



Dams and Levee Erosion Research: Context

Today we have four presentations – each on different aspects of dam and levee erosion research, but all connected with a common goal of improving our ability to predict, plan, design for better dam and levee performance

Climate change typically means increasingly more extremely load conditions (whether overflow or overtopping...)

Over the past decade the various speakers have collaborated or crossed paths on various research initiatives – in particular the review of research needs and priorities on this topic at the Aussois Workshop in Dec 2017.

Here's a chance to see how we are all progressing...

Predicting dam and levee erosion and breach processes is not simple.

Combines soils, hydraulics and structures under conditions which are often rapidly changing and difficult to measure.

Many different pathways towards failure, requiring a clear understanding of many basic processes before considering how you may 'flip' from process to process as a failure progresses.

Research challenges...some key questions

Some key questions include:

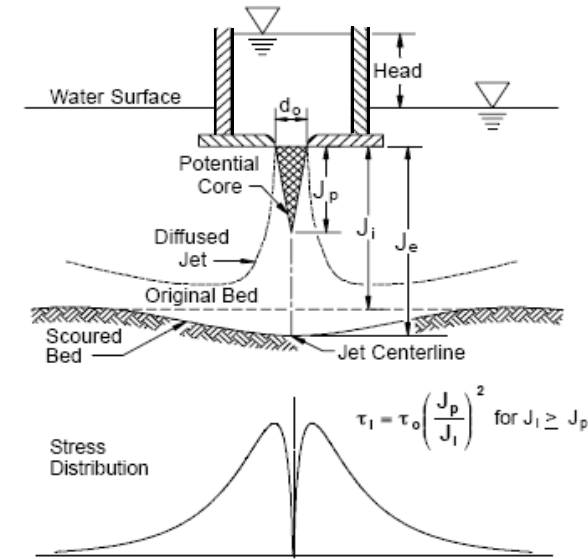
- What are the different macro and micro erosion processes? When, why and how do they occur?
- What is soil erodibility? How does it affect these processes? How do you measure it?
- How do processes measured in the laboratory translate to flood risk management in practice? How do we deal with scale effects?



Tony Wahl will talk about his work on Jet Testing:

- JET test equipment intended to allow measurement of soil erodibility and critical shear stress for a sample exposed to a jet
- Lab equipment – small scale field equipment – larger scale (EDF)
- How do results from the different scales correlate?
- How does this compare to Hole Erosion Test? What soils can be tested?
- What erosion conditions does this reflect?

If we base breach prediction models on soil erodibility, we need to be able to understand and measure it!

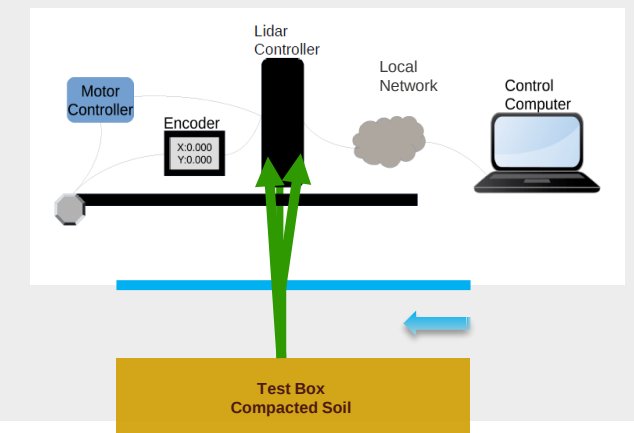
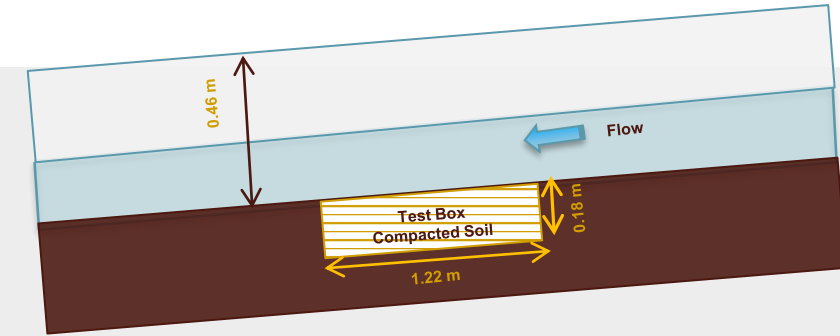


Research challenges...Understanding Erosion Rate

Ghada Elithy will talk about her work on soil erosion measurement:

- Flume box tests undertaken to study how coarser grained soil mixes eroded under lateral flow conditions
- Having overcome the challenge of measuring erosion through water (Shallow water lidar), the focus is on how the erosion process develops under different soil and load conditions.

