

Tidal River Management  
in the Lower Bengal Delta

# Tidal River Management

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## in the Lower Bengal Delta

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Gourango Nandy  
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March, 2020

@ Environmental Science Discipline, Khulna University

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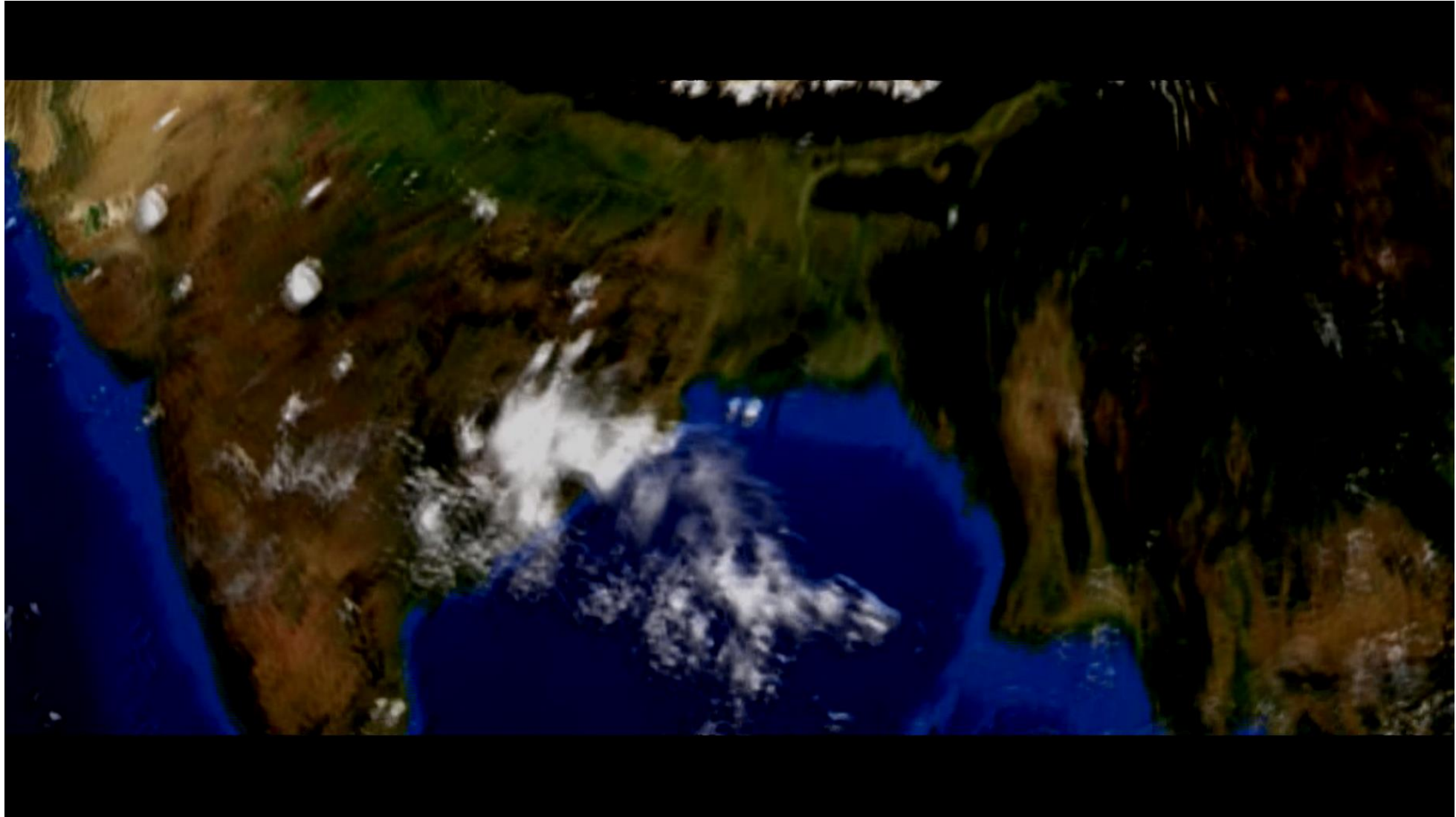
A product of the research project *Strengthening Strategic Delta Planning Processes in Bangladesh, the Netherlands, Vietnam and Beyond* supported by the **URBANIZING DELTAS OF THE WORLD** programme of the *Netherlands Organization for Scientific Research (NWO)* under project # W 07.69.106

An aerial photograph of a wide river delta, likely the Lower Bengal Delta, showing a large body of water with several small boats. The river curves to the right, bordered by a densely populated area with buildings and trees. In the foreground, there are some smaller water bodies and structures. The sky is overcast and hazy.


## Tidal River Management in the Lower Bengal Delta

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A satellite image of the Bengal Delta, showing a vast network of river channels and distributaries flowing from the north into the Bay of Bengal. The land is a mix of green and brown, indicating different vegetation and soil types. The water in the Bay of Bengal is a deep blue. The text is overlaid on the right side of the image.

The Bengal Delta – the largest and most inhabited deltas of the world – has a geological history of more than a million year. However, the delta attained its present shape during the last 10 to 11 thousand years

Tamir River Management  
in the Lower Bengal Delta

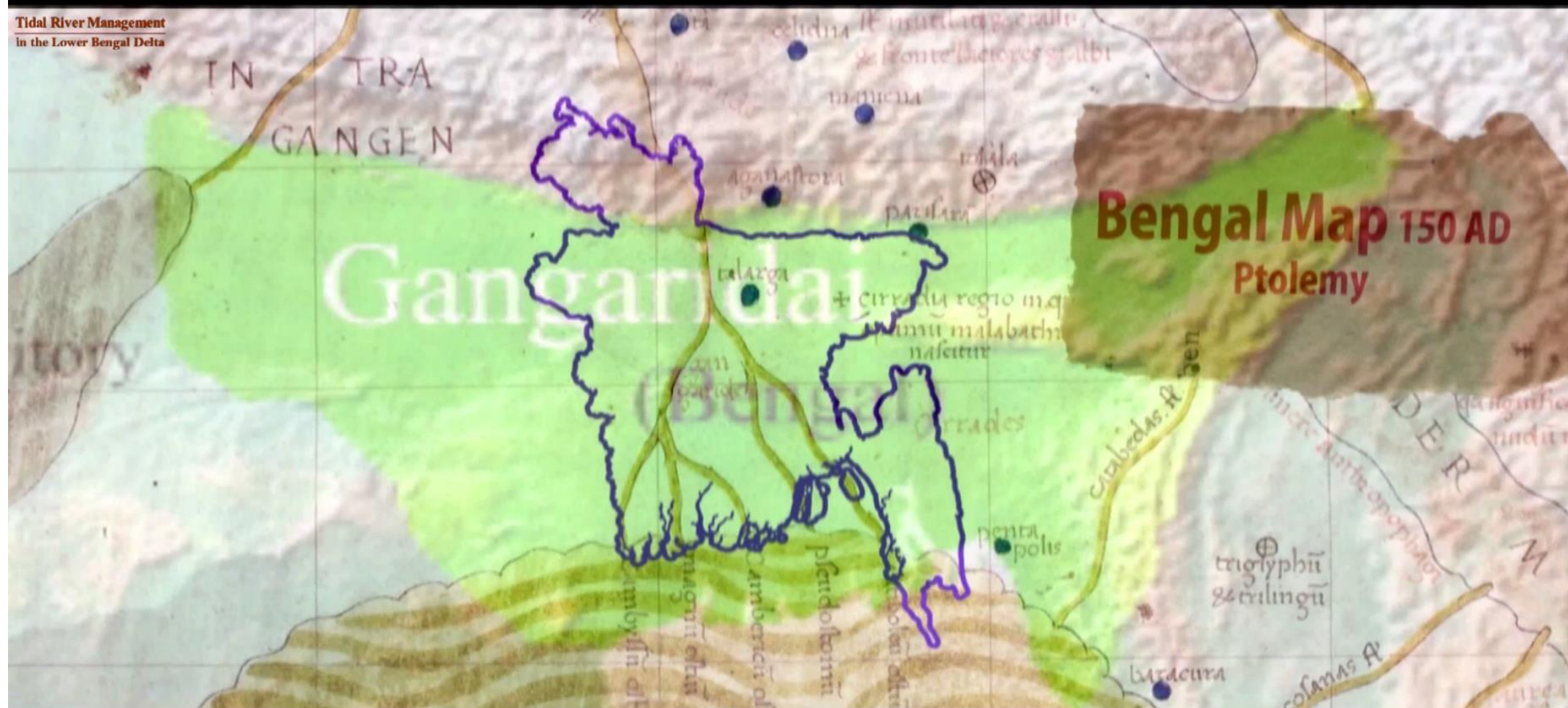




Human settlement  
started in the Bengal Delta  
from around 3 thousand  
years before present –  
mostly by premature  
reclamation of virgin lands





