



# **Deltares**

**Research institute and specialist consultant  
for water, subsurface and infrastructure**

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Sao Paulo, Brasil, Nov 2012

# Themes

## Flood risk



## Availability of water and soil resources



## Delta infrastructure



## Healthy water and soil systems



## Sustainable delta planning





A composite image featuring a grid pattern over a background of a beach with footprints and a small inset of a bridge.

# A bio-based solution to repair infrastructure leakages

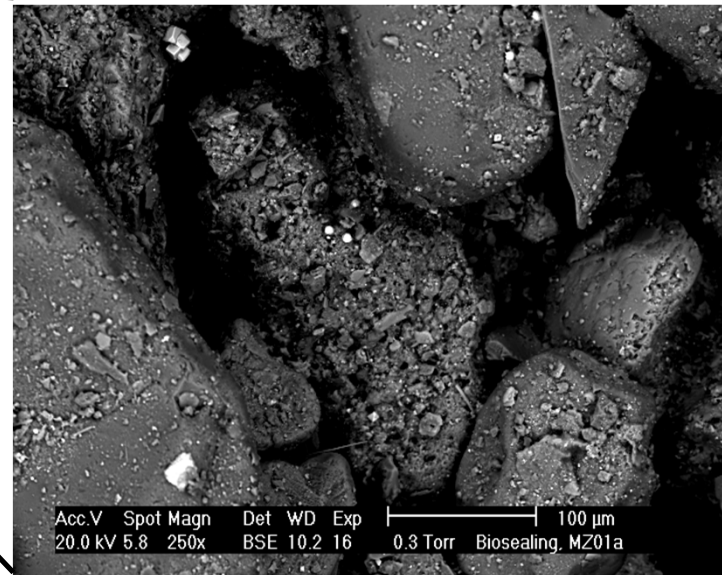
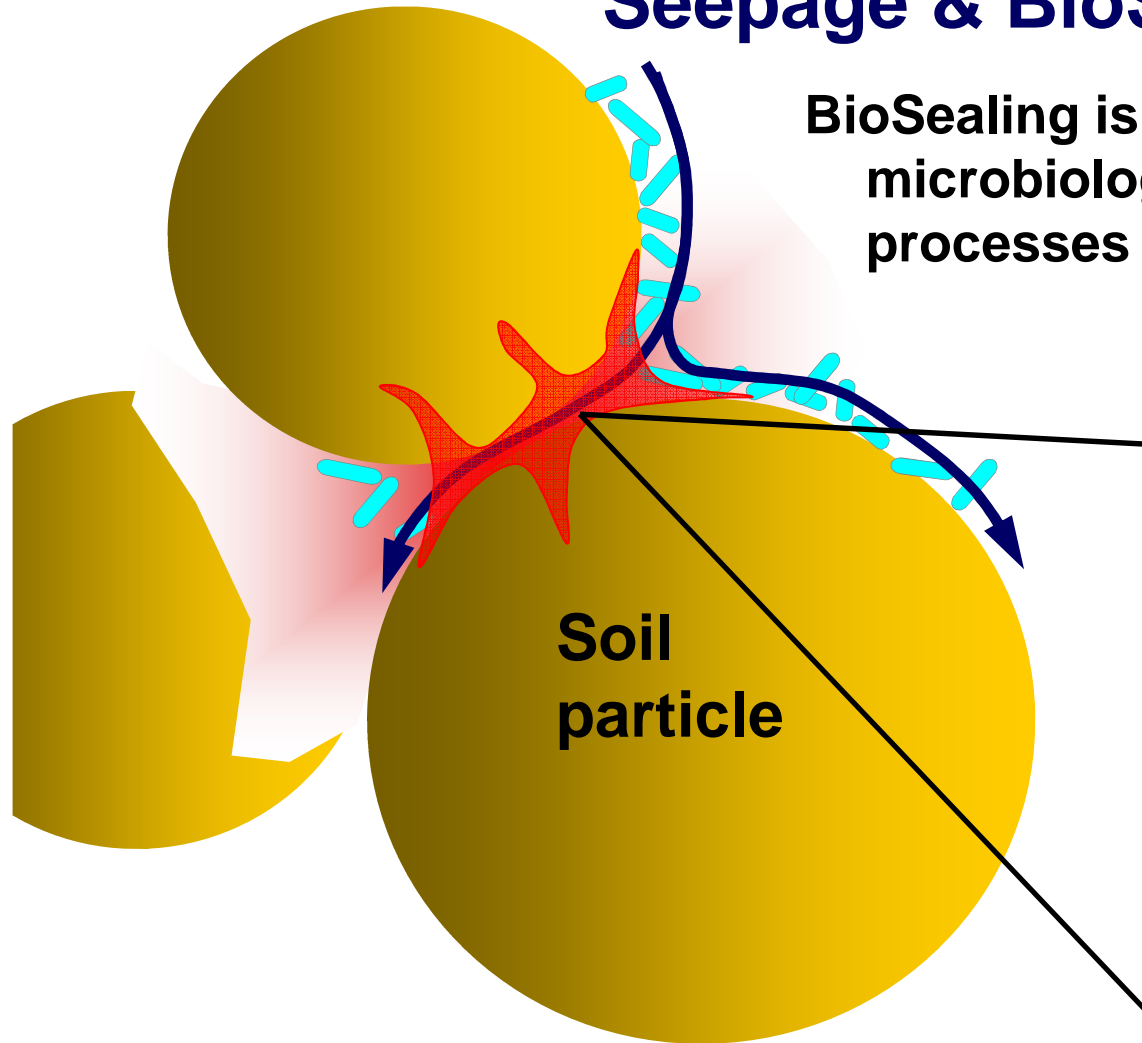
## BioSealing

