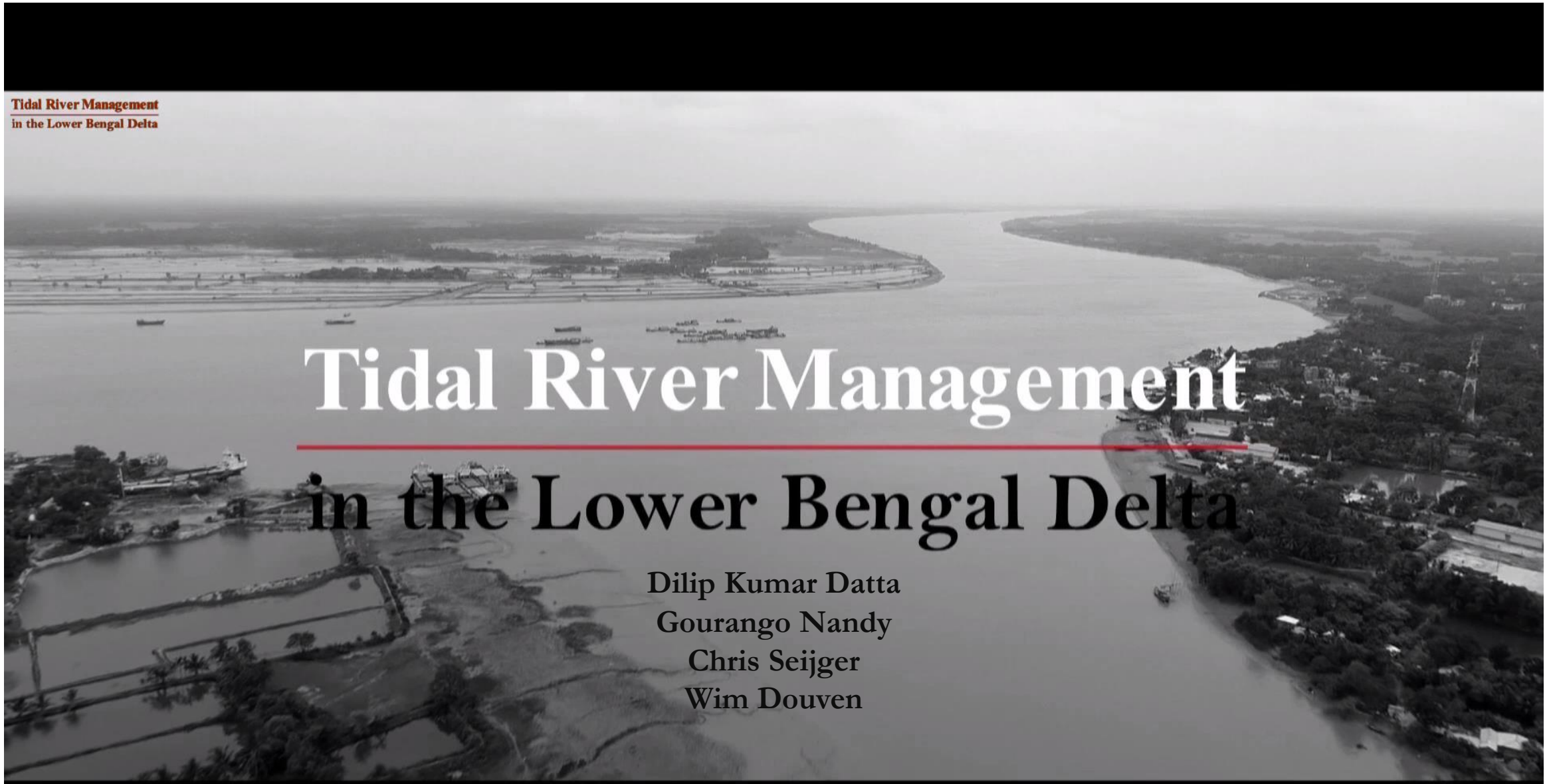

Tidal River Management in the Lower Bengal Delta

Dilip Kumar Datta
Gourango Nandy
Chris Seijger
Wim Douven

March, 2020

@ Environmental Science Discipline, Khulna University

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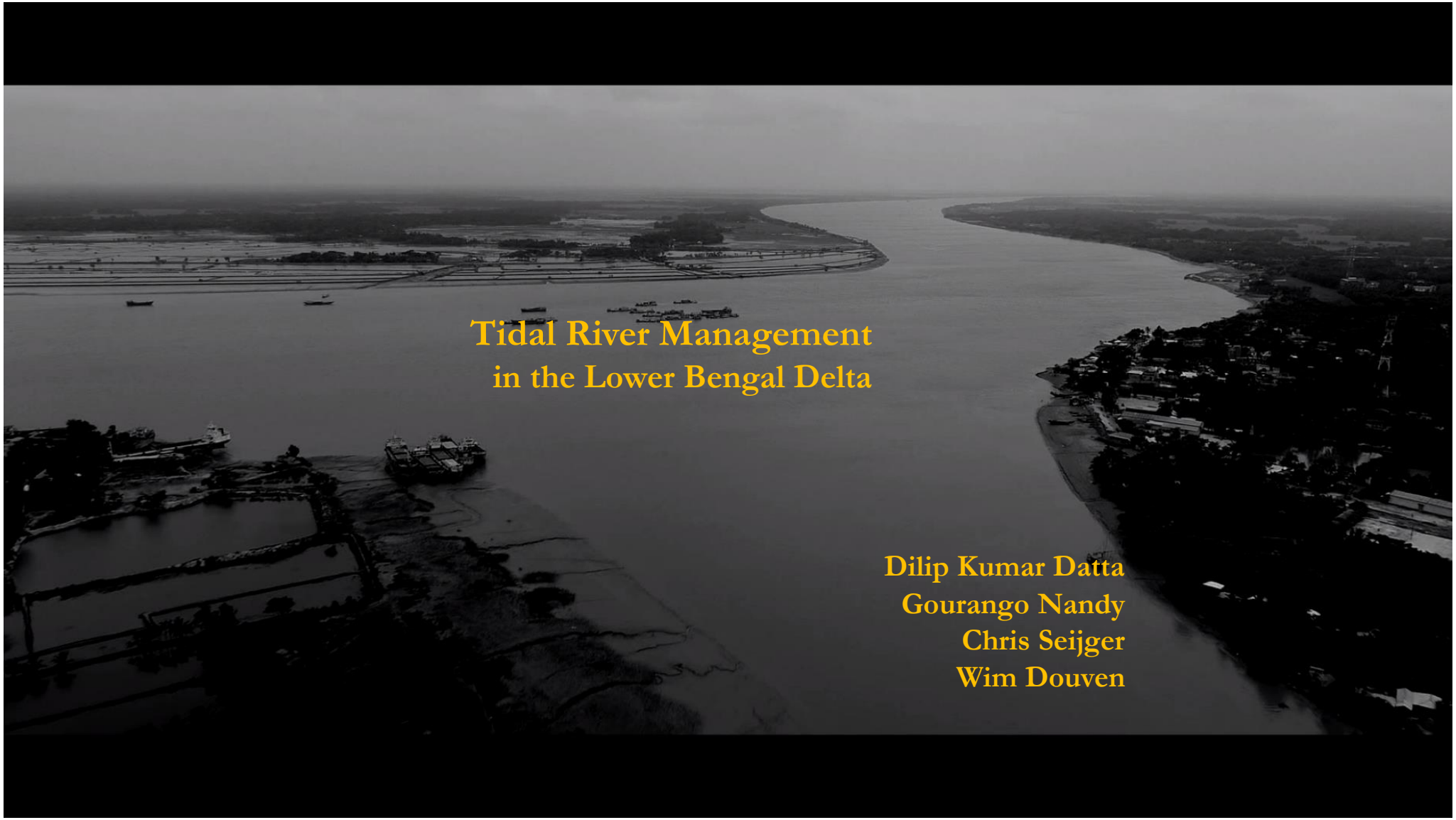
A product of the research project *Strengthening Strategic Delta Planning Processes in Bangladesh, the Netherlands, Vietnam and Beyond* supported by the URBANIZING DELTAS OF THE WORLD programme of *the Netherlands Organization for Scientific Research* (NWO) under project # W 07.69.106