Erosion processes change according to soil mix, rate of change and magnitude of hydraulic loading, soil erodibility... many dimensions to consider.



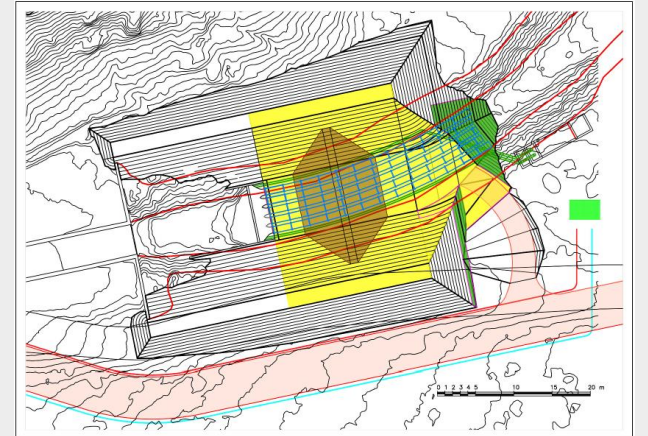
Research challenges...Breach Prediction

The OVERCOME Project

The OVERCOME Project

(EDF & CNR – UPM & HRW & INRAE):

- Overall goal is to improve breach prediction models for flood risk engineers by understanding both macro and micro erosion behaviour in relation to varying soils, permeability, erodibility and hydraulic load (absolute and rate of change).
- Understand the range of erosion behaviour – not just a snapshot of specific conditions - and the effects of scaling
- Using a combined programme of:
 1. Small scale lab tests – levee sections 0.6m high
 2. Medium scale lab tests – levee sections 1.0m high
 3. Numerical models – breach and 3D flow simulations (shear stress distributions)
 4. Construction of field scale test facility + field tests – levee sections ~2m high, 10m wide
 5. In situ (Rhône levee) overflow erosion tests



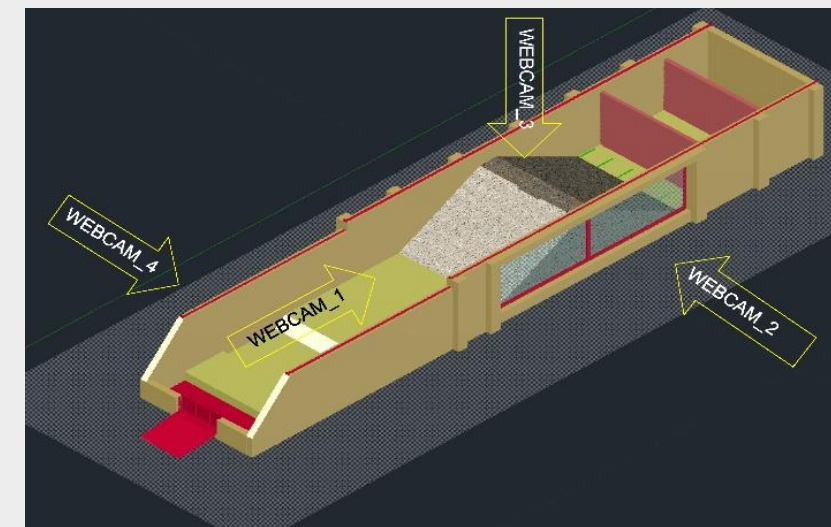
Research challenges...Breach Prediction

The OVERCOME Project

Rafel Morán and Ricardo Alves will talk about the work at UPM on The OVERCOME Project undertaking the laboratory flume test programme:

Small (0.6m) and medium (1.0m) scale flume tests (UPM) with different coarser grained soils to understand both macro and micro erosion processes

- Varying soil grading using filtered and real levee soil samples – alignment with US research
- Changing hydraulic loading (absolute and rate of change)
- Sealing of upstream face – with and without effect on the breach erosion process
- When does headcut occur, surface erosion occur, slumping occur? Why & how?
- How does changing scale towards prototype affect the research results?