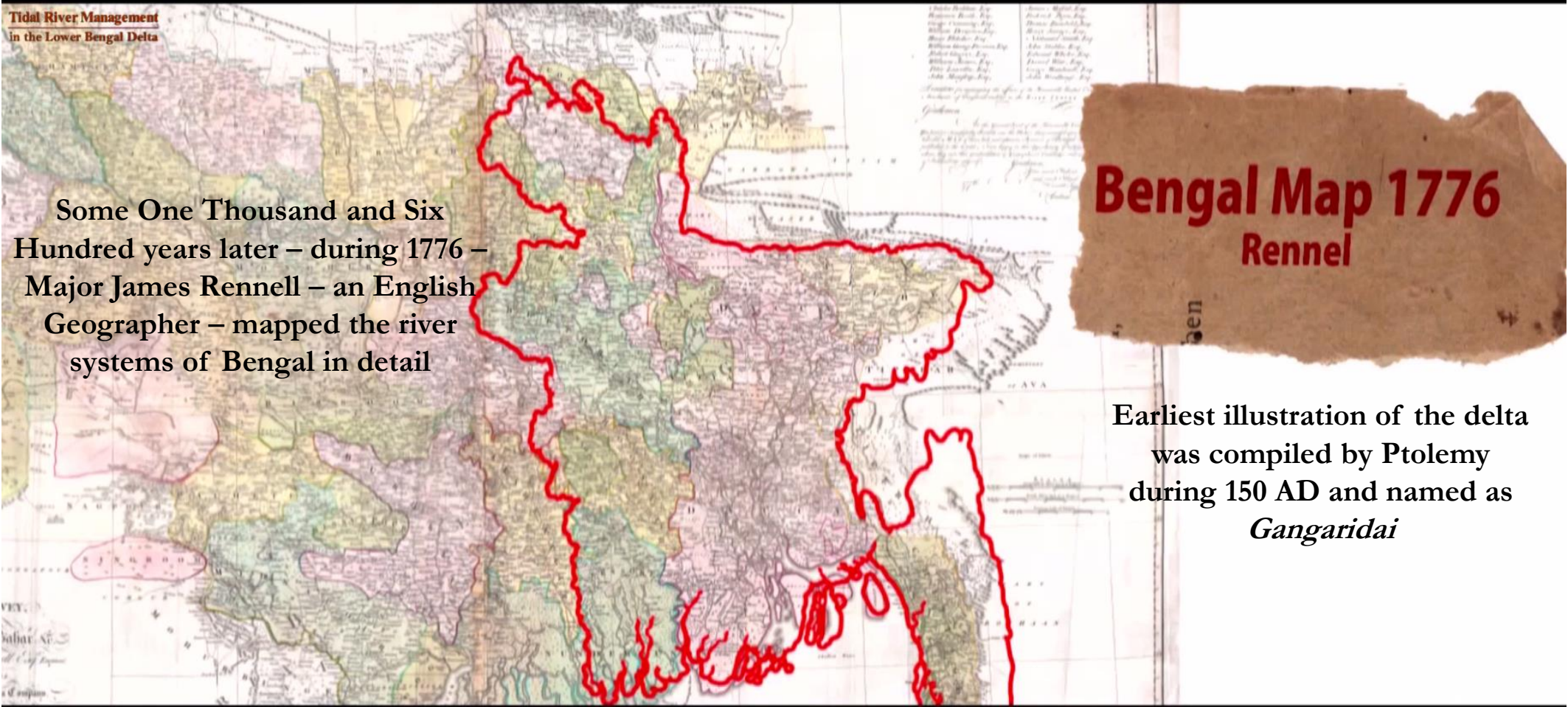


**Tidal River Management  
in the Lower Bengal Delta**

Some One Thousand and Six  
Hundred years later – during 1776 –  
Major James Rennell – an English  
Geographer – mapped the river  
systems of Bengal in detail

**Bengal Map 1776**  
Rennel

Earliest illustration of the delta  
was compiled by Ptolemy  
during 150 AD and named as  
*Gangaridai*

