

Serious game design uncovering the Δ ENIGMAs for flexible andadaptive flood risk management

Cortes Arevalo, V.J.; van Belzen, Jim; Ellen, Gerald Jan; Slinger, J; Bouma, Tjeerd J.; Vreugdenhil, H.S.I.

Publication date

2025

Document Version

Final published version

Citation (APA)

Cortes Arevalo, V. J., van Belzen, J., Ellen, G. J., Slinger, J., Bouma, T. J., & Vreugdenhil, H. S. I. (2025). *Serious game design uncovering the Δ ENIGMAs for flexible andadaptive flood risk management*. Poster session presented at NCR DAYS 2025, Delft, Netherlands.

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

Serious game design uncovering the Δ ENIGMAs for flexible and adaptive flood risk management



Juliette Cortes-Arevalo (1), Jim van Belzen (2), Gerald Jan Ellen (3), Jill Slinger (1), Tjeerd Bouma (2), and Heleen Vreugdenhil (1,3)

email: vj.cortesarevalo@tudelft.nl

(1) Delft University of Technology, Faculty of Technology, Policy and Management
(2) NIOZ Royal Netherlands Institute for Sea Research
(3) Deltares knowledge institute

A productive (learning) aim

The Δ ENIGMA research infrastructure monitors sustained and in high-resolution water and sediment dynamics to support nature-based flood management in the Dutch Delta.

- **The Productive Knowledge interaction facility** joins university labs creating interfaces (**Fig. 3 bottom**) and tools to support and document collaboration within and beyond Δ ENIGMA.
- **This poster shows a game prototype co-developed** with support of TUDelft serious game design students (Kontaxopoulou et al., 2024) to communicate about dike-wetland strategies (**Fig. 1 right**).