**an in situ biological method to seal leakages  
in subsurface constructions and soil layers**

# BioSealing principle

## Seepage & BioSealing

BioSealing is induced by a combination of microbiological and geochemical processes



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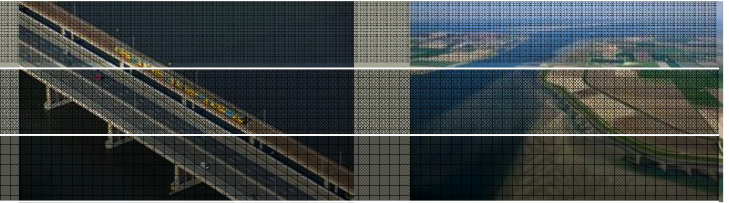


# Application areas for BioSealing

- Repairing (old) **underground constructions** that have leakage problems (e.g. metro stations, tunnels, parking lots, etc.)
- Sealing leakage of **hydropower reservoirs** and potable **water basins**
- Sealing seepage under and through **dams and levees**
- **Restoring impermeable soil layers** in case of migration of contamination or salt water intrusion



# Water for a bio-based economy



Questions like:

- Do we have **enough water** for an envisaged land-use ?  
(e.g. culturing plants for biofuel production, product processing)
- How best to **manage the water** resources in periods of **scarcity** ?
- How to plan and adapt for projected **climate change** impacts ?

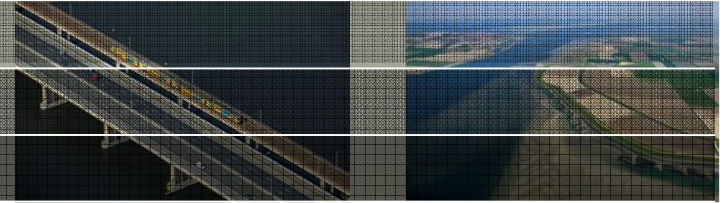
May be addressed through:

- Downscaling global climate change **scenarios** to relevant **scales**
- **Modelling hydrology** respective to **land use** patterns
- Adaptation **pathways** under the **uncertainty** of climate change
- **Measures** to optimise Integrated Water Resources Management

Using:

- **Open software** and data-platforms
- **Rapid Assessment Tools** and **Decision Support Systems**
- **Serious Gaming** for decision support and education

# In conclusion



**Deltares** provides:

- Smart, bio-based **solutions** for disfunctioning infrastructure
- **Research & Advice** on Integrated Water Resources Management  
(ref. bio-based innovations)  
and on Disaster Risk Reduction  
(ref. industrial assets & investments in areas prone to floods, land-slides, droughts)
- Processed data “**from Satellite to Citizen**”  
jointly with the Dutch Cooperation on **Water and Climate Services**

Deltares interacts with Brasil on

- Flood Risk Management with the ANA National Water Institute, State Authorities from Sao Paulo, Minas Gerais, Pernambuco, the CEMADEN Institute for Natural Disasters and through the World Bank platform Understanding Risk in Brasil;
- Integrated Water Management planning with the State of Sao Paulo;
- Coastal protection ref. flood forecasting and now-casting with the Brasil Navy, and alike proposed with Petrobras.