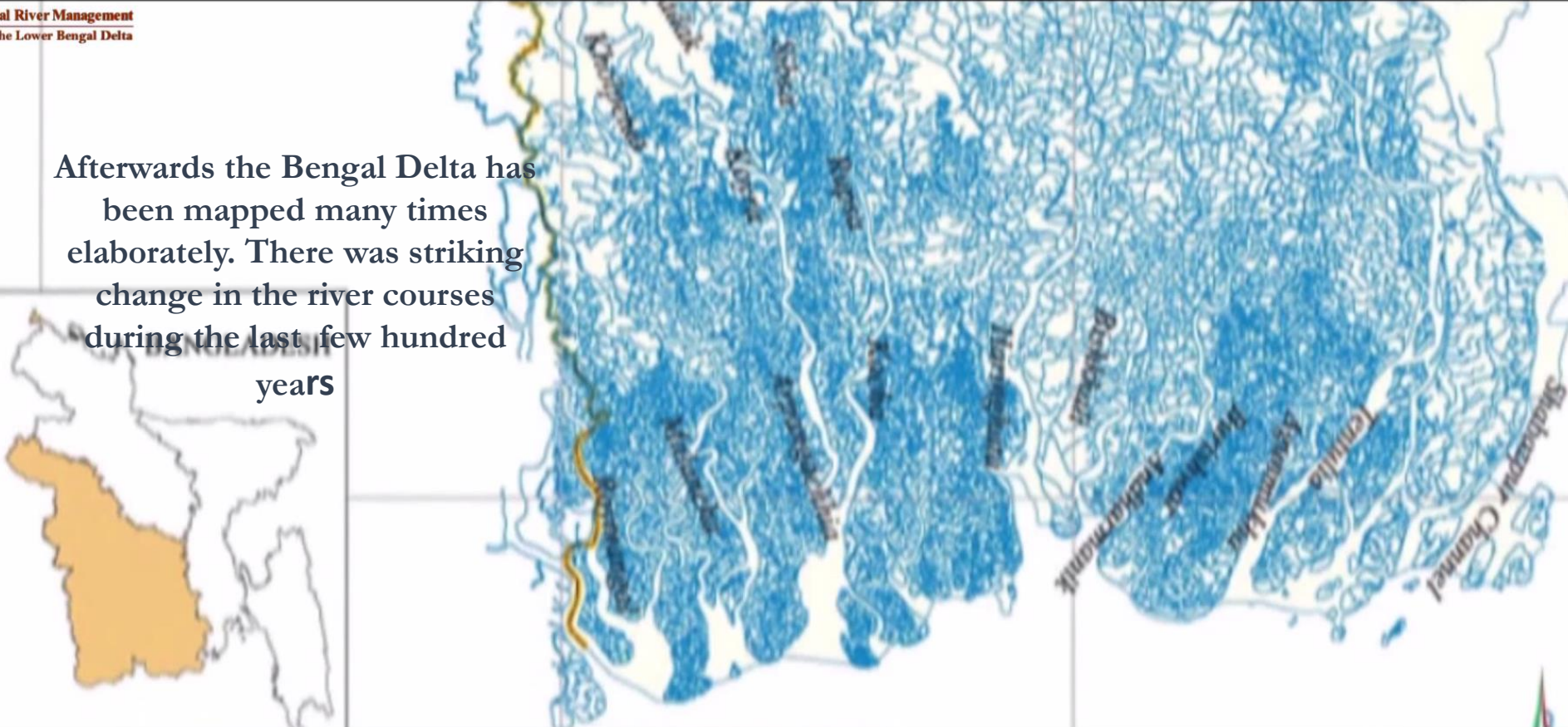


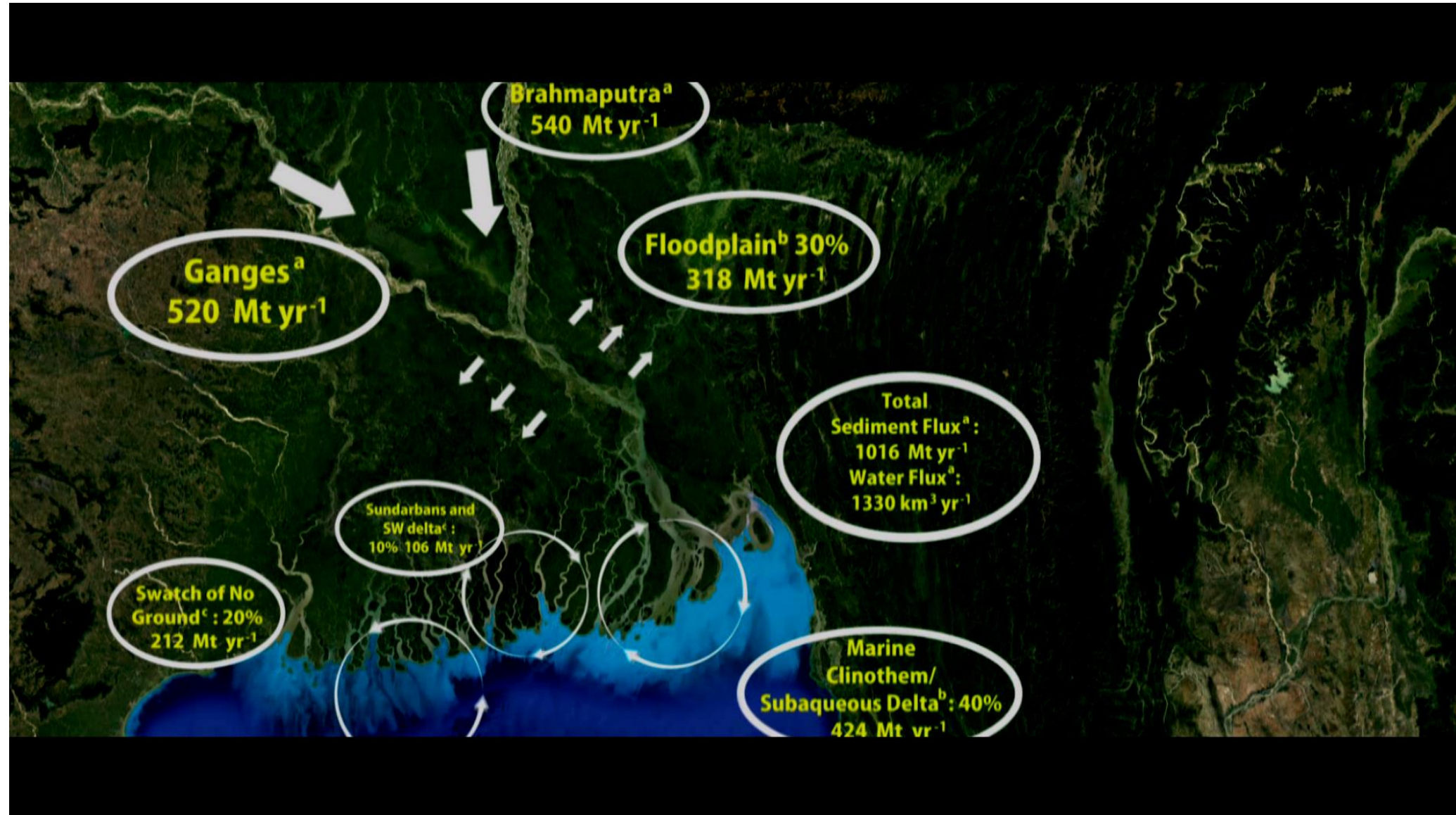


**Bengal Map 1949**  
**US Army**

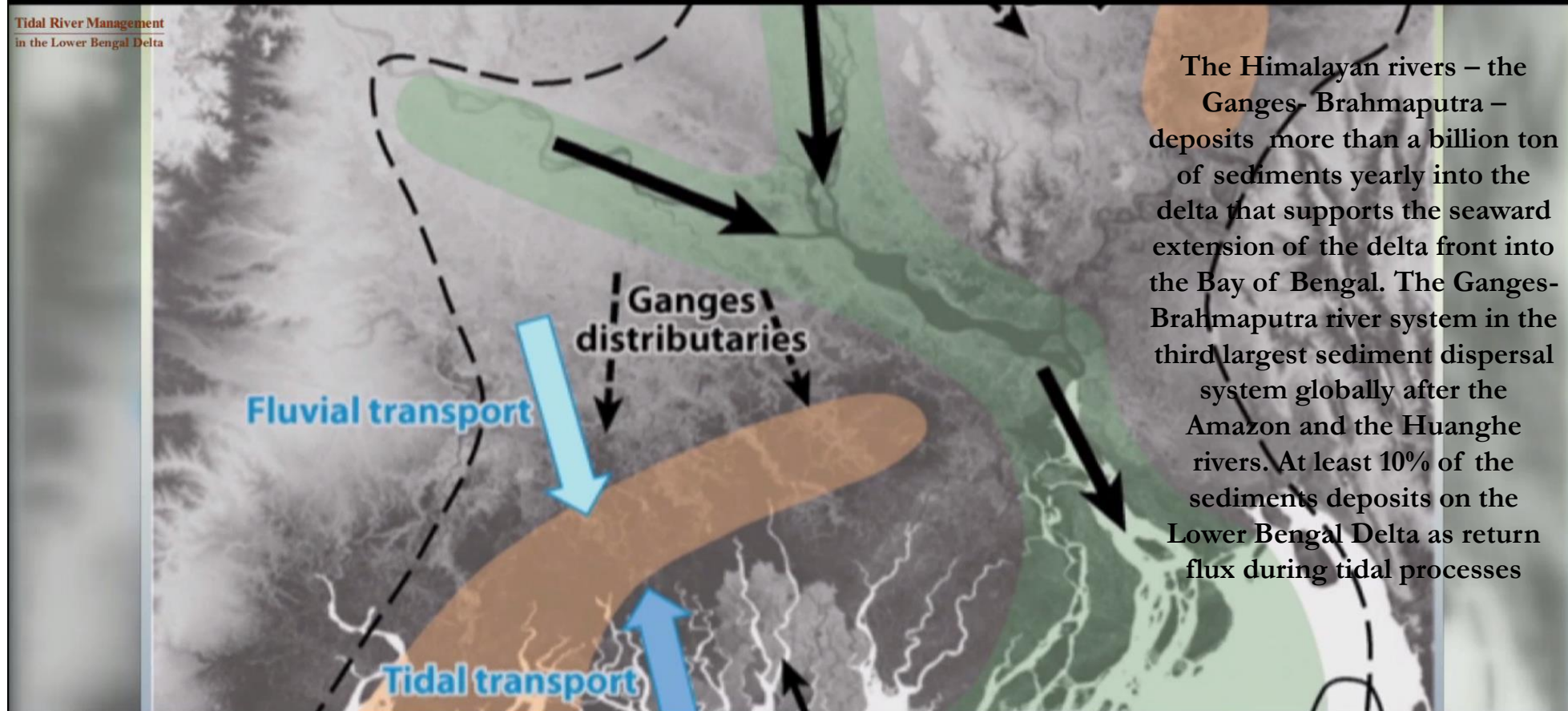


Afterwards the Bengal Delta has been mapped many times elaborately. There was striking change in the river courses during the last few hundred years











Tidal River Management  
in the Lower Bengal Delta



The efforts of water management in the Lower Bengal Delta before 1960s were in the form of construction of small-scale low-height embankment during winter – provides enough space for sediment deposition in the tidal floodplain during monsoon



These embankments were high enough to protect the *aman* crop-field, but low enough for flooding and sediment deposition in the tidal floodplains during June to October – the monsoon months





The tidal floodplains were  
good for a single rice crop

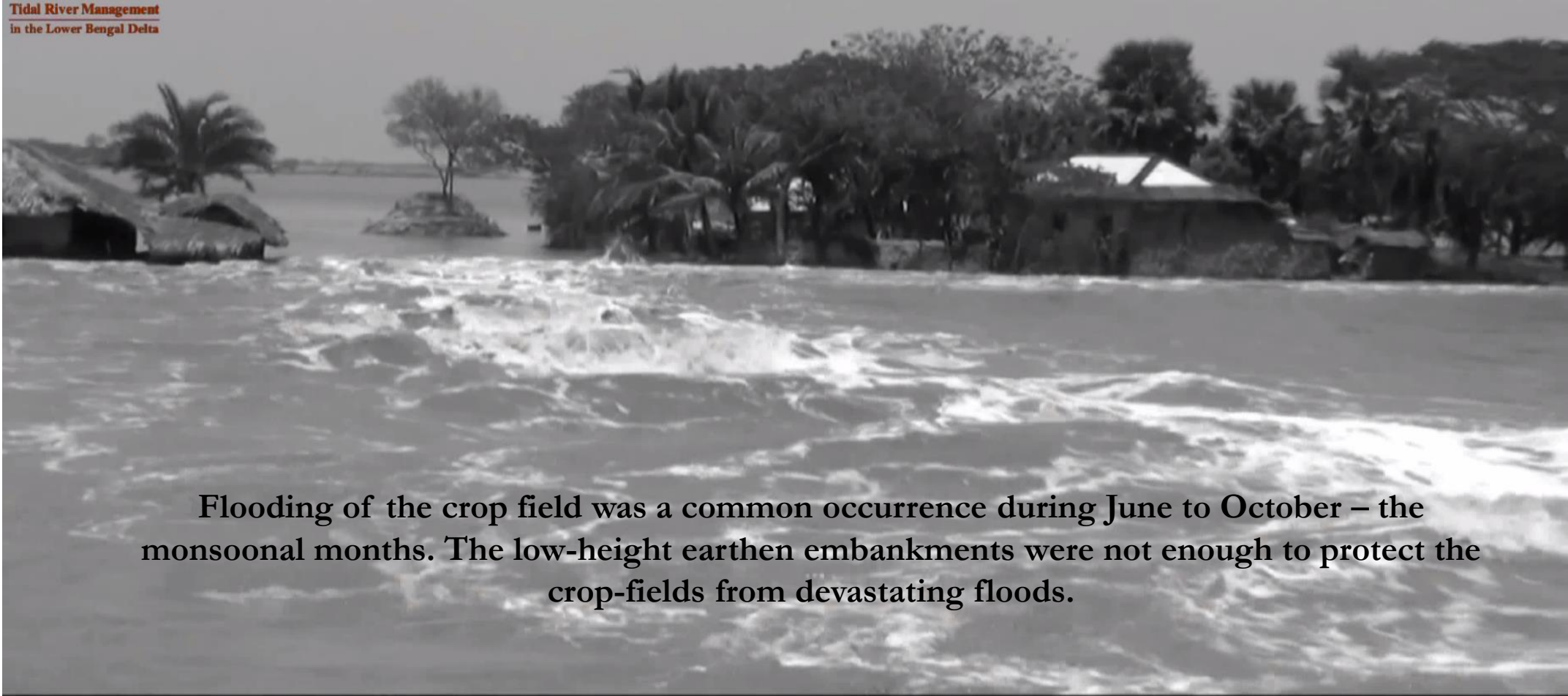


The earthen embankments  
protects the monsoon rice  
*aman* from saline invasion  
during monsoon

**Tidal River Management**  
**in the Lower Bengal Delta**







Flooding of the crop field was a common occurrence during June to October – the monsoonal months. The low-height earthen embankments were not enough to protect the crop-fields from devastating floods.

# DELTAIC FORMATION

with special reference to the hydrographic processes of the Ganges and the Brahmaputra

BY  
C. STRICKLAND  
M.A., M.D.  
Fellow of the Royal Geographical Society,  
sometime Scholar of Gonville and Caius College,  
and Assistant in Protozoology, in the University of Cambridge,  
also Professor of Medical Entomology and Officiating Director  
in the School of Tropical Medicine, Calcutta.

with A FOREWORD by  
FRANK DEBENHAM  
O.B.E., M.A.  
Professor of Geography in the University of Cambridge.

AND  
an INTRODUCTION by  
CYRIL FOX  
F.R.S., F.R.A.S.D., F.N.I.  
Chief Survey of India.

## FLOOD CONTROL OF EAST PAKISTAN

  
Government of Bengal  
Irrigation Department  
  
Report on  
Rainfall and Floods in  
North Bengal  
1870—1922

## REPORT ON HYDROLOGY OF EAST PAKISTAN

BY  
J. TH. THIJSE

Dear Mr. Krug,  
I am delighted to have had the opportunity of meeting you and discussing with you the problems of flood control and water resources development in East Pakistan. The problem is vast and tremendously important for the development of East Pakistan and as matters are now shaping, the very existence of East Pakistan is at stake if we are unable to solve them satisfactorily. The difficulties also are enormous. You will possibly find that the waters of East Pakistan, the rivers the tidal estuaries is one of the greatest in the world. This calls for complex technical and administrative arrangements, and this task must be approached on an integrated basis and on a scale commensurate with the size of the problem flood control, irrigation and drainage, channel maintenance for inland water transport, and power generation and use, all affect each other and are affected by each other.

Our Governmental machinery is totally inadequate to deal with such a vast problem. It is widely dispersed and many departments deal with its several facets. It will be necessary to create a new Government organisation — a new water and power authority — with sufficient powers to do an effective and comprehensive job, with definite responsibilities and with large measure of autonomy. In order that such an organisation may begin to function immediately and appropriate departments and divisions be established, I would greatly appreciate the help and assistance of the very best outside managerial and engineering advisors. There is no time to lose and the problems are so complex that only the best scientific knowledge and the best managerial and engineering know-how can hope to tackle them satisfactorily. Unfortunately, we have not sufficiently trained water and power experts that can assume managerial and technical leadership but in the guidance of experts such as I have indicated, we can hope to train our own experts to assume such responsibilities.