Tidal River Management
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Dilip Kumar Datta
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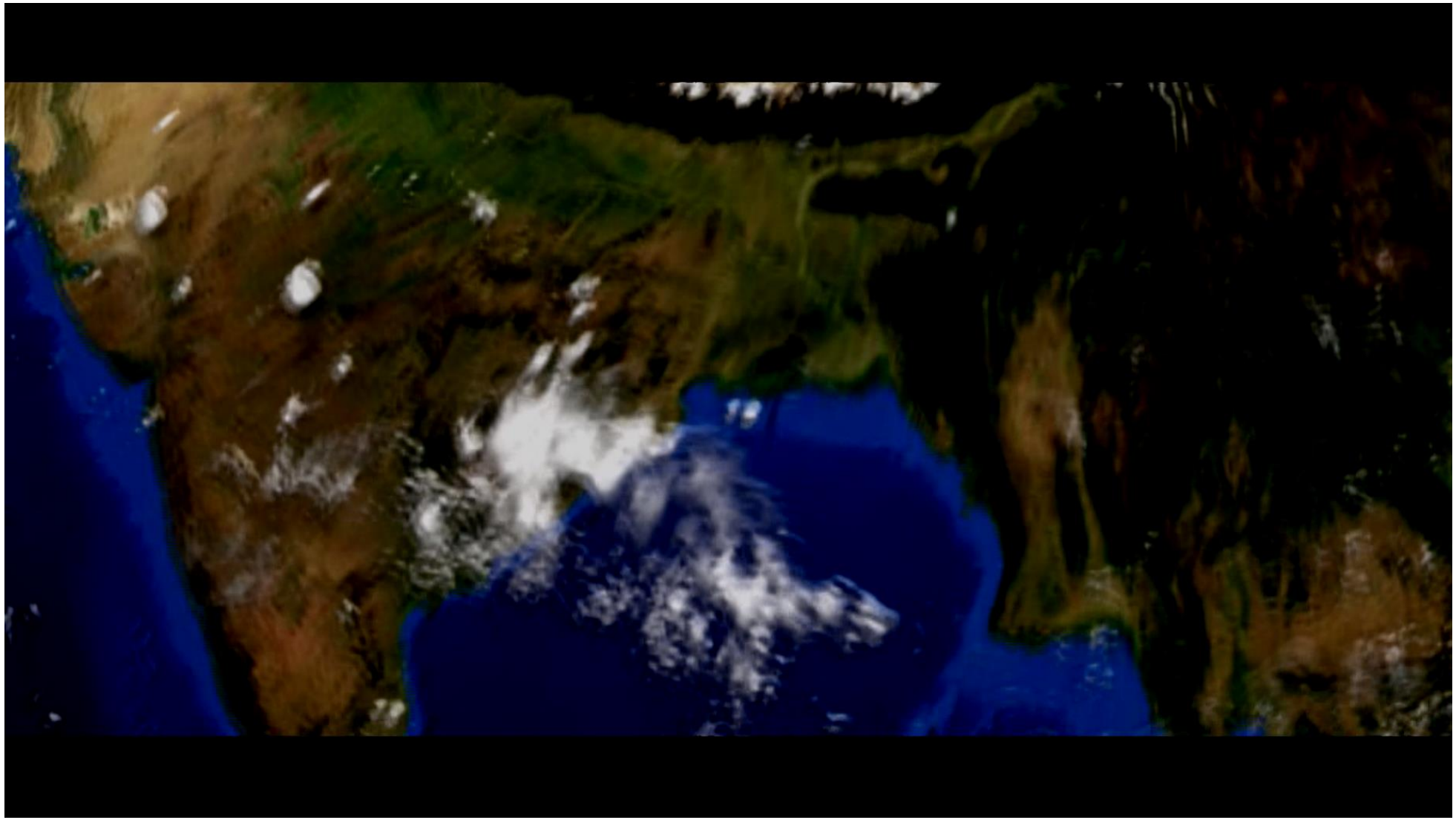
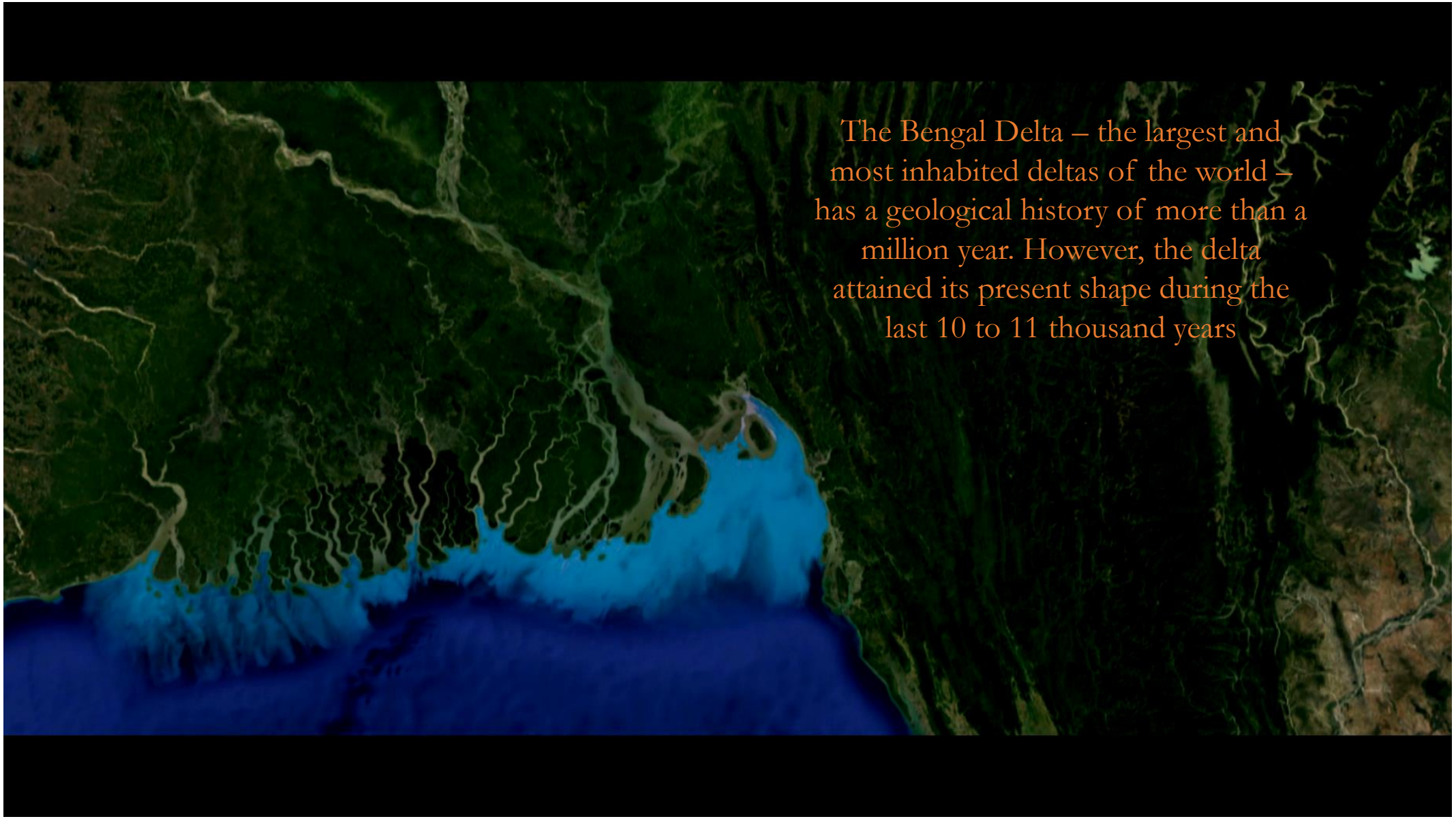
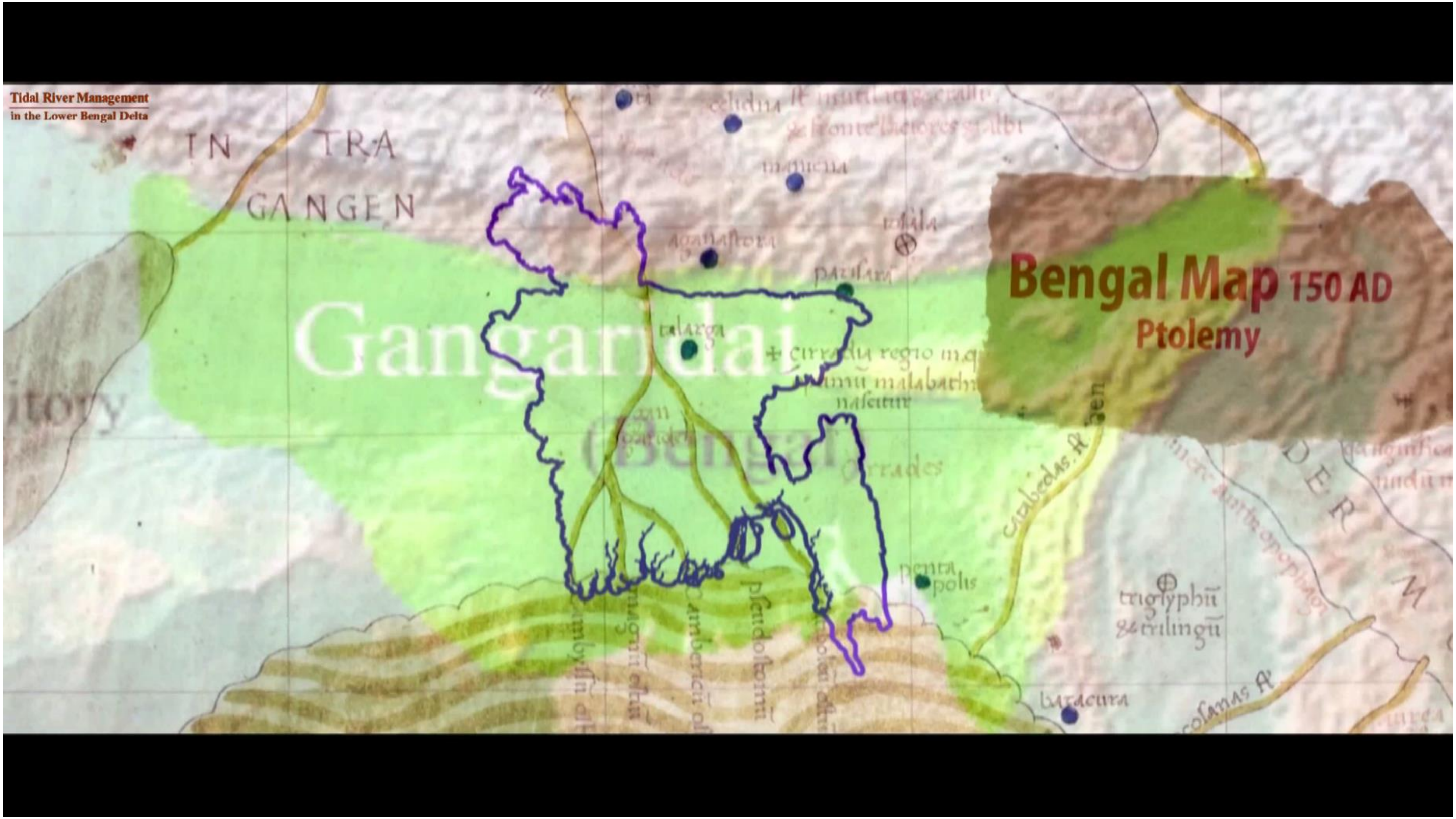
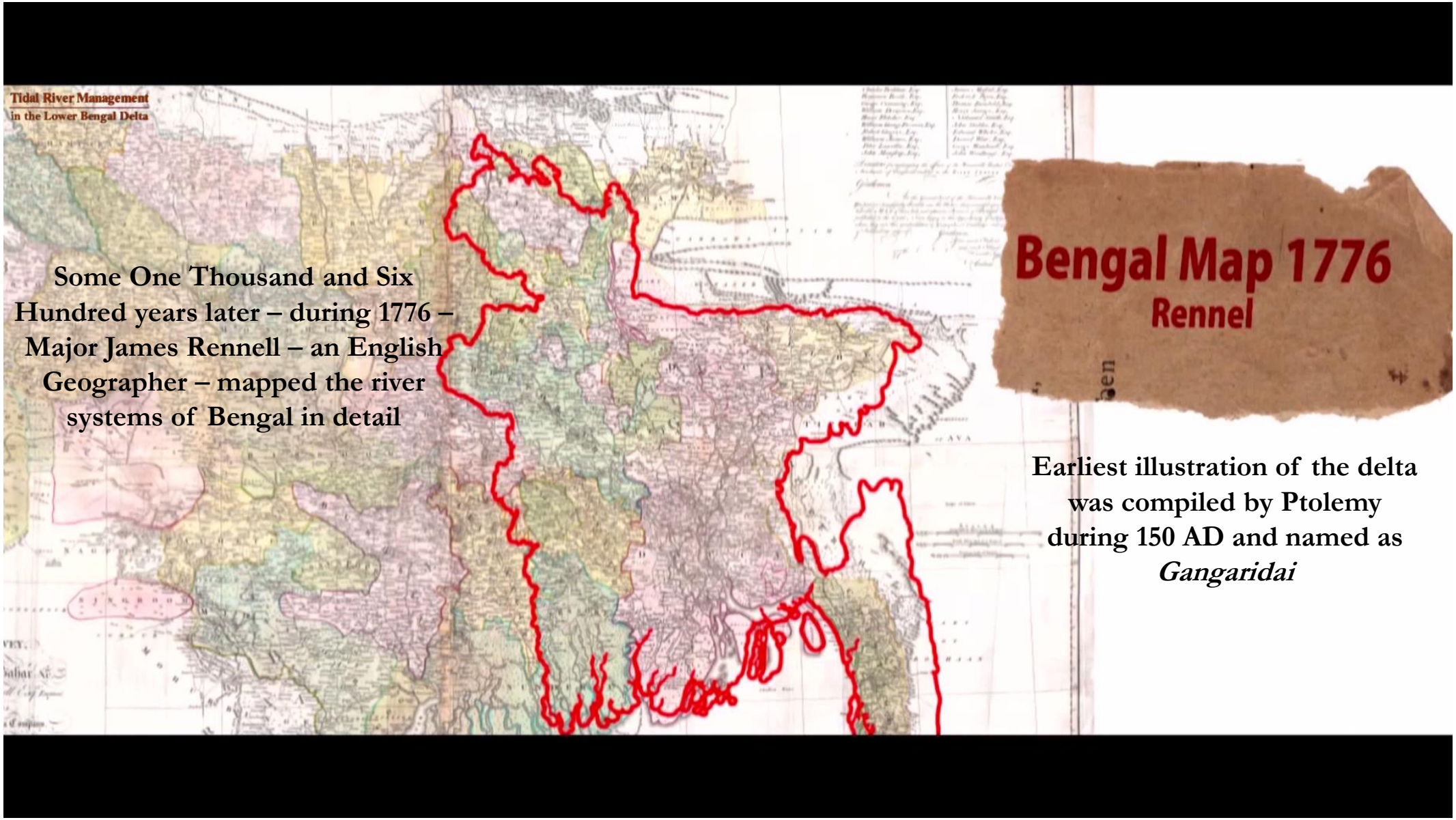



The Bengal Delta – the largest and most inhabited deltas of the world – has a geological history of more than a million year. However, the delta attained its present shape during the last 10 to 11 thousand years

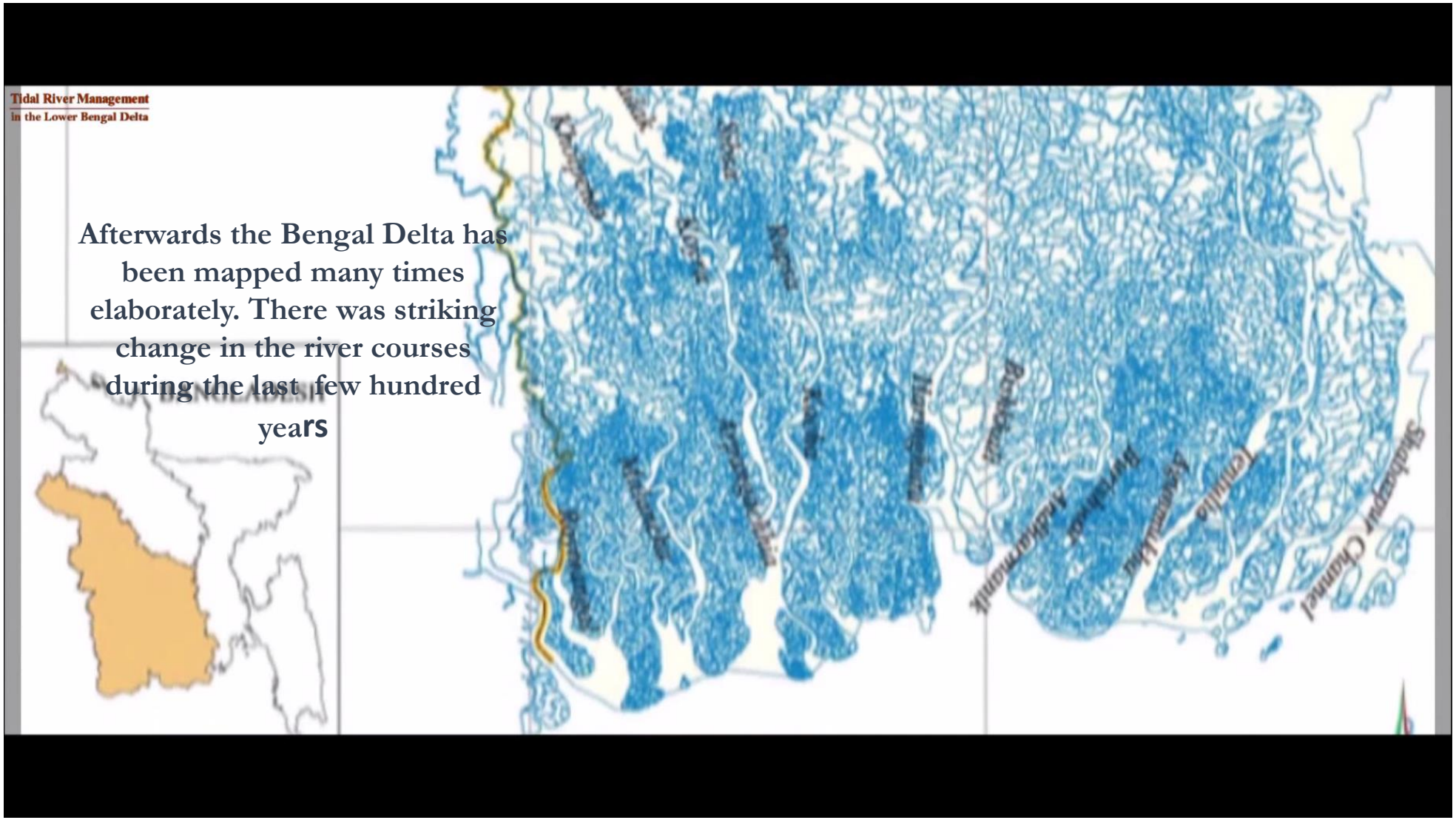

Tidal River Management
in the Lower Ganga Delta

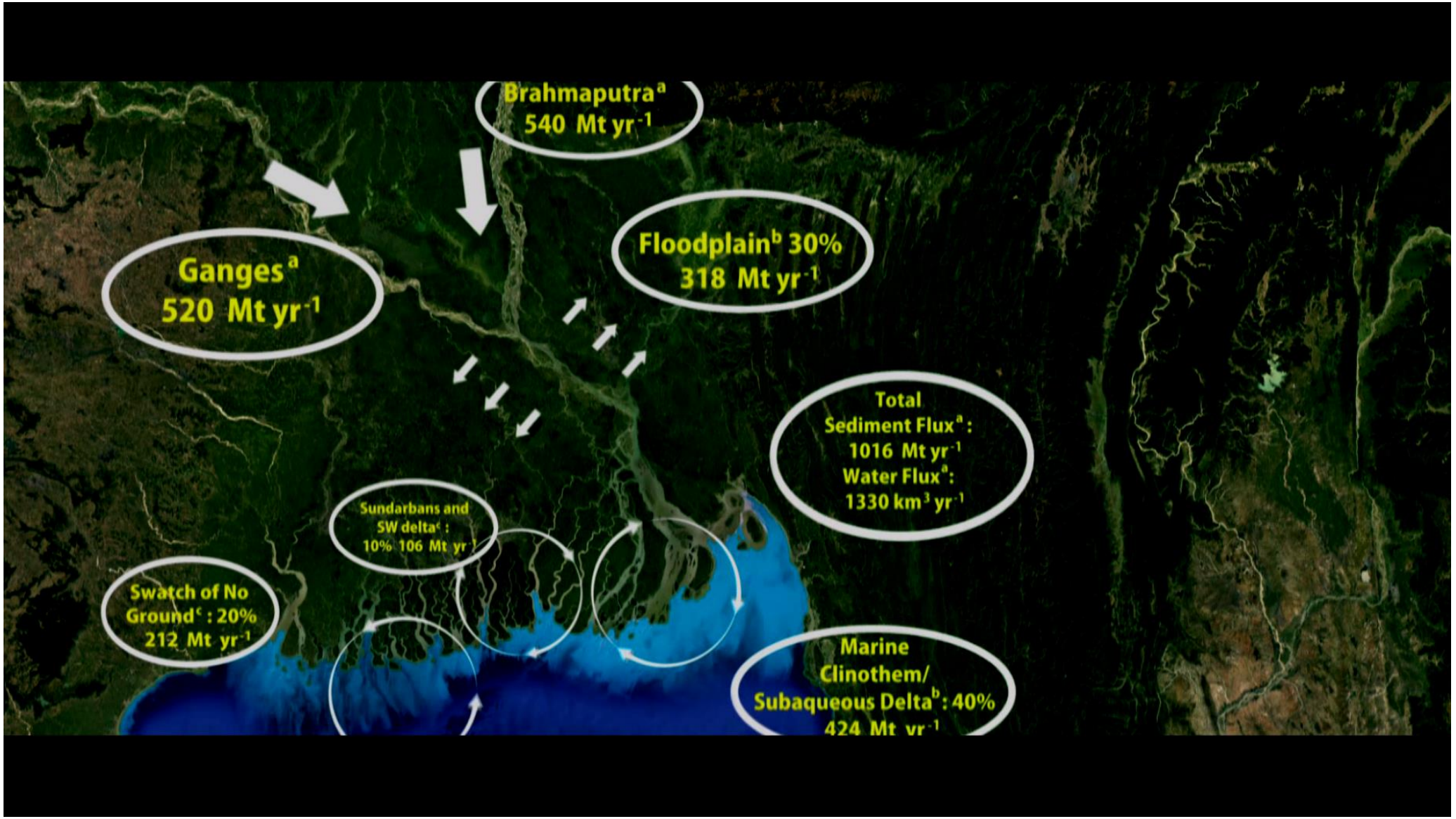

Tidal River Management
in the Lower Bengal Delta
Human settlement
started in the Bengal Delta
from around 3 thousand
years before present –
mostly by premature
reclamation of virgin lands

