[NWO-DST: ResilientHydroTwin]

Workshop:

Enhancing Water Resilience with Digital Twins in Rotterdam: Co-creation

Agenda

Time	Session
14:00 – 14:15	**Welcome & Check-in**
14:15 – 15:00	**Scene-Setting Presentation**

① Introduction of the project – Resilient Hydro Twin

② What are Digital Twins?

③ Our progress:

- Digital twin development & Stakeholder engagement

15:00 – 15:15	**Stakeholder Perspectives Panel**

④ Stakeholders' perspective

- Questions & comments

15:15 – 15:30	**Coffee break & Informal networking**
15:30 – 16:15	**Group discussion**

⑤ Participants join small groups around thematic tables

- Table 1: Data & Modeling [Erica & Özgün]
- Table 2: Monitoring & decision-making [Johan]
- Table 3: Digital tools in urban governance [Marian]
- Table 4: Stakeholder communication [Yaren]

16:15 – 16:50	**Plenary Wrap-Up: Insights & Tensions**

Each table shares top 2–3 takeaways

16:50 – 17:15	**From Insights to Action: Next Steps**

⑥ Opportunities for collaboration, research, or pilots

17:15 – 17:30	**Closing Remarks and introduction of the next workshops**

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Through participatory Digital Twins

1.1 Research team: Indo-Dutch cooperation

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Ranjith Kuttantharappel Soman
Assistant Professor of Digital Construction

Maria Nogal
Assistant Professor of Resilience Engineering

Johan Ninan
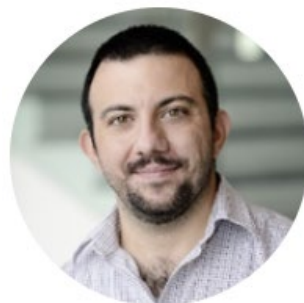Assistant Professor of Transdisciplinary design of infrastructure

Marian Bosch-Rekveldt
Associate Professor of Project Management
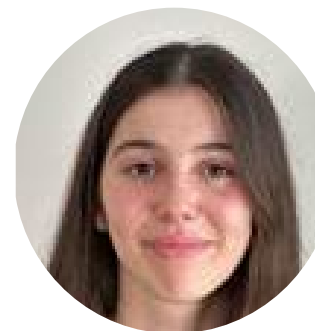
Erica Arango
Postdoc