Research challenges...Research into Practice

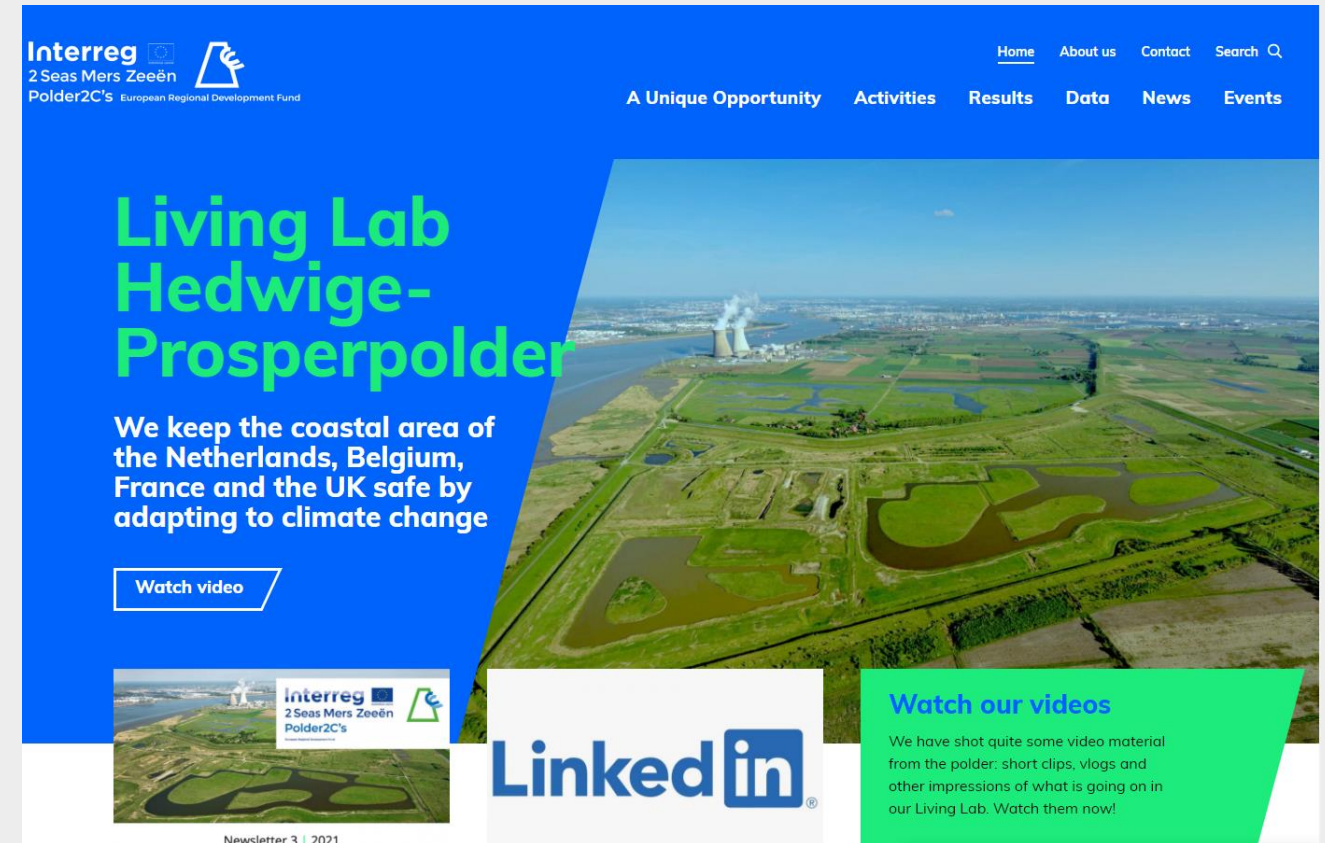
The POLDERS2C's Project

Patrik Peeters will talk about the work currently underway on **The POLDERS2C's Project**

Aiming to improve levee flood resilience, the project is using redundant levees to test a wide variety of processes including overtopping and overflow erosion, effect of animal burrows, resistance to explosives, emergency repair solutions...

The list is very long!

