action Plan
GIFT	Genetically Improved Farm Tilapia GIFT
GoB	Government of Bangladesh
GoN	Government of Netherlands
GPWM	Guidelines for Participatory Water Management
Ha	Hectare
HH	Household
HYV	High Yielding Variety
IGA	Income Generating Activity
IAPP	Integrated Agriculture Productivity Project
IPM	Integrated Pest Management
IPs	Input Providers
IPSWAM	Integrated Planning for Sustainable Water Management
IPSWARM	Integrated Planning for Sustainable Water Resources Management

IRRI	International Rice Research Institute
KII	Key Informant Interview
KJDRP	Khulna-Jessore Drainage Rehabilitation Project
LCS	Landless/Labour Contracting Societies
LGED	Local Government Engineering Department
LGI	Local Government Institutions
M&E	Monitoring and Evaluation
MFI	Microfinance Institutions
MFS	Market Oriented Farmers Field School
NGO	Non-Governmental Organisation
O&M	Operation and Maintenance
PCD	Program Coordinating Director at BWDB
PD	Program Director at DAE
PDP	Polder Development Plan
PSF	Pond Sand Filter
PTO	Power Tiller Operator
PWMR 2014	Participatory Water Management Rules 2014
RF	Resources Farmers
SAAO	Sub-Assistant Agricultural Officer
SaFaL	Sustainable Agriculture, Food Security and Linkages
SMART	Specific Measurable Attainable Relevant Time Bound
SRDI	Soil Resources Development Institute
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TA	Technical Assistance Team of Blue Gold Program
TL	Team Leader
TOT	Training of Trainers
UP	Union Parishad
VC	Value Chain
VCA	Value Chain Analysis
VCD	Value Chain Development
VCS	Value Chain Selection
WASH	Water Sanitation and Hygiene education
WMA	Water Management Association
WAP	Water Management Group Action Plan
WMF	Water Management Federation
WMG	Water Management Group
WMO	Water Management Organisation
XEN	Executive Engineer
ZSE	Zonal Socio Economist

Glossary

Arotdar	Service provider to Bepari and Pikers in wholesale markets. Facilitates the buy/sell process. May provide purchase negotiation assistance, storage space, selling space, short term and seasonal credit, and arrange truck transport of goods purchased by Bepari to markets.
Beel	Naturally depressed land inundated under water for at least one season
Bepari	Key wholesaler in the supply chain. Moves goods between markets buying in source markets and selling in destination markets. Exerts the main influence on price earned by farmers.
BKash	BKash Limited is a joint venture between BRAC Bank Limited, Bangladesh, and Money in Motion LLC, USA. Less than 15% of Bangladeshis are connected to the formal banking system whereas over 68% have mobile phones. BKash utilize these mobile devices and the omnipresent telecom networks to extend financial services to the under-served remote population of Bangladesh.
Business service	Service that is sustainable through private sector transactions and that improves the performance of the value chain, its access to markets, and its ability to compete.
Capture Fisheries	Capture fisheries refer to open water fisheries resources in both marine and freshwater environments. Capture fisheries is exploitation of aquatic organisms without stocking the seed. Recruitment of the species occurs naturally. This is carried out in the sea, rivers, reservoirs, khal, beel, floodplain etc.
Climate Change	Climate change refers to any change in climate (average weather) over time, whether due to natural variability or as a result of human activity. Average weather includes temperatures, wind patterns and precipitation.
Cross-cutting issues	Issues that affect all areas of concern within their context.
Culture Fisheries	Culture fisheries are the cultivation of selected fishes in confined areas with utmost care to get maximum yield. The seed is stocked, nursed and reared in confined waters, and then the crop is harvested. Culture takes place in ponds, ditches, rice fields which are fertilized and supplementary feeds are provided to fish to get maximum yield.
Disaster Risk Reduction (DRR)	DRR is a conceptual framework intended to systematically avoid (prevent) and limit (prepare/mitigate) disaster risks with regard to losses in lives and the social, economic and environmental assets of communities and countries.
Embankment	An embankment is a high earthen dike surrounding an area in order to protect it from external floods and salinity.
Enabling environment	Environment favourable to working, participating and demonstrating potentials.

Farmers Field School (FFS)	FFS is a participatory group based learning approach where farmers can learn by doing and share their experiences.
Governance	Description of the dynamic distribution of power, learning, and benefits among participants in a value chain.
Inlet	Inlets are small structures across the embankment to take in fresh water for irrigating high lands along the periphery of the polder. Outlets are small structures across an embankment to drain out local pockets in the polder.
Landless/Labour Contracting Societies	It is an approach to engage local poor people/labourers as a group for construction of rural infrastructures. The group is treated by the development authorities/project as a contractor for the work allocated.
Local Governmental Institutions (LGIs)	The institutions formulated under different Acts/Ordinances to run the different administrative unites of Local Government system by the Government.
Kharif-I	Pre-monsoon season, from March to half July.
Kharif-II	Monsoon and post-monsoon season, from July to October.
Khal	Excavated or natural routes across any land area for draining out excess water and flushing in required water.
Market Actor	Smallholder, input supplier and output market players directly participating the value chain.
Market development based	Activities that try to make the interaction between demand and supply more effective.
Market transaction	The exchange between demand and supply is at full market price (the price at which suppliers are prepared to sell and consumers are prepared to buy, in an unsubsidized situation).
Market	A set of arrangements by which buyers and sellers are in contact to exchange goods or services—the interaction of demand and supply.
Needs Assessment	It is an assessment of the needs and priorities of local population in a polder.
Piker	Buys directly from various farmers to ensure a bulk. Bulk is sold to Arotder or to destination market. Exerts the main influence on price earned by farmers.
Polder	A polder is an area protected by embankment all around, having necessary structures across the embankment to drain out excess rain water and flush in required fresh water for irrigation.
Rabi	Dry season, from November to March.
Standing Committees of UP	Standing Committee means the Standing Committee formulated under the Local Government (Union Parishad) Act, 2009.

Sluice	A sluice is a structure constructed across an embankment to drain out excess water from a polder and / or flush in required water in to the polder.
Union Parishad (UP)	Union Parishad means the Union Parishad formulated under section 10 of the Local Government (Union Parishad) Act, 2009.” It is the lowest tire of the Local Government system in Bangladesh.
Value Chain	A ‘value chain’ can be defined as all the actors who buy and sell from each other in order to supply a particular set of products or services to final consumers.
Water Management Group Action Plan (WAP)	It is the plan and strategy of the WMG, to address issues and problems of their area at a given time as well as to implement their actions as part of the polder development planning.
Ward	Ward means the Ward of Union Parishad. Each Union Parishad consists of 9 Wards.
Water Management Organisations (WMO)	It is a common name for all organizations formed for the purpose of water management in a polder, namely WMG, WMA and WMF.
Water Management Group (WMG)	Local people organized within a hydrological unit or at village level to manage water resources are collectively called Water Management Group.
Water Management Association (WMA)	It is a higher tier of water management organization formed by representatives of WMGs.
Water Management Committee (WMC)	It is a committee to initiate and coordinate operation and maintenance activities in a catchment area. It is formed by representatives of WMGs.
Water Management Federation (WMF)	This is the highest tier of water management organization in the polder. It is formed by representatives of all WMAs.
Zonal level	Blue Gold has three field offices in Patuakhali, Khulna and Satkhira to coordinate and manage the project interventions; these are sometimes called zonal offices.

1. Introduction

1.1 Blue Gold Program Context

The overall objective of the Blue Gold Program is to reduce poverty in the coastal area by enhancing the livelihood of the rural population, through more efficient water resources management and increase productivity of mainly crops, fishery and livestock in the polders and by empowering the communities to be the driving force.

The specific objectives of the Program are to:

- Increase sustainability of the development of the polders through effective community participation. The community organizations will become the driving force for the natural resources based development, whereby environment, gender and good governance are effectively addressed in their operations;
- Protect floods and use water resources effectively;
- Increase farmers' income and strength livelihood through improved productivity (for each polder a Business Plan will be developed with the value chain analysis); and
- Improve environment, drinking water and sanitation. The living environment will be realized and sexual reproductive health rights (SRHR), balanced nutrition, and good governance issues are well understood and applied.

1.2 Definition and Objective of a Polder Development Plan

Definition of a Polder Development Plan

A Polder Development Plan (PDP) contains an integrated analysis and planning for developing a polder in relation to community mobilization, water management, agriculture, business development, environment, gender, and institutions¹.

Objectives of a Polder Development Plan

1. The provision of an internal discussion document for the Blue Gold TA team and the implementing agencies (BWDB and DAE) to plan, design and implement at polder level in an integrated manner;
2. A clear outline for WMOs what type of activities Blue Gold is providing, which helps them to develop their own WMG Action Plans (WAP);
3. A starting point for BWDB to prepare detailed rehabilitation plans and for DAE to fine-tune the FFS modules and stimulate business activities as well as a strategy to strengthen institutions like Union Parishad (UP); and
4. Linkages with Blue Gold's logical frameworks and M&E activities, to ensure that the proposed interventions at polder level are contributing to the overall program objectives and can be justified towards stakeholders and donors.