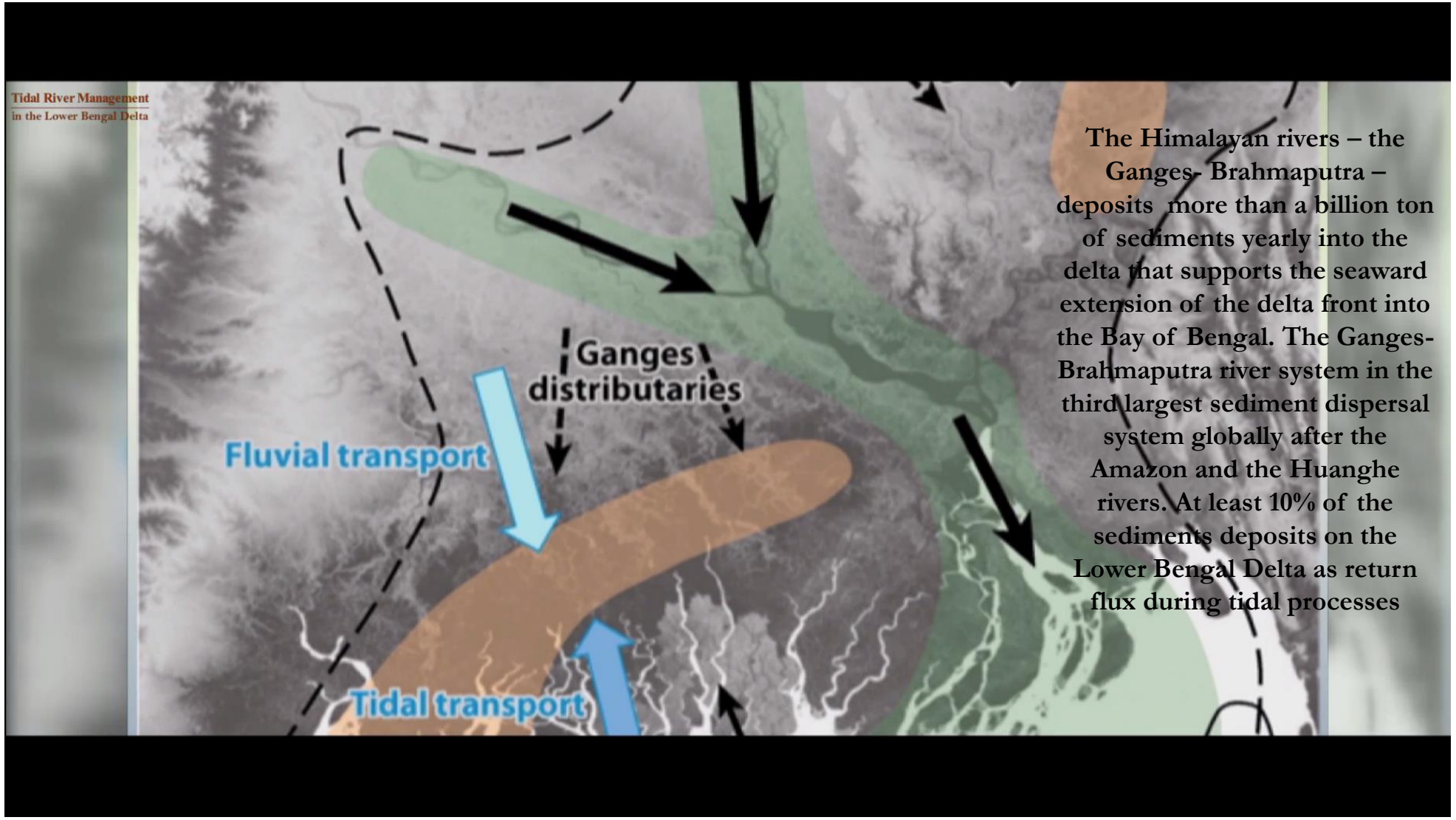

Tidal River Management
in the Lower Bengal Delta
Bengal Map 150 AD
Ptolemy
Gangaridai
(Bengal)
IN TRA
GANGEN


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
KHULNA
BAGHERHA
KHIRA


Tidal River Management
in the Lower Bengal Delta
Afterwards the Bengal Delta has been mapped many times elaborately. There was striking change in the river courses during the last few hundred years
BANGLADESH
Shahbazpur Channel

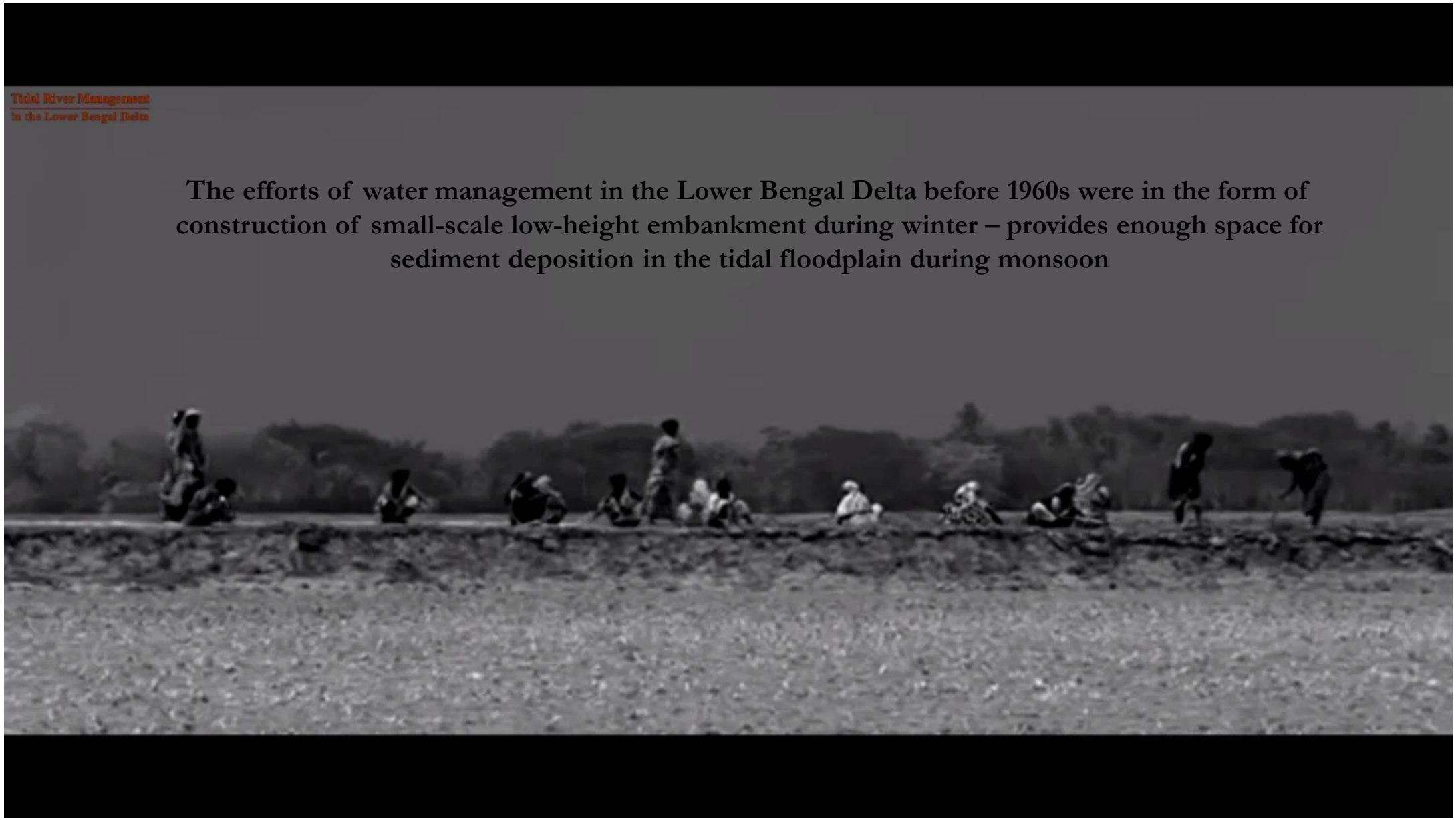

Brahmaputra[a]
540 Mt yr-1
Ganges[a]
520 Mt yr-1
Floodplain[b] 30%
318 Mt yr-1
Total
Sediment Flux[a]:
1016 Mt yr-1
Water Flux[a]:
1330 km3 yr-1
Sundarbans and
SW delta[c]:
10% 106 Mt yr-1
Swatch of No
Ground[c]: 20%
212 Mt yr-1
Marine
Clinothem/
Subaqueous Delta[b]: 40%
424 Mt yr-1



The Himalayan rivers – the Ganges- Brahmaputra – deposits more than a billion ton of sediments yearly into the delta that supports the seaward extension of the delta front into the Bay of Bengal. The Ganges-Brahmaputra river system in the third largest sediment dispersal system globally after the Amazon and the Huanghe rivers. At least 10% of the sediments deposits on the Lower Bengal Delta as return flux during tidal processes


Tidal River Management
in the Lower Bengal Delta

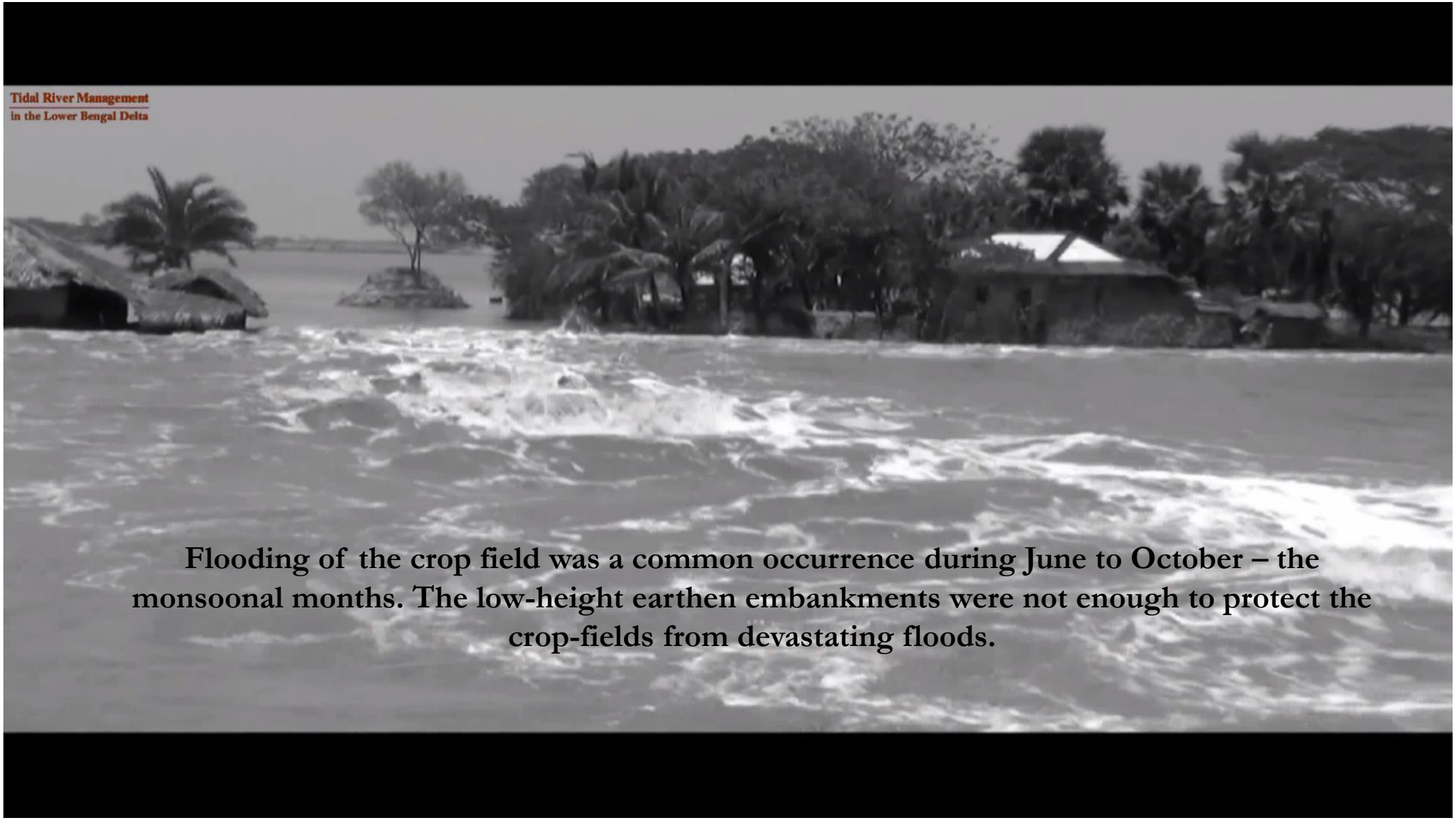
The efforts of water management in the Lower Bengal Delta before 1960s were in the form of construction of small-scale low-height embankment during winter – provides enough space for sediment deposition in the tidal floodplain during monsoon