See <https://polder2cs.eu>



The screenshot shows the homepage of the Polder2C's project website. The header is blue with the Interreg logo and navigation links: Home, About us, Contact, Search, A Unique Opportunity, Activities, Results, Data, News, Events. The main content area features a large aerial image of a polder with a blue overlay containing the text 'Living Lab Hedwige-Prosperpolder' and 'We keep the coastal area of the Netherlands, Belgium, France and the UK safe by adapting to climate change'. Below this is a 'Watch video' button. At the bottom, there is a 'Watch our videos' section with a green background and a 'Linked in' logo. A small inset image shows a newsletter cover for 'Newsletter 3 | 2021'.

Opportunity for more detail later in the year:

See Protections 2022!

Madrid – 30th Nov – 2nd Dec 2022)

<http://www.protections2022.com/>

[Extended abstract submission to 4th April]



Protections 2022 4th International Seminar on Dam Protections against Overtopping

Madrid, Spain 30 November - 2 December 2022

Seminar scope

The present seminar continues the series of events initiated in Madrid (Spain) in 2014 with the objective of bringing together leading experts in research, development, and practical implementation of **protection systems to address overtopping of dams and levees and mitigate against potential damages**. The inaugural seminar was successfully followed by the meetings held in Fort Collins (Colorado, USA) in 2016 and Grange-over-Sands (UK) in 2018.

These efforts have produced challenging initiatives to improve the exchange of knowledge among specialists about both the physical processes involved in overtopping scenarios and the preventive measures required to protect critical infrastructures such as dams or fluvial levees. Thus, the European Club of the International Committee on Large Dams (EURCOLD) launched an international working group termed

European Working Group on Overflowing and Overtopping Erosion (EWGOOE) which is hosted by the European Club of ICOLD and is structured according to the following topics:

- Overflowing erosion of embankment dams and fluvial levees.
- Overflowing erosion of concrete dams and spillways.
- Overtopping erosion of sea dikes.
- Protections against overflowing erosion of embankment dams and fluvial levees.

The EWGOOE was officially presented in the ICOLD Annual Meeting that was held in Ottawa in June 2019. The intention of the EWGOOE is to adopt **Protections as the meeting place** of the working group. The permanent Organizing Committee of the series of Protections seminars is thus happy to announce this new collaboration to the technical and scientific community.

1. The event will be recorded for later sharing online

- If you do not want to be recorded please mute and turn off your video

2. If your internet connection drops, please try to reconnect to the meeting.

- Someone will be monitoring the waiting room at all times to assist with any problems.

3. If our internet connection drops, please bear with us.

- We have co-hosts allocated to help manage such issues!
- Speakers will be presenting through sharing their screens. If there are repeated problems, we will move to the next speaker and come back to the original speaker later on (time permitting)
 - If a speaker prefers, the host can share slides whilst they commentate

4. Please leave your microphone muted unless you are invited to speak.

- However, we encourage everyone to leave their video on so that we can all see the participants (unless you experience internet bandwidth / connection difficulties)

5. During the discussion session please ask questions by either:

- Typing your question into the chat window – await for the chairs to respond to your point
- Raising your hand – either emoji or real – await for the chairs to respond
- We will have brief Q&A sessions after each presentation

Ref	Item	Time	Speaker / Action
S1	Welcome EWGOOE Chairman	16:00	Jean-Robert Courivaud (EDF, France)
S2	Programme Context / Overview	16:05	Mark Morris (HR Wallingford, France)
S3	Submerged Jet Erodibility Test Methods Research - Overview of research (20 mins) - Q&A (5 mins)	16:15	Tony Wahl (USBR, Denver)
S4	Using Machine Learning in Estimating Erosion Rate of Coarse-Grained Soil Mixes - Overview of research (20 mins) - Q&A (5 mins)	16:40	Ghada Elithy (ERAU, Florida)
S5	The OVERCOME Project - UPM laboratory tests (20 mins) - Q&A (5 mins)	17:05	Rafael Morán & Ricardo Alves (UPM, Madrid)
S6	The POLDER2C'S Project - Overview (20 mins) - Q&A (5 mins)	17:30	Patrik Peeters (Flanders Hydraulics Research, Belgium)
S7	Concluding observations	17:55	Jean-Robert Courivaud (EDF, France)
	Close	18:00	