¹ An important consideration is that a polder is a multi-dimensional geographical unit delineated by water in which various and continuously changing development processes take place. Polder boundaries do not always coincide with administrative boundaries. The PDPs developed by the Blue Gold Program therefore do not capture the full picture. They zoom in on specific water and production related features of polders and try to make a dynamic analysis of the water management organisations operating in that sphere, their resources, their activities and their needs. Other Local Government Institutions (LGIs), NGOs and donors are operating in the same polders and they have their own sphere of interest, scope, analysis, plans and programs within or even beyond the physical boundaries of these polders. A Blue Gold PDP is thus not a substitute or umbrella plan for all types of activities and programs taking place in the polder.

2. Present Situation and its Challenges

2.1 Physical Features and Demography

Polder 47/3 is managed by the Bangladesh Water Development Board (BWDB) and was constructed during 1961-1964. It is located in Mithagonj union under Kalapara upazila of Patuakhali district. It is surrounded by Hauder Bharani khal in the north and northwest, Charpara khal in the south and southwest, Pakhyapara khal in the east and Sapuria khal in the north east (shown in the figure 1). The characteristics of the polder can be found in Table 1 and the location map of the polder with respect to Upazilla and Union headquarters is shown in Figure 1.

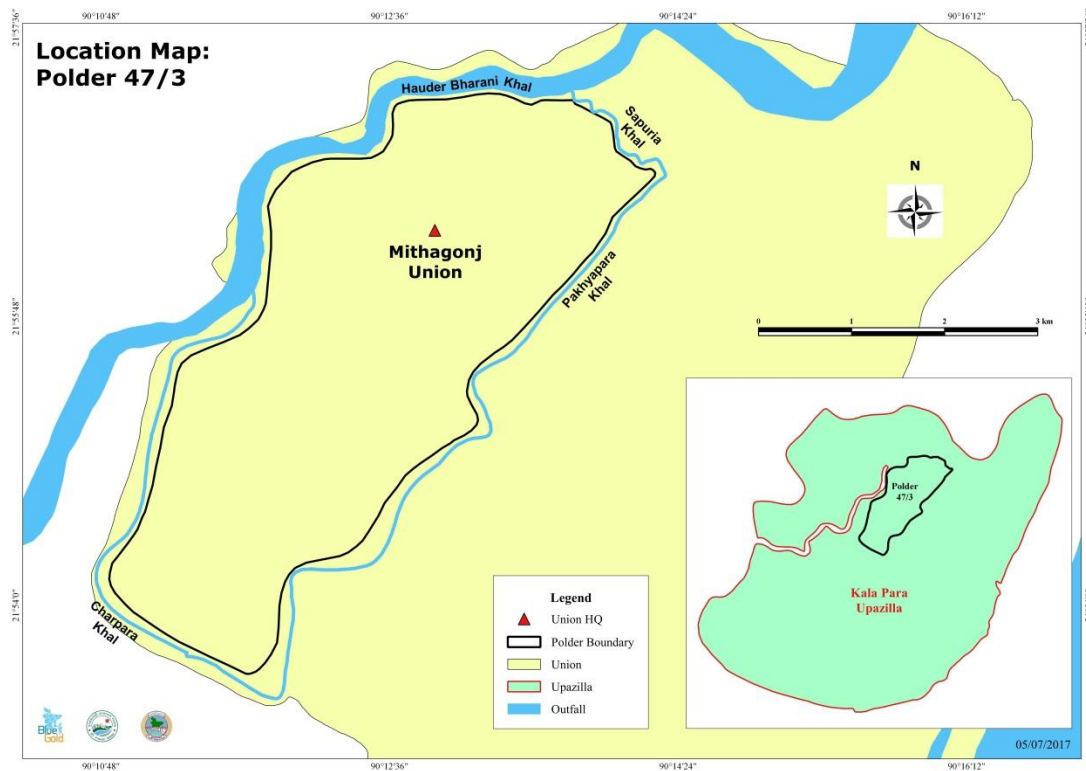


Figure 1: Location of Polder 47/3 in Kalapara Upazilla under Patuakhali District

Table 1: Main Physical and Demographic Characteristics of polder 47/3

Characteristics	
Included Upazila(s)	Kalapara
Included Union(s)	Mithagonj
Polder boundary (in km)	19.70
Total number of Mouzas	02
Total polder area (in ha)	2025

Total number of households in the polder	4336		
Total number of catchments	08		
Total cultivable land (ha)	1115		
Population	11587	M 5798	F 5789
Literacy rate	63%		
Major occupations	Agriculture 80%	Business 10%	Other 10%
Economic condition	Rich: 5%	Middle class: 35%	Poor: 60%
Status of seasonal labour migration	About 10% labours seasonally migrate to Dhaka, Chandpur, Chittagong and some others districts for working as rickshaw puller and brick field worker.		
Status of internal road communication	Polder 47/3 is very close to the Bay of Bengal. The internal roads consist of about 7 km of bituminous road, 3 km of brick soling road and 30 km of earthen road.		

2.2 Water Resource Management and Infrastructure

Main features of the water resource management and infrastructure in polder 47/3 are highlighted in Table 2. Figure 2 shows the existing water management infrastructures including khals in polder 47/3. Further details can be found in Appendix 2.

Table 2: Main Features of Water Resource Management and Infrastructure in Polder 47/3

Features			
Length of embankment (in km)	19.70		
No. of drainage and flushing sluices	08	Good condition:00	Poor condition: 08 Damaged:00
No. of inlets	02	Good condition:00	Poor condition: 02
No. of (drainage) outlets	03		
No. of khals	38 (8 main and 30 secondary)		
Length of khals (in km)	60		
Main outfall rivers, drainage khals, Drainage sluices, Surface Drainage sluices and Several sizes Flushing Sluices	<p>Main Outfall rivers/Khal: Hauder Bharani khal, Charpara khal, Sapuria/Madhukhali khal, Pakhyiagara khal.</p> <p>Main drainage khals: Pashim Madhukhali khal, Melapara-1 khal, Melapara-2 khal, Sapakhali khal, Dakshin Charpara khal, Charpara khal, Golbunia khal, Aligonj khal</p> <p>Drainage and Surface Drainage Sluices: Pashim Madhukhali Sluice, Melapara Sluice-1, Melapara Sluice-2, Sapakhali Sluice, Dakshin Charpara Sluice, Charpara Sluice, Golbunia Sluice, Aligonj Sluice</p>		
Locations with water logging and siltation.	Water logging intensity is low, occur in the Tegachia beel, Uttar Charpara beel, Dakshin Charpara beel, Safakhali beel, Melapara beel and Azimuddin beel of this polder area.		
Most river erosion prone area	There are two erosion points, one is located from Tegachia Bazar to Joy Bangla Bazar in the bank of Hauder Bharani khal/river and another one is near Dakshin Charpara bridge.		
Other relevant water issues	Silted and moderately silted khal. No water can tight because of mechanical problem.		

Key challenges in effective water management	<ol style="list-style-type: none"> 1. Most of the khals are silted up which resulted in poor drainage and internal water logging during monsoon. 2. No gate in the sluice so water cannot be controlled. 3. Water salinity problem. 4. Political leader control the sluice gate and they cultivate fish in khal which hamper the natural water flow.
Challenges in planning construction of water infrastructures within polder area	There is a conflict between local people regarding crops cultivation and fish farming. This conflict may hamper the planning of a sustainable water management system.
Current internal polder water management practices	Sluice gates are not water tight so water cannot be controlled by sluice gate. During winter season polder dwellers make cross dam in the outfall river side of sluice gate to restrict saline water flow within polder and during rainy season they remove these cross dam by their own initiative in most of the cases.
Overall condition of internal polder water management	Very poor
Opportunities for internal polder water management	<ol style="list-style-type: none"> 1. Re-excavation of major khals and re-sectioning of embankment; 2. Repair and/or re-construction of sluice gates; 3. Make several small drain for drainage purpose during rainy season 4. Improved agricultural practices.

