



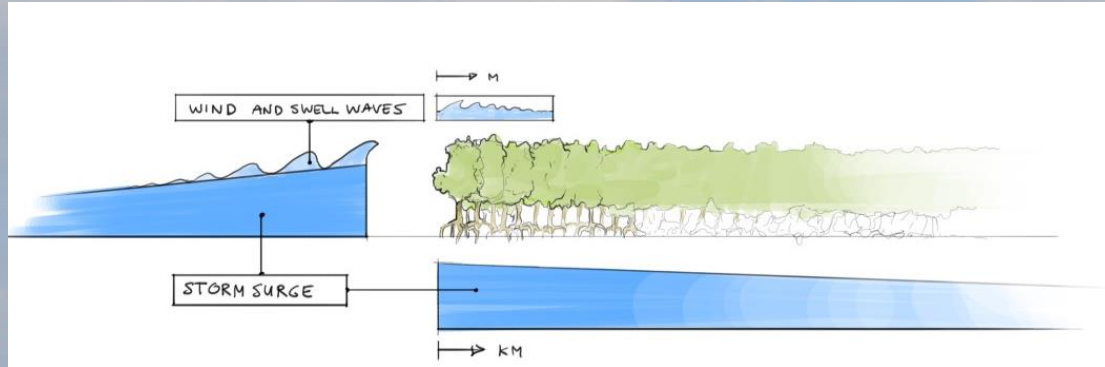
Mangrove restoration

To plant or not to plant?

Pieter van Eijk
Programme Head Deltas & Coasts

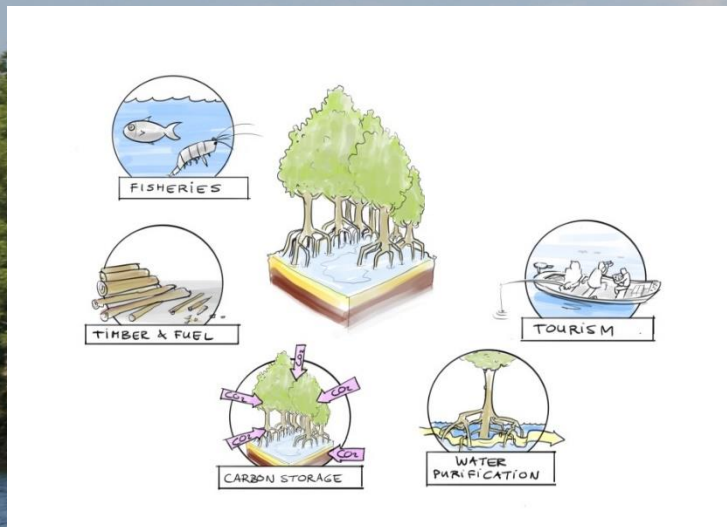
Menno de Boer
Intern

The world needs mangroves

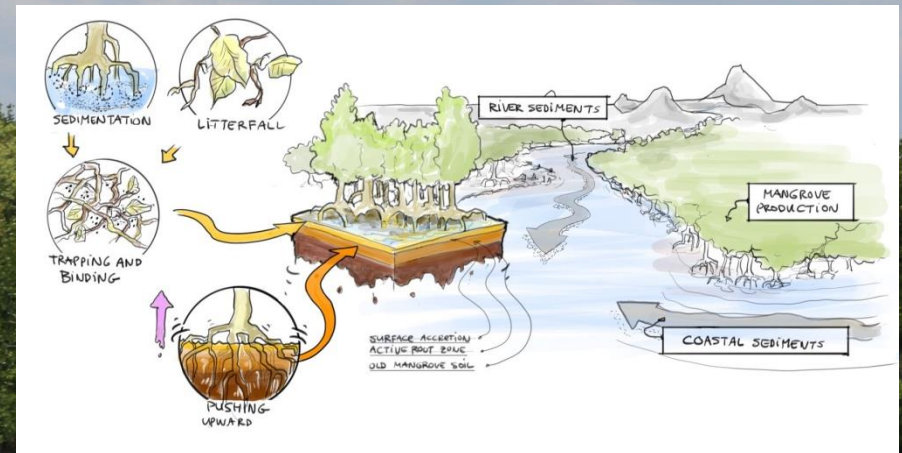


Reducing wave and height:
13-66% in 100 meter belt,
buffering storm surge

1-10mm/yr soil build
up, erosion control



Socio-economic resilience



But we are losing our mangroves fast



Mangrove restoration

- Several hundred thousand hectares
- Boosted by the 2004 Tsunami
- Planting is popular: NGOs, government agencies, communities and private sector