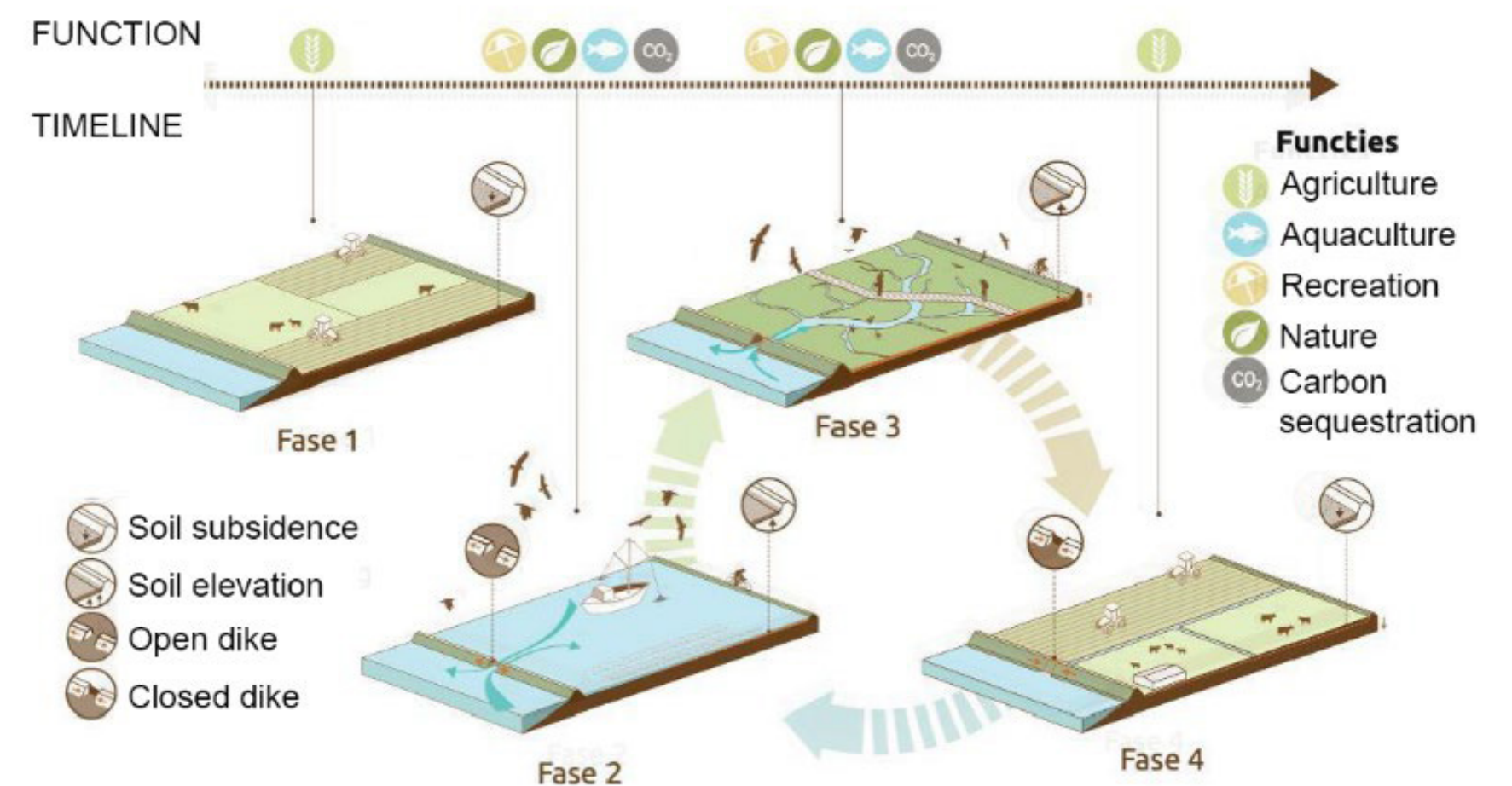


Figure 1. Combining dikes with wetlands (van Belzen et al. 2021)

following a collaborative design to define game requirements



Currently at step 1 of the **Fig. 2**, we involve various stakeholders from public, private and civic organisations representing the nested processes behind the prototype as informants or co-designers based on mutual benefit from their involvement.