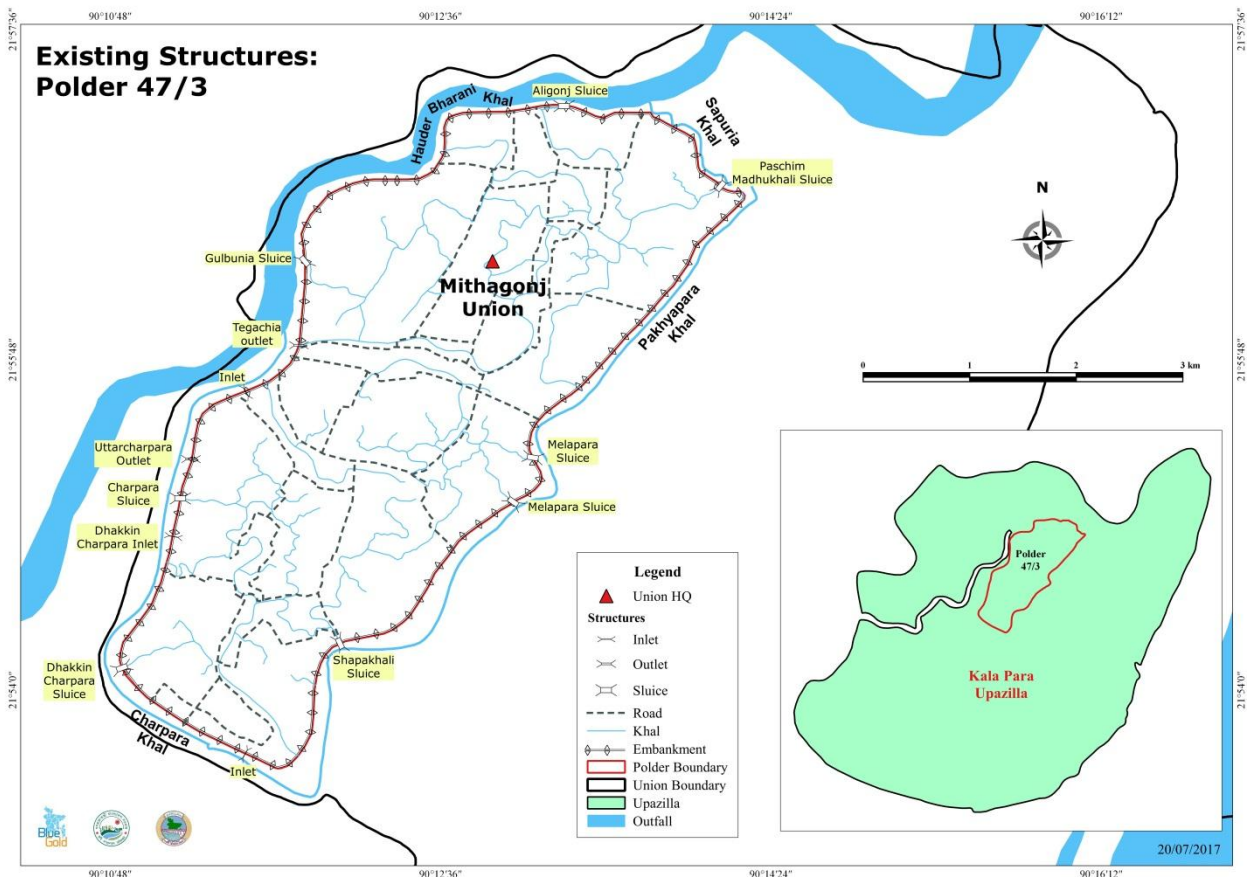


Figure 2: Map of Polder 47/3 showing the existing Khals and Water Management Infrastructure

2.3 Institutional Framework for Participatory Water Management

The main institutional actors in polder 47/3 are Union Parishad (UP), its wards, various Local Governmental line departments, a number of NGOs, Micro-finance Institutions, Market Committees and Union Disaster Management Committees (UDMC). Main characteristics of the institutional actors are highlighted in the Table 3. The boundaries of the WMGs and its areas are shown in figure 3.

Table 3: Main characteristics of the Institutional Framework of PWM in polder 47/3

Characteristic	
Number of WMGs	Currently there are no WMGs, neither formed by the previous projects nor formed by the Blue Gold Program yet. The map below in Figure 3 shown the tentative areas of proposed WMGs.
Members of WMGs	-
HHs being part of WMGs	-
Number of WMAs	-
Female representation in WMGs	-
Total deposited fund (BDT)	-
Total savings of WMGs (BDT)	-
Total number of WMGs with O&M fund	-
Names of projects and organisations with similar / related activities	<ul style="list-style-type: none"> • Integrated Farm Management Component (IFMC) – DAE (DANIDA funded) • Disaster Management- World Concern (Dutch funded)
Existing WMOs linkages with other stakeholders	-
Number of WMGs member including in UP standing committee	-
O&M agreement signed with BWDB	-
Current participation of WMOs in O&M	-
Existing conflicts on water management	Local elite culture fish in sluice khal by establishing cross dam so there is a conflict between crop grower and fish farmers.
Key challenges in strengthening PWM	<ul style="list-style-type: none"> • Adopt Collective Action • Financially strengthening of WMOs • Keep continuous liaison with UP, BWDB, DAE • Good Leadership • Regular O&M activity • Involvement of rich farmer in WMGs.
Key challenges in relation to women participation	Women are still in backward situation and male are not willing to allow them come out and religious prejudice. Social barrier also a challenges for women participation.
Key opportunities in PWM	<ul style="list-style-type: none"> • DAE works in this area by group approach (FFS) and it is easy to turn them in PWM group. • .In these area farmers can grow only one crop (T. Aman) and they are highly interested to grow two or three crops in same piece of land. To grow more than one crops in a piece of land only possible by PWM.

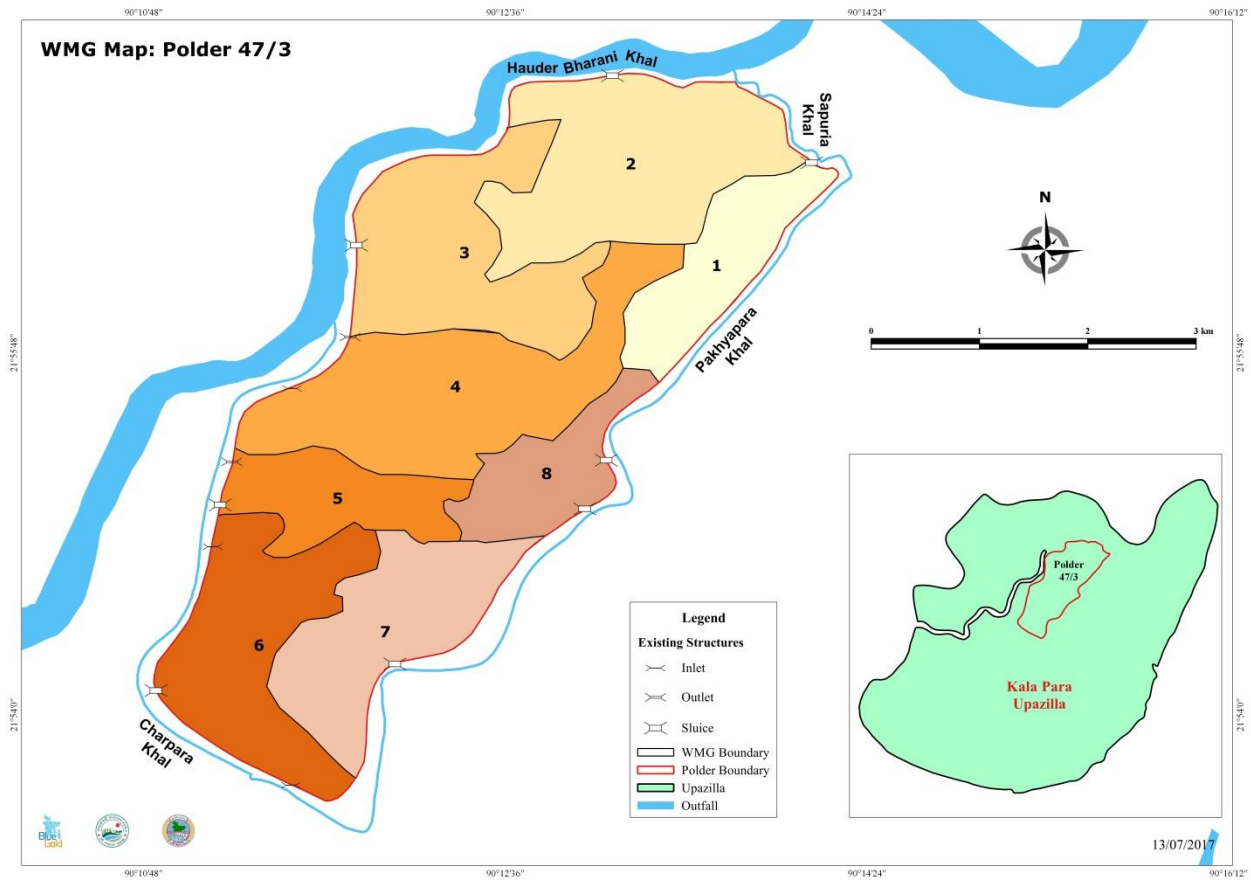


Figure 3: Proposed WMGs and its areas in Polder 47/3

2.4 Agricultural and Marketing Services

In polder 47/3 most of the polder dwellers are involved in crop production and fish culture. Livestock rearing is to some extent important. The most important characteristics and challenges of agricultural production and marketing services can be found in Table 4.