Özgün Balaban
Postdoc

Zhaowen Liu
Postdoc

Yaren Aytepe
Master student

Sam Colijn Llinares
Master student

Prethwin Rathnavelu
Master student

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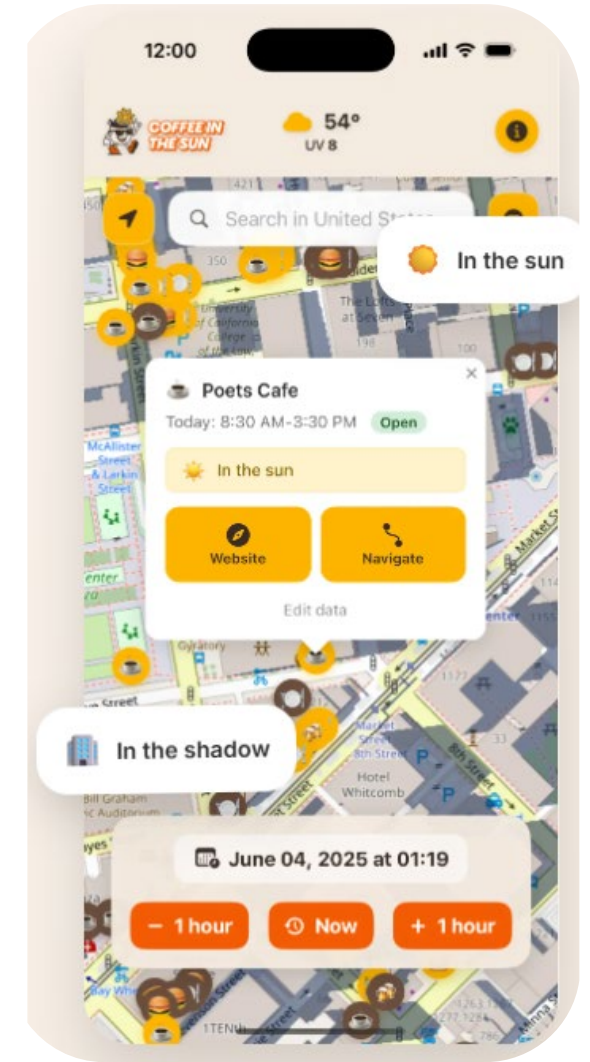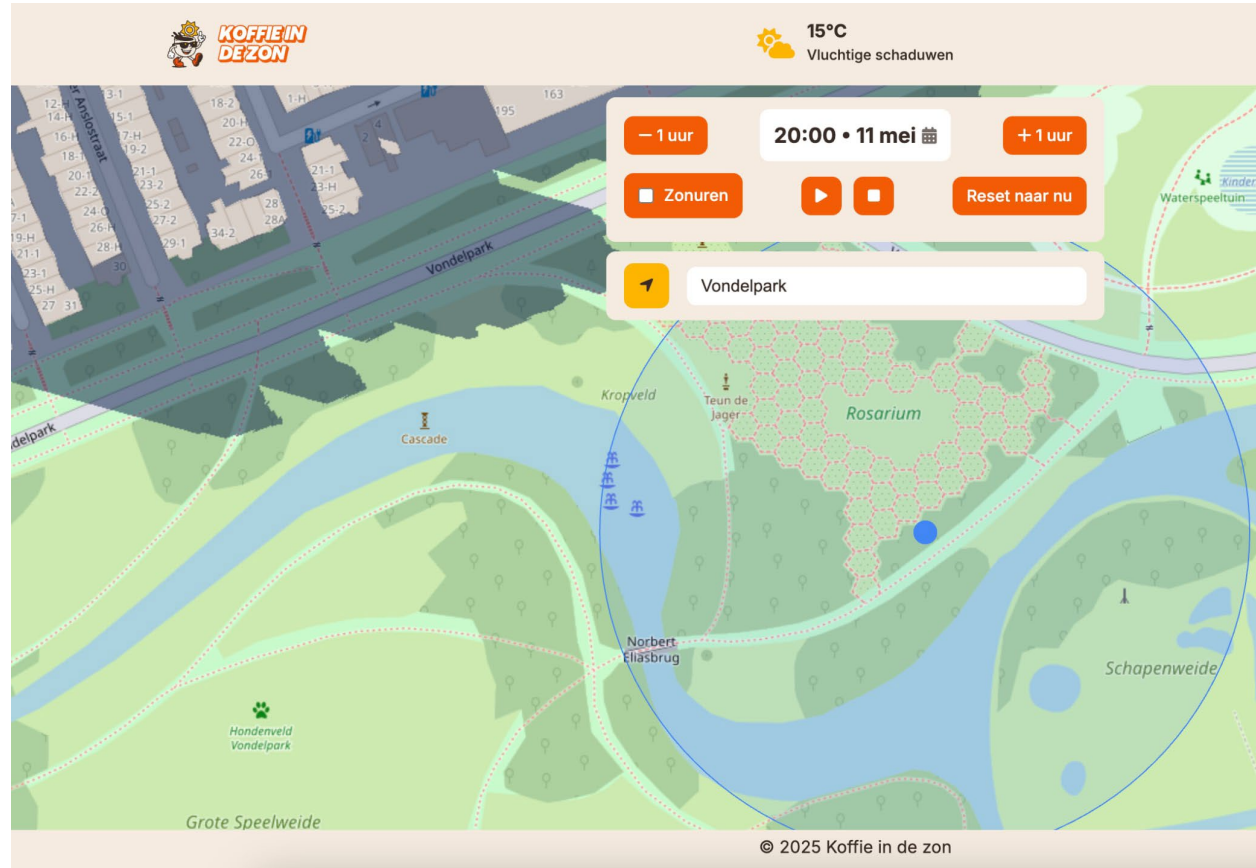
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What are

Digital Twins

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in our daily life

2.1 How can a DT benefit our daily life?

- 3D building models + sun position
- Atmospheric programming
- **Real-time** sunlight visualization
- Personalized sunlight **forecast**