I would like to thank you once again for all the trouble that you have taken, and I am anxiously waiting your report and your suggestion. Will you kindly convey my thanks to your colleagues who have so kindly undertaken the trouble to investigate our problems and give us the benefit of their experience.

Yours sincerely  
(Signed) H.S. Sukrawardy

## HISTORY OF THE RIVERS IN THE GANGETIC DELTA 1750—1918

BY  
C. ADDAMS WILLIAMS, ESQ., C.I.E.,  
Superintending Engineer, P. W. D., Bengal.

"Whom God create the land, then fertilize it and finally distribute its produce."

CALCUTTA :  
BENGAL SECRETARIAT PRESS.  
1918.

## TECHNICAL ASSISTANCE PROGRAMME 1957 EPWAPDA

## LECTURES ON THE ANCIENT SYSTEM OF IRRIGATION IN BENGAL AND ITS APPLICATION TO MODERN PROBLEMS

Government of Bengal  
Department of Communications and Works  
Irrigation Branch

RIVERS OF THE BENGAL DELTA

Lectures  
Delivered by Mr. S. C. Majumdar  
Chief Engineer, Bengal  
As Special Reader of the Calcutta University





GOVERNMENT OF EAST PAKISTAN

REPORT OF THE  
EVALUATION COMMITTEE  
EAST PAKISTAN WAPDA

"On no soul doth Allah place a burden greater than it can bear.  
It gets every good that it earns, and it suffers every ill that  
it earns"

—Al-Quran

Officer on Special Duty, S. & G.A. Deptt.  
In-charge East Pakistan Government Press, Dhacca  
1964

Printed at the  
Government Press, Dhacca

Government of Bengal  
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As Special Reader of the Calcutta University

Superintendent, Government Printing  
Bengal Government Press, Alipore, Banjal  
1964

The Water and Power Development Board (WPDB) of then East Pakistan with technical assistance from the United Nations compiled a report during 1957 commonly known as Krug Mission Report the form the basis of Coastal Embankment Project (CEP).

TECHNICAL ASSISTANCE PROGRAMME  
1957

EPWAPDA

Report  
of a  
United Nations Technical Assistance Mission

VOLUME- I

DELTAIC FORMATION

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LONDON, NEW YORK, AND TORONTO  
1940

REPORT

ON

HYDROLOGY OF EAST PAKISTAN

BY

J. TH. THYSSE

May  
October 1964

Tidal River Management  
in the Lower Bengal Delta





An area of 540,000 hectare was enclosed within 123 *polders* by constructing around 4,000 km of embankment along the river channels



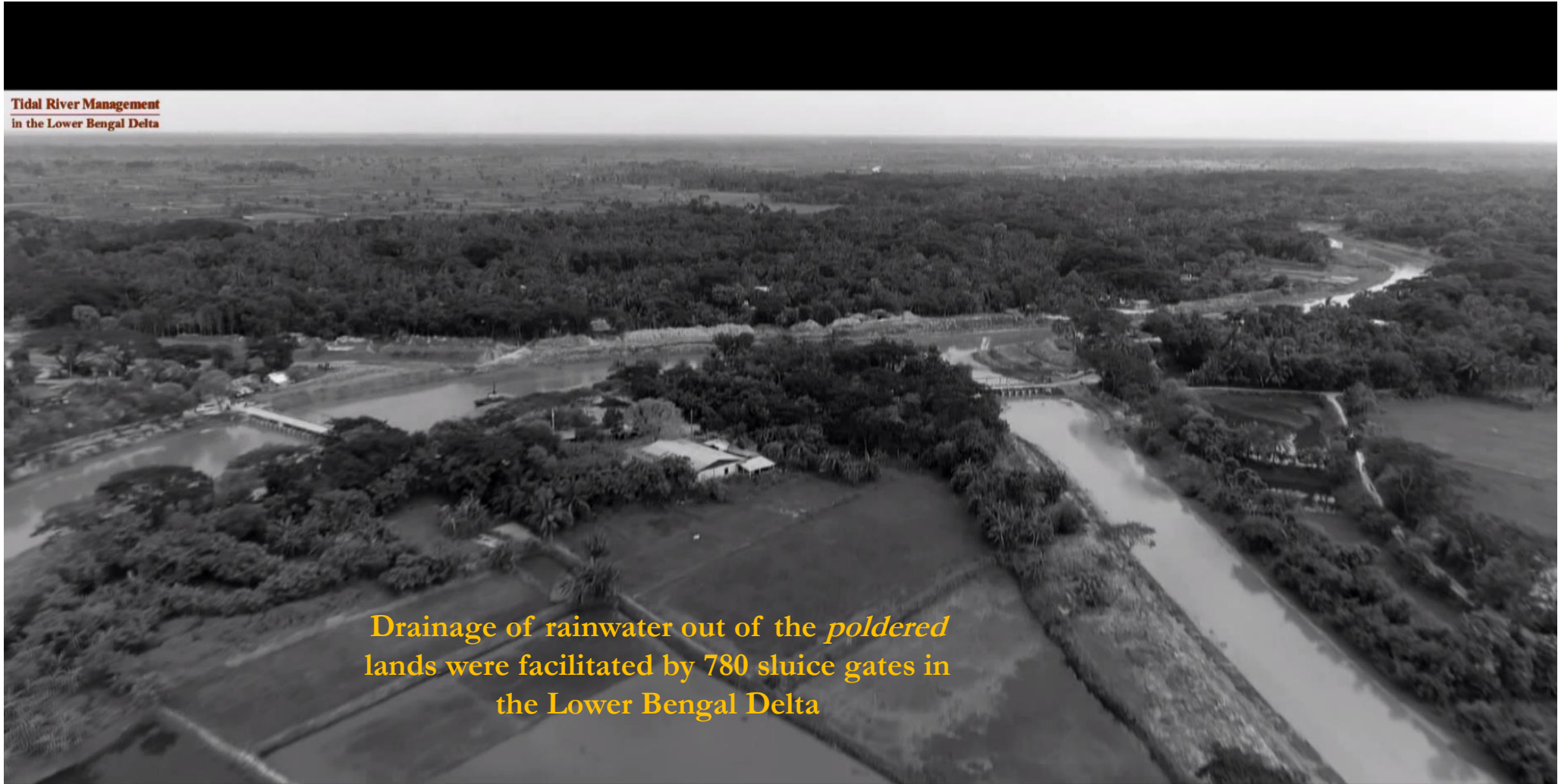
*Polder* is a piece of low-lying land that is  
enclosed by embankments





**Tidal River Management  
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Drainage of rainwater out of the *poldered*  
lands were facilitated by 780 sluice gates in  
the Lower Bengal Delta



Tidal River Management  
in the Lower Bengal Delta




*Poderization* offered an immediate relief to the community by facilitating road network



Tidal River Management  
in the Lower Bengal Delta

*Poderization* protected the coastal floodplains from saline  
water invasion as well

Tidal River Management  
in the Lower Bengal Delta



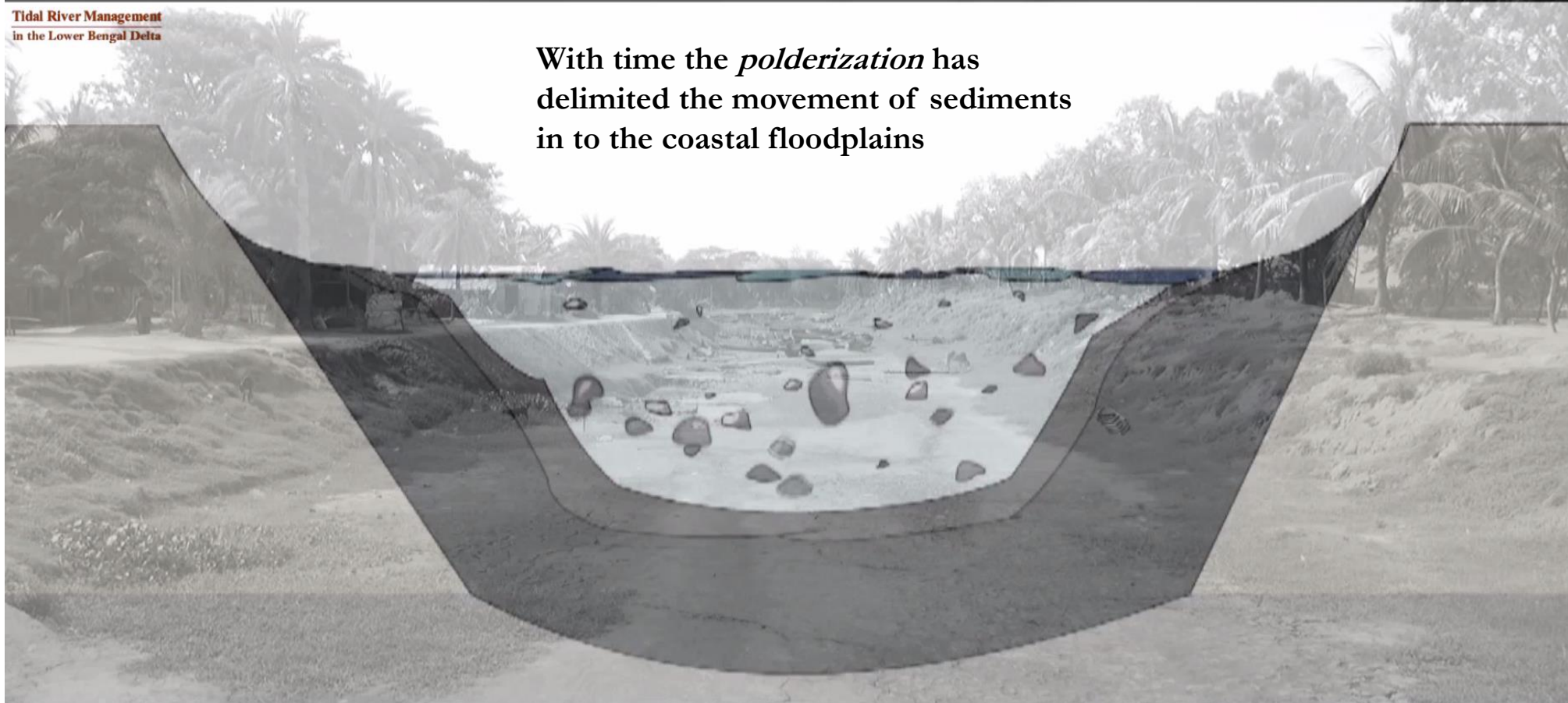
The land was good for  
even three crops in a year