Table 4: Main characteristics of Agricultural and Marketing Services in Polder 47/3

Characteristic			
Main crops (top three)	1. T. Aman (HYV)	2. Grass pea	3. Falon (pulses)
Current most common cropping pattern	Fallow-Fallow-T. Aman (LIV) Fallow-Fallow-T. Aman (Local) Grass Pea –Fallow – T. Aman Felon –Fallow – T. Aman Mungbean-Fallow-T. Aman Chilli-Fallow – T. Aman Ground Nuts-Fallow-T.Aman Sweet Potato-Fallow-T.Aman Fallow-Aus-T. Aman		
Current cropping intensity	180%		
Main vegetables	Winter: Okra, Cucumber, Brinjal, Bottle Gourd, Country Bean, Red Amaranths, Cabbage, Sweet Gourd, Tomato, Spinach, Radish etc. Summer: Indian Spinach, Amaranths, Bitter Gourd, Snake Gourd, Eggplant,		

	Ass Gourd, Ridge Gourd etc. mainly in the homestead
Main fruits	Coconut, Guava, Mango, Lemon, Banana
Available agricultural machinery	In polder 47/3 there is some agricultural machinery to manage the agricultural activities. Especially farmers use power tiller, irrigation pump, spray machine, thresher machine etc. Still now some farmers plough their land by country plough due to unavailability of power tiller. A sufficient numbers of Rice Husking Machines are available in some forward locations of the polder.
Present irrigation practices	In polder 47/3 irrigation facilities is very poor. Approximately 3% lands come under irrigation facilities especially for cultivation of vegetables, maize and boro rice in Rabi season. Mainly surface water (reserve canal and pond water) is used for irrigation purpose.
Availability of inputs	Seed, fertilizer, pesticide, farm machineries and irrigation are the main inputs in agriculture sector. Some input companies and private sectors have been working in this polder and also they are established close connection with farmers. Inside the polder area 5 retailers are available for providing input services.
Current knowledge on proper input use	Farmers have a little bit knowledge about the quality seed; they used HYV seed for rice and vegetable cultivation. In rice production farmers do not follow proper doze of fertilizer, pesticides. Beside vegetable farmers also use high volume of pesticide and farmer always use higher number of seedling (6-8 seedlings) for T. Aman cultivation.
Important business trend in crop production	Rice and fruit production are increasing. In this area there is a shortage of Rice and Vegetables. So there is a high market price of vegetables and some farmers are interested to grow vegetables. Fishermen catch fish from sea, river, khal and they sell this fishes either fresh or dried fish in local or outside market.
Key challenges in agriculture	<ol style="list-style-type: none"> 1. Salinity is the main problem in this area. Farmers can grow only T. Aman rice and a small area for pulses and vegetables. In Rabi and Kharif-1 season they cannot grow crop due to saline water problem. 2. In rainy season drainage is a problem because sluice khal and branch khal are silted. 3. Extreme weather events like Cyclone, Storm Surge and High tide badly effects to the agriculture productions 4. Unavailability of quality agricultural inputs.
Percentage of households owning livestock	Cattle 50%; Goat – 60%; Poultry – 95%.
Availability of inputs for livestock	The farmers of the polder 47/3 rear cow for milk and meat, poultry for egg and meat. In this area only one retailer for poultry feed so there creates monopoly business in polder areas.
Important business trend in livestock	Farmers rare poultry for meat and egg. Some are household level and some are commercially. There are some local buyers/businessmen who buy local poultry egg and cattle from the farmers. Milk- Collectors (<i>Goala</i>) collect milk from the milk producing households. They supply milk in Kalapara upazila market
Key challenges in livestock	<ol style="list-style-type: none"> 1. Livestock vaccine and vaccinator is not available in this area. 2. Disease problem 3. Feed is not available in local market. 4. Fodder unavailable due to saline during dry season. 5. Fodder cultivation practices are very poor; 6. Lack of modern technology about livestock rearing.
Percentage of households involved in	80%

fish culture	
Types of fish	White fish farming are the main aquaculture practice in polder 47/3. There are also other several species of fish are cultivating in the polder, i.e. Pangus, Rui, Katla, Mregel, Thai puti, Grass carp, Silver carp etc.
Availability of inputs	Fingerling is available in polder 47/3 but all are not maintain quality. Fish feed is not available in this area. There are five Fry nurseries and one hatchery in the area. Bhai Bhai Hatchery produce Spawn through induce breeding and Nurseries collect Spawn from Bhai Bhai Hatchery and other hatcheries located in distance upazilas and districts. Only three retailer sell fish feed as a partial business.
Important business trend in fisheries	The traditional white fish supply chain in polder 47/3 is characterised by a large number of middlemen (Faria, Aratdar, Depots, Paiker and Accountholders). These middlemen provide financial or other services (e.g. collecting, auctioning or transportation) and consolidate raw material along the supply chain. The marketing channel that a farmer uses depends mainly on the harvest volume, the location of the farm, the financial ties of the farmer, and they offered terms of payment. The exact configuration of the supply chain varies widely from location to location and from farmer to farmer.
Key challenges in fisheries	<ul style="list-style-type: none"> • Salinity prone area; • Quality and food safety; • Disease problem; • Quality fingerlings are not always available; • Low fish production per hectare; • Low quality feed; and • Extension facilities are less.
Existing extension services	DAE has one Sub Assistant Agriculture Officers (SAAOs) assigned in the polder area. DoF has one Field Assistant for Union level to assist in fisheries extension services and providing new technologies. Overall, their services are not sufficient due to lack of manpower; also the services mostly address big and medium sized farming households.
Name and location of markets	In polder 47/3 there are two markets named Tegachia bazar in Tegachia village and Safakhali bazar in Safakhali village.
Products provided/ marketable products	In polder 47/3 there are many products – vegetables, rice, pulses, fruits, poultry meat, eggs, cows, goat, fishes etc. are main marketable products.
Surplus destination of products outside polder	In polder 47/3 vegetables rice, pulses import from outside the polder. Only white fishes are surplus in this area. They sell their fishes in upazila market. A small portion of rice go to Chatals (Rice mill) located in Kalapara and a big volume of rice go to Dhaka,
Main value chain actors	<p>T. Aman and Fish are the selected value chain products for polder dwellers. Five input traders (seed, pesticide and fertilizer), 2 fish feed and medicine seller, two service providers (poultry and Livestock vaccinator), efficiently work as value chain actors for strengthening the value chain activities.</p> <p>The Blue Gold programs not yet selected any value chain for this polder but T. Aman/Felon/Grass pea/carp fish/tilapia/poultry might be the potential value chain of this polder. There are some Faria/Arotder/Paiker/Chatua available in the polder who are involved in rice/pulses/chilli/groundnuts/egg/poultry/cattle/fish marketing. There are some inputs company representatives employed for marketing of inputs.</p>