Source: Worldpress, 2017

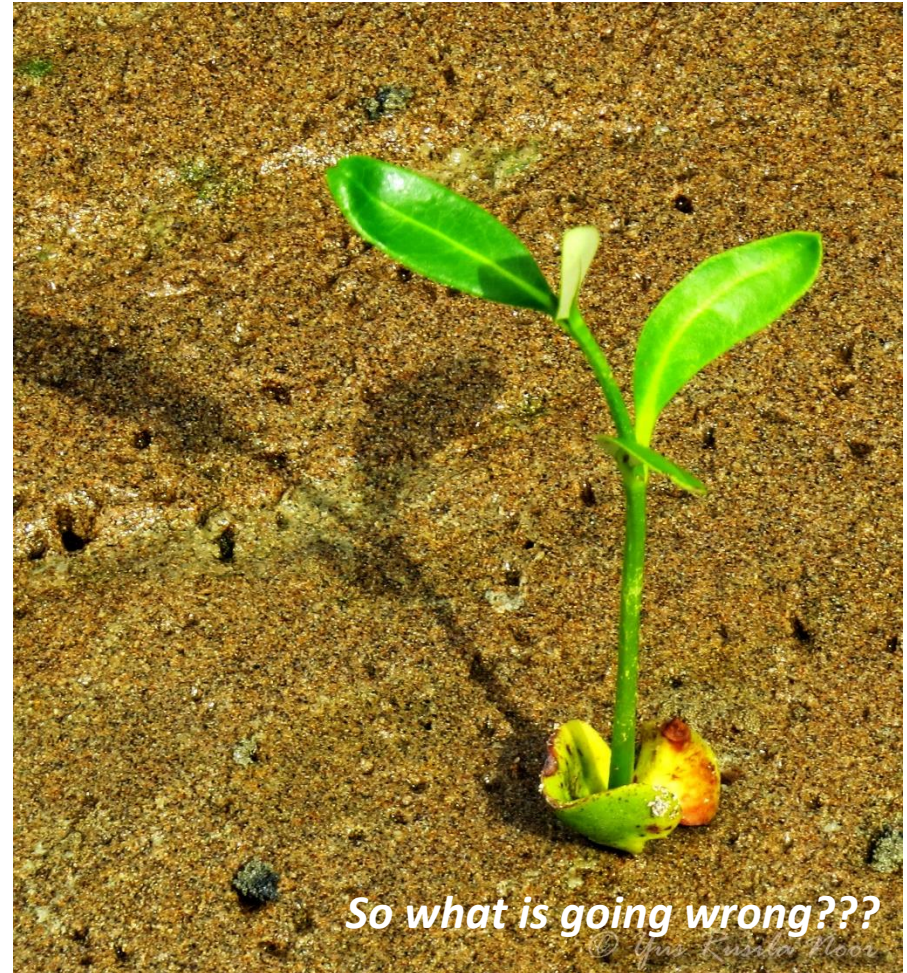
Mangrove restoration succes

Phillipines (Primavera and Esteban 2008)

- App 25.000 ha
- Survival rate 10-20%

Sri Lanka (Kodikara et al., 2017)

- 1000-1200 ha
- Survival rate 20%



Planting in the wrong zone



Source: Jim Enright & Alfredo Quarto (MAP)

Wrong species, extreme densities



Source: Jurgenne Primavera (ZSL)

Site conditions disturbed: acidity and salinity



Site conditions disturbed: hydrology





Site conditions: disturbed sediment balance

Source: Mark Spalding (TNC)

No community ownership



Source: <http://www.colegiodestaanadevictorias.com>

Ecological Mangrove Restoration: a new approach initiated by Mangrove Action Project

Lewis 2005; Erftemeijer and Lewis 2000; Lewis 2001;

1. Understand the autecology of the mangrove species at the site
2. Understand the hydrological patterns that determine distribution and establishment of mangrove species
3. Assess modifications in the original mangrove environment
4. Restore hydrology and other environmental conditions to encourage natural recruitment
5. Only consider active planting if natural recruitment can not take place

Winterwerp et al., 2013:

6. If needed, restore the sediment balance by removing obstacles in the intertidal zone and by facilitating sediment capture through 'saltmarsh works'

And ensure community ownership and involvement!!!