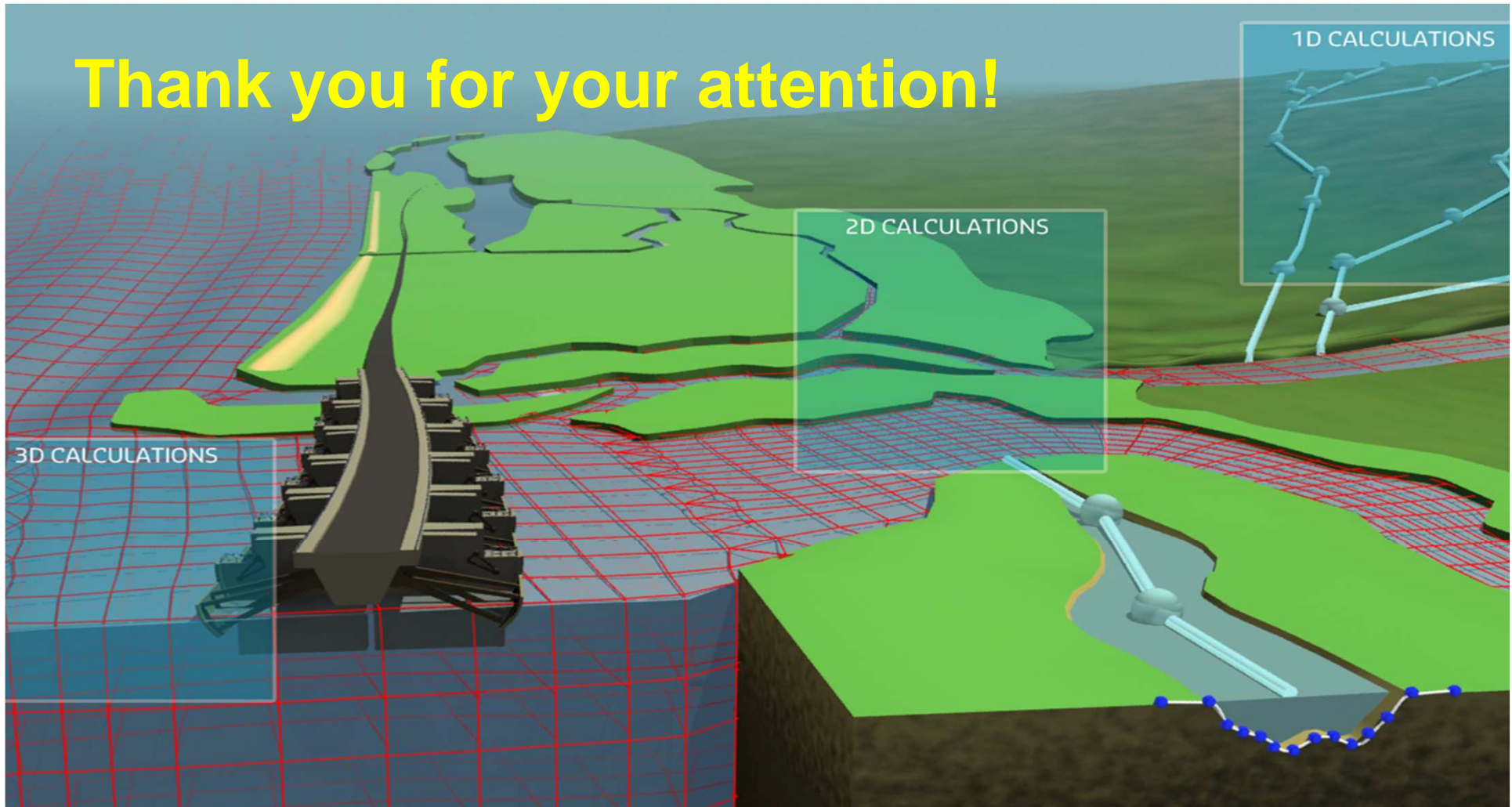
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# Open software

System informatics

## Thank you for your attention!



- Deltares software used in more than 100 countries
- Open software establishes sharing community
- Over 1100 registrations on open source portal

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