Apparently the *poldered*  
community were happy

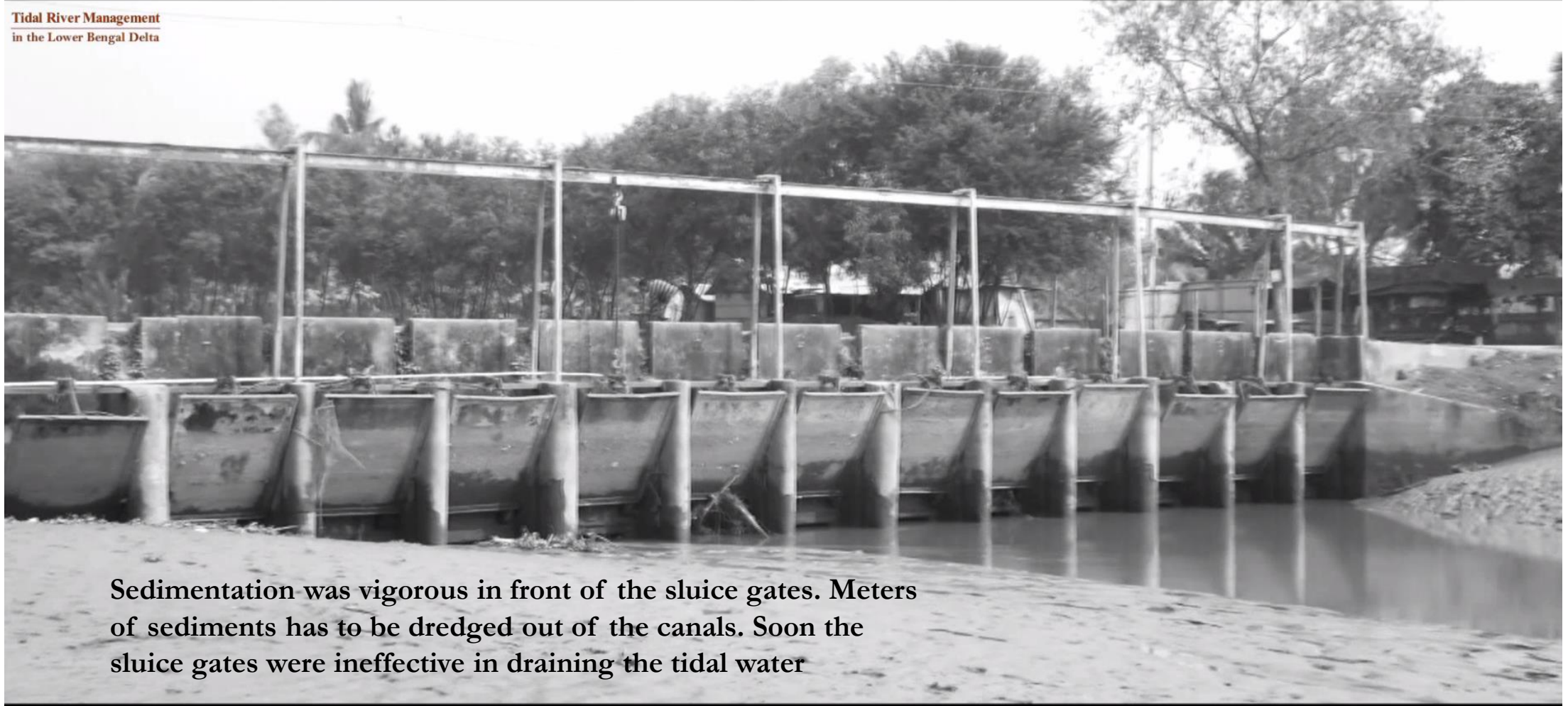


With time the *polderization* has  
delimited the movement of sediments  
in to the coastal floodplains



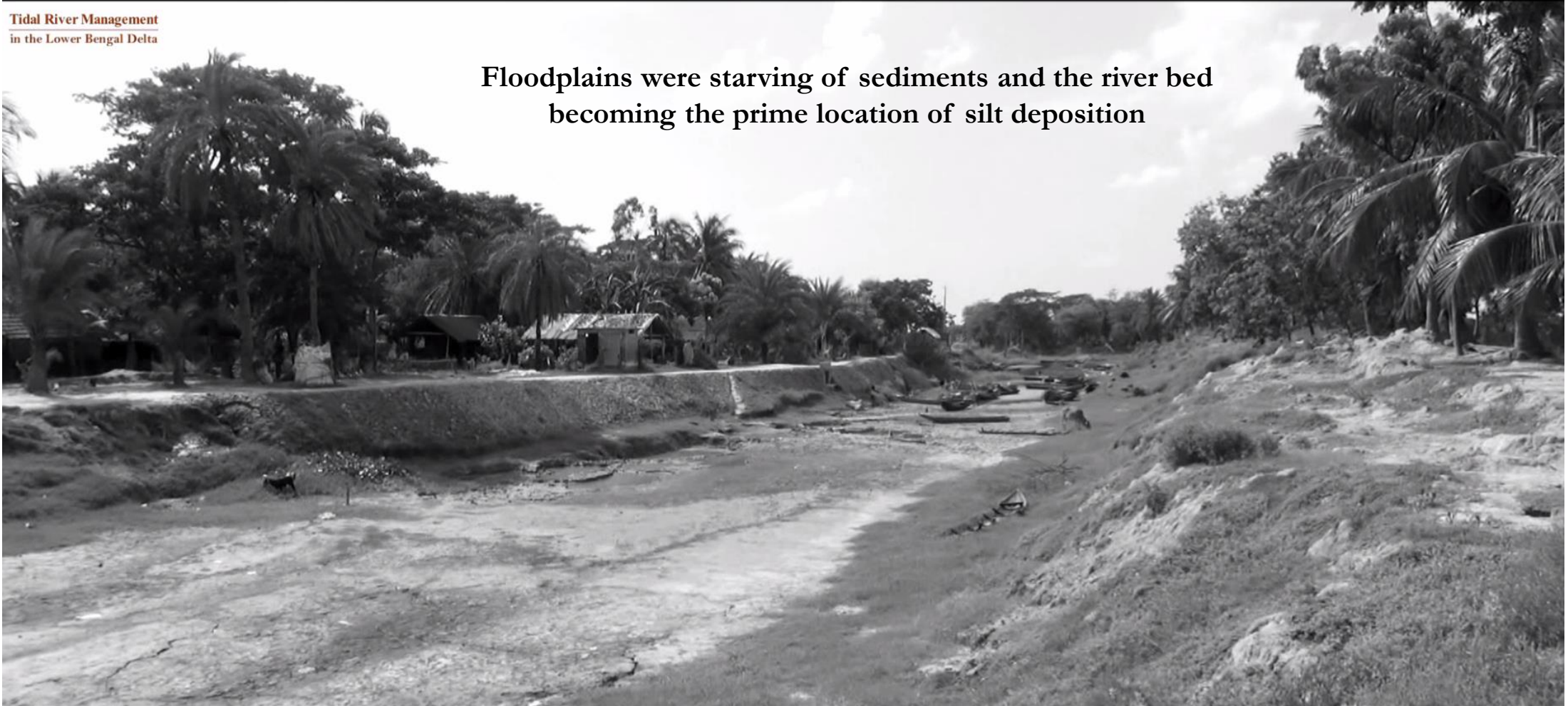


**Tidal River Management  
in the Lower Bengal Delta**



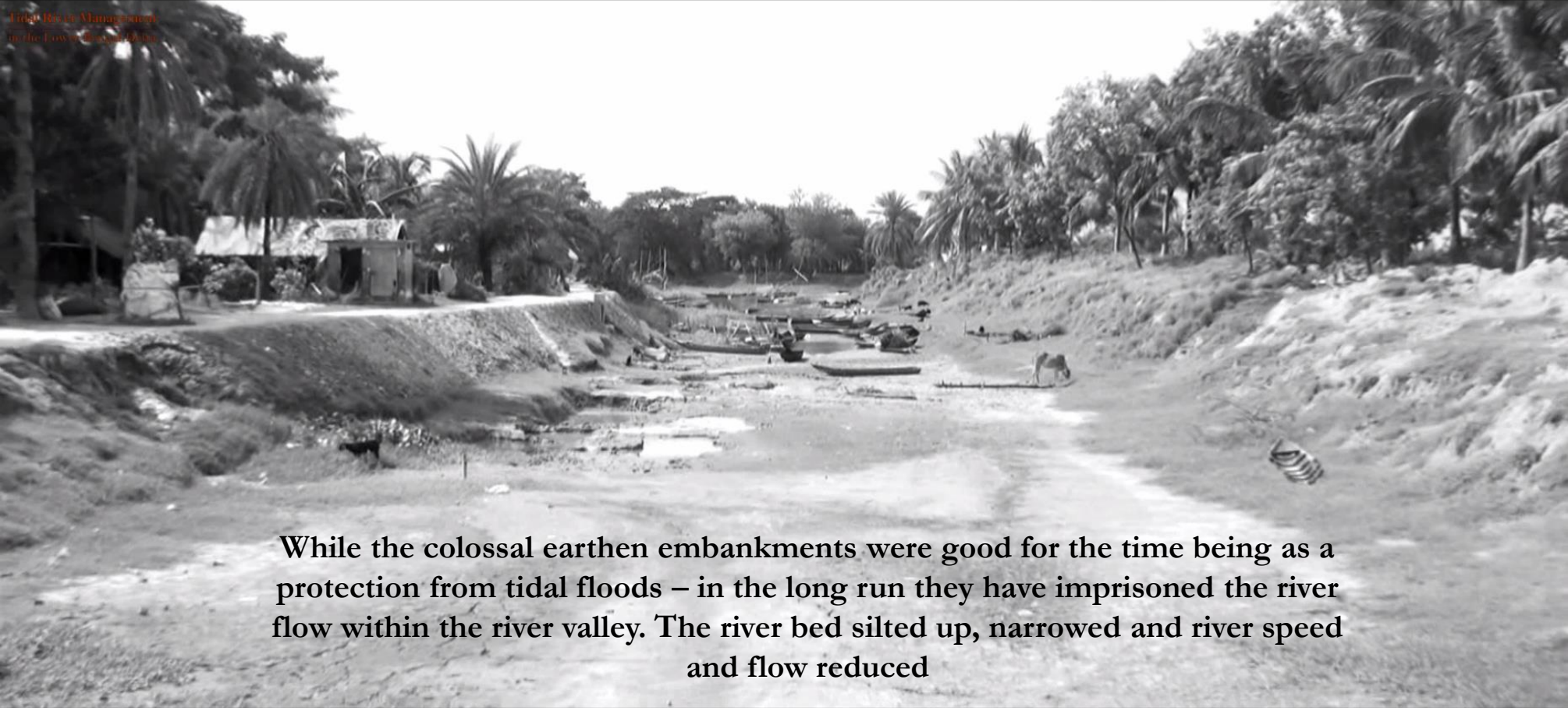
Sedimentation was vigorous in front of the sluice gates. Meters of sediments has to be dredged out of the canals. Soon the sluice gates were ineffective in draining the tidal water