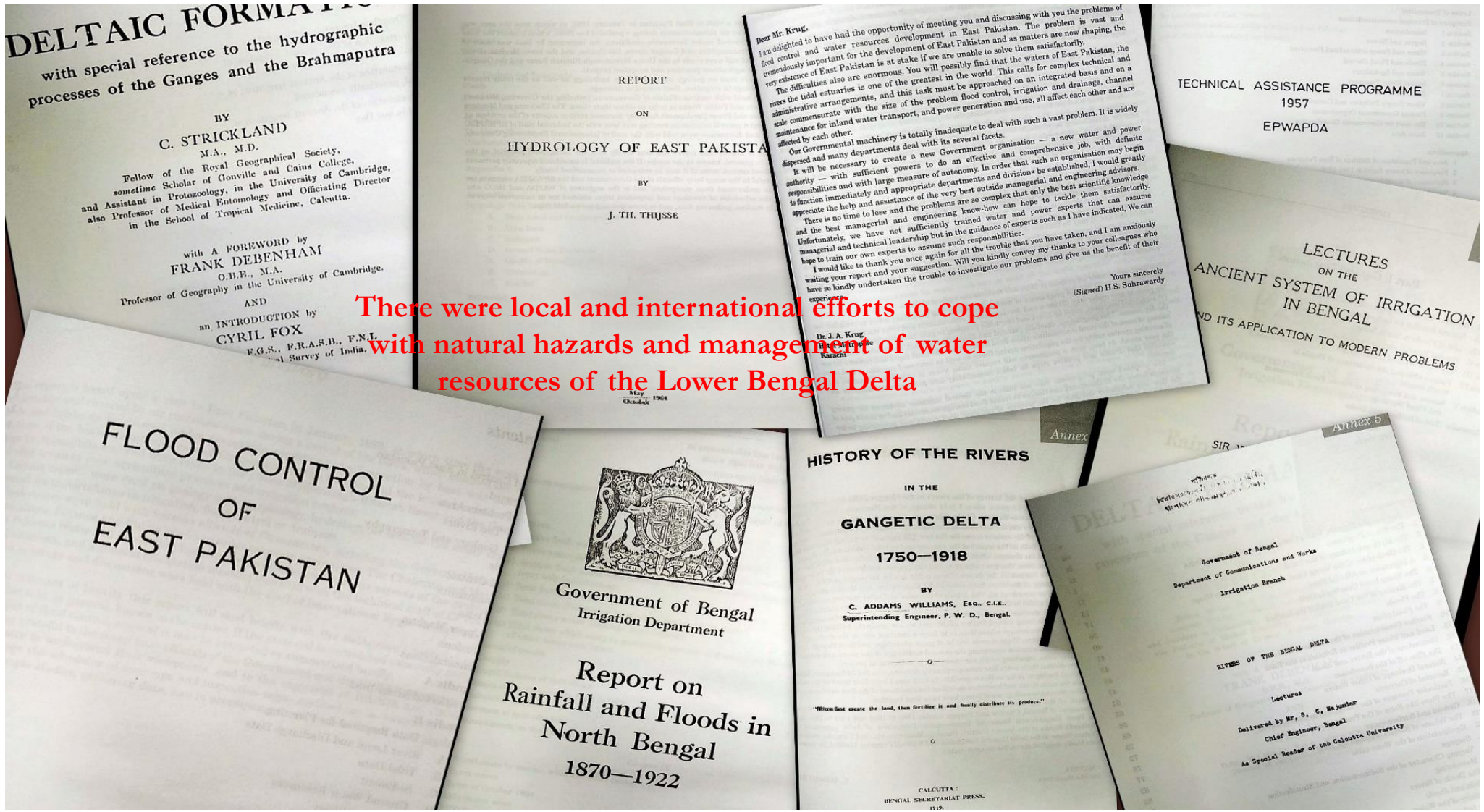
These embankments were high enough to protect the *aman* crop-field, but low enough for flooding and sediment deposition in the tidal floodplains during June to October – the monsoon months


Tidal River Management
in the Ganges-Brahmaputra Delta
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

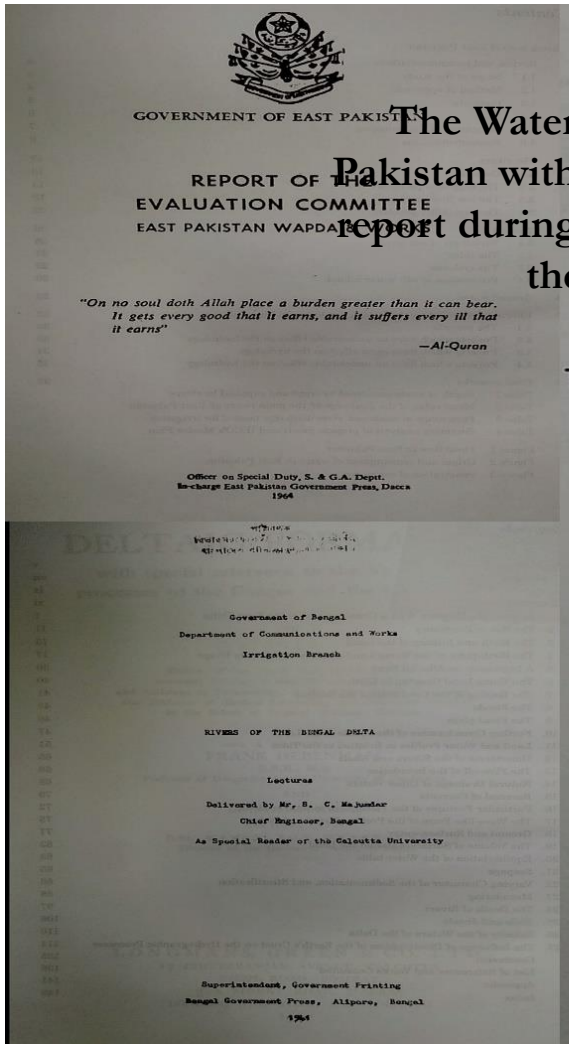


Flooding of the crop field was a common occurrence during June to October – the monsoonal months. The low-height earthen embankments were not enough to protect the crop-fields from devastating floods.



There were local and international efforts to cope with natural hazards and management of water resources of the Lower Bengal Delta

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).


GOVERNMENT OF EAST PAKISTAN

REPORT OF THE
EVALUATION COMMITTEE
EAST PAKISTAN WAPDA PROJECTS

"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, Dacca
1964

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

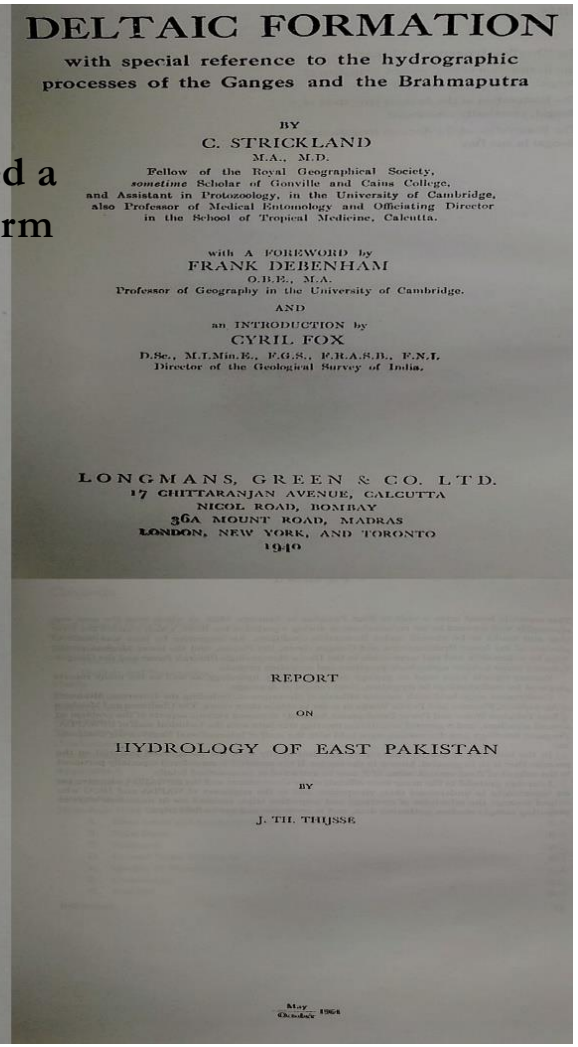
Superintendent, Government Printing
Bengal Government Press, Alipore, Bengal
1954

TECHNICAL ASSISTANCE PROGRAMME
1957

EPWAPDA

Report
of a
United Nations Technical Assistance Mission

VOLUME-I


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
D.Sc., M.I.Min.E., F.G.S., F.R.A.S.B., F.N.I.
Director of the Geological Survey of India.

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36A MOUNT ROAD, MADRAS
LONDON, NEW YORK, AND TORONTO
1940

REPORT

ON

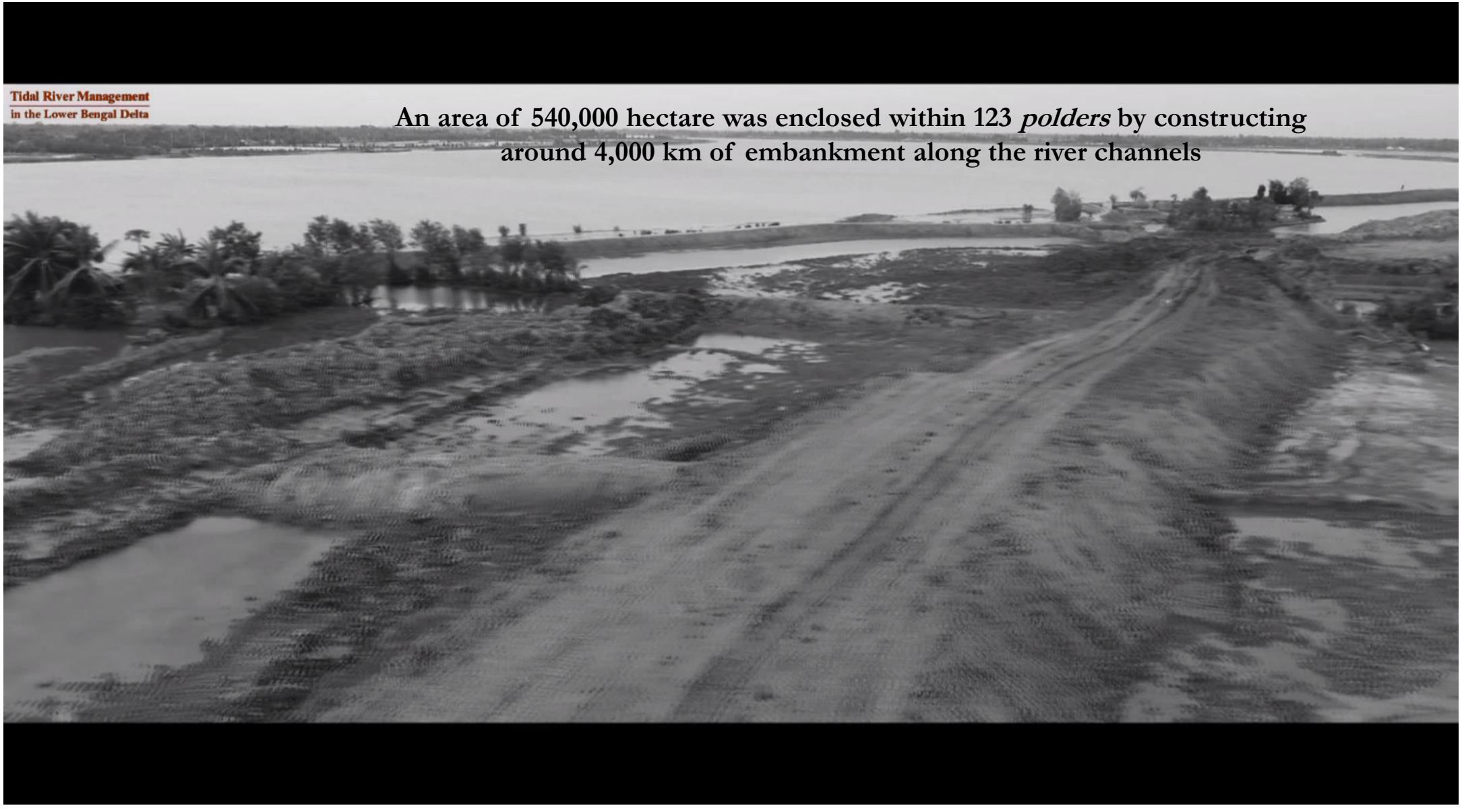
HYDROLOGY OF EAST PAKISTAN

BY

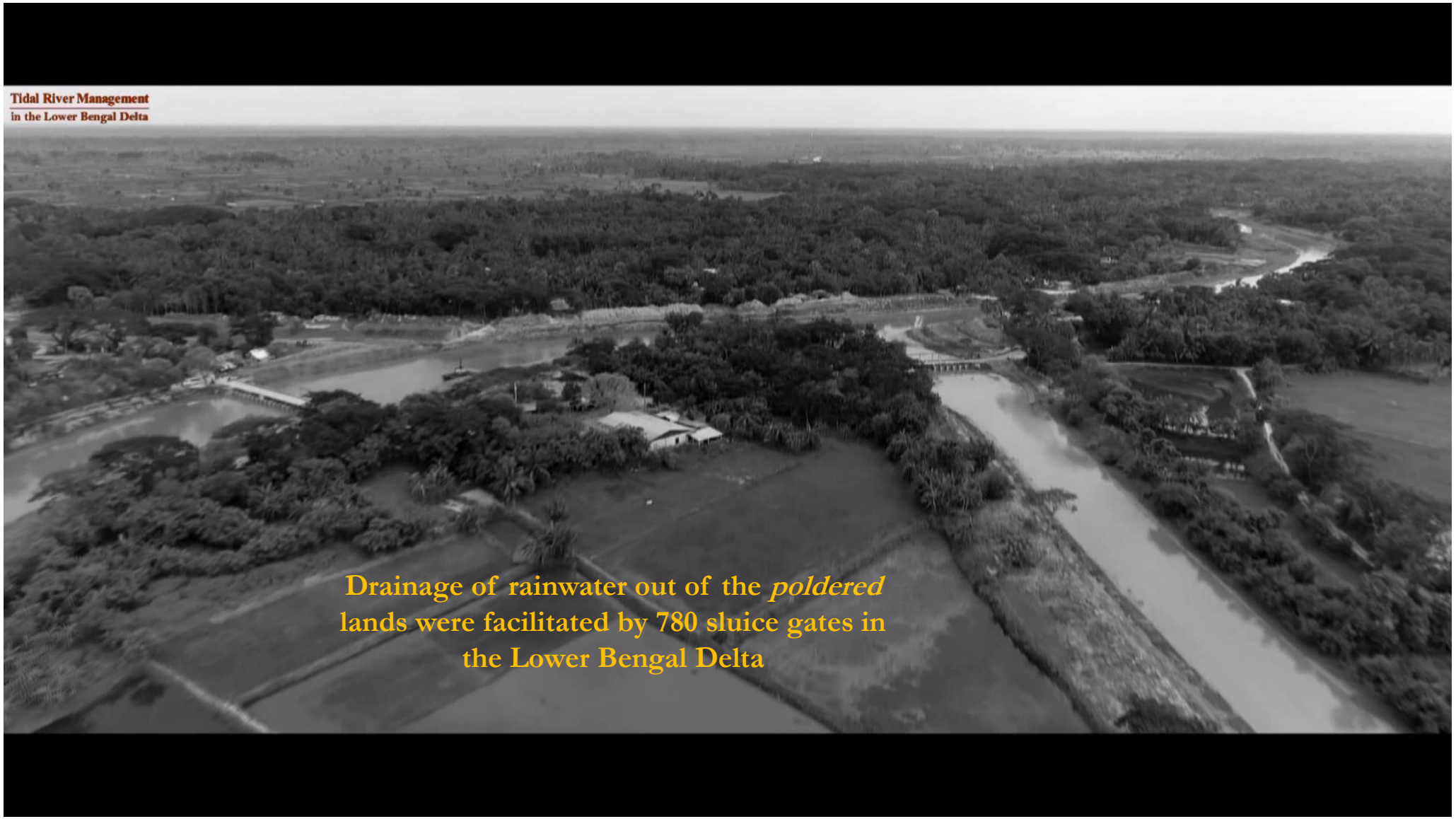
J. TH. THIJSSE

May
October 1964


Tidal River Management
in the Lower Bengal Delta


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


Tidal River Management
in the Lower Bengal Delta
Polder is a piece of low-lying land that is enclosed by embankments


