

Breaches to Polder Embankments

Key Messages from Blue Gold

Good morning Your Excellency, Ambassador of the Netherlands and Director General BWDB, colleagues, ladies and gentlemen



SLIDE 1

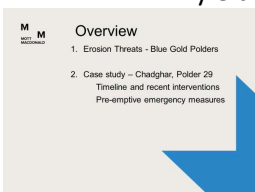
Introduction

1. All of those who live and work in the SW face the consequences of erosion damage to polder embankments. And the majority of the engineering professionals here in the audience will have practical experience of the consequences of breaches to polder embankments in the SW coastal region of Blue Gold.
2. But those who are resident in the polders, and whose families and livelihoods are dependent on the exclusion of flood waters from the polder bear the brunt of the consequences when polder embankments fail. And there can be an enormous social and economic impact when this happens.



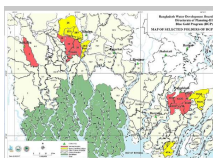
SLIDE 2

3. The flooding which results from a breached embankment impacts on the lives and livelihoods of polder communities.
 - a. In severe cases, loss of life
 - b. Immediate loss of economic production - crops, fish/shrimp/prawn, poultry, livestock, and businesses
 - c. Damage to infrastructure – roads, utilities, homes, shops, schools
 - d. Longer term impacts - If the waters that enter the polder are saline either during the initial flood event or when the breach remains open in the longer term when more saline river waters are able to enter the polder, long term damage can be caused to the soil structure, resulting in lowered crop yields over a number of years until unwanted salts have been leached through the soil profile.



SLIDE 3 - Overview

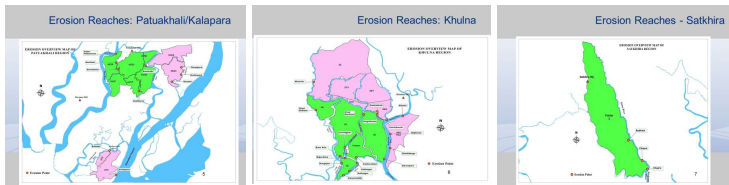
4. My presentation today is not from the perspective of a specialist river engineer, but as a team leader who witnesses the impact of embankment breaches on people's lives and the difficulties faced by BWDB's field staff in the O&M Divisions in taking appropriate action. And I bring as a particular illustration, a breach in Polder 29 close to Chandghar village, on the banks of the Lower Bhadra River.
5. This is a location that some of you will have visited over the years – including the Ambassador and First Secretary..



SLIDE 4

Background to Blue Gold

6. Blue Gold works in 22 polders spread across Patuakhali, Barguna, Khulna, Bagherat and Satkhira.



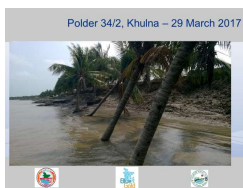
SLIDES 5, 6 and 7 – Maps of Severe Erosion Damage

7. Of these 22 polders, our recent records show that there is active threat to 13 polders at 29 different locations.

Patuakhali/Kalapara: severe erosion affecting 10 reaches of 5 polders (out of 10 polders)

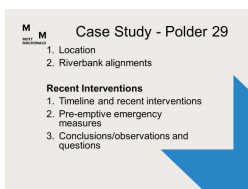
Khulna - severe erosion affecting 16 reaches of 7 polders (out of 11 polders)

Satkhira - erosion affecting 3 reaches of 1 polder (Polder 2)



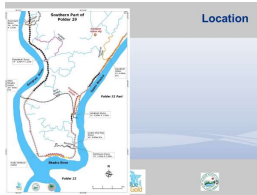
SLIDE 8

8. What happens when a field XEN is confronted by a threat such as that in this slide – which requires a series of decisions – should they go for embankment retirement, do they have agreement from the community to provide land for the retired embankment, do they have a budget for land acquisition, will the community accept an alignment of the embankment sufficient to ensure embankment integrity for a period of (say) ten years – and this can be up to 100m away from the face of a bank which is being actively eroded?
9. When you consider that the Board is responsible for 139 polders in the coastal zone, the scale of the problem is clear.