Floodplains were starving of sediments and the river bed  
becoming the prime location of silt deposition





Urban River Management  
in the Lower Mekong Delta



While the colossal earthen embankments were good for the time being as a protection from tidal floods – in the long run they have imprisoned the river flow within the river valley. The river bed silted up, narrowed and river speed and flow reduced

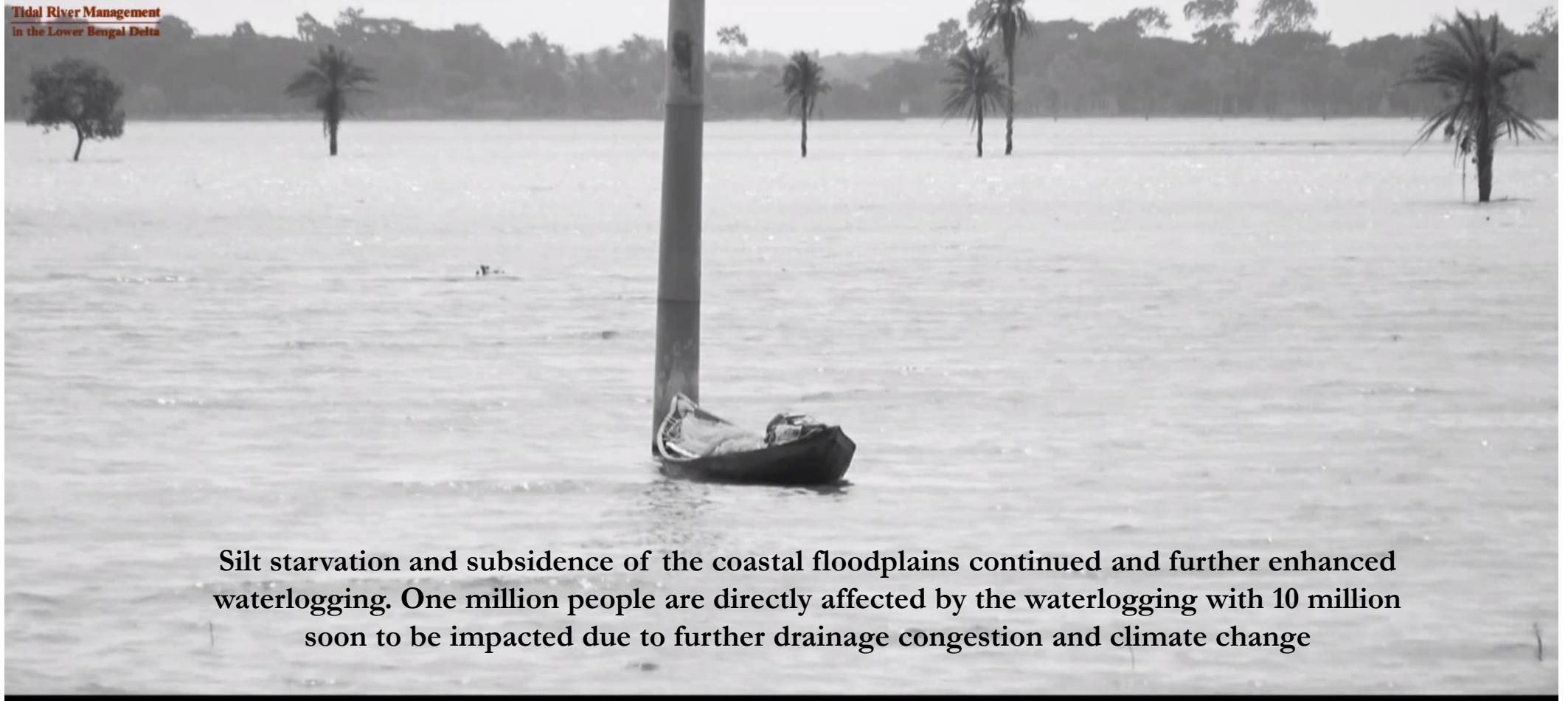
The once mighty rivers of the Lower Bengal Delta turned to tiny quiet streams.  
The rivers started to die as the flow and flood dynamics were heavily modified





## Drainage congestion initiated

Waterlogging became a formidable problem in the tidal floodplains since the river bed – due to siltation – were at higher elevation, and monsoon waters could no longer be flushed out from the low-lying *polders*



Silt starvation and subsidence of the coastal floodplains continued and further enhanced waterlogging. One million people are directly affected by the waterlogging with 10 million soon to be impacted due to further drainage congestion and climate change



But life has to be lived with

The community started seeking alternative ways of living

Shrimp aquaculture by constructing *gheers* stated. *Gheers* are shrimp ponds, physically isolated water bodies linked to the canals or rivers for supply of brackish and saline water during high tide

The *gheers* for shrimp culture requires inflow of brackish and saline water from the tidal rivers – further accelerated drainage congestion and ensued waterlogging and increase in salinity with in the *polders*. The physical barrier to the natural flow of water by *gheers* also blocked the inflow of sediments in to the coastal floodplains









Tidal River Management  
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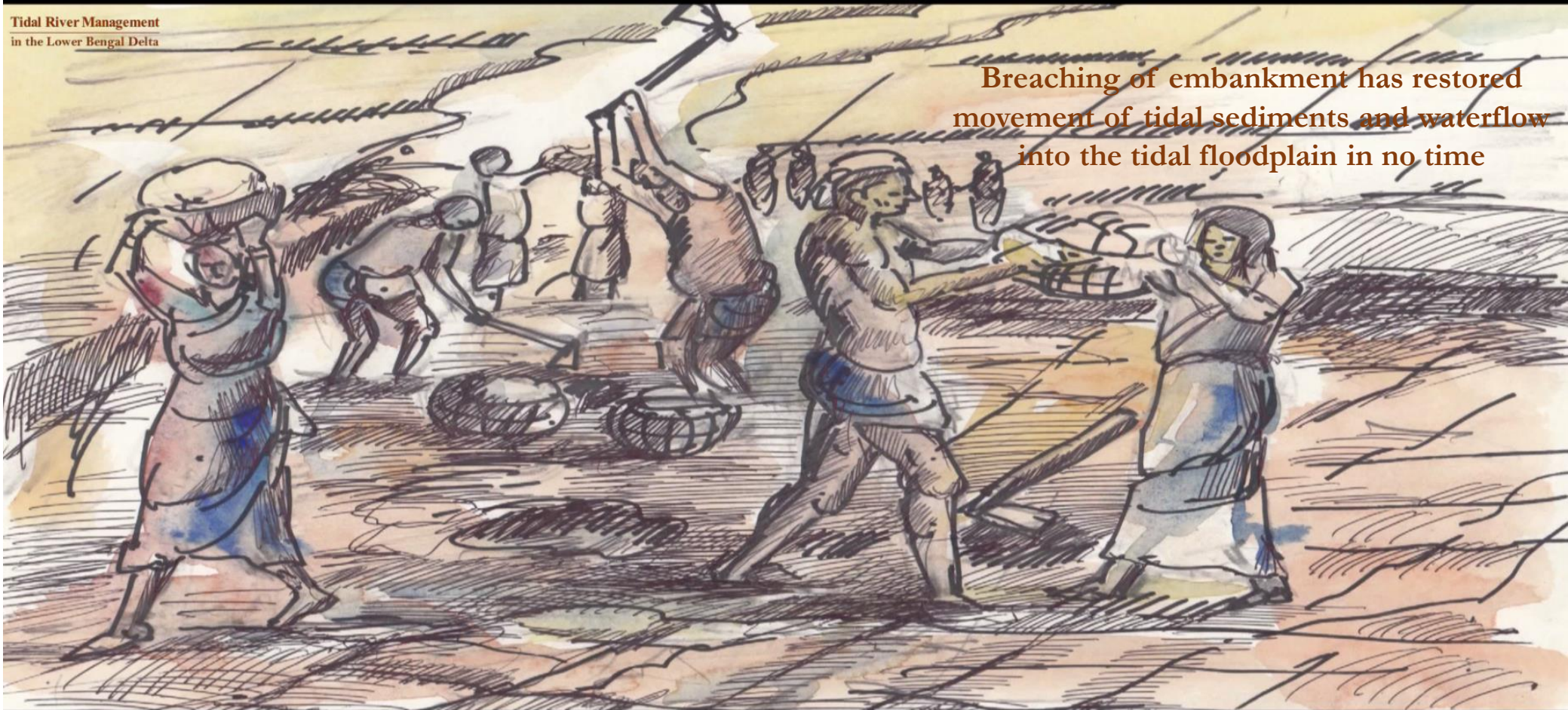