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

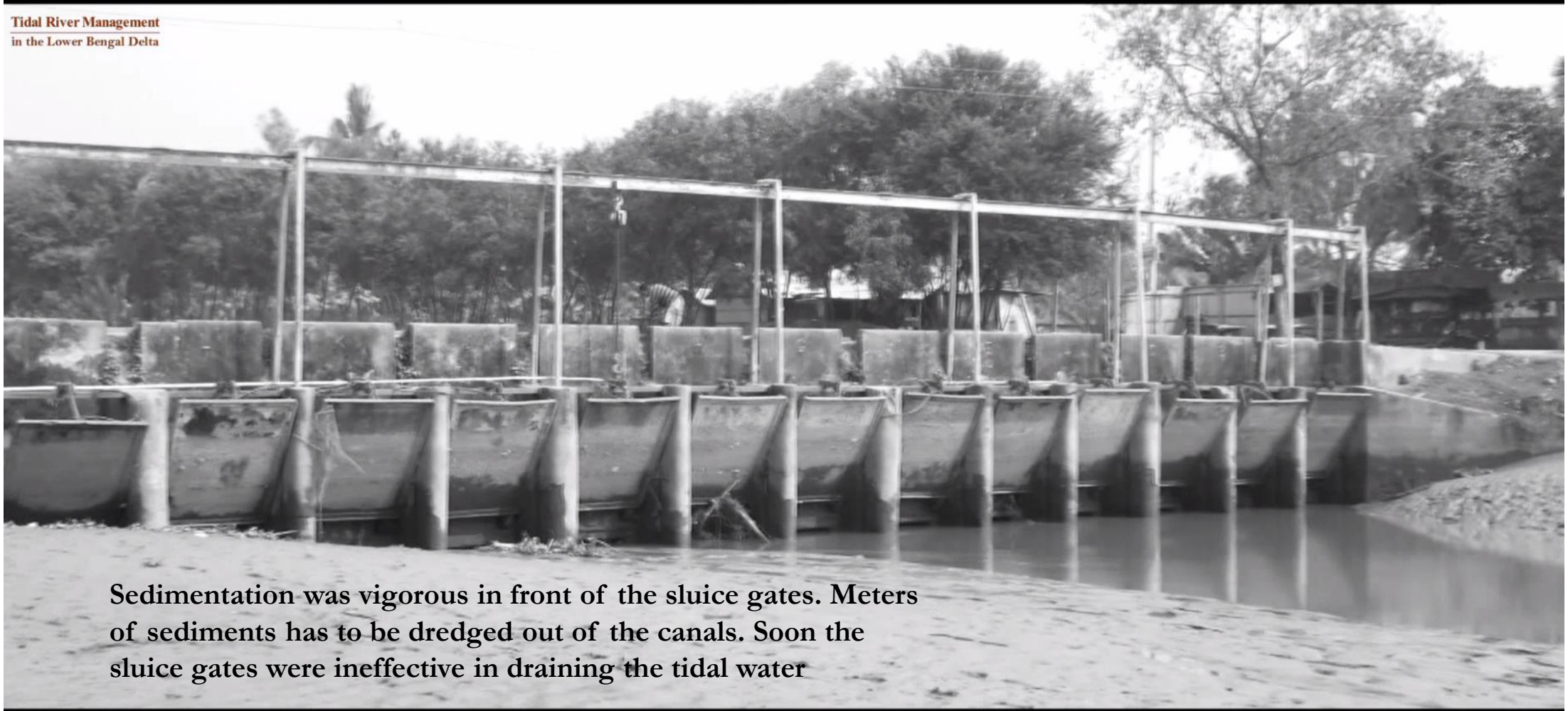
Poderization offered an immediate relief to the community by facilitating road network

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

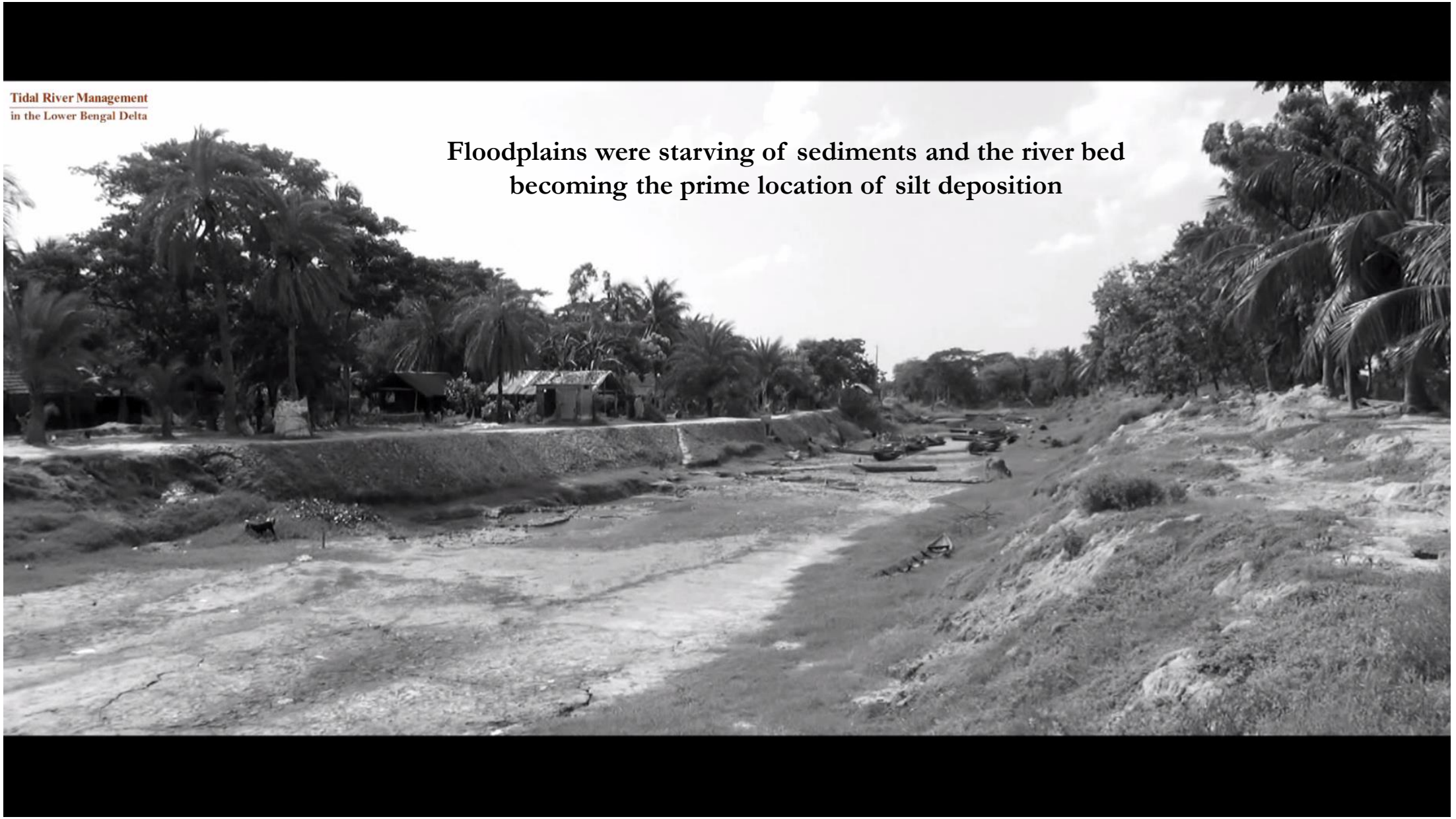

Tidal River Management
in the Lower Bengal Delta
The land was good for
even three crops in a year

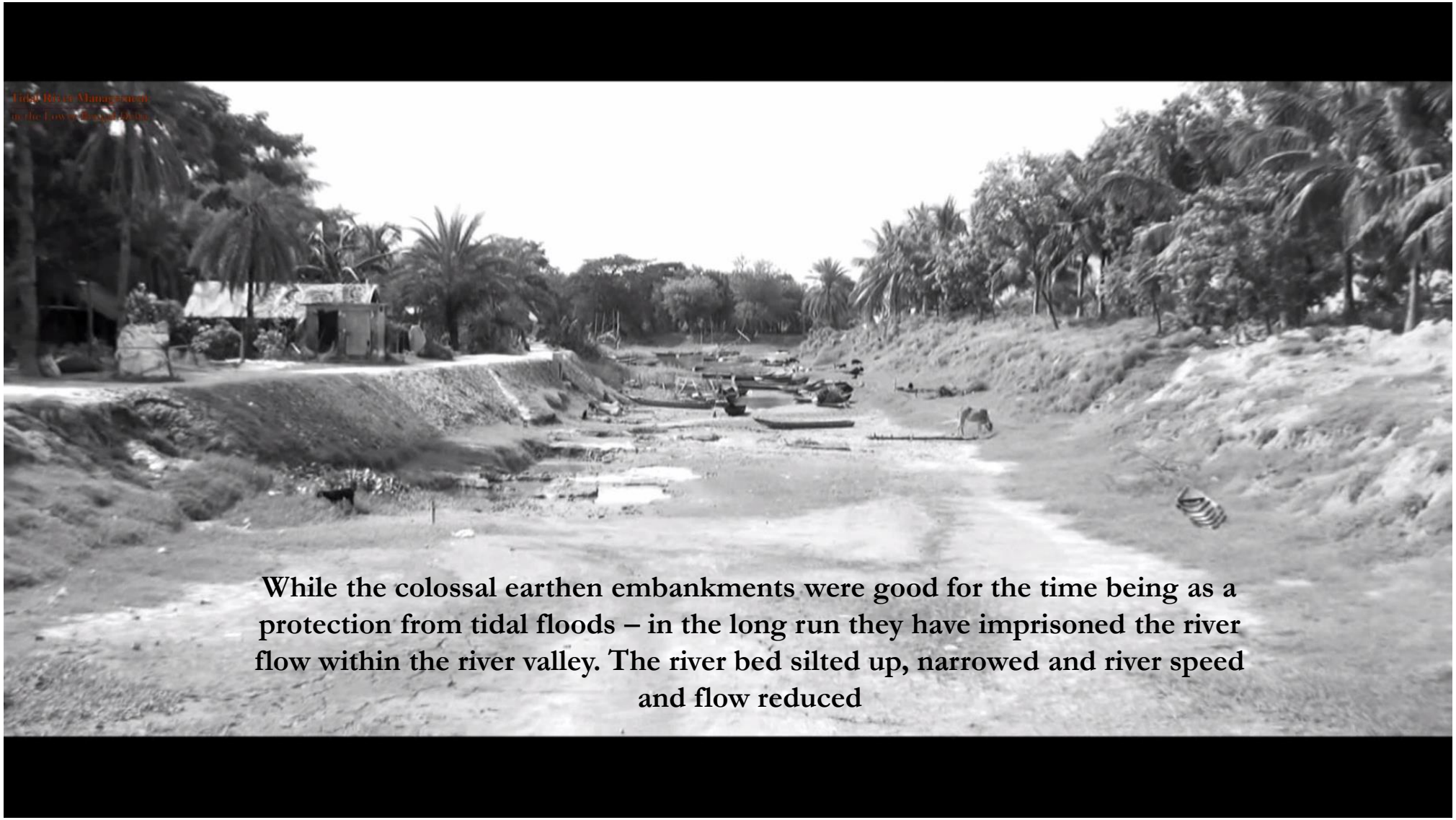

Apparently the *poldered*
community were happy

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



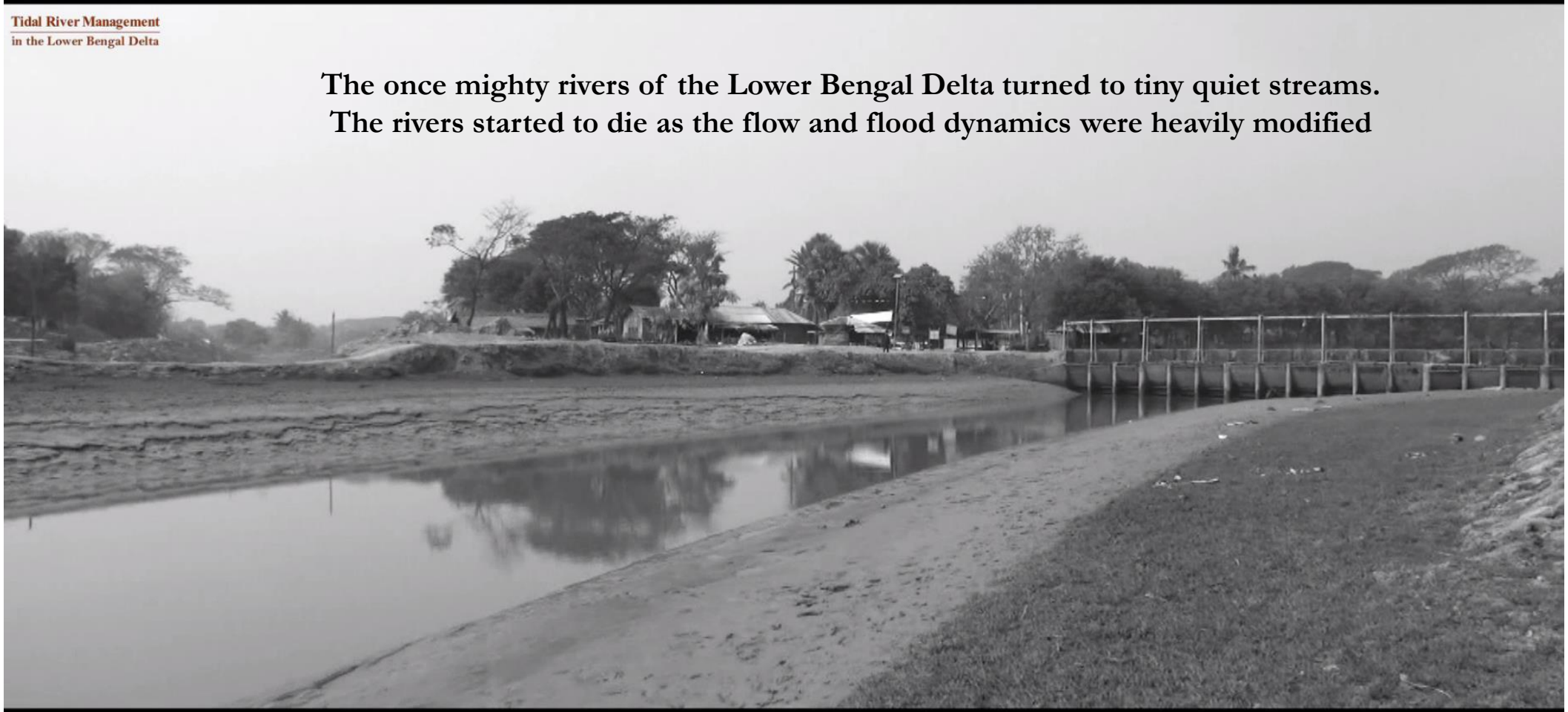
Sedimentation was vigorous in front of the sluice gates. Meters of sediments has to be dredged out of the canals. Soon the sluice gates were ineffective in draining the tidal water