SLIDE 9

CASE STUDY – POLDER 29



SLIDE 10

Location

- Chadghar village is located in Sharafpur union of Dumuria upazila in Khulna district, close to the eastern perimeter bund of Polder 29 and adjacent to the Lower Bhadra river.

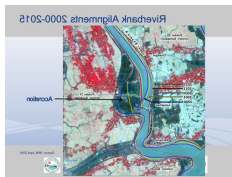
Note on slide

Sharafpur Union HQ

Chadghar village

Erosion reach just north of Jaliakhali Sluice (which drains Mora Badri Nadi Khal)

Also erosion at Baro Aria – and across the Bhadra River in Polder 22 at Bigordana



SLIDE 11

- Since the creation of the polder in 1968, the embankment has been prone to river erosion and the embankment in this reach has been eroded eleven times. During IPSWAM (2004-2011), the embankment was eroded twice.

- Satellite image shows the shifting riverbank alignment 2000, 2001, 2009, 2011 and 2015.

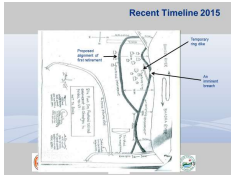
- Accretion is also shown on the left bank (around 67ha from 2001 to 2009)



SLIDE 12

- 2014 Dry Season:** For the sake of this discussion, let us start the timeline from dry season 2014. Several meetings were held with WMGs, WMA and UPs regarding possible courses of action, finally recommending a retired embankment at a sufficient setback distance (min. 100m). The community was unwilling to accept embankment retirement as they had already lost huge amount land during last decades because of erosion as well as retirement.

- 2014 Monsoon:** Further erosion of embankment with reaches close to Chandghar now in a critical state, and vulnerable to collapse. WMA, WMGs, UP and Field XEN had several meetings at the erosion site trying to convince the people to allow land for a retired embankment.



SLIDE 13

16. **2015 Dry Season:** The recommended alignment of retired embankment some 100m distant from the active river bank. Local community (Chatchatia Sluice WMA - known as “CS WMA” in 2015) objects because no offer for land acquisition or compensation, and many houses and land would be outside the proposed embankment and be at risk. Eventually, the WMA accepts an alignment which was too close to the actively eroding river bank. Although the diagram shows a 60/75m set-back, the retired embankment was in fact much closer.

April 2015: construction contract for the retired embankment was awarded.



SLIDES 14, 15

In the meantime, apprehending probable danger the local UP did some backing of the embankment in several reaches. In some places they also used porcupines using BWDB designs. Local people also tried with different techniques but nothing worked well.



SLIDE 16

There was almost an imminent breach at one location and apprehending the danger the field XEN constructed a ring dike in the countryside of this point.

17. July 2015: Site visit by BWDB identifies physical progress of the ongoing work was approximately 20%, poor quality earthwork too close to river bank (ca 20m) – community opposition to BWDB/TA (contrasted with measures provided by CEIP).



SLIDE 17

Breach - July 2015

18. On 30 July a depression developed in the Bay of Bengal and finally turned in to a cyclone called “Komem”, which crossed the shoreline on 31 July 2015. The original embankment breached at the end point Baintala khal during high tide compounded by effect of cyclone Komen accompanied with heavy rainfall, resulting in flooding and damage to houses and crops. The breach also developed three deep channels across the alignment of the underconstruction retired embankment, making continuation of work very difficult.



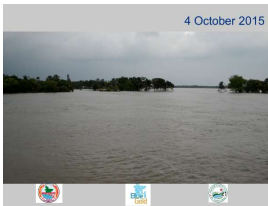
SLIDE 18

19. According to preliminary reports, the flood affected about 9 to 11 villages under Dumuria Upazila and 2 villages under Shurkhali Union of Batiaghata Upazila of Khulna District. About 1286 households were affected, 404 houses were totally damaged and 325 houses were partially damaged. Some 684 gheres were destroyed. T. Aman seedlings were damaged in about 30 ha of land and vegetables were damaged in about 20 ha of land. A vast area of land was covered by silt.