The community of *Beel Bhaina* – one of the largest wetland on the floodplain of *Hari* river in the Lower Bengal Delta – were suffering from prolonged drainage congestion and waterlogging – reacted

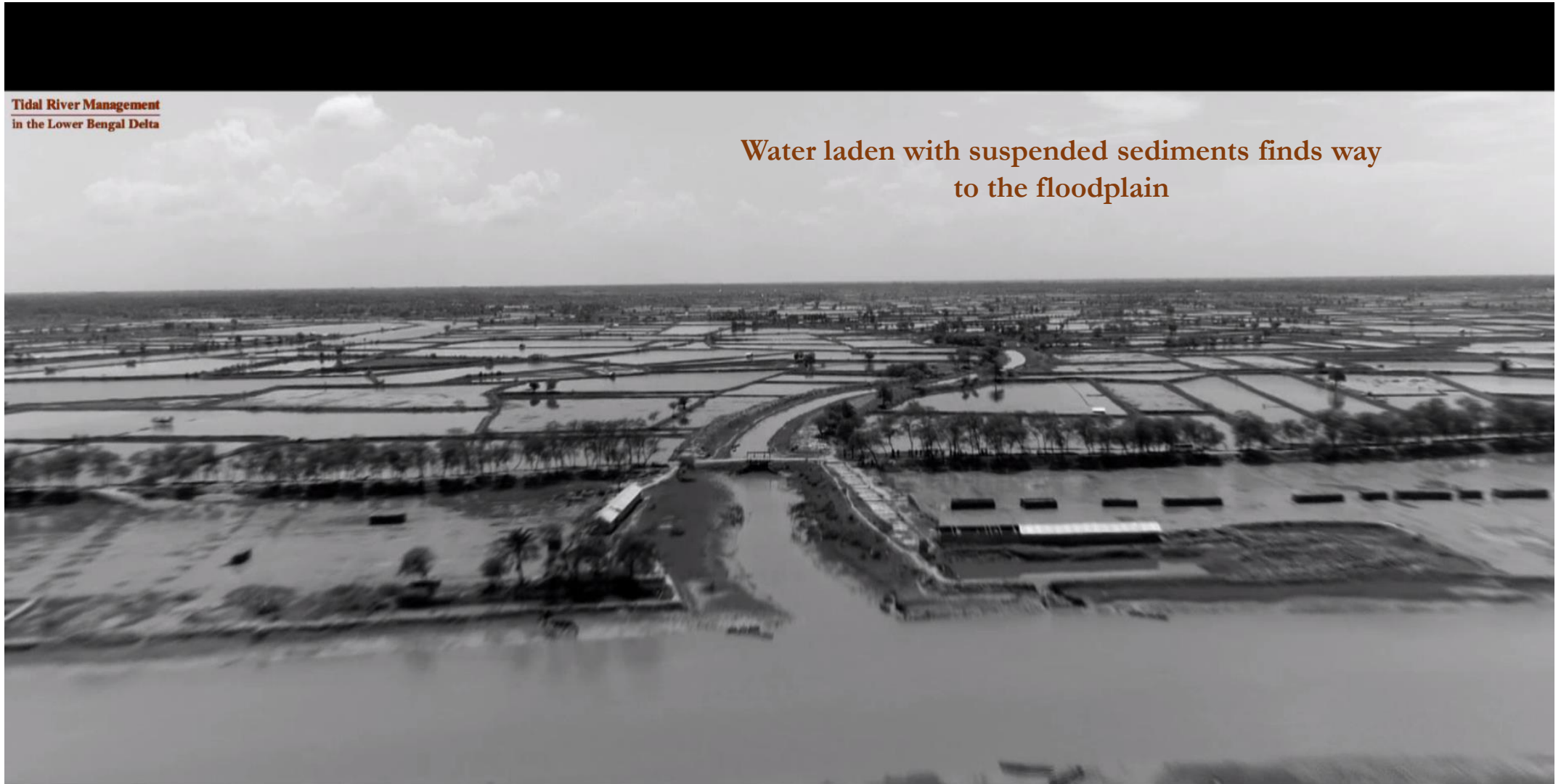
A portion of the community decided to relink the river channel to the floodplain by breaching the embankment through a pre-existing silted-up natural link canal.

Breaching of embankment has restored  
movement of tidal sediments and waterflow  
into the tidal floodplain in no time

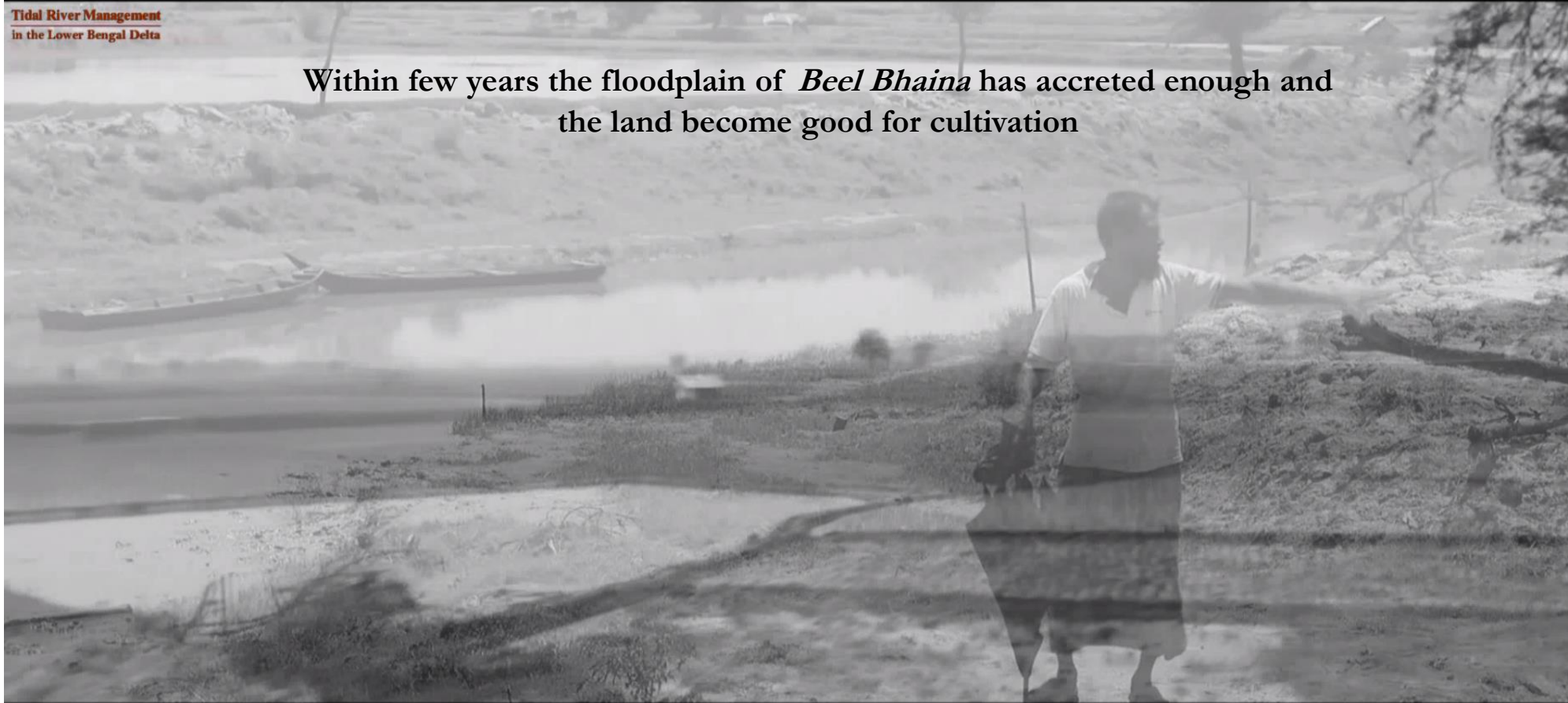




Water laden with suspended sediments finds way  
to the floodplain



Within few years the floodplain of *Beel Bhaina* has accreted enough and the land become good for cultivation





The wetland community then opined  
to replicate the experience in other  
locations of the Lower Bengal Delta

the river beds become deeper because of scouring of the river bed

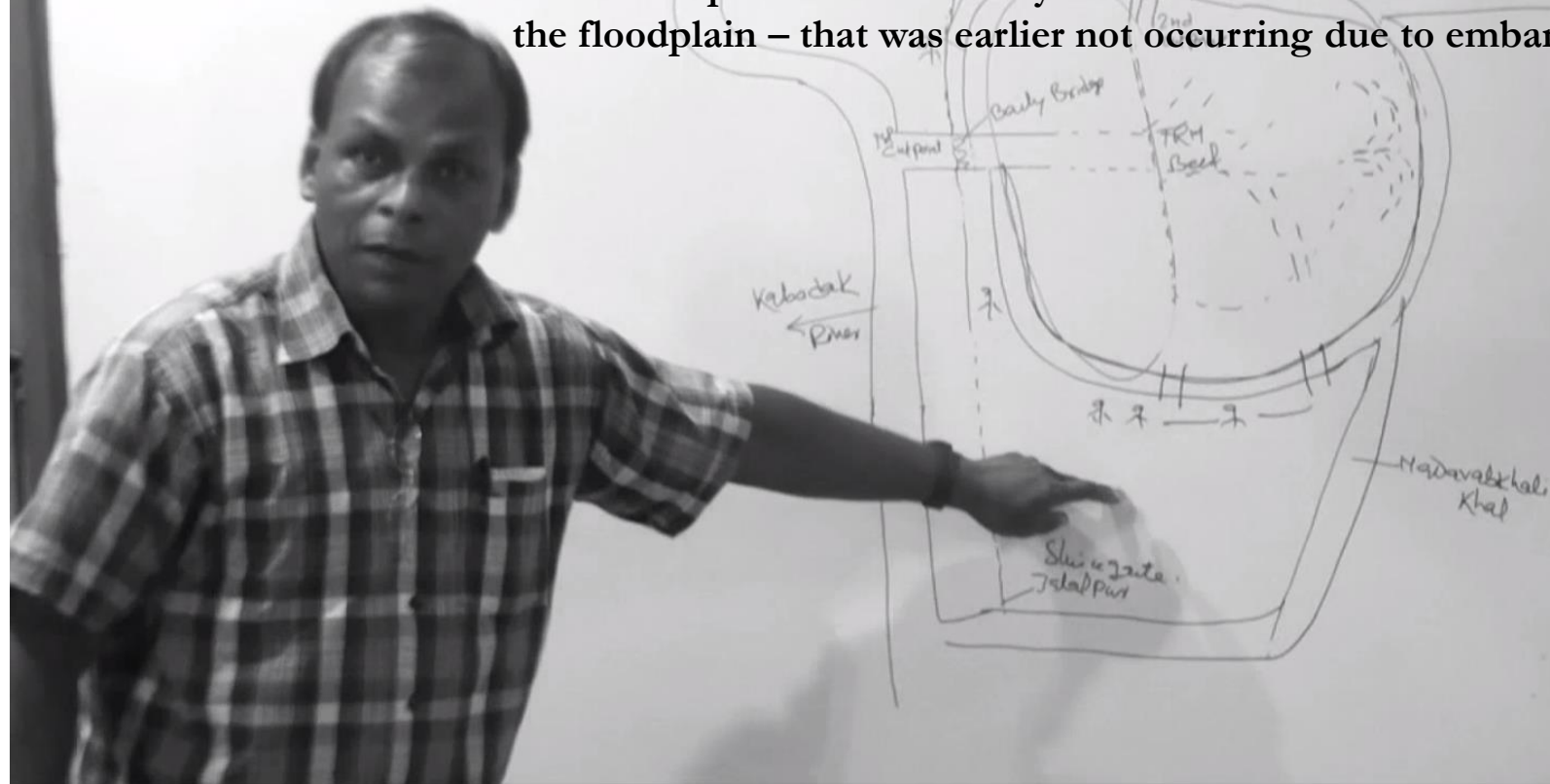
**Tidal River Management  
in the Lower Bengal Delta**