<p>Key challenges in marketing</p>	<ol style="list-style-type: none"> 1. Very difficult transportation facilities due to isolated road communication and as a result big buyers cannot easily go inside the polder for buying bulk quantity of product; 2. Farmers' always pay high transportation cost for selling their products through polder markets to upazila or district whole sell market. Due to limited opportunity to get high price and price fluctuation inside the polder markets farmers feel demotivated; 3. Farmers don't have minimum of market orientation and awareness about how to make the farming more profitable. 4. Influence of local broker and 5. No big market in the polder area.
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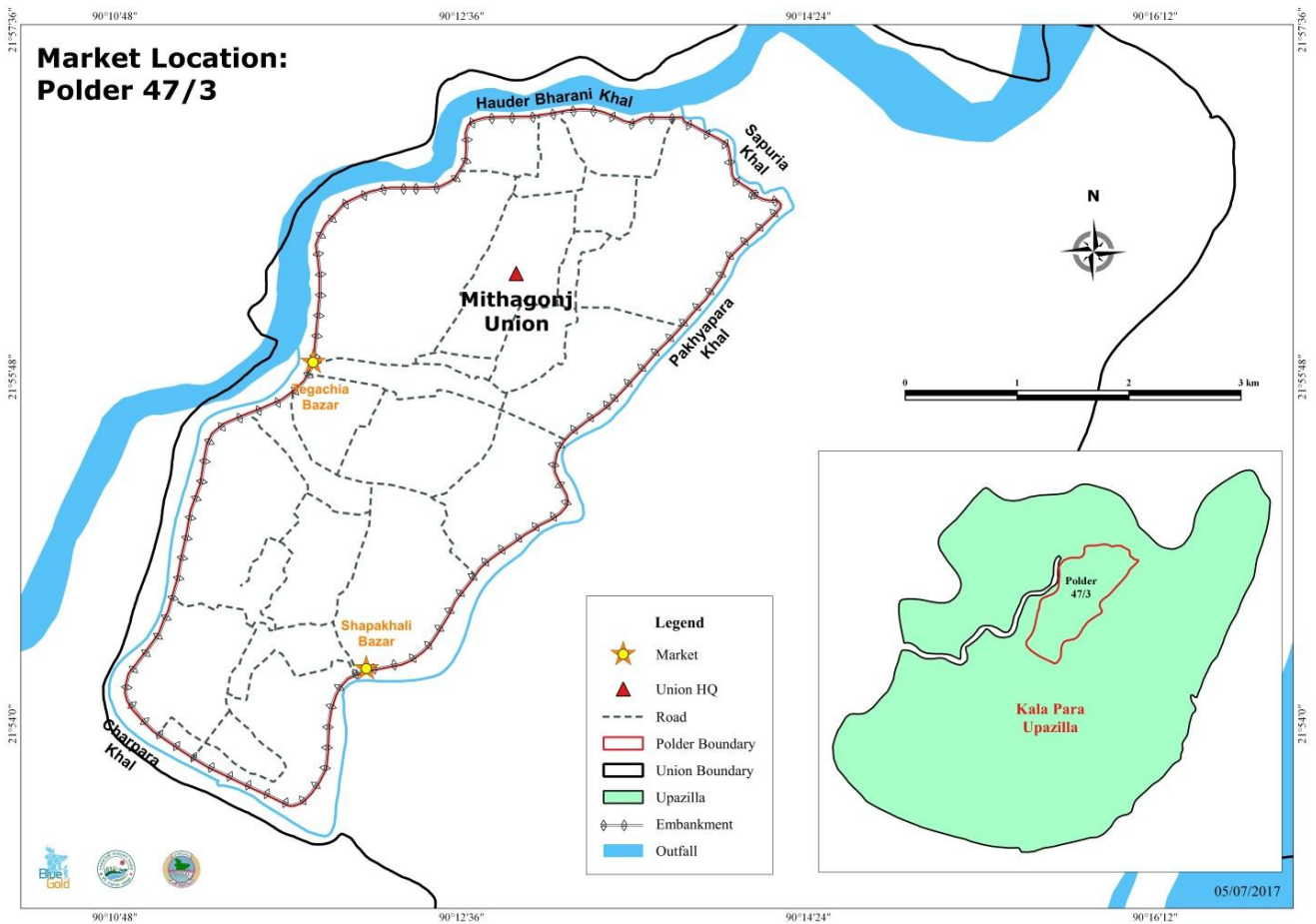


Figure 4: Markets and Union headquarters in Polder 47/3

2.5 Environmental Sustainability and Disaster Risk Reduction

Table 5: Main environmental and DRR characteristics of polder 47/3

Characteristics	
Existing environmental problems	<ol style="list-style-type: none"> 1. Waterlogging found major problem in the polder area. Functionally, almost all the drainage outlets cannot drain out water during and immediate after heavy rainfall events. The outlets were damaged during cyclone Sidr in 2007 which yet not repaired, moreover one blockage made on the Gabbaria river which influence waterlogging particularly at Tegachia mauza area; 2. According to Chairman and UP members of Mithagonj union there are few breaching points and low height embankment from Joykhali bazar point to Pashim Modhukhali bridge point which cannot protect flood and high tide even at the time of signal 4/5; 3. Most of the khals within the polder area are silted. Among others Shapurja khal, Gulbunia khal, Melapara khal, Charpara khal and Pakhyapara khal were closely connected with Sonatola and Andharmanik river, now almost silted up; 4. As the local people claimed that around 90% people are depends on deep tube-well as source of drinking water and remaining 10% people depends on pond water, kup (protected dug well) water etc.
Common hazards	Cyclone, waterlogging, river bank erosion, salinity intrusion and scarcity of drinking water are the common hazards.
Cyclone shelters	There are in total 6 cyclone shelters, all are school cum shelter means in normal time these are using as school but during disaster theses are shelters. Additional two shelters are under construction
Obtained environmental clearance certificate	Not yet conducted EIA
Formulated environmental and social management plan (ESMP)	Not yet done
Formulated community based disaster risk reduction (CBDRR) plan	Not yet done
Recruited WMG environment and DRR counselor	Not yet done
Members of WMOs included in UDMC	0
Opportunities for environmental and DRR activities	<ol style="list-style-type: none"> 1. The Cyclone Preparedness Program (CPP) is very active in the polder area. There are a number of 120 CPP volunteers under 8 units, 1 Union Disaster Management Committees, 2 NGOs (Speed Trust and World Concern) are working to reduce the risk of disaster. We could make linkages between WMGs and existing platforms for joint collaboration; 2. Awareness raising and encouragement of balanced fertilizer use, and the use of alternatives to chemical fertilizers; 3. The Bangladesh's Ministry of Environment and Forests is very active in this area with number of programs for coastal afforestation and reforestation as well as social forestry program. We could make an agreement with them for plantation program after completion of fine-tuning and rehabilitation works.

3. Development Action Plan

On the basis of the present situation and its key challenges as presented in chapter 2, a Development Action Plan has been prepared by the Blue Gold program, and is presented in this chapter.

3.1 Water Resources Management and Infrastructure

To plan a sustainable water management system, 1st consultation meeting for engineering needs assessment for polder 47/3 was held in Mithagonj on 18 January, 2017 in UP hall rooms. The chairman, respective UP members, BWDB officials, DAE officials and local stakeholders were present in those meetings. The decisions and list of rehabilitation items which were elicited from the meetings will be validated after the formation of WMOs. Land and Water Use Workshop were arranged in Mithagonj UP where UP chairman, DAE representatives, BWDB representatives and local stakeholders discussed about the present cropping system, raised water management related issues and possible solutions to address those issues. BWDB and BGP team members jointly discussed and pointed out the constraints of Blue Gold Program.

Embankment re-sectioning where the damage is severe, embankment retirement, repair/re-construction of structures with gates and re-excavation of major khals for drainage were considered as priority-1 work. Embankment re-sectioning in comparatively less vulnerable places, construction of WM culverts, construction of drain pipes and temporary protective works were considered as priority-2 work².

3.1.1 Summary of Rehabilitation Works

SL.	Name of Work	Units	Quantity	Estimated Total Cost, BDT
Priority 1				
1	Embankment Re-Sectioning	km	13.00	16,900,000
2	Canal/khal Re-excavation	km	16.00	20,735,890
3	Repair of Sluices	nos.	8.00	32,458,317
4	Construction of Sluice	nos.	1.00	16,000,000
5	Construction of Culvert	nos.	1.00	3,000,000
6	Inlet Repair	nos.	3.00	453,202
7	Outlet Repair	nos.	2.00	2,500,000
Priority 1 Total=				92,047,409
1	Canal/khal Re-excavation	km	2.00	3,000,000
2	Drainage Pipe	m	800	160,000
Priority 2 Total=				3,160,000
Total cost for Rehabilitation Works in Polder 47/3 =				95,207,409

Note: The items for rehabilitation works for this polder may be changed after WMA formation and joint field assessment by Zonal TA & BWDB engineers. Proposed rehabilitation plan is given in Figure 5

² Actually all works are needed for efficient water management and to reduce health and environmental hazards in the polder. However, since fund is limited, prioritization will give a scope for phasing out the work depending on DPP provision and availability of fund. Priority-1 works include activities that are related to the safety/immediate problem solution of the polder. Priority-2 works include activities that are required for proper functioning of the polder. If DPP allows and fund is available all works will be done.