Example: Guinea Bissau



Mangroves in Guinea Bissau

- 8% mangrove cover mangroves (Lourenço et al. 2008)
- High biodiversity and socio-economic values
- Coastal protection
- Vulnerable to droughts
- Large scale conversion for rice farming



West African mangroves harbour millions of wintering European warblers

Leo Zwarts*, Jan van der Kamp, Erik Klop, Marten Sikkema & Eddy Wymenga



Zwarts L., van der Kamp J., Klop E., Sikkema M. & Wymenga E. 2014. West African mangroves harbour millions of wintering European warblers. *Ardea* 102: 121–130. doi:10.5253/arde.v102i2.a2

Mangrove forests attract many insectivorous birds. Bird density in West African mangroves in January–March 2014 is higher in *Avicennia* (21 birds/ha canopy) than in *Rhizophora* (11 birds/ha). The Palearctic species are dominant in the most northern mangroves (14–16°N), but further south resident birds become as numerous as migrants (11–12°N). The European Reed Warbler *Acrocephalus scirpaceus* is the most common winter visitor in West African mangroves between 12 and 16°N, with an estimated total of 4–6 million birds, which may account for 30–50% of the European population. The mortality of European Reed Warblers while crossing the Sahara desert in spring is higher when their Sudan-Guinean wintering areas have been drought-stricken in the preceding winter. European Reed Warblers wintering in mangroves suffer the same fate, because mangroves in the Sahel region massively die off in drought years.

Key words: mangrove, *Avicennia*, *Rhizophora*, West Africa, European Reed Warbler, insectivorous warblers, migration, carry-over effect