SLIDES 19/20

20. Emergency measures were taken up by Union Parishad with technical advice from BWDB using the local community and the help of WMA. They attempted to construct a ring dike at the country side of the existing embankment. Although all efforts were made to close the breach, they were prevented by high velocity flows.



SLIDE 21 – 4 October 2015

Cost Increases for Emergency Work

21. One of the problems faced by the field XEN who represents the Board to the polder community – is that the funds for “emergency works” are allocated only after a breach has occurred. At this stage, costs for repair are much more expensive:
22. Land in the vicinity of a breach is flooded, so:
- a. borrow pits with soils suitable for use in embankments are generally not available close to the site of a breach, so there is a cost of haulage – delivering materials to the site of the breach
 - b. It is difficult to get machinery, equipment and materials to the site of a breach, so labour gangs are used and boats are used to deliver equipment and materials
 - c. Access by land to the site of a breach is restricted, along narrow embankments especially constructed to gain access to the breach site
 - d. Soil from borrow pits is often saturated, and achieving acceptable level of soil compaction at high moisture content is impossible
23. In tidal reaches of coastal rivers,
- a. the effective working time for a contractor is limited to 4 hours in two sessions either side of high or low tide (depending on the tidal regime during daylight hours).

- b. the velocities either side of high tide can be very considerable. In these conditions, the final closure of breaches often requires driving bandals to contain earthfill geotextile bags – so that they are not swept away by the high velocity flows.



SLIDE 22

2016 Dry Season

24. To close the three breaches (deep channels/creeks) formed during monsoon 2015 and to protect Chandghar region, BWDB's Design Circle designed a new embankment with three closures provided with a minimum set-back distance of 100m.
25. 14 February 2016: Contract awarded, although it was reported that start of construction of retired embankment by was delayed because of the Union Parishad elections.



SLIDES 23/24

26. Closure of the third creek "breach 3" – the site shown in the earlier slide with the high velocity flows. An immense amount of work was involved in driving bullah piles.



SLIDE 25

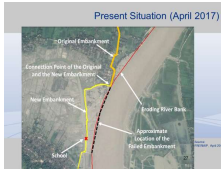
27. In late-May and early-June, repeated attempts to close the channel of the third creek failed as the inter-tidal velocities were too high. It was finally closed on 28 June 2016. The main embankment was still very weak but intact. Bamboo pins, bandalings and sand bags were used to close the main breaches.



SLIDE 26

2016 Monsoon/2017 Dry Season

28. The embankment withstood the 2016 floods.
29. Repair works from 2015/16 and are still only 50% complete: a stretch of land acquisition prevents closure of the embankment and a primary school on the alignment of the embankment has to be relocated.



SLIDE 27

Pre-2017 Monsoon Intervention

30. A reconnaissance visit (on 13th March 2017) was made to the site of the breach by a specialist river engineer, the FRERMIP team leader.

Both FRERMIP and BGP incorporate pilot works into their design with the purpose of testing innovative, low-cost structures and river training approaches relevant to the project concepts. They are both part-funded by the Dutch Government – although in the case of FRERMIP, it is routed through the ADB.

31. During the field trip, the thalweg of the incoming high velocity spring tide flows were close to the riverbank in the area of the breached embankment.



SLIDE 28

32. The overall situation indicates the need for emergency riverbank protection, to control the riverbank, using sand-filled geotextile bags along the bank. These bags, once undercut from erosion slide down the underwater slope and protect the slope against further erosion, as the sand-fill acts as filter against the fine clayey and silty subsoils.

33. But this type of emergency design has limitations, which need to be further investigated

- a. The underwater slopes of the eroding banks need to be studied, to assure that the launching process can take place – commonly slopes of around 1V:2H are attained after launching, but could be steeper in case of clay banks, even up to 1V:1H.
- b. The scour depth needs to be fixed, to correctly calculate the required number of bags

34. A rough cost estimate of the work, indicates a sum of USD 210,000 is required for the emergency works. In addition, an estimated cost of the survey work is BDT 35 lakh (or USD 43,000)

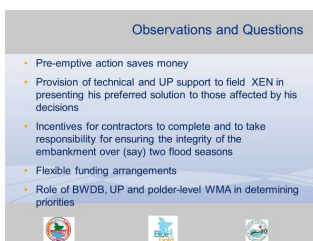
35. We are now running out of construction time for even this emergency work, so the consequences for the community look bleak.