Koffieindezon developed by an AI expert **Frank Nantinga**

2.2 Digital development in water management
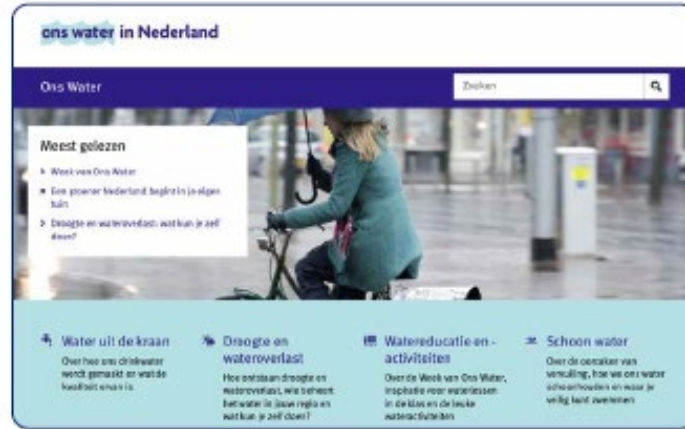
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What are

Digital Twins

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water management

Ons water
https://www.onswater.nl

Wat doet de overheid aan schoon en voldoende water en waterveiligheid en wat kun je als burger doen?


Overstroom ik
https://overstroomik.nl

Door je postcode in te vullen kun je zien hoe hoog het water maximaal bij je huis en in je omgeving komt in het geval van een grote overstroming en hoe je je hier het beste op kunt voorbereiden.

Risicokaart
https://www.risicokaart.nl

Risicokaart geeft op een kaart informatie over risicosituaties die zich kunnen voordoen in Nederland.
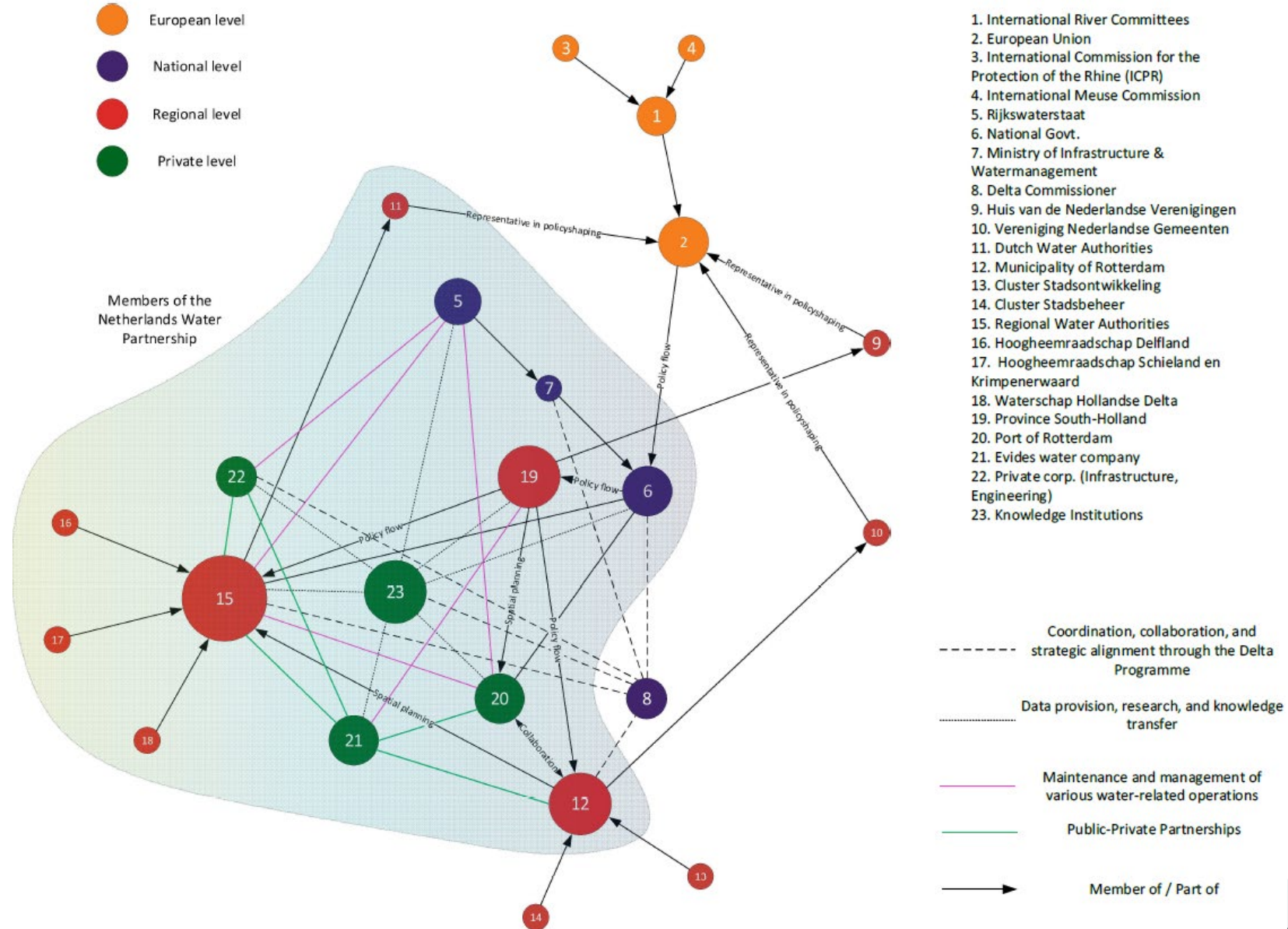