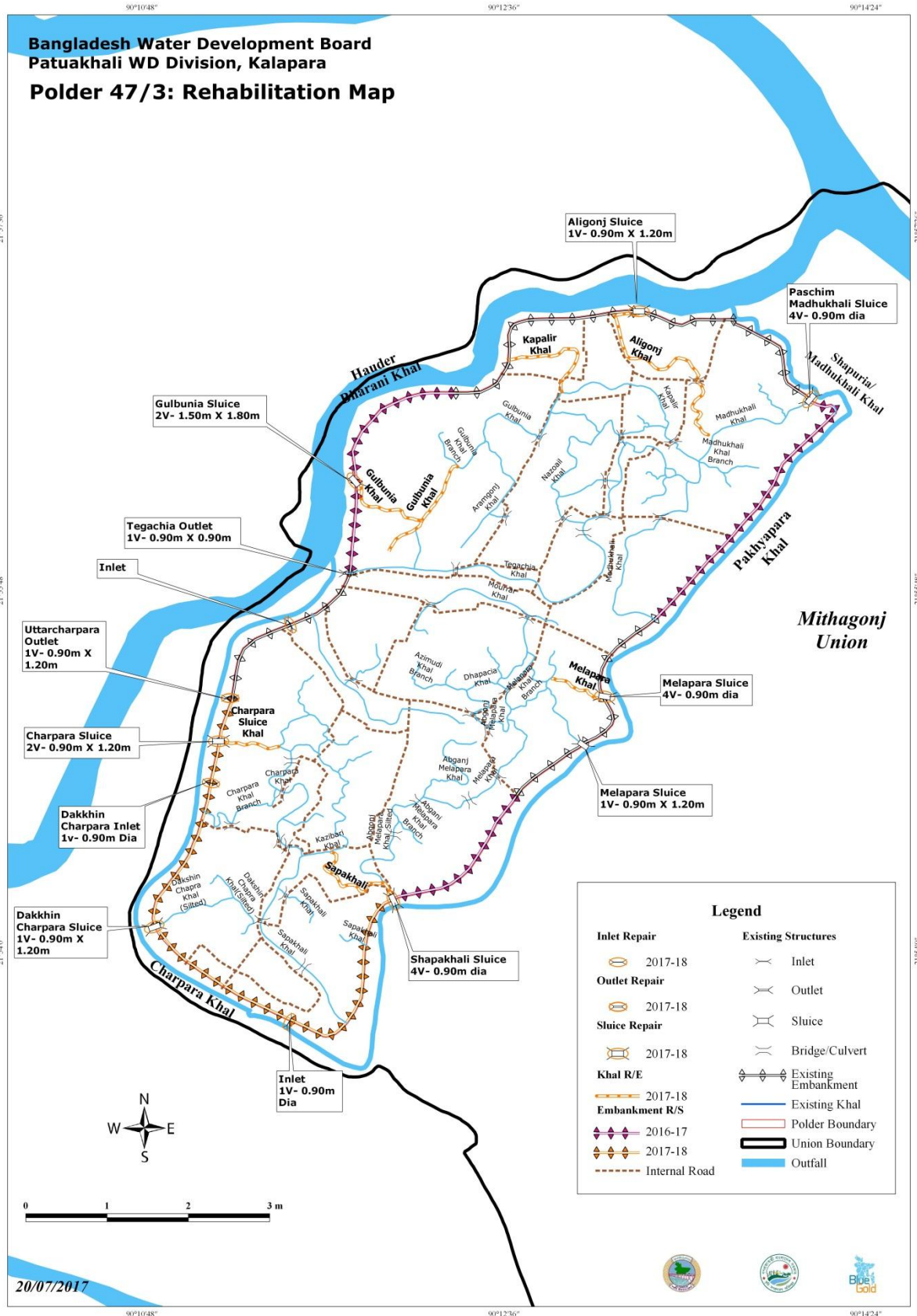


Figure 5: Proposed Rehabilitation Plan

3.1.2 Operation and Maintenance and Internal Polder Water Management

After rehabilitation the Water Management Association (WMA) will play an important role in operation and maintenance, on the basis of an agreement between the WMA and the concerned BWDB field Executive Engineer. The O&M agreement will identify all operation and maintenance activities in the polder and delineate sharing of the responsibilities between BWDB and WMA. Small routine maintenance works will be implemented by WMOs; and larger routine and periodic maintenance works implemented by BWDB. However, the real sharing can be anything according to the terms of agreement and mutual concurrence. The O&M agreement may also identify BWDB resources in the polder that can be used by WMA to partly or wholly mobilize resources for operation and maintenance. Technical knowledge will be provided by Blue Gold through training.

Based on this, in the first year after completion of rehabilitation, WMA's along with BWDB and TA Team will make operation and maintenance plans, implementation budget and resource mobilization plan. The WMGs will develop Internal Polder Water Management plans as part of their WMG Action Plans. All plans will be implemented by WMOs and BWDB with direct technical assistance from TA Team. In the second year after completion, as part of the exit strategy, WMOs and BWDB will make their plans as usual, but TA team will provide only backstopping support as and when required.

In the meantime, the TA team will continue to work with BWDB at different levels to find an institutional basis which will encourage effective commitment to and action for fulfilling the BWDB commitments under the O&M agreement with the WMA.

No.	Activity	Time Frame	Responsible Actors	People to involve
1.0	Engineering assessment and topographic surveys	2016-2018	BWDB, TA-Engineering team, Socio-Economists and Polder Team	UP, WMO members and local elites
1.1	Site survey, design data collection, detailed design and preparation of work packages			
1.2	Pre-work measurements			
2.0	Formation of Labour Contracting Societies (LCS)	2017-2018	WMG, BWDB, TA- Engineering team, Socio-Economists and Polder Team	LCS, WMA Monitoring Committee, WMA
2.1	LCS training (WMG) and contractor orientation			
2.2	Construction monitoring training to WMAs			
3.0	Draft contract, tendering and work award	2017-2020	BWDB, TA-Engineering team, Socio-Economists, Polder Team	WMA Monitoring Committee WMA and WMG Executive Committee
3.1	Resource mobilization and implement physical works like embankment re-sectioning/ construction, khal re-excavation and repair/construction of structures			
3.2	Construction monitoring			
4.0	Polder inspection and identification of O&M requirements	2017-2020	BWDB, TA-Engineering team, Socio-Economists, Polder Team	WMA Monitoring Committee WMA and WMG Executive Committee
4.1	O&M agreement			
4.2	Implement catchment level water management and O&M plan			
5.0	Internal Polder Water Management	2018-2020	SAAOs (DAE), XOs (BWDB), TA-Socio-Economists, Engineering team, Polder Team	WMA and WMG Executive Committee, UP
5.1	Identify WMGs interested to work along Community Agricultural Water Management (CAWM) model.			
5.2	CAWM planning			
5.3	CAWM implementation			
5.4	Monitoring of CAWM			

6.0	Back-up support in the yearly joint polder inspection and assessment of O&M requirements and CAWM	2018-2020	BWDB, TA-Socio-Economists, Polder Team and Engineering team	WMA and WMG Executive Committee, BWDB, UP
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3.2 Institutional Framework for Participatory Water Management

Activities to strengthen the Institutional Framework for PWM have been planned with multiple objectives: (i) to help the WMOs to become active and sustainable organizations, and able to participate responsibly in polder development activities (ii) stimulate effective women's participation (iii) to orient Union Parishads and other relevant stakeholders to support planned activities effectively.

Sl. No.	Activity	Time Frame	Responsible Actors	People to involve
1.0	Consultation meeting for Engineering Assessment	January 2017	Zonal and polder TA team, BWDB and DAE	UP, Potential Leaders
2.0	Conduct UP & Upazila orientation	2016-2018	Zonal and polder TA team, BWDB and DAE	UP, Upazila Administration
3.0	Identify and support existing collective actions (CA) and liaise with their leadership	January 2017 to June 2017	Zonal and polder TA team, BWDB and DAE	UP, Potential Leaders
4.0	Conduct walk-through, mapping with CA leadership & key informants and data collection (household survey)	March 2017 to Sept 2017	Zonal and polder TA team, BWDB and DAE	UP, Potential Leaders
5.0	Form Core Group of interested CA leadership	June 2017 to Dec 2017	Polder TA team, Socio-economists, BWDB	UP, Potential Leaders
6.0	Conduct WLUA workshop with Core Group	May 2017	Polder TA team, Socio-economists, BWDB	WMG and WMA members UP, BWDB, DAE
7.0	Conduct catchment-level planning meetings to define WMG boundaries and collective actions	May 2017	Polder TA team, Socio-economists, BWDB	UP, DAE, Potential Leaders, local stakeholders
8.0	Ad-hoc committee formation and review and update/amend by-laws in accordance with Participatory Water Management Rules 2014	Sep 2017-Oct 2017	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
9.0	Prepare PDP and submit to BWDB	August 2017	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
10.0	Facilitate and expand existing CAs through horizontal learning	January 2017 to June 2010	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
11.0	WMG EC formation and registration	August 2017 to February 2018	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
12.0	Promote and implement new CAs with WMG as identified in the catchment level planning meetings	March 2017 to March 2020	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE

12.0	Provide selective WMG foundation courses using experimental learning methods	October 2017 to June 2018	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
13.0	Support WAP formulation and implementation of CAs with relevant sub-groups	January 2018 to June 2020	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
14.0	Facilitate LCS implementation with WMGs	January 2018 to June 2020	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
15.0	Organise CA exchange visits/horizontal learning	January 2018 to June 2020	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
16.0	Facilitate networking and partnerships	August 2017 to Dec 2018	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
17.0	WMG Sub Committee formation (O&M Catchment Level & others in WMG Level)	January 2018 to July 2018	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
18.0	Regular catchment-level water management and O&M planning	January 2018 to July 2018	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
19.0	Continue assisting WMGs to improve performance	September 2017 to May 2020	Zonal and polder TA team, BWDB and DAE	WMG and WMA members UP, BWDB, DAE
20.0	Gender Workshop with LGI and other Stakeholders	January 2018 to April 2018	Zonal and polder TA team	WMG, UP, BWDB, DAE

3.3 Agricultural and Marketing Services

The agricultural production and business development aspects of the Development Action Plan focus on the development potentials and required actions in relation to crops, fisheries and livestock while taking into account development potentials of specific value chains.