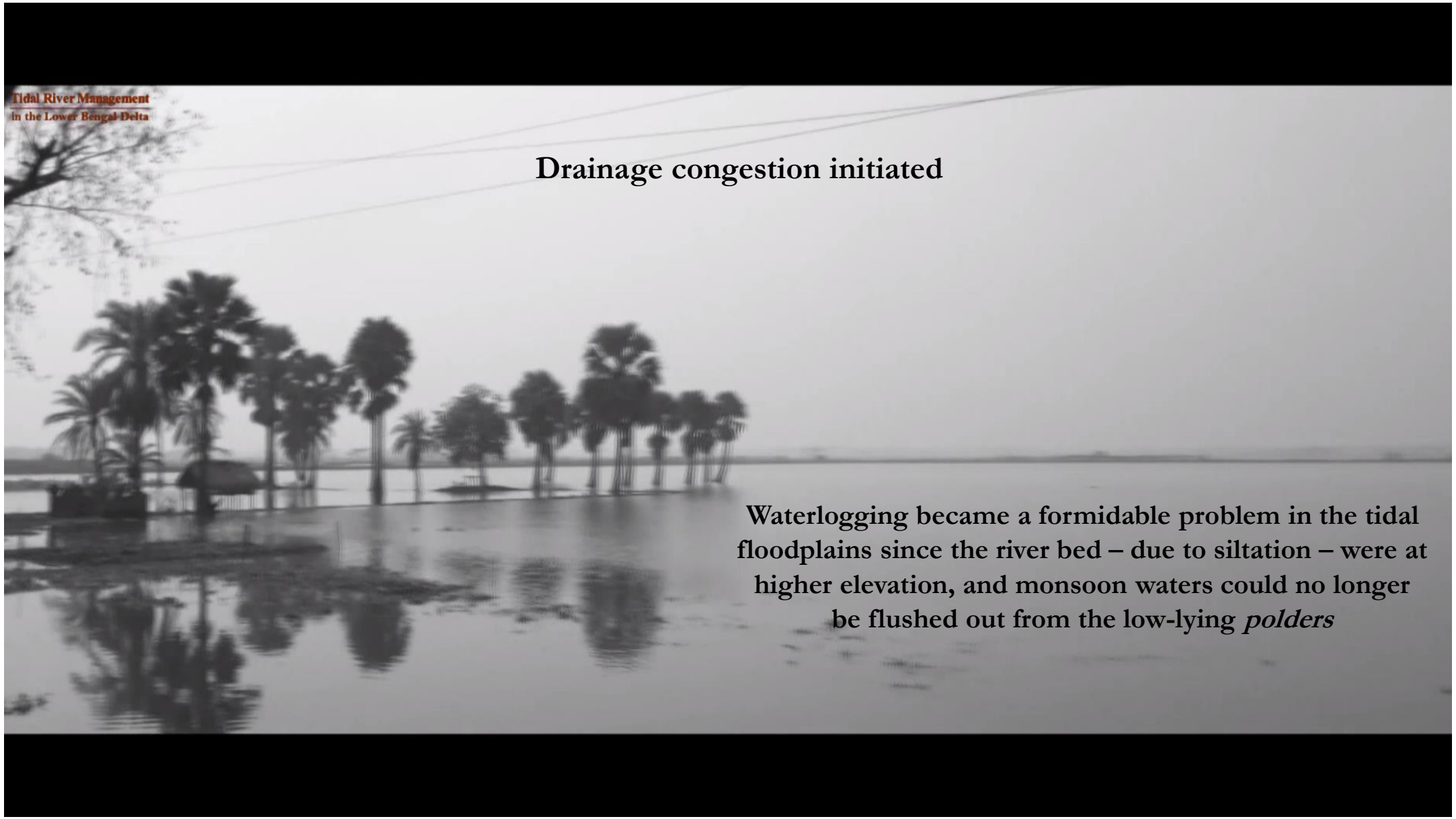

Floodplains were starving of sediments and the river bed
becoming the prime location of silt deposition



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

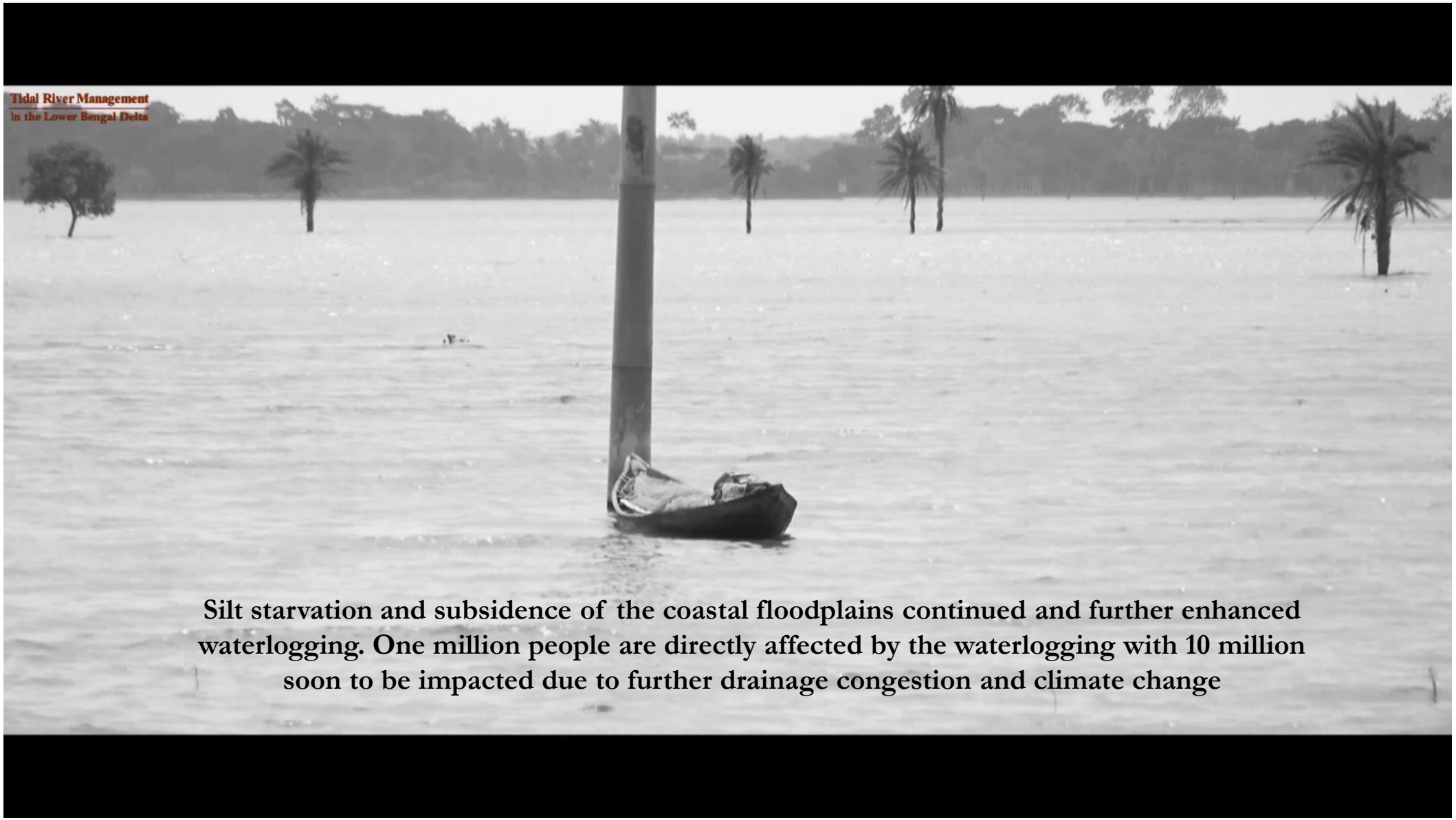
The once mighty rivers of the Lower Bengal Delta turned to tiny quiet streams.
The rivers started to die as the flow and flood dynamics were heavily modified