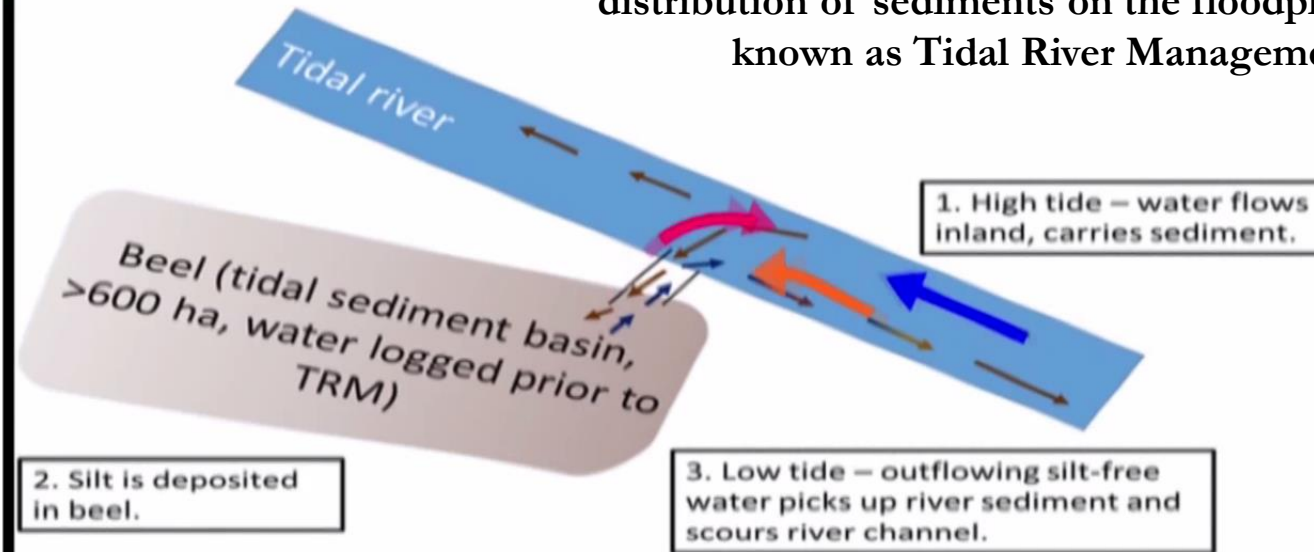
With local persuasions, this exercise has been replicated in *Pakhimara* – a wetland on the floodplain of the *Kapatakshow* river

The link canal to the main channel carries enough silt to the floodplain that elevates the floodplain within 4 to 5 years – thus restore the sediment delivery to the floodplain – that was earlier not occurring due to embankments





This process of reactivating tidal rivers and natural distribution of sediments on the floodplain in now-a-days known as Tidal River Management (TRM)



Tidal River Management  
in the Lower Bengal Delta





TRM helps in regeneration of floodplain good for cultivation. The flow-dynamics inherent in the process of TRM scours the river bed – thus river depth increases – offering opportunities for fish and several other aquatic species to thrive. The flow along the link canals renews the water of the wetlands frequently


Thus the TRM minimizes the adversarial consequences of rapid changes in the climatic pattern such as sea level rise and waterlogging by offering elevated floodplain and securing natural drainage respectively in deltaic environment

**Tidal River Management**  
**in the Lower Bengal Delta**



**Tidal River Management has proven to be an effective strategy for restoring the sediment delivery to the floodplains and regenerating the dynamics of mighty tidal rivers of the Lower Bengal Delta**





However, implementation of TRM may be difficult as most community concern moves round the process of acquisition and requisition of land – and compensation for the produces of the land – that to be under water for few years

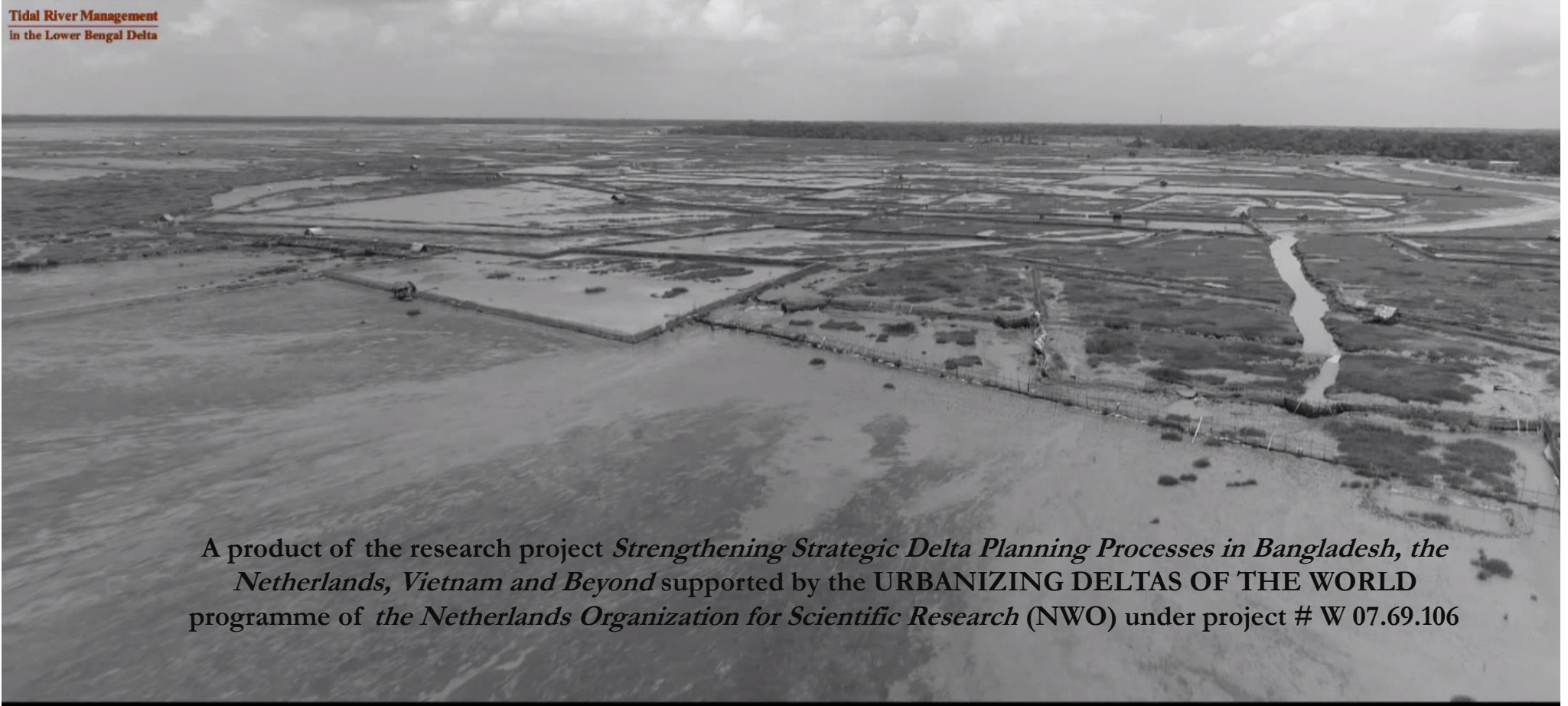
**Tidal River Management  
in the Lower Bengal Delta**





The stakeholders need to find a common ground for – a rewarding and bright environmental and livelihood future – on restoration of sediment delivery to the floodplains of coastal rivers through natural sustainable way

**Tidal River Management**  
in the Lower Bengal Delta

An aerial photograph of a coastal delta region, likely in Bangladesh. The landscape is characterized by a complex network of water channels and land parcels. A prominent feature is a large, rectangular area of land that has been reclaimed or dyed, creating a grid-like pattern. This area is surrounded by water, and the water appears to be a mix of light and dark tones, possibly indicating different depths or sediment levels. The sky is overcast with grey clouds. The overall scene depicts a significant human intervention in a natural river delta environment.

A product of the research project *Strengthening Strategic Delta Planning Processes in Bangladesh, the Netherlands, Vietnam and Beyond* supported by the **URBANIZING DELTAS OF THE WORLD** programme of *the Netherlands Organization for Scientific Research* (NWO) under project # W 07.69.106