Waterinfo
https://waterinfo.rws.nl
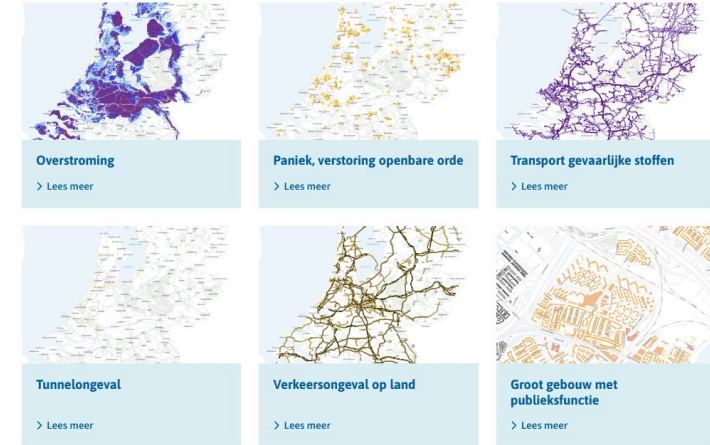
Op verschillende kaarten kun je watergerelateerde informatie inzien, zoals waterhoogte, wind, golfhoogte,

2

What are

Digital Twins

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urban governance

2.4 Research goal

We aim at co-creating a user friendly Digital Twin for urban water managent, it supports

- Virtual replica of urban systems integrating hydrological, behavioral, and resilience models

- Real-time monitoring and predictive simulations

- Decision-making for water-related disasters

- Human-in-the-loop systems like WAR rooms

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2.5 How can a DT benefits

Common platform for academia, policy, industry, community

- Transdisciplinary value for all
- Facilitates joint scenario building and decision-making
- Accelerates innovation through shared knowledge (Ninan et al., 2023) - networking
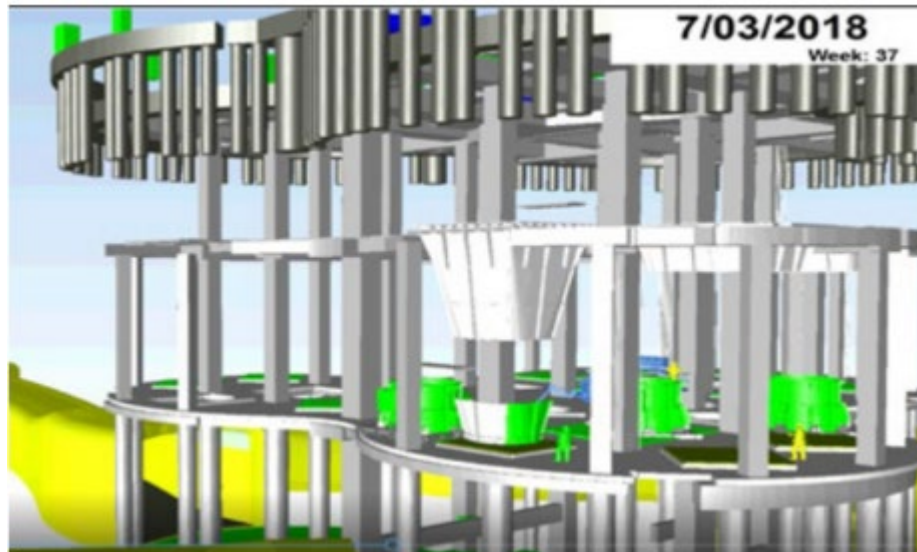
Visual interface bridges expert-layperson gap