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The Bolanha polder system

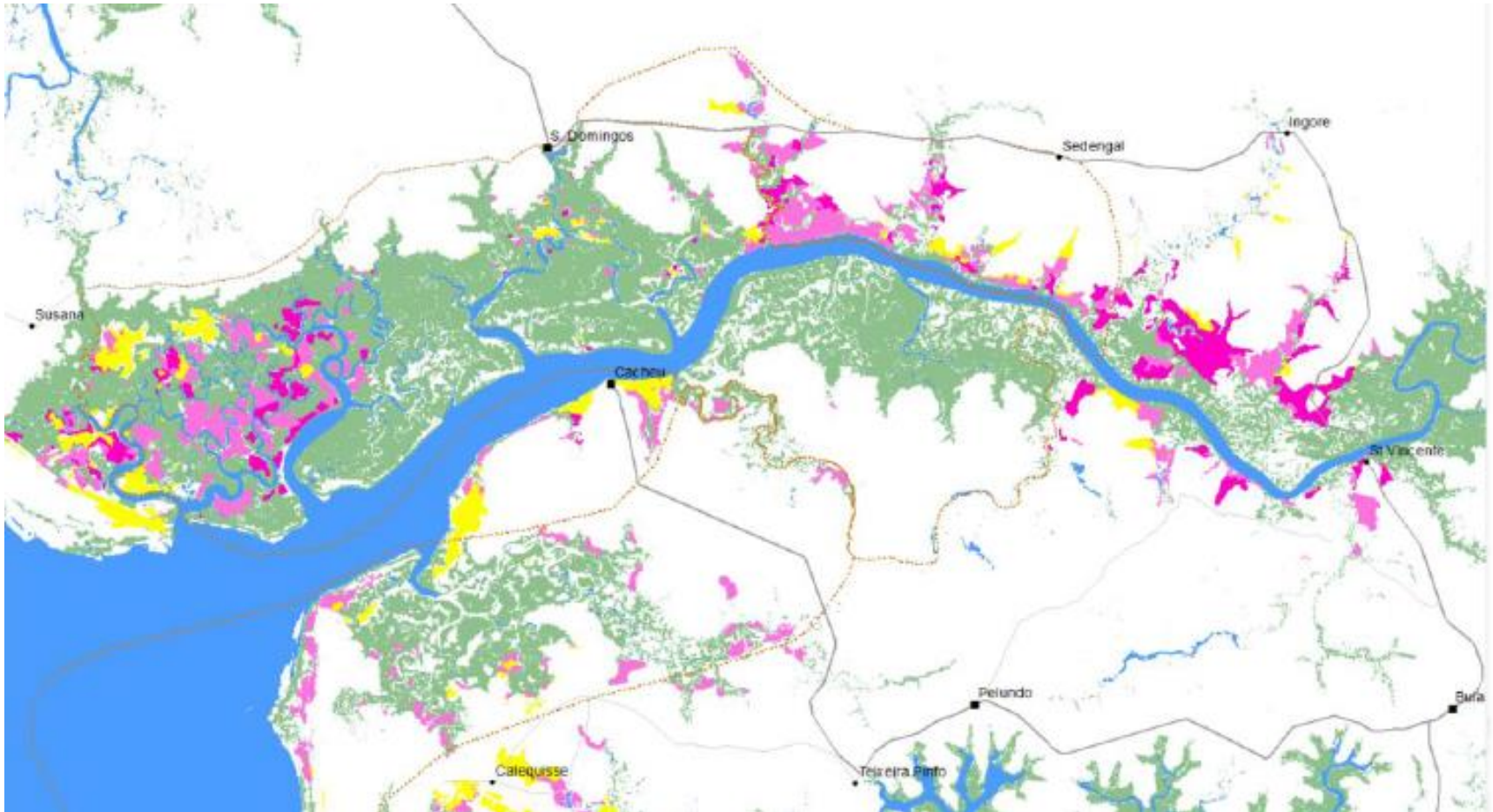


Cacheu National park: aerial view



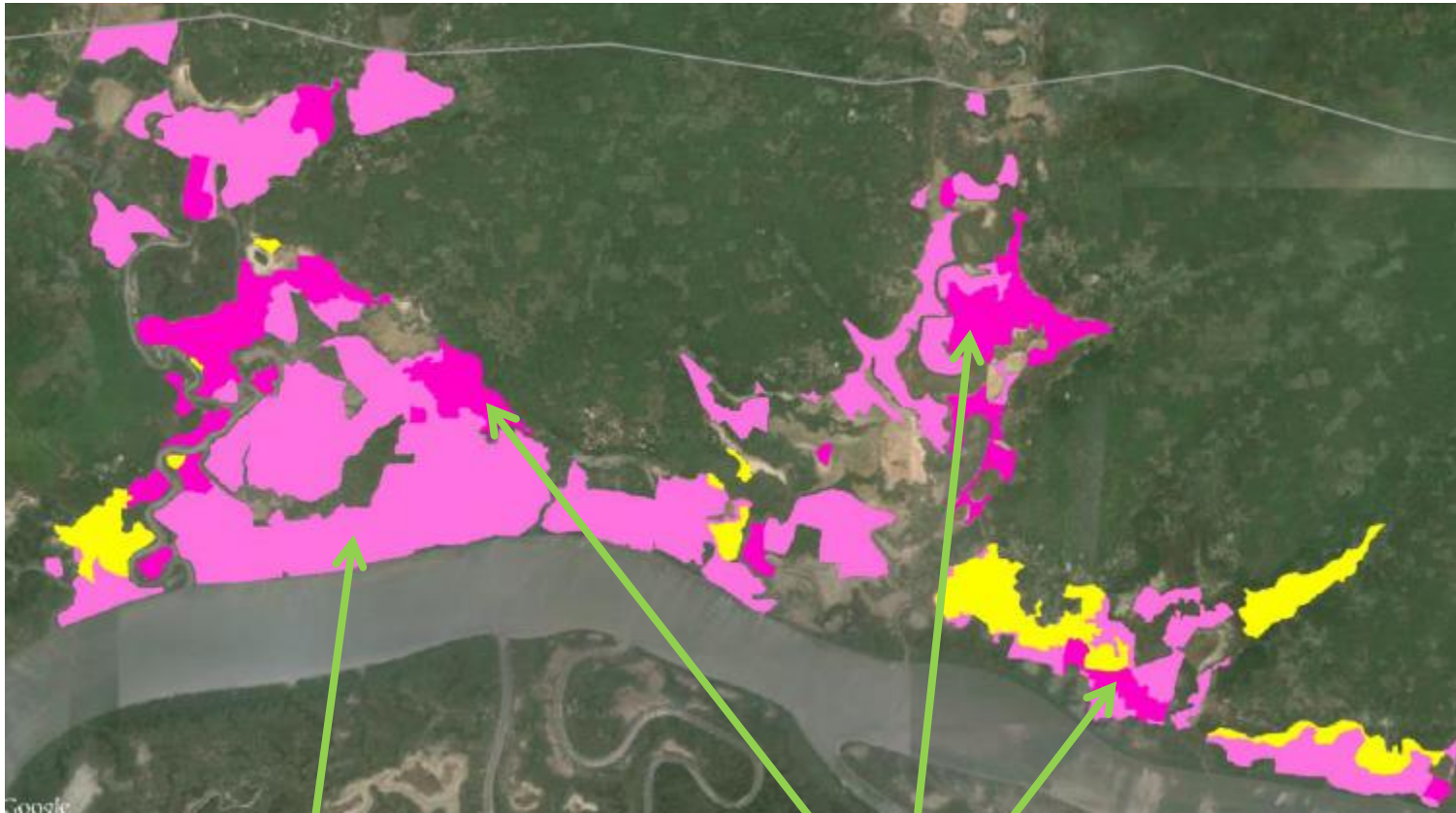
Source: Leo Zwarts (A&W)