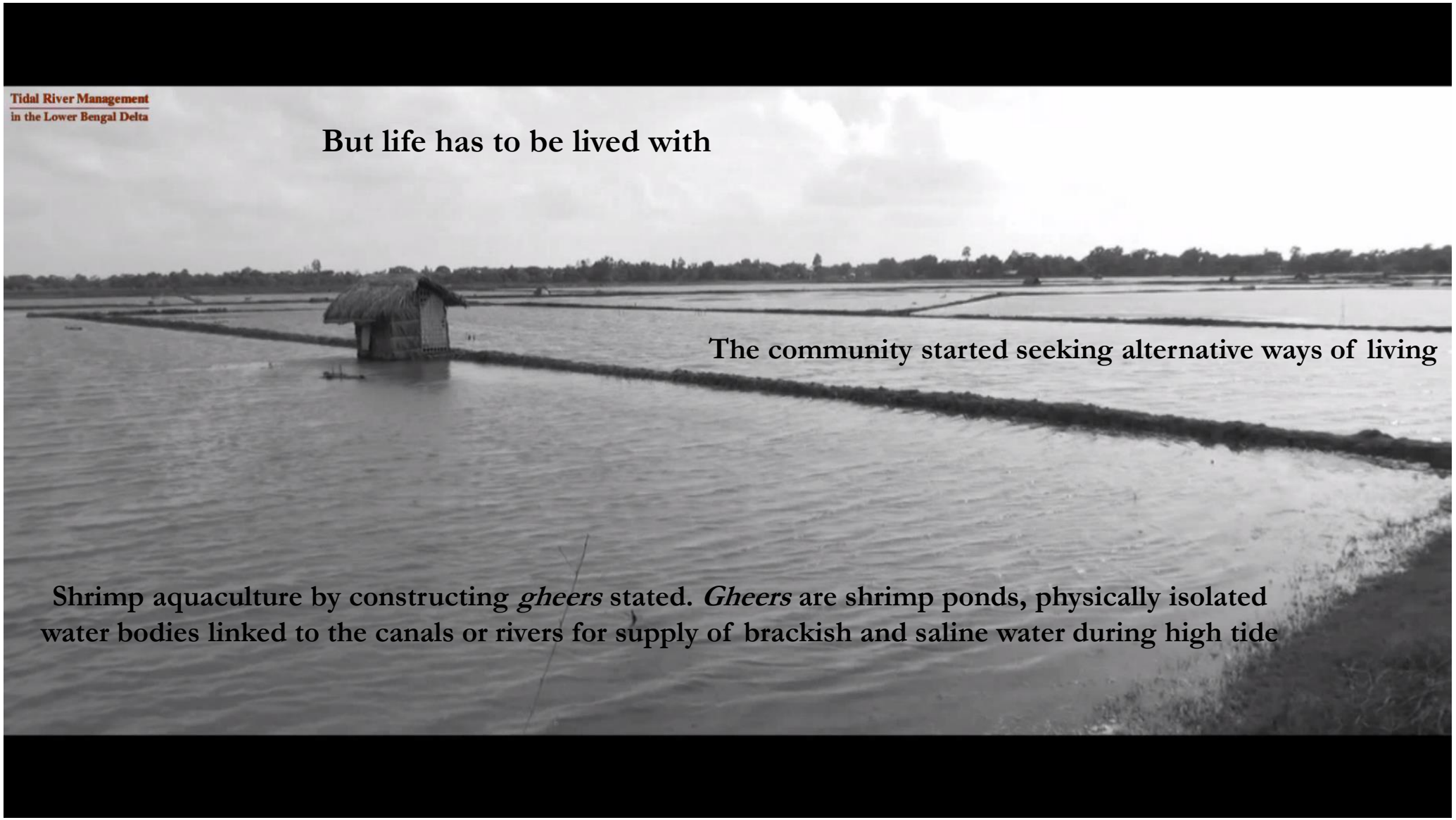


Drainage congestion initiated

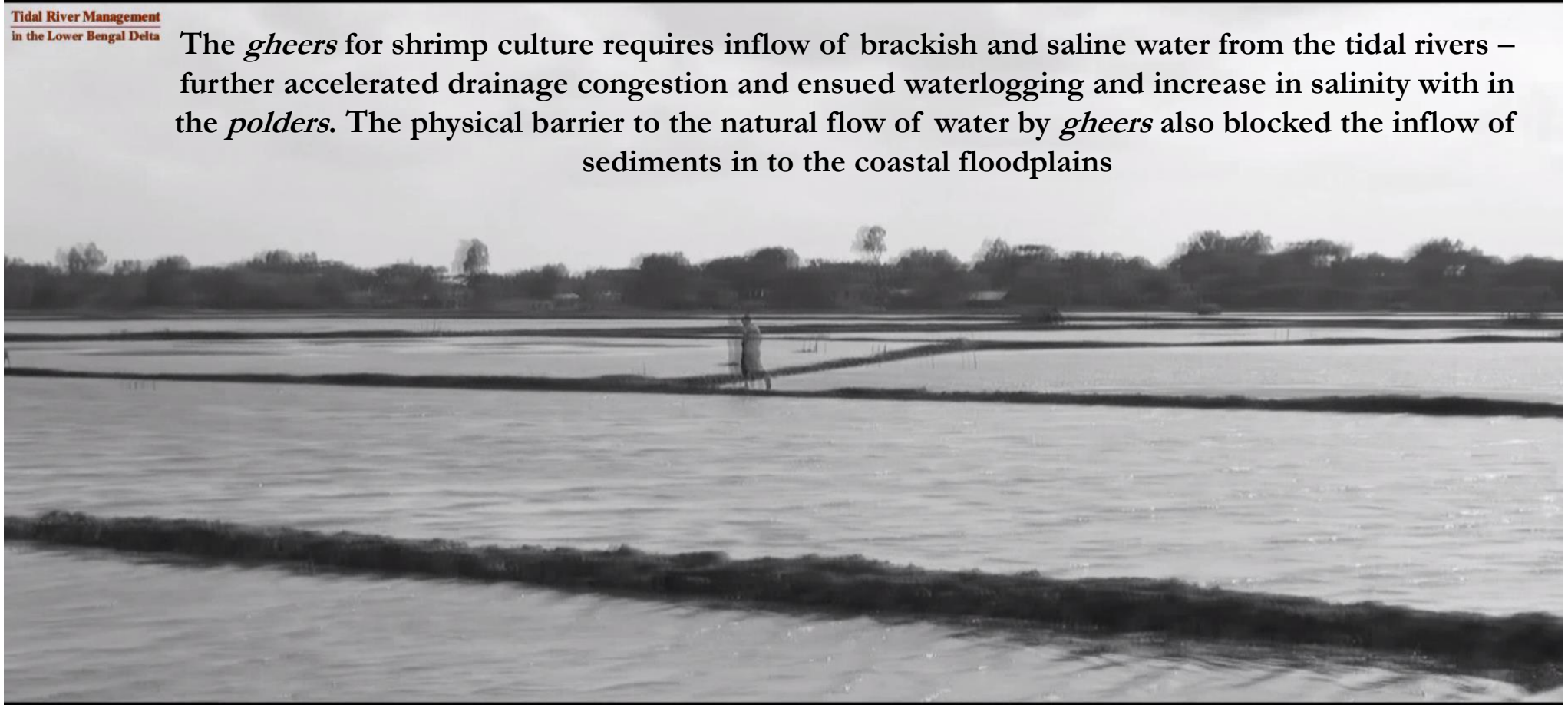
Waterlogging became a formidable problem in the tidal floodplains since the river bed – due to siltation – were at higher elevation, and monsoon waters could no longer be flushed out from the low-lying *polders*



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

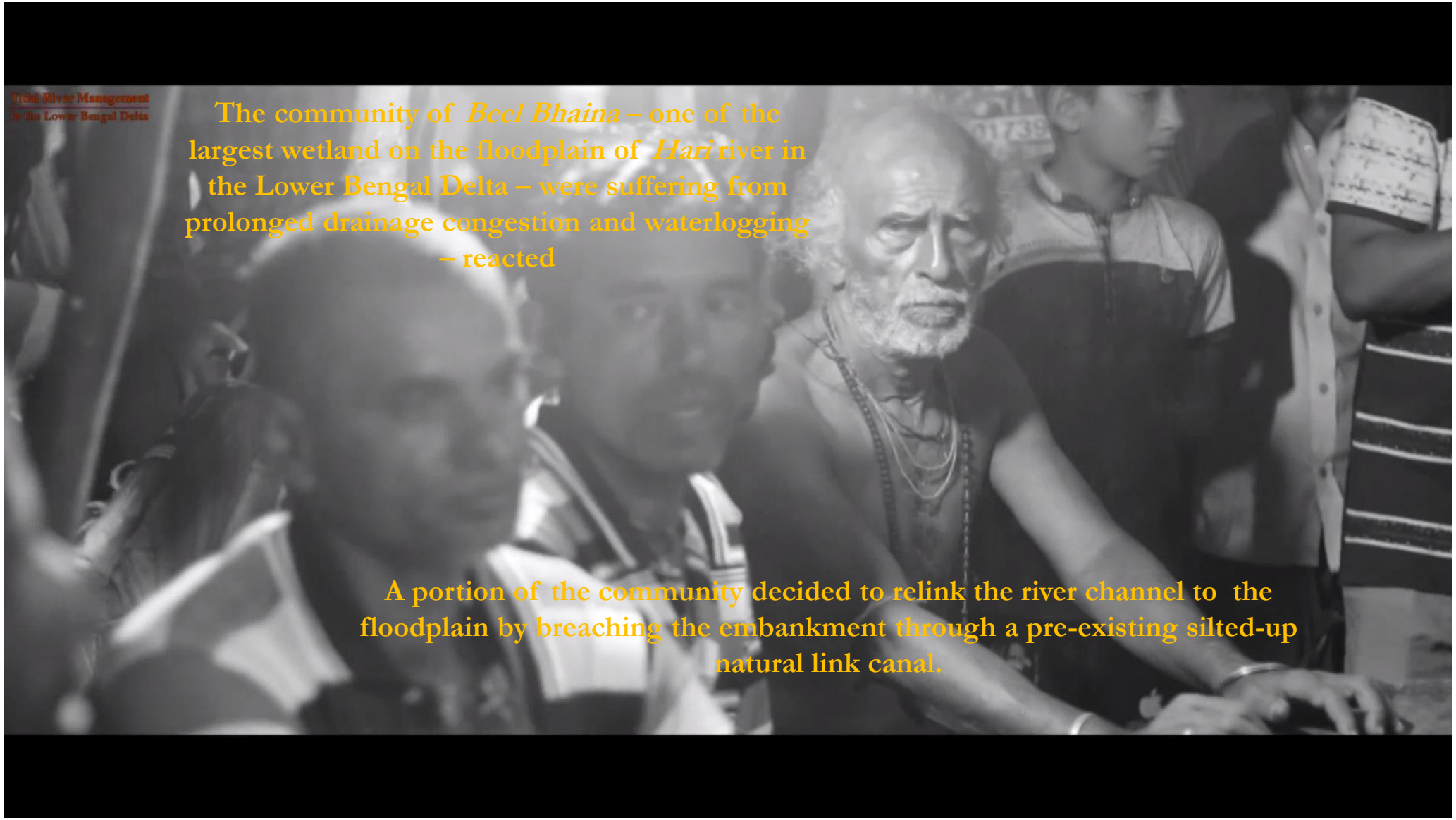

But life has to be lived with
The community started seeking alternative ways of living
Shrimp aquaculture by constructing *gheers* stated. *Gheers* are shrimp ponds, physically isolated water bodies linked to the canals or rivers for supply of brackish and saline water during high tide

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



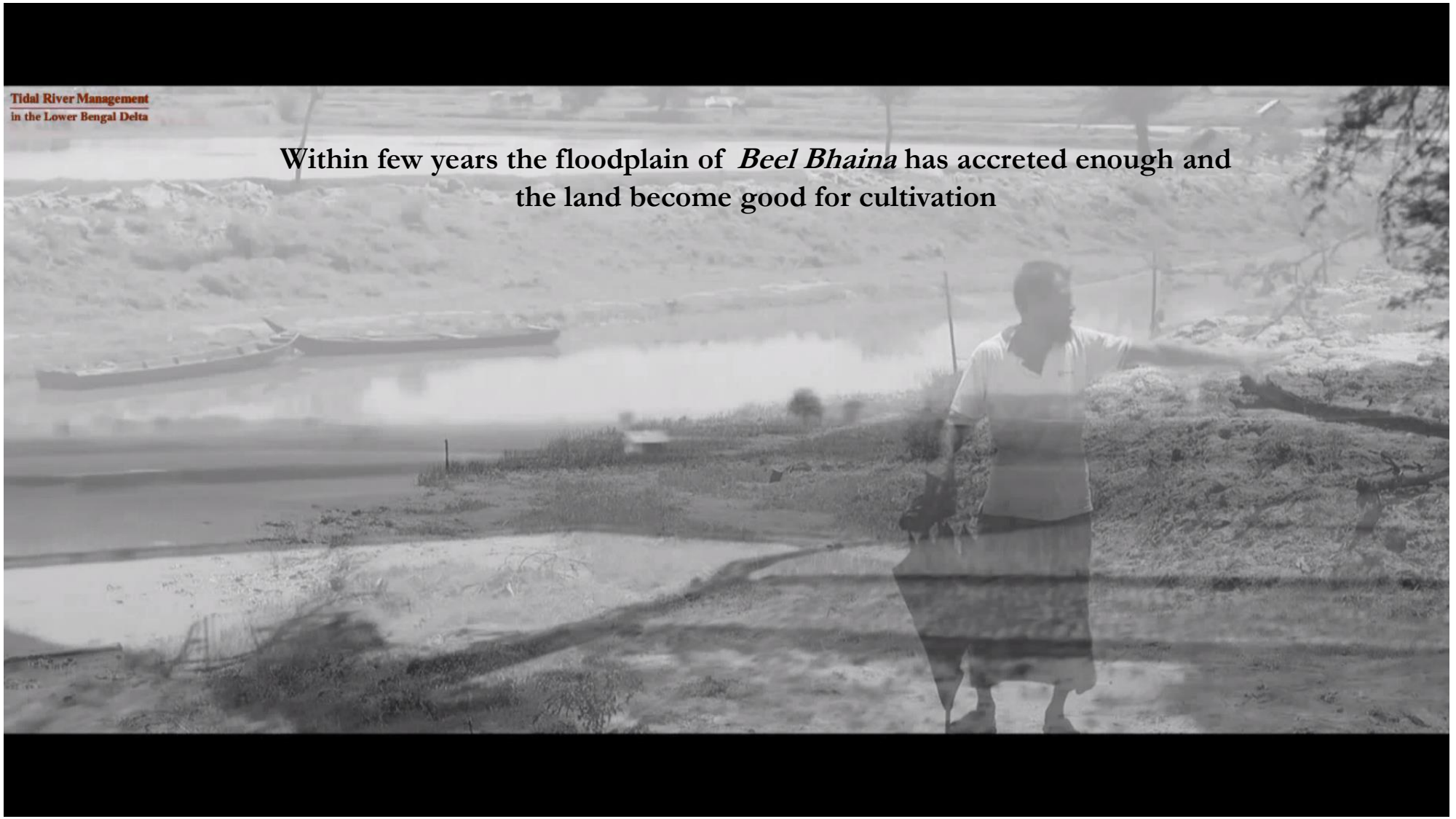

সংবাদ
১৫ বছরে ৬০ হাজার হেক্টর জমি জলাবদ্ধতায় পরিণত হয়েছে
অপরিকল্পিত ভেড়িবাঁধ ও স্লুইস গেট ভবদহ সমস্যার মূল কারণ
Declare south western wetlands 'disaster-hit'
Heavy siltation triggering recurrent crop failures
living in utter distress
Death is only a matter of time
Conflicts over how to use the tidal rivers and adjacent lands continued


Tidal River Management
in the Lower Bengal Delta


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.


Tidal River Management
in the Lower Bengal Delta
Breaching of embankment has restored
movement of tidal sediments and waterflow
into the tidal floodplain in no time

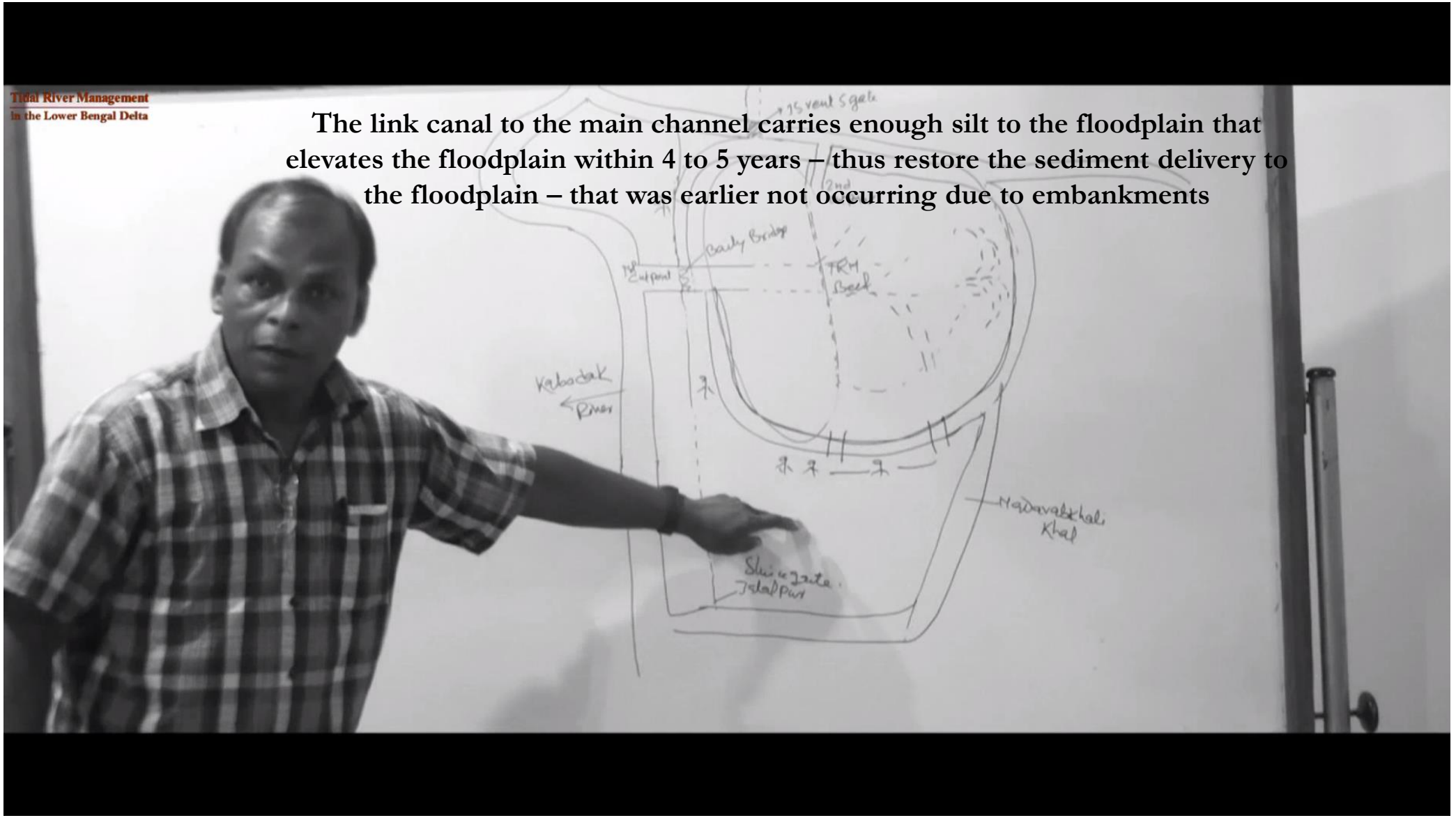

Water laden with suspended sediments finds way
to the floodplain


Tidal River Management
in the Lower Bengal Delta
Within few years the floodplain of *Beel Bhaina* has accreted enough and
the land become good for cultivation