- Addresses knowing doing gap (Datta et al., 2020)
- Enhances trust and transparency (Ninan et al., 2024)

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3

Our progress

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Digital twin

development

3.1 System Overview

3

Our progress

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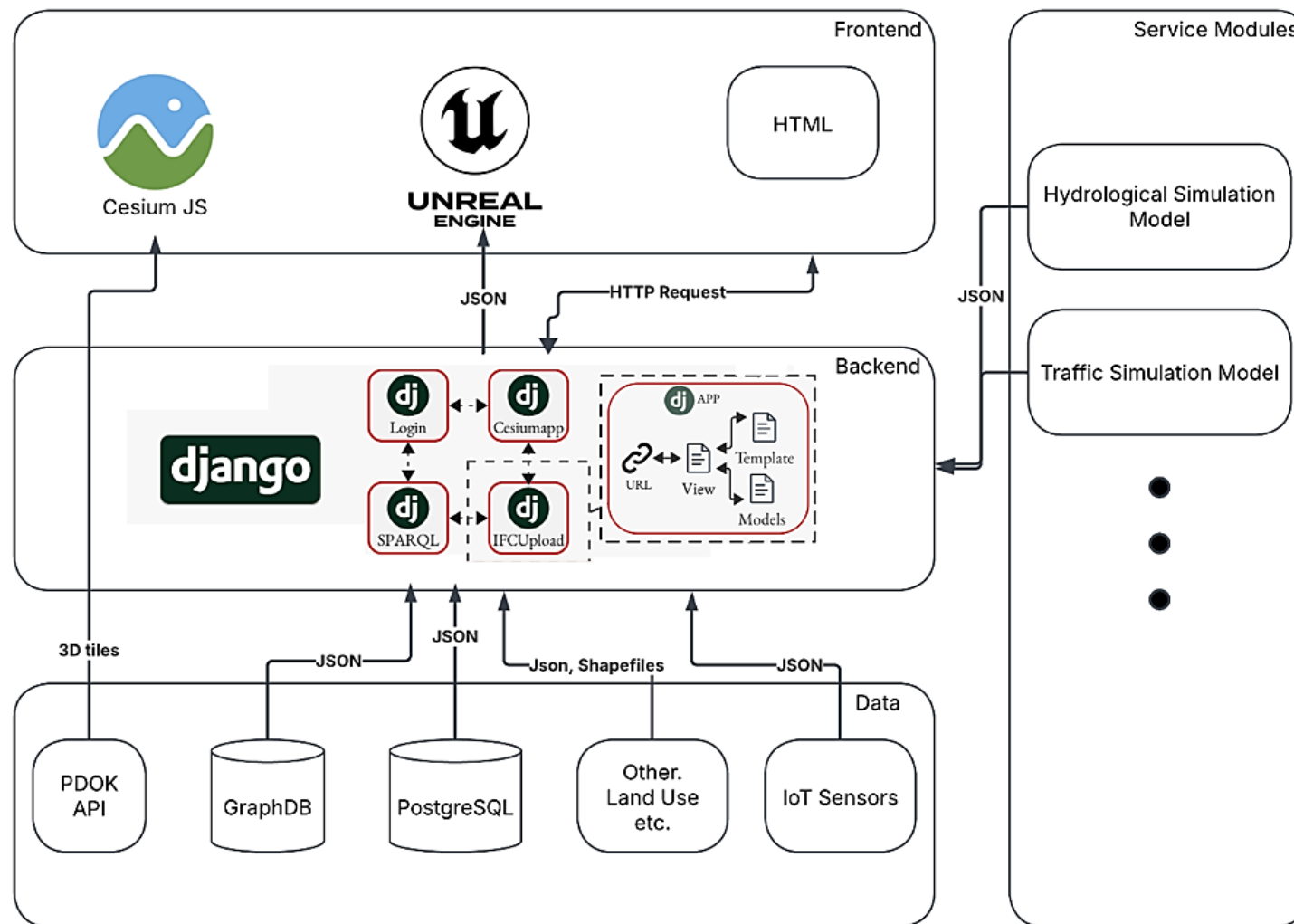
Digital twin