1. Mapping of restoration potential



Mapping by: Altenburg & Wymenga

1. Mapping of restoration potential



Large areas are already
overgrown

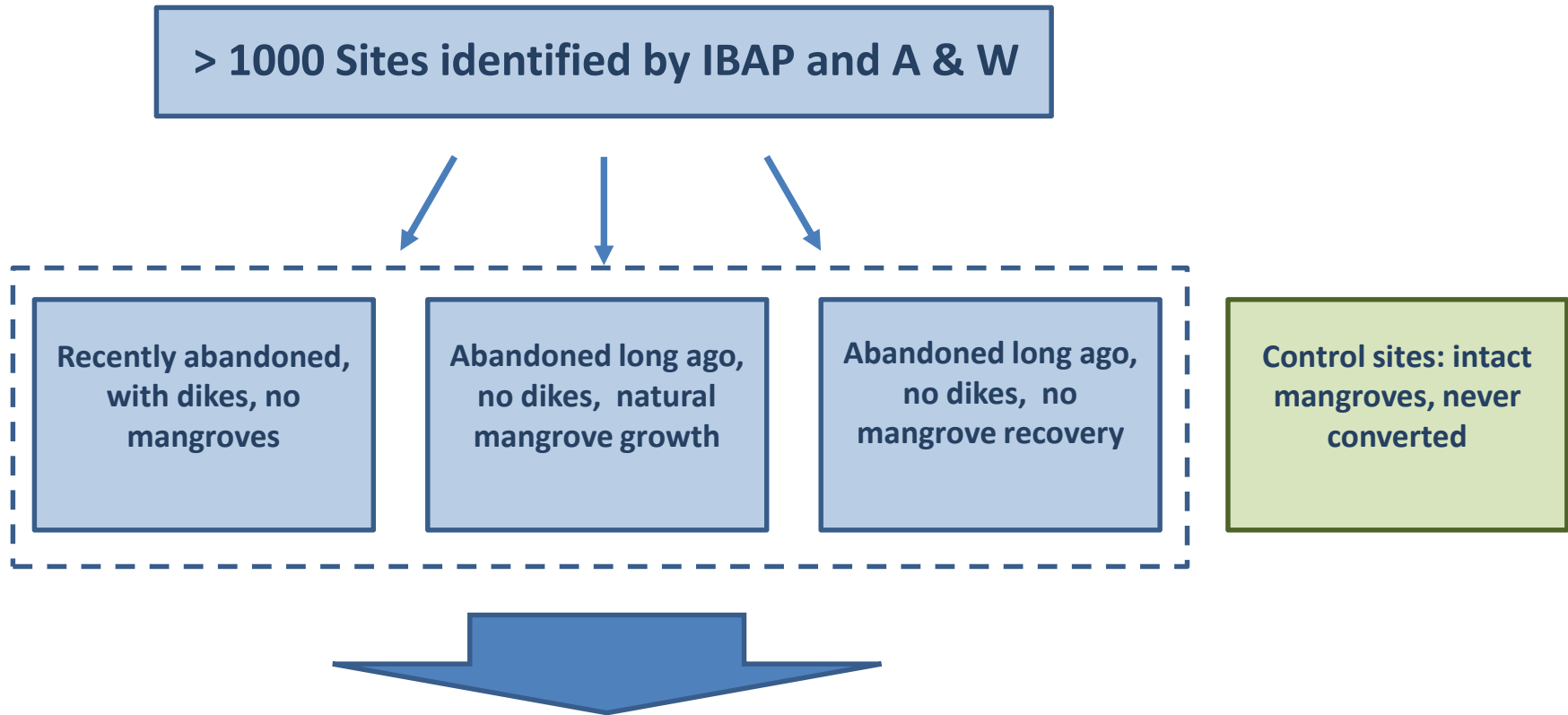
Bare

Mapping by: Altenburg & Wymenga

1. Mapping of restoration potential



2. Ground-truthing and prioritisation



- **Hydrology:** flow patterns - flooding height and duration - salinity - acidity
- **Soil conditions:** soil structure - organic matter content - salinity - acidity
- **Biotic parameters:** availability of propagules, biodiversity

2. Ground truthing



3. Restore enabling conditions



Results after 6 months



Reappearance of tidal creeks

Natural widening of breached embankment

Results after 6 months



Flushing of salt, softening of soil and massive natural recruitment...