Tidal River Management
in the Lower Bengal Delta
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

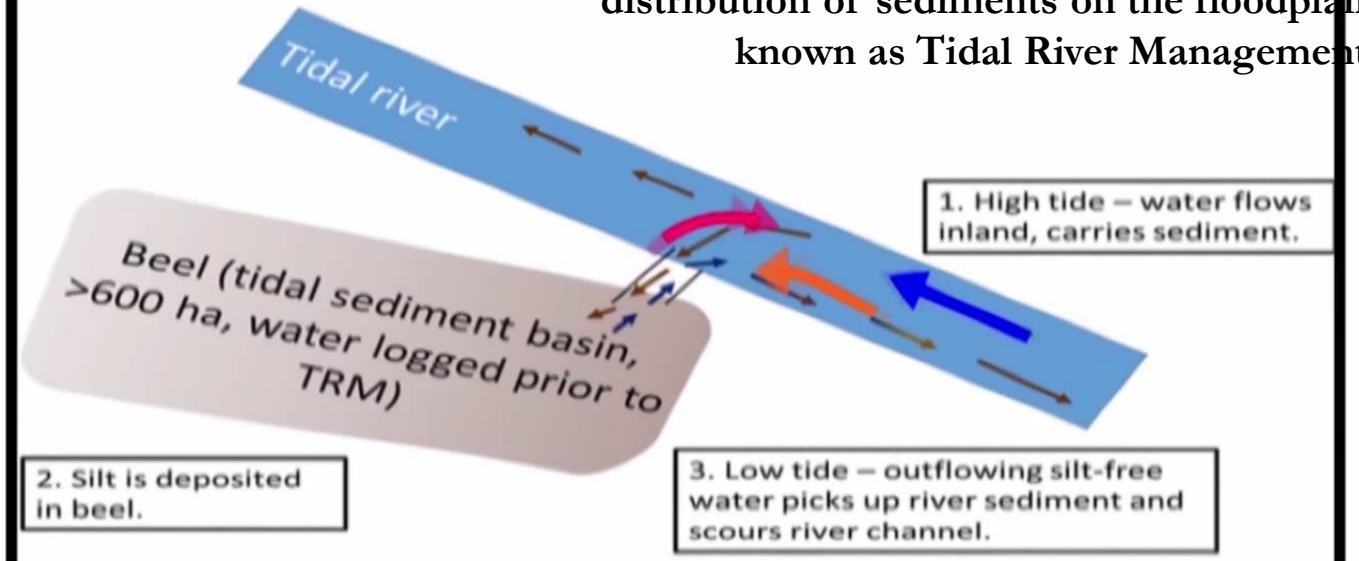

Tidal River Management
in the Lower Bengal Delta


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

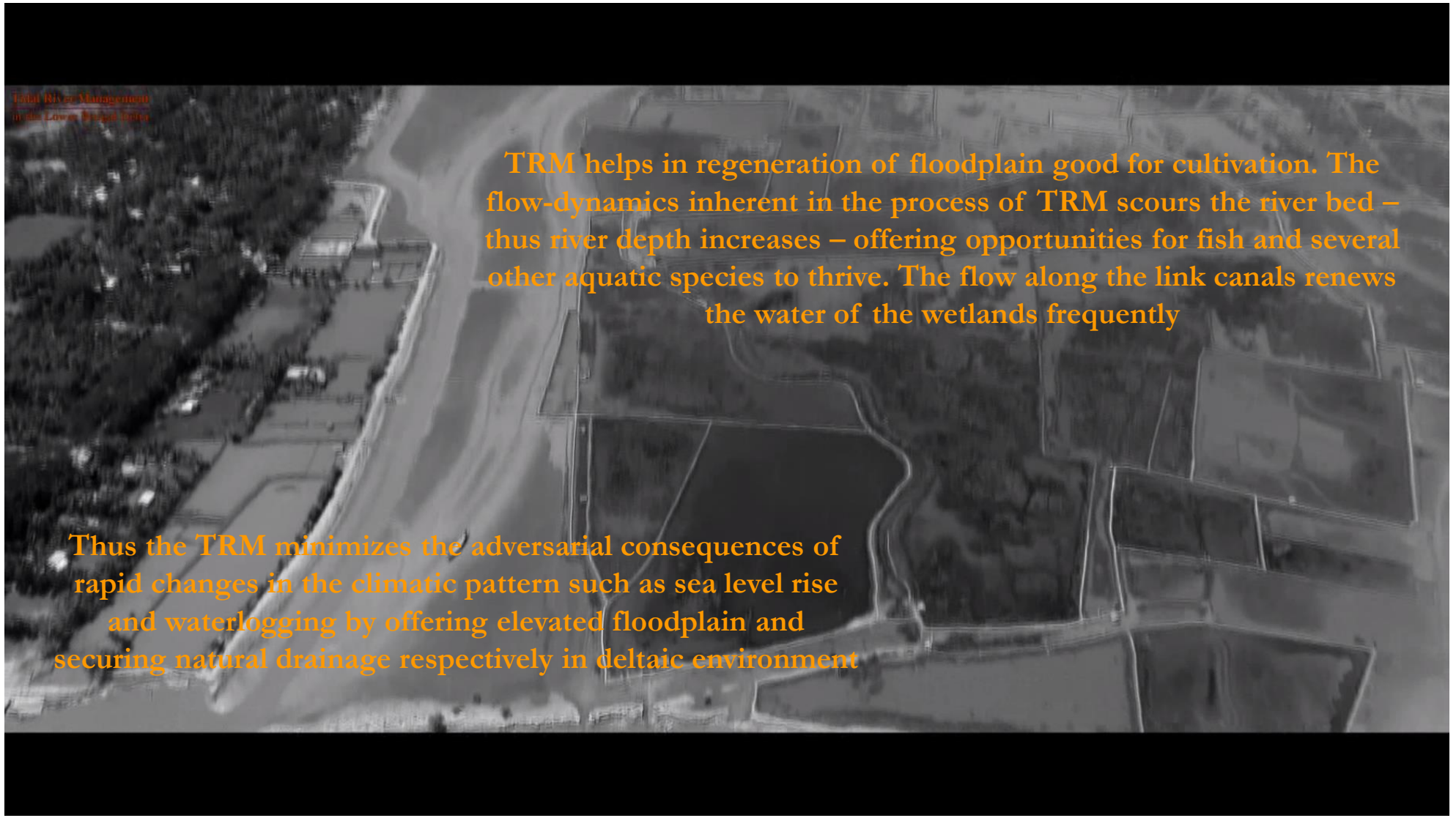

Tidal River Management
in the Lower Bengal Delta
The link canal to the main channel carries enough silt to the floodplain that elevates the floodplain within 4 to 5 years – thus restore the sediment delivery to the floodplain – that was earlier not occurring due to embankments
Kabadak
River
Sluice Gate
Jalalpur

Tidal River Management
in the Lower Bengal Delta

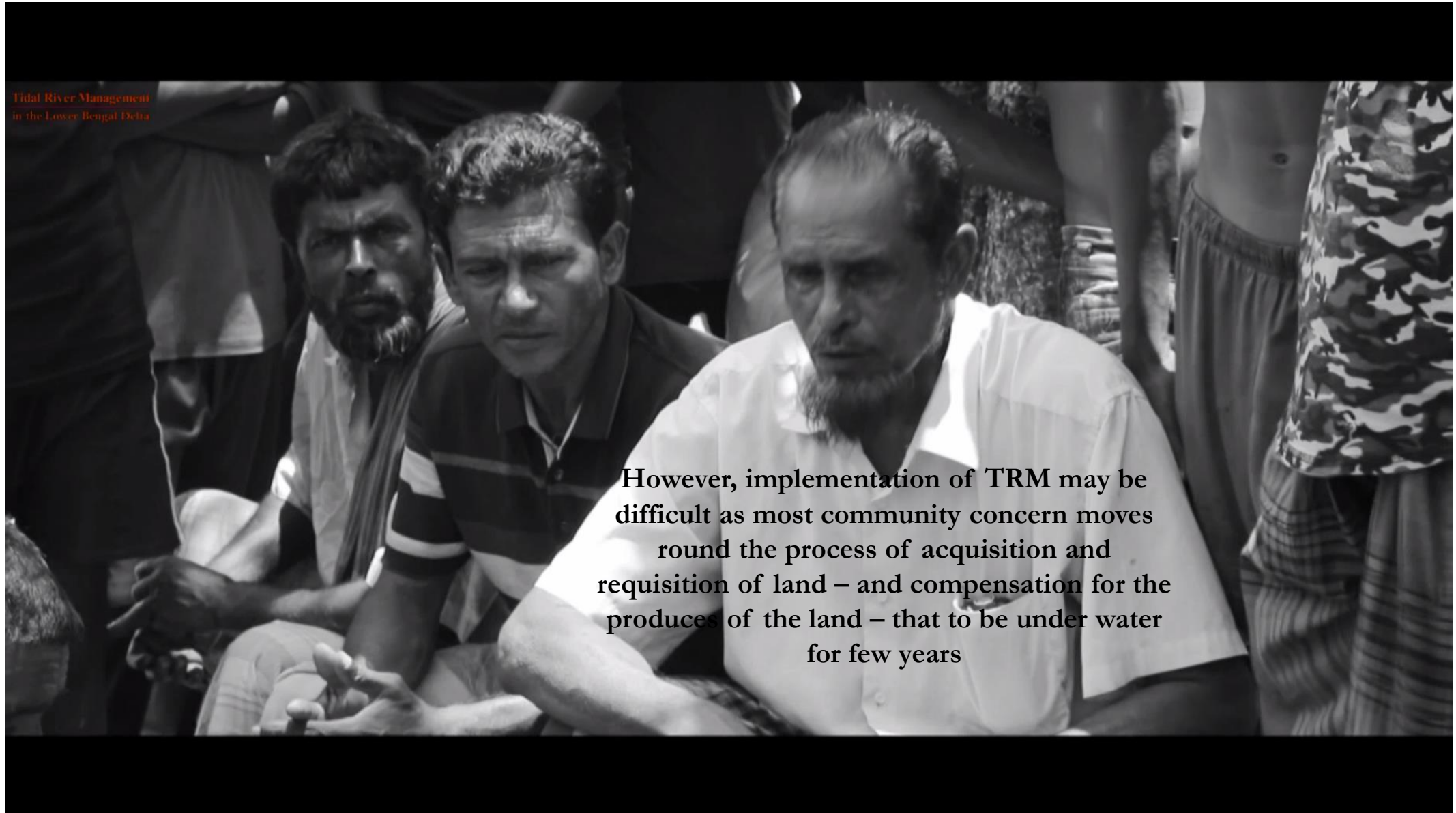
This process of reactivating tidal rivers and natural distribution of sediments on the floodplain in now-a-days known as Tidal River Management (TRM)



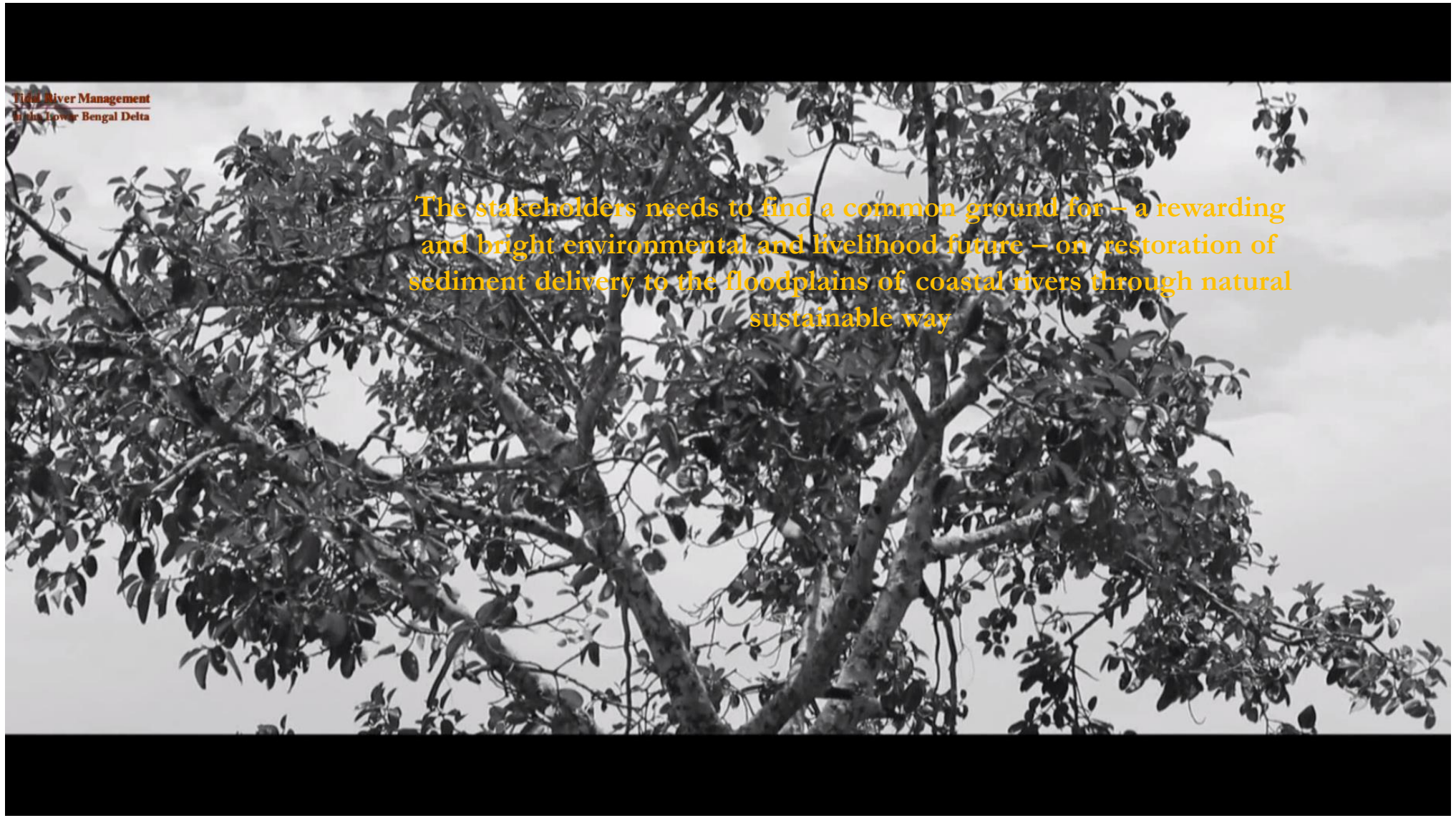

Tidal River Management
in the Lower Bengal Delta


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


Tidal River Management
in 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


Tidal River Management
in the Lower Bengal Delta
The stakeholders needs 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

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