development

3.2 Project status demo:

https://surfdrive.surf.nl/files/index.php/s/9pPaPJ7qZn81dmt

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Our progress

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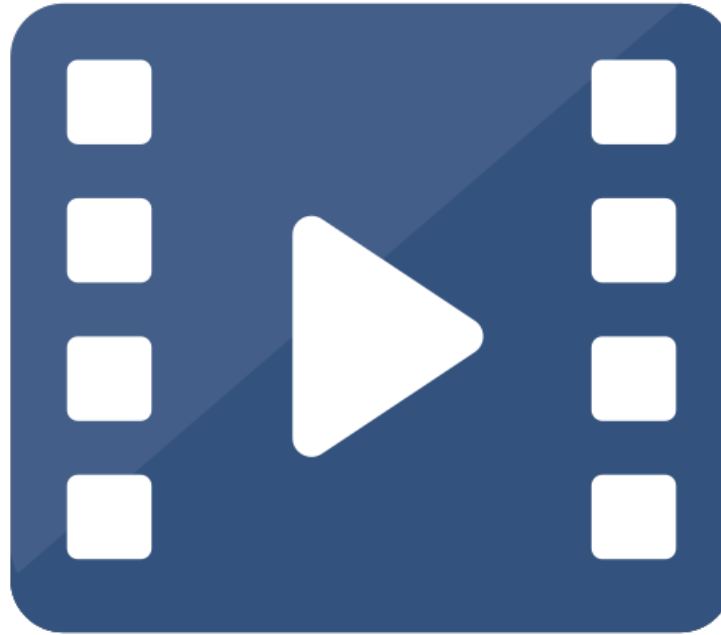
Digital twin

development

The interface - Rotterdam

3

Our progress

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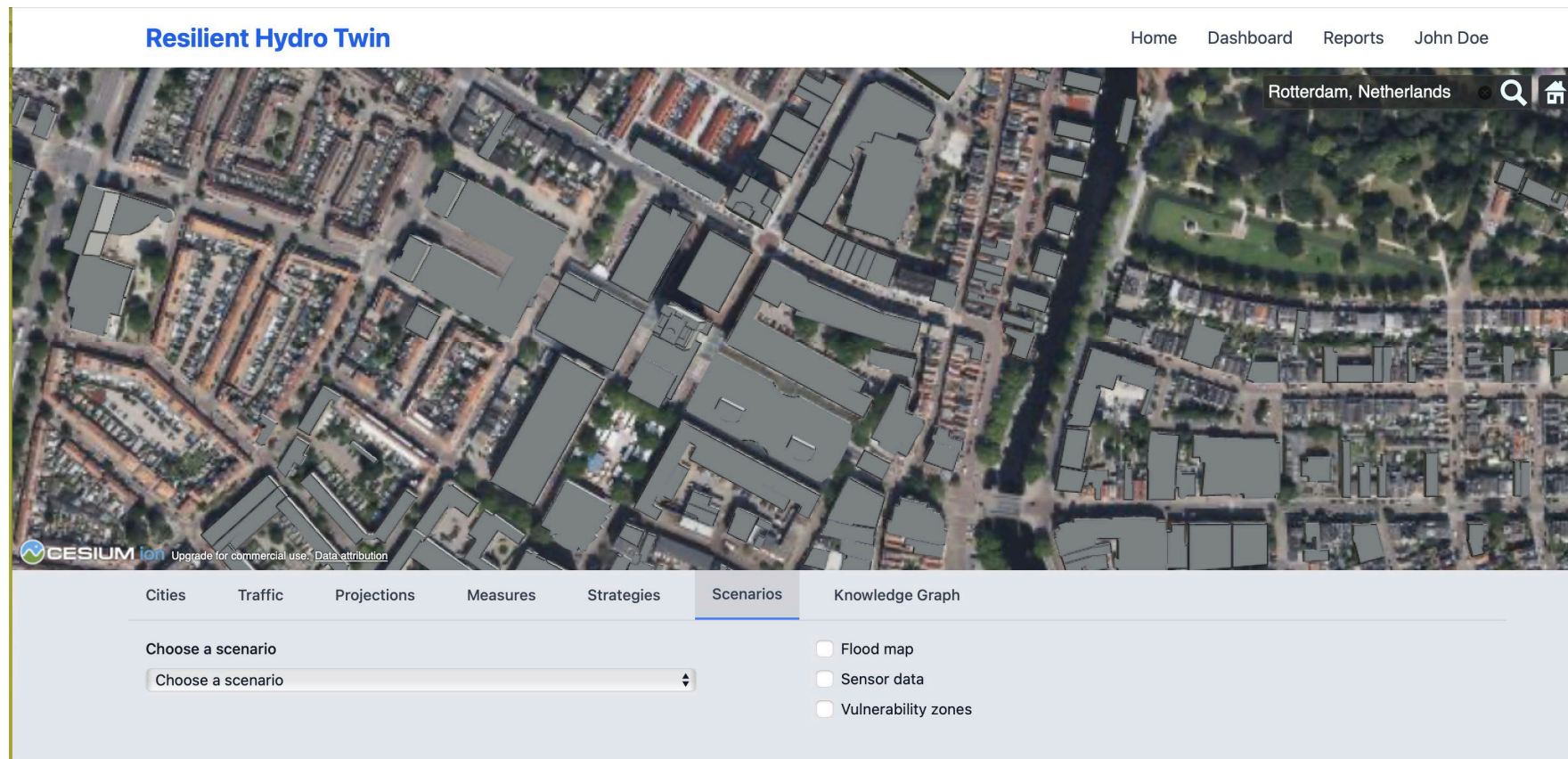
Digital twin