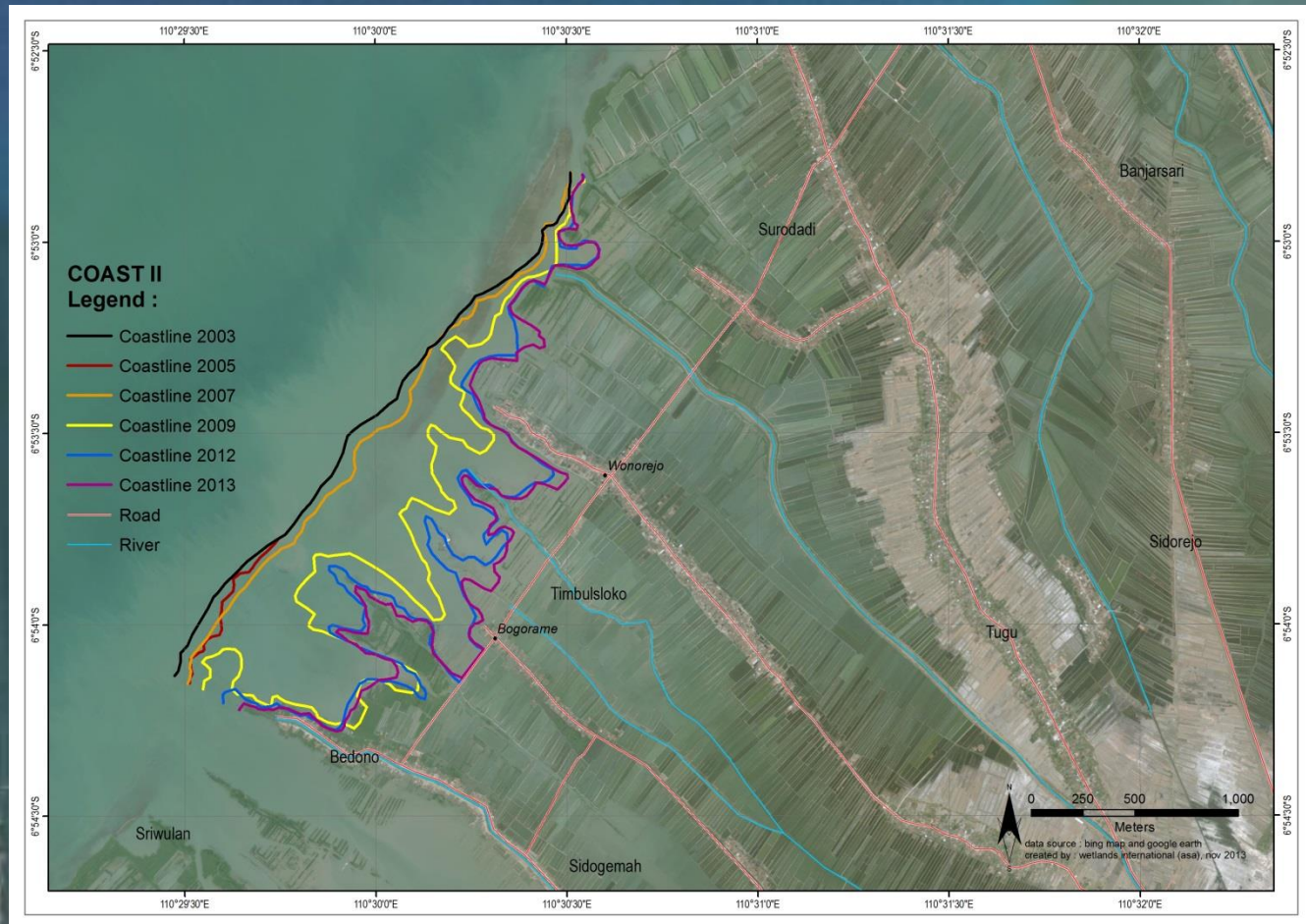
Example: Indonesia



Pieter van Eijk
Programme Head Deltas & Coasts



Demak, Central Java



Meet the people of Demak



Flushed in the sea...



Hard solutions make it worse



Mangrove planting could work

- **But:** mangroves require a stable coast to settle
- As a result mangrove rehabilitation along eroding coasts fails



Building with Nature in Demak?