Sl. No	Activities	Time frame	Responsible actors	People to involve
	Agricultural Services			
1.0	FFS on homestead gardening (vegetables and fruits), Poultry, Pond fish, beef fattening and Nutrition.	2017-2019	DAE, TA-Polder Team, Master Trainers, Agricultural Expert, FTs,	WMG and WMA members
2.0	a. Women focused FFS on homestead garden , poultry, pond fish, beef fattening, and nutrition; b. Demonstrations / trials on winter vegetables; and poultry, pond fish, beef fattening. c. Field day	2017-2019	DAE, TA-Polder Team, Master Trainers, Agricultural Expert, FTs	WMG and WMA members
3.0	Activities to improve livestock production: a. Poultry and nutrition FFS	2017-2019	DAE, TA-Polder Team, Master Trainers, Agricultural Expert, FTs	WMG and WMA members

	b. Livestock vaccine cold chain at WMG/WMA level c. Community Livestock Worker training d. Community Poultry Worker Training e. Field day on livestock activities			
4.0	Cropping intensity initiatives	2017-2019	TA-Polder Team, Master Trainers, Agricultural Experts,	WMG/WMA members
	Business Development			
1.0	Workshop with WMOs to promote CA, Business Planning and private company linkage	2018-2019	BDC, TA-Polder Team	WMG/WMA
2.0	Linkage Building meeting/Workshop with VC actors	2018-2019	BDC, TA-Polder Team, RFs	WMG/WMA
3.0	Workshop with GL/RF /FT/LF on agriculture development (FFS with market orientation) business networking and Linkage	2018-2019	BDC, TA-Polder Team, RFs	WMG/WMA
4.0	Linkage workshop between RF/CF/LF/FT & Market actors	2018-2019	BDC, TA-Polder Team, RFs	WMG/WMA/UP
5.0	Actors meeting with WMO for Linkage, Discussion negotiation and Intervention designing	2018-2019	BDC, TA-Polder Team, RFs	WMG/WMA
6.0	Promote and implement new CAs with WMG as identified in the catchment level planning meetings	2018-2019	BDC, TA-Polder Team, RFs	BWDB/DAE/UP/DLS/
7.0	Organise CA exchange visits/horizontal learning	2018-2019	BDC, TA-Polder Team, RFs	BWDB/DAE/UP/DLS
8.0	Input traders capacity building	2018-2019	BDC, TA-Polder Team, RFs	PS/DAE/DLS

3.4 Environmental Sustainability and Disaster Risk Reduction

The environmental sustainability and DRR aspects of the Development Action Plan focus on: i) compliance with social and environmental management regulations; and ii) strengthening DRR activities.

Sl. no	Activities	Time frame	Responsible actors	People to involve
1	Conduction of Environmental Impact Assessment (EIA) and obtaining Environmental Clearance Certificate (ECC) from DoE	2017-2018	Hired SPs	BWDB, DTL and TA-Env. Expert
2	Environmental compliance monitoring and quarterly reporting to DoE	3 months interval after obtaining ECC	TA- polder team and Env. Expert	CE/Sr. QCE/QCE from TA and XEN/ SDE from BWDB
3	Formulation of Environmental and Social Management Plan (ESMP)	Oct-Nov, 2017	TA-Polder team and Env. Expert	TA- ZSEs, Env. Counselors, BWDB

4	Formulation of Community Based Disaster Risk Reduction (CBDRR) plan	Oct-Nov, 2017	TA-Polder team and Env. Expert	TA-ZSEs, DRR Counselors
5	Coordination workshop with UDMCs and WMGs	Jan-Feb, 2018	TA-Polder team and Training Team	TA- Env. Expert, ZSEs
6	Recruit WMG's Environment and DRR Counselors	2017-2018	TA-CDFs, WMG-EC, hired SPs	TA- Env. Expert, ZSEs
7	Orientation to LCS Leaders, contractors & WMA leaders regarding Env. Safeguards & Conditions of Env. Clearance certificates.	July-Dec, 2017	TA-Polder Team, Training Team	Counselors, Env. Expert
8	Disaster preparedness and implementation of CBDRR plan	July 2017 to June 2019 (during dry months)	BWDB and WMA/WMG, Upazilla, UP, Agriculture Office	Polder Team, Engineer team and Env. Expert
9	Training to Env. and DRR Counsellors and UDMCs on Env Safeguard and Dis.Mgt/Coordination workshop with UDMCs	July 2017 to June 2019	BWDB and WMA/WMG, Forest Department, UP	Polder Team, Engineer team and Env. Expert
10	Awareness on disaster preparedness and WatSan	July 2017 to June 2019	Env. and DRR Counselors, WMA and WMG president, BWDB, UP	TA-Polder Team
11	<p>Awareness raising program</p> <p>a. Discussion on using fertilizer and pesticide use, and reducing indiscriminate fishing practices from the natural wetlands at WMG meeting, FFS & MFS session and FFD</p> <p>b. National and International Day observance related to environment and DRR (i.e. World Environment Day, National Disaster Preparedness Day, International Day for Disaster Reduction etc.)</p>	March 2016 to June 2018	Env. and DRR Counselors, TA-Polder Team	Env. Expert, Zonal Socio-Economists
12	Integrate ESMP and CBDRR with the WAP, Annual Polder Action Plan and UDMC's DRRAP	2017-2018	TA-Env. Expert, ZSEs, CDFs	WMA & WMG executive committee and DRR Counselors.

4. Planning Timeline

**Blue Gold Program, BWDB
Polder Completion Timeline (Overall Activities)**

Polder - 47/3

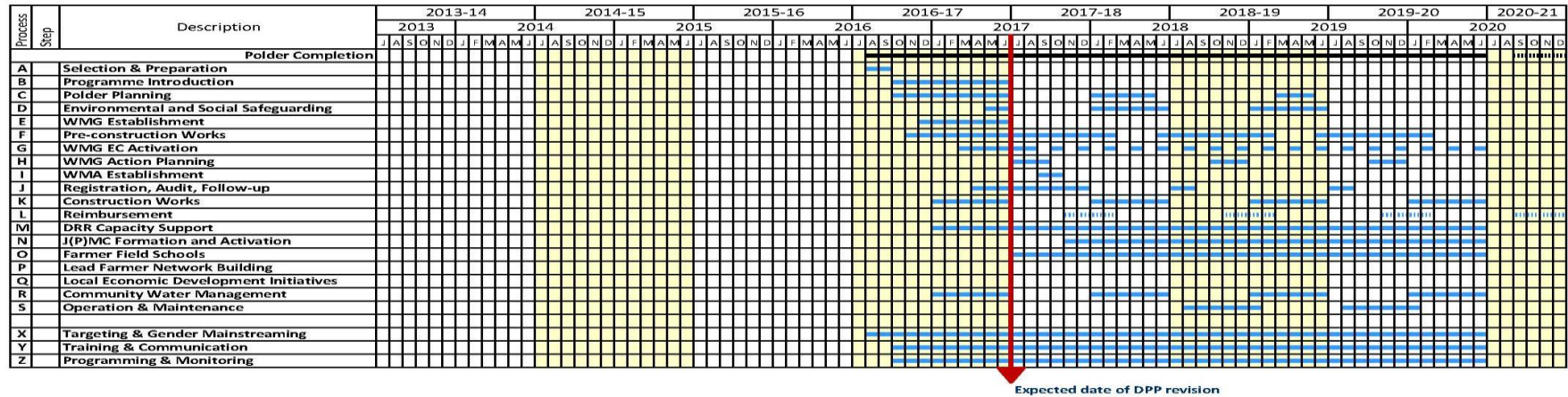


Figure 6: Polder Completion Timeline

5. Polder Budget

The overview of the estimated allocated budget for polder activities in polder 47/3 is presented in Table 6.

Table 6: Polder Budget

S.N	Task Name	Total Amount	
		BDT* ^{x100000}	EUR** ^{x1000}
1.0	Institutional Framework for Participatory Water Management	8.00	9.41
2.0	Main Infrastructure	936.47	1101.73
3.0	Internal Water Management <i>(Polder-wise budgets are based on an average amount per CAWM-site. In reality budgets will vary per CAWM-site)</i>	10.00	11.76
4.0	Agriculture & Marketing Services <i>(Actual polder-wise budgets will be higher as exact #FFS per polder will be determined later, estimated DAE contributions have been included in these estimations)</i>	60.00	70.59
5.0	Environmental & Social Management / Disaster Risk Reduction (DRR)	35.00	41.18
6.0	Training and communication	25.15	29.59
	TOTAL	1074.62	1264.26

Note: Exchange rate is 1 EURO=85 BDT

Appendix 1. PDP Formulation Process³

The Blue Gold Program makes use of the 6-step planning approach described in the Guidelines for Integrated Planning for Sustainable Water Resources Management (IPSWARM) that was adopted by the BWDB in 2008 for its medium sized existing Flood Control and Drainage schemes. Polder Development Plans are the 4th step which follows after the participatory data collection and needs assessment (step 2) and the formation of WMOs (step 3).