development

Transport simulation visualization - SUMO - Rotterdam

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Our progress

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Digital twin
development

Flooding simulation - MIKE+ - Chennai – Tambaram area

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3.1 Stakeholder mapping (Rotterdam)

3

Our progress

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Stakeholder engagement

National level
[Policy and regulatory framework]

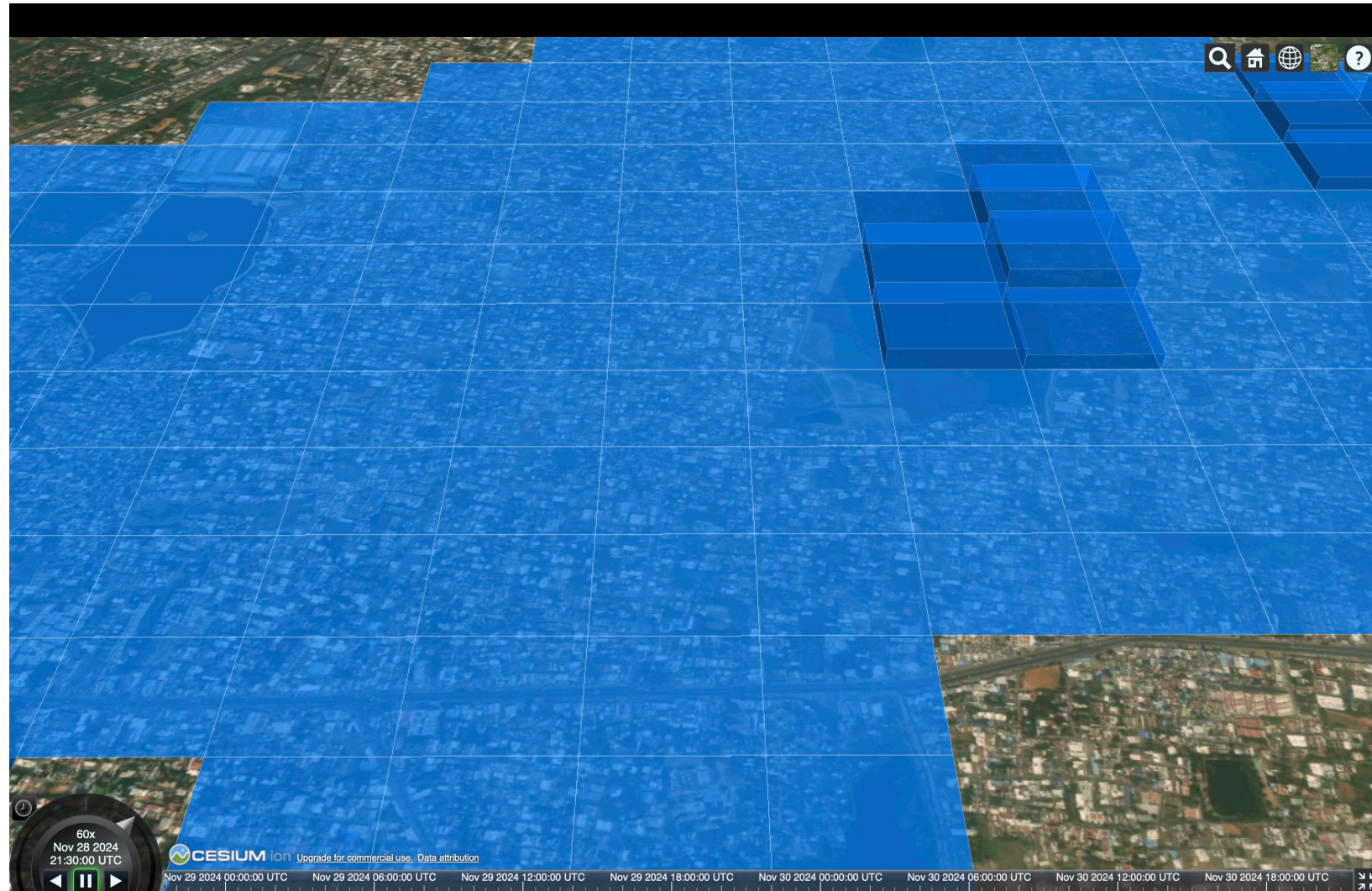| Ministry of Infrastructure and Water Management (IenW)	Ministry of Economic Affairs (EZ)	Ministry of Climate and Green Growth (KGG)	Ministry of Defence (MinDef)