Designing interventions



Sediment nourishment



Sediment traps

1. Smart engineering



2. Restoring mangrove belts



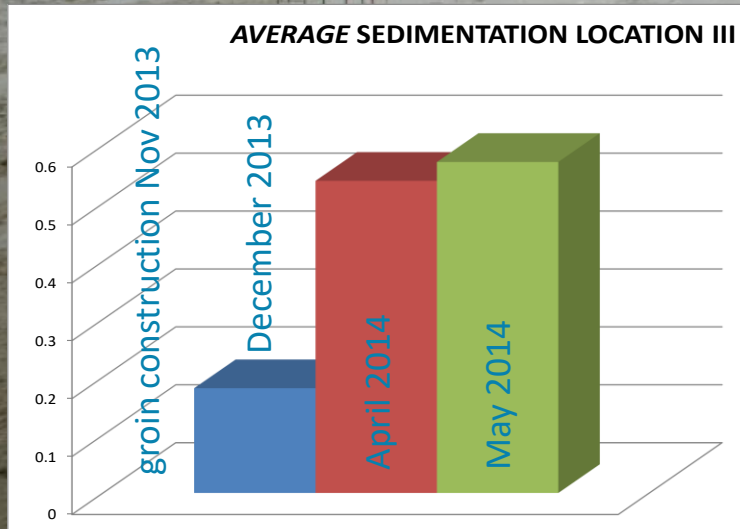
3. Enabling sustainable aquaculture

Integral land-use
planning

2013: first pilot



2013: first pilot



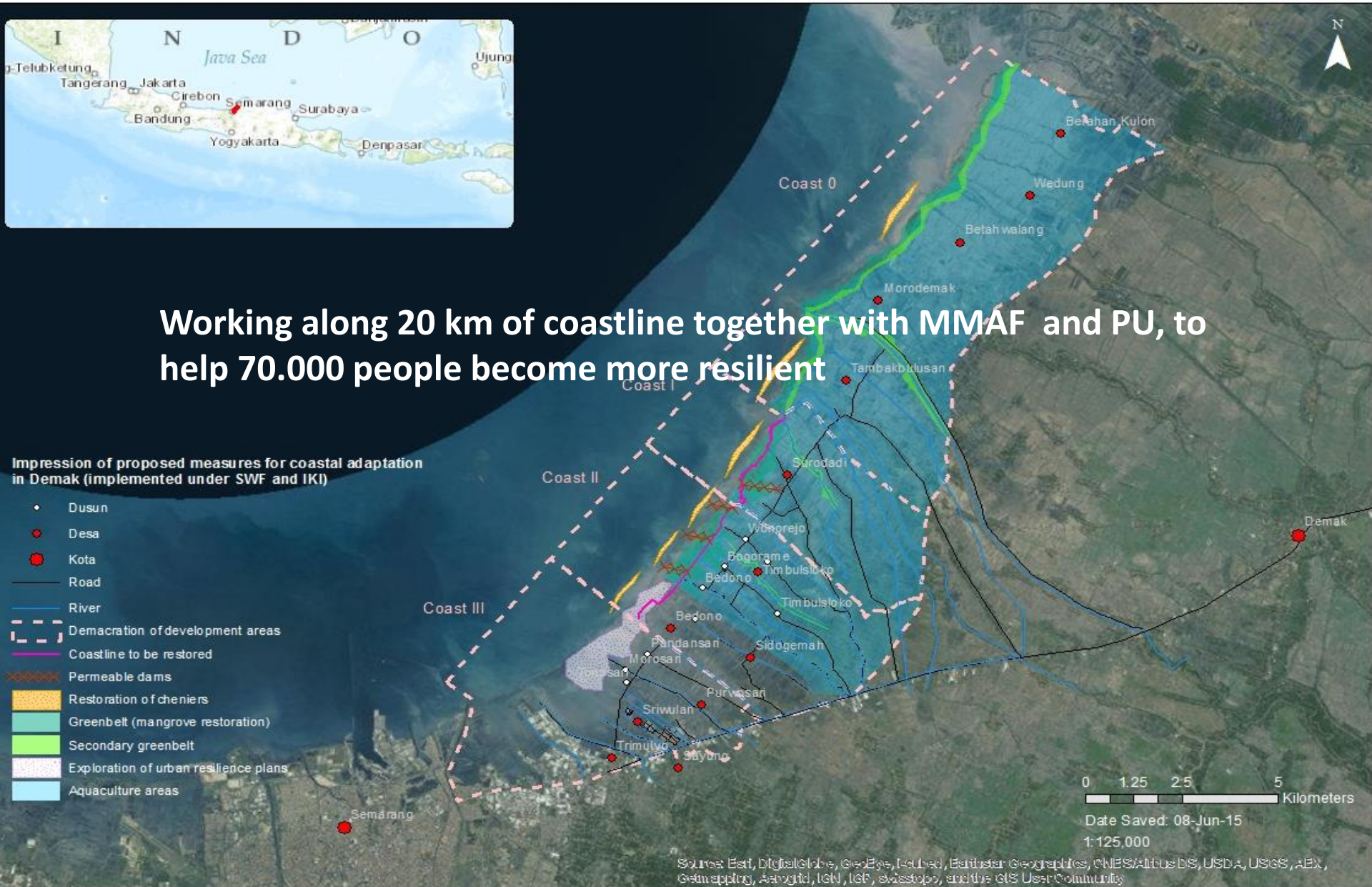
Our dream (1)