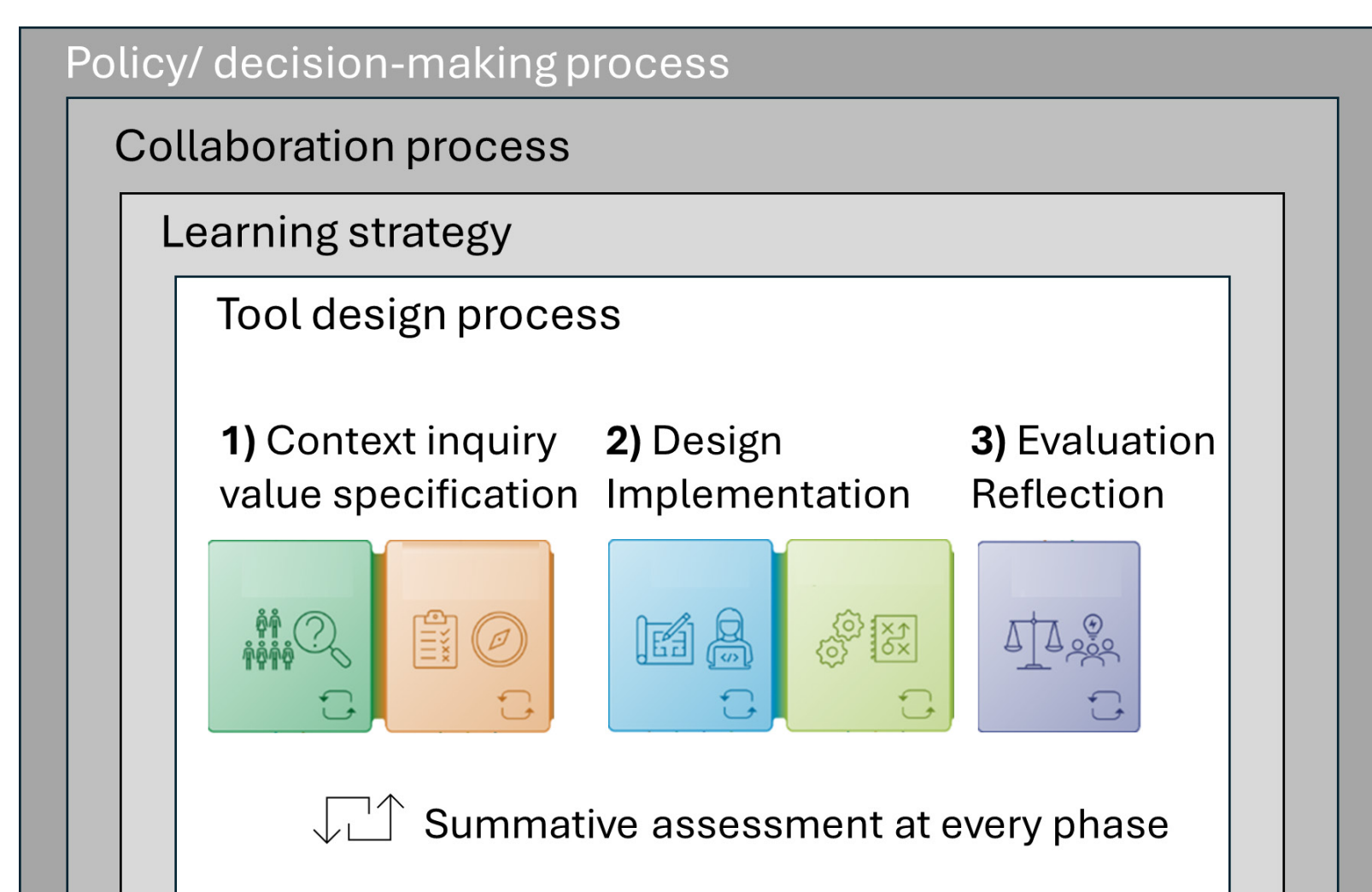


Figure 2. Collaborative design framework (Adapted from Kip et al., 2025)

Policy-making context: Delta communities and managers prioritized land reclamation over long-term flood safety and nature.

Decision and collaboration value: Combining dikes with wetlands needs space, long-term vision, and community support.

Learning strategy

1. Role of water-sediment dynamics in the delta's resilience and long-term sustainability,
2. Benefits and challenges of combining protection,
3. Collective reflection and responsibility on past management to enable flexible and adaptive futures.

and explore prototypes addressing all generations

Audience	School students	Their families	(Future) managers and experts.
Learning Goal	Water and sediment dynamics	Manage expectations and emotions	Envision and discuss adaptation pathways
Setting	Classroom	Exhibition or field visit	Ice-breaking of meetings with elements customised to the areas explored through the Δ ENIGMA (Fig. 4)

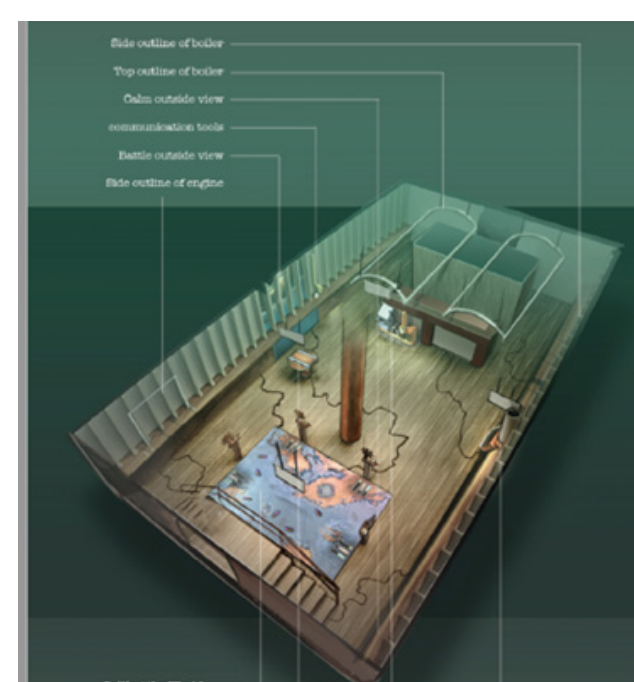


Figure 3. Top: Preliminary game design (Kontaxopoulou, A., Boudewijn, B., Theodoropoulou, M.-A., & Zygiannidis, P., 2024)., 2024) and Example of an exhibition set up (van Bekkum, 2019) Bottom: Snapshot of featured tools per university lab.

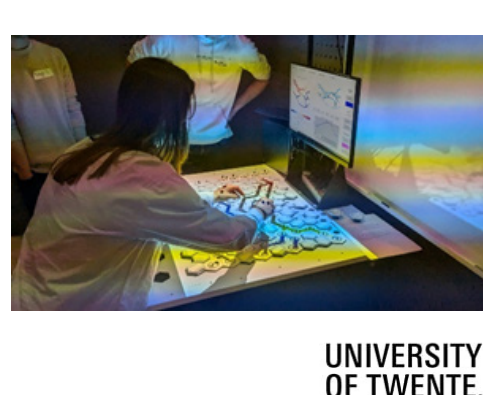


Figure 4. Δ ENIGMA areas where sustained high resolution observations are collected in rivers (1) estuaries; (2) rivers (and (3) beaches and dunes