*Emergency

Rijkswaterstaat (RWS)   Delta Commissioner

Regional level
[Plan, Implement & monitor]

Province of South Holland	Municipality of Rotterdam	Waterboards	DCMR

Governments & Policy Makers
Academia & Research Institutions
Knowledge
TU Delft
Erasmus Uni
Universities
IHE
TNO
Research institutions
Deltares
PDPC Academy
THRIVE Institute
Innovation hubs
Clean Tech Delta

Stakeholder Network

Port of Rotterdam
Private Sector & Industry
Infrastructure/ Service providers
Public transport (RET, NS)
IT, energy, electricity
Corporations & SMEs
Consultancy
Media
Financial institutions & investors
Banks and foundations

Civil Society & Community Organizations
Local communities
NGOs & Advocacy groups
Culture & Religious
Flood-sensitive communities
JCI Rotterdam
WE-Society
Church

International & Regional Networks
Multilateral organizations
URBACT (EU)
Global Resilience Networks
Global Center on Adaptation (GCA)
C40 Cities
100 Resilient Cities
Resilient Cities Network

Power	Interest	Legend
High	High	🔴
High	Low	⬛
Low	High	🔴 (dotted)
Low	Low	/

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Our progress

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Stakeholder

engagement

3.2 Communication among stakeholders

Stakeholder A

encode   message

DIGITAL
TWIN

semantic
noise

feedback   decode

Stakeholder B

❖ **Information and communication interoperability in digital twins**

❖ Interdisciplinary collaboration, both across **disciplines** and **organizational levels**, poses significant challenges in the implementation of digital twins.

- A Shared Visual Language

- Semantic Models

- Bridge Roles

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Our progress

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Stakeholder

engagement

3.2 Communication among stakeholders

"It's not only language, it's also a perspective on the world… "

1. Communications and understanding

2. Governance and organizational structure

3. Cultural and interpersonal dynamics

We can integrate data — but can we understand each other's data?

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Stakeholder

perspectives

Our participants are from:

- Municipality of Rotterdam
- Rijkswaterstaat
- Hoogheemraadschap van Delfland
- Deltares
- IHE Delft Institute for Water Education
- TU Delft
- Eindhoven University of Technology
- Erasmus University Rotterdam
- Leiden University
- University of Twente

Questions and comments?

5

Group discussion

Insights & Tensions

Participants join small groups around thematic tables

🕐 15:30 – 16:15   Group discussion

- Table 1: Data & Modeling [Erica & Özgün]
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- Table 3: Digital tools in urban governance [Marian]
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🕐 16:15 – 16:50   Plenary Wrap-Up: Insights & Tensions

Each table shares top 2 – 3 takeaways:

- [Opportunities] Where DT might (or might not) add value?
- [Challenges] What's missing for DT to work effectively?

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Upcoming events

We are looking forward to seeing you in the upcoming events! Contact us if you see opportunities for collaboration!

[Workshops]

- October 2025, **Stakeholder Integration Strategy: Vision, voice, visualization**

- February 2026, **Community Engagement and Participatory Approach**

- June 2026, **Governance Framework Establishment**

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