Working along 20 km of coastline together with MMAF and PU, to help 70.000 people become more resilient

Impression of proposed measures for coastal adaptation in Demak (implemented under SWF and IKI)

- Dusun
- Desa
- Kota
- Road
- River
- - - Demarcation of development areas
- Coastline to be restored
- Permeable dams
- Restoration of cheniers
- Greenbelt (mangrove restoration)
- Secondary greenbelt
- Exploration of urban resilience plans
- Aquaculture areas



0 1.25 2.5 5
Kilometers

Date Saved: 08-Jun-15

1:125,000

Sources: Esri, DigitalGlobe, GeoEye, IGN, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Geomatics, AeroGRID, IGN, IGP, Swisstopo, and the GIS User Community

Our dream (2): replication across the country

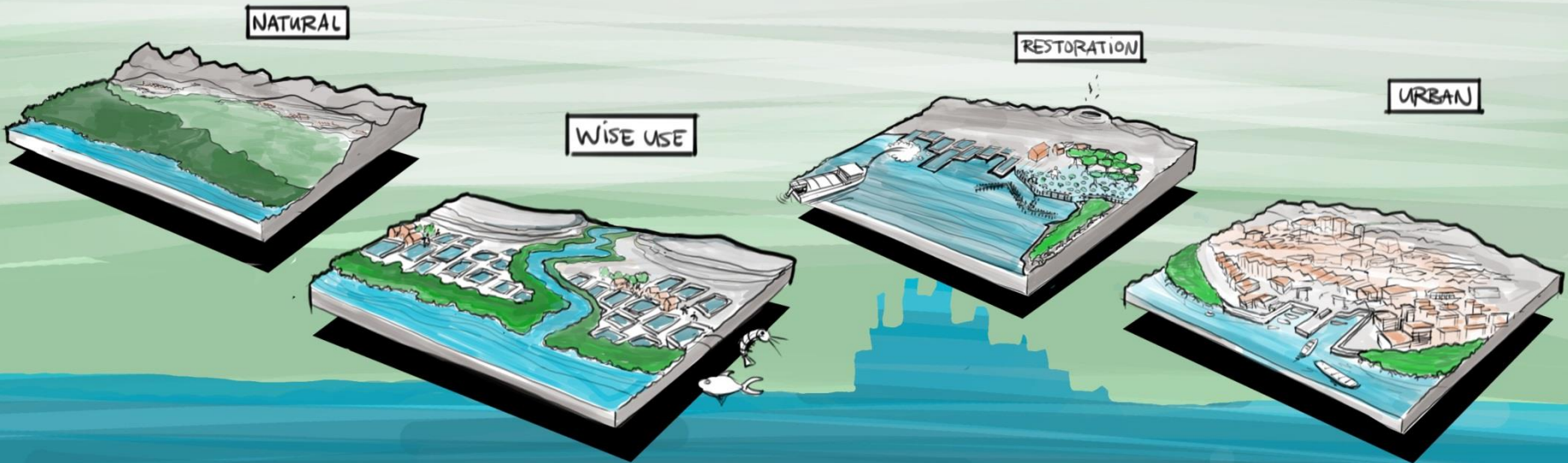
Soft solutions

Hybrid solutions

Hard solutions

more space, no dike
flexible and cost-effective

less space, dike
less flexible, extra investment



Aerial view

- The approach works!
- Successful applications in Suriname and Vietnam
- But: The subsidence in Demak poses a major challenge
- We need to define thresholds



So, to plant or not to plant?

- Mangrove planting may be needed, if seedlings can not naturally recolonize a degrade area
- Sometimes it has an important symbolic value and contributes to awareness and ownership of local people
- But at all times, the key steps of Ecological Mangrove Restoration approach should be followed, to prevent mass failure and environmental damage

Thank You!

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