SLIDE 29

Conclusions from Case Study

36. There was every effort made to do the right thing. An immense investment of time and effort has been made by all: BWDB, community and UP.
37. A considerable investment has been made and there has been significant economic impact on the community – both the infrastructure and livelihoods.
38. The uncertainty continues over a long period - our case study dates back three/four years to 2013/2014. And this means the community has been in a vulnerable condition and is understandably unwilling to make long term investments whilst there is such uncertainty.
39. There is a need to act in the short time now available to finalise the current contract for the, and to take measures to prevent a breach in monsoon 2017



SLIDE 30

Some Observations and Questions

40. Let me preface this section of my presentation by appreciating that this case study is repeated in many different polders and is all in a day's work for many BWDB field staff.
41. One of the Board's main responsibilities is to ensure the integrity of the polder embankment and to thus protect the vulnerable communities who live in the polders.
42. We believe there are two good reasons to take pre-emptive action to strengthen vulnerable embankments before they fail:
 - a. Because the cost of repair of damaged infrastructure (embankments, sluices etc) is reduced; and
 - b. Because the cost in terms of human lives, and damage to crops, livestock, businesses and households can be prevented.

I appreciate that there are good reasons why so called "emergency funds" are only released after failure of an embankment. But I ask for a reconsideration..

43. The field XEN is under immense pressure – the predecessor of the current XEN found it impossible to continue in the face the community's hostility..
 - a. He needs a rationale for solution and alignment of retired embankment – based on objective recommendations.

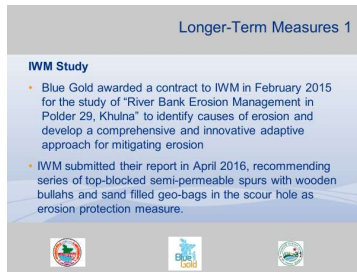
? What can be done about design principles for interventions so that the field XEN is not subject to pressure from the community to relent to an alignment of the retired embankment which is too close to an active eroding riverbank?

? Can there be a specialist design team with practical experience of erosion measures who visit, prepare recommendations and explain them to the local community – not as a basis for negotiation but the best practice.

- b. He needs to have his proposed technical solution supported by the UP, UZP and any local MP in order to obtain community acceptance and support, and land provision

- 44. Incentives for contractors to complete the job on time and to a good quality, and to be responsible/accountable for successful implementation and holding back floodwaters during monsoon.
- 45. Making funds available for repair measures is a challenge. Embankments damaged during the monsoon/flood season may only be identified as floodwaters recede, say in September or October. Surveys, designs and estimates for the repairs to these embankments can only then take place in November/December. So this means that the budgets for these works can only be introduced in early-February during the preparation of the revised annual development plan (RADP), and then approved by MoWR in March. So the tender and construction window is then four months from March to June (when the onset of the monsoon can prevent work from continuing).
Can more flexible funding arrangements be found so that an early and accurate solution can be identified and implemented on time?
- 46. What role can BWDB and the polder-level WMA (who together have an O&M agreement) play in determining priorities for urgent investment in pre-emptive works?

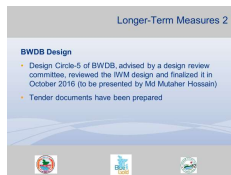
Longer-term measures



SLIDE 31

Study by Institute of Water Management

47. In February 2015, IWM was awarded a contract to conduct a study of "River Bank Erosion Management in polder 29, Khulna" to identify the causes of erosion and develop a comprehensive and innovative adaptive approach for mitigating erosion.
48. IWM's final report (of April 2016) recommended series of top blocked semi-permeable spars with sand filled geo-bag in scour hole as erosion protection measure.



SLIDE 32

BWDB Design

49. BWDB Committee Design circle-5 of BWDB supplied the design as per recommendation of the report in October 2016. Md Mutaher Hossain will be presenting his design later this morning.

SLIDE 33