In the PDP Formulation Process one can distinguish the following activities/tasks and their outputs (see Figure 6)

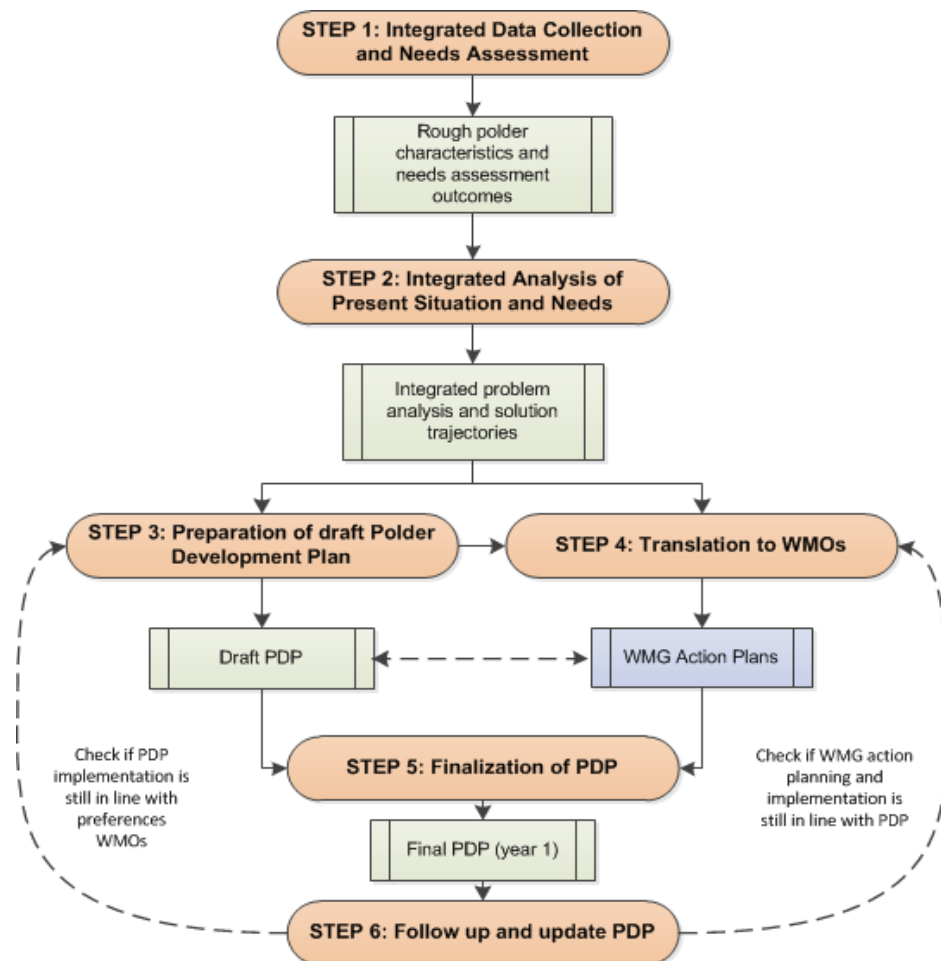


Figure 7: The steps of the PDP Formulation Process

Explanation of the different steps:

STEP 1: Integrated Data Collection and Needs Assessment: For the purpose of planning, data is collected through various methods: collection of existing information from governmental departments, observations in the field, and informal interviews with people living in the polder area and key stakeholders, focus group discussions, consultation meetings, engineering surveys, agricultural surveys and value chain mapping and analysis. The various components do their field data collection individually, but coordinate their work to avoid overlap, gaps and misunderstanding among WMOs. The results and outcomes of each

³ For the preparation of this PDP, focus group discussions were conducted with potential leaders and UPs. Polder Team and Zonal Experts were actively involved to in the process of specific data collection. In the case of polder 47/3, after drafting the PDP it was shared with the representatives of potential leaders and UPs for data validation and updating

field visit, meeting, interview or focus group discussion are recorded. Data among others includes the Integrated Needs Assessment executed by component 1 and 2 (WMO strengthening); engineering survey details collected by component 2 and data collected by component 4 in relation to the value chain selection and analysis. The rough data are managed by the GIS specialist and used to generate specific geo-information maps or figures, which are published on an open source website (Lizard Portal).

Outputs:

- Rough data of polder characteristics
- Needs assessment report

STEP 2: Integrated Analysis of Present Situation and Needs: The integrated data collection and needs assessment is used to describe the present situation of the polder by summarizing the collected info in tables, figures, pie charts and maps with supporting text, as one of the core chapters of a PDP. The present situation in combination with the Needs Assessment is an input for a joint SWOT (strengths, weaknesses, opportunities, threats) analysis workshop within the Blue Gold Team. The outcomes of this SWOT exercise are used in a second workshop at polder level to formulate solution trajectories and activities for polder development. Extra attention is paid to address the severity of problems and the potential of opportunities while selecting activities. The fact that Blue Gold has a limited scope and budget, and cannot address all needs, only those connecting to program objectives and those financially feasible are taken in consideration.

Output:

- An integrated problem analysis and solution trajectories

STEP 3: Preparation of draft Polder Development Plan: After the integrated analysis, a draft Development Action Plan (including actions related to strengthening WMOs; water resources management; agricultural production; business development; sustainable environmental management; community based disaster risk management; gender and institutional strengthening) is developed. The Blue Gold Team organises an internal meeting to make sure the planned activities across components are coherent and support each other and cross-cutting issues are integrated well (avoid overlaps and gaps). The draft Development Action Plan is integrated with the present situation and the integrated problem analysis and solution trajectories to result in a draft PDP.

Output:

- Draft PDP

STEP 4: Translation to WMOs: Since the WMOs yet not formed, so the draft PDP is being developed through active involvement of potential leaders, UP members and collective action groups. When the WMOs will be formed then the draft PDPs will be presented among them for validation. The Blue Gold staff will support the WMOs to prepare a WAP on the basis of their preferred actions and the draft PDP.

Output:

- WMG Action Plans (WAPs)

STEP 5: Finalization of PDP: On the basis of feedback provided by the potential leaders and possibly other stakeholders like UP, the Blue Gold Team finalises the PDP. The PDP is forwarded to interested stakeholders and a limited campaign for awareness creation at local level is planned and carried out.

Outputs:

- Final PDP

STEP 6: Follow-up and update of PDP: Field staff of Blue Gold initiates the implementation of activities with WMOs. Regular follow-up meetings are held, participatory monitoring to keep track of implementation is stimulated and the WAPs are regularly updated by the WMGs. Furthermore the developments of specific value chains, gender issues, disaster risk reduction and environment actions, which are to be incorporated in the WAPs, are discussed. If required, PDPs are updated after 1 or 2 years.

Appendix 2. Water Management Infrastructure of Polder 47/3

Embankment: Total length of the embankment around polder 47/3 is about 19.71 km. There are two types of embankment in this polder one is interior dyke embankment with a crest width of 4.30m, crest level of 4.88m PWD.C/S slope 1:2 & R/S slope 1:3 and another is marginal dyke embankment with a crest width of 2.44m, crest level of 4.57m PWD.C/S slope 1:2 & R/S slope 1:2

Sluices: There are 8 Sluices in this polder. These are:

S.N.	Name of Sluices	Number of Vents	Size, (mxm)	Location, km
1.	Paschim Madhukhali	4	0.90 m dia	0.00 km
2.	Melapara-1	4	0.90 m dia	3.900 km
3.	Melapara-2	1	0.90mX1.20 m	4.300 km
4.	Shapakhali	4	0.90 m dia	6.900 km
5.	Dakshin Charpara	1	0.90mX1.20 m	10.500 km
6.	Charpara	2	0.90mX1.20m	12.400 km
7.	Gulbunia	2	0.90 m dia	15.600 km
8.	Aligonj	1	0.90mX1.20 m	19.300 km

Drainage Outlets:

S.N.	Name of Outlets	Number of Vents	Size, (mxm)	Location, km
1.	Dakshin Charpara Outlet	1	0.90mX0.90m	8.900 km
2.	Uttar Charpara Outlet	1	0.90mX1.20 m	12.800 km
3.	Tegachia Outlet	1	0.90mX0.90 m	14.200 km

Irrigation Inlets:

S.N.	Name of Inlets	Number of Vents	Size, (mxm)	Location, km
1.	Dakshin Charpara Inlet	1	.90 m dia	12.00 km
2.	Inlet	1	.90mX.90 m	13.800 km

Khals: There are about 38 recognizable khals with branches and having a total length of above 60.00 km.