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the next 25 years of river studies

Book of Abstracts
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Frank P.L. Collas
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The Productive Interaction Facility (PROD) – A National Research Infrastructure Facility

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Highlights

- The Δ-ENIGMA National Research Infrastructure Facility grant has been awarded
- A networked, accessible Productive Knowledge Interaction Facility (PROD) is part of Δ--ENIGMA
- Labs from Deltares, TUD, WUR and UT form complementary and specialized building blocks
- Setting up, protocols and testing of the PROD facility in use will be undertaken in the coming years

Overview

As a Large-scale Research Infrastructure facility, the overall aim of Δ-Enigma is to strengthen the international position of bio-geomorphological research in the Netherlands, by providing advanced observation instruments, distributed over key areas in the river-estuary-coast continuum, and capable of observing normal conditions and extreme events. It will support interdisciplinary research by promoting developments in process knowledge at the interface between geology, physics, ecology, and the social sciences. In particular, the Productive Knowledge Interaction Facility (PROD) will enable social science action research on productive knowledge interactions between bio-geomorphological scientists and engineers (science-science), policymakers and managers of the delta (science-practice).This will deliver insights on the role of visualisation, simulation modelling, interpersonal interactions and activity design in the efficacy of knowledge interventions related to river-estuary-coast systems. Through the provision of high quality facilities for ongoing, structured research in this field, different knowledge interactions can be compared and patterns can be identified over a longer time horizon. The insights obtained can lead to the improved design of diverse knowledge interaction methods and management decision making that is based on a sound understanding of bio-geophysical dynamics in a delta. The involvement of a wide range of scientists, public officials and stakeholders in these knowledge interventions also serves to actively communicate results to management authorities in the Dutch Delta.

The four facilities that form complementary and specialized building blocks for the national network or Productive Knowledge Interaction Facility (PROD) when it comes to river-sea systems and geoscience include:

- TUD: Simulation and Game Lab: Focusses on simulation and gaming to support complex decision making at the Faculty of Technology, Policy and Management and at mobile locations.
- WUR: Wanderlab provides state of the art visualisation of monitoring data and predictive modelling outputs of geomorphic systems.
- Deltares: The Deltares iD-Lab brings together models, data, visualisation techniques and expert knowledge for geoscience applications.
- UT Design Lab is the experimental collaborative ecosystem at UT for innovative changemakers aiming to connect society, technology, science and design.

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Background

Decision making regarding river-estuary-coast management involves dealing with inherent uncertainties and variability as well as with the complexity of various stakeholders and their interests. Insight into the consequences of proposed interventions, based on state-of-the-art bio-geomorphological and engineering knowledge, as well as the effects on all stakeholders is needed. Involvement of non-academic stakeholders provides access to experiential knowledge and promotes the real-world relevancy of research outcomes (Lang, 2012). However, knowledge uptake and understanding of the societal impact of science are still often framed as a linear model that eventually leads to an effect or 'impact' outside of research. Exemplary of this is the 'end of pipe' approach where dissemination often forms a separate work package at the end of a complex research project, although empirical studies show that the production and use of knowledge can better be understood as a process of interaction and co-creation. A seminal article by Spaapen and van Drooge (2011) termed these 'productive interactions', which they described as exchanges between researchers and stakeholders in which knowledge is produced and valued that is both scientifically robust and socially relevant. Such productive interactions can contribute to the societal impact of research. Productiveness is considered to be fulfilled 'when it leads to efforts by stakeholders to apply research results to social goals, i.e. when it induces behavioural change' (Spaapen et al. 2012, p. 2).

Current practice in the field of river, estuarine and coastal science in the Netherlands reveals that important networks where science and practitioners connect are already in place e.g. NCR and NCK. Within these networks stakeholders participate in the science process and its interpretation. However, how *productive knowledge interactions* function, how they can be studied over longer periods of time, and how this understanding can be used to enhance the interchange and use of knowledge does not receive attention. We lack a national infrastructure of facilities supporting the ongoing study of productive knowledge interactions and their effects in designing and decision making on river-estuary-coast systems. Within Δ-Enigma, we aim to create a joint national facility or network for the study of productive knowledge interactions - the Productive Knowledge Interaction Facility (PROD) (Middelkoop, 2022).

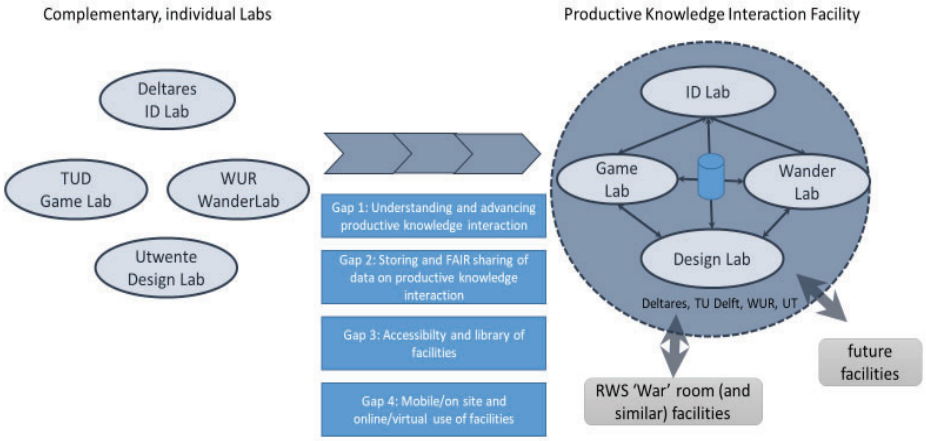

Figure 1. From 4 islands to a complementary, networked, accessible Productive Knowledge Interaction Facility (PROD)

PROD Components and Design

As depicted in Fig.1, each of the four labs at TUD, WUR, UT and Deltares has different, specific and complementary expertise, but (1) there is no coherence between the labs when it comes to undertaking research on productive knowledge interactions; (2) there are no shared protocols nor exchange of information on technology and methodologies, nor are ethically responsible and FAIR data capturing and data storage procedures routinely applied; (3) access to the facilities is limited to staff or projects from the own organisation; and (4) a lack of mobile or online facilities is hampering the study of productive knowledge interactions on site rather than in the labs themselves.

By connecting the four specialised facilities from Deltares, TUD, WUR and UT in an accessible national network and adding specific technology, protocols and shared data storage, a joint platform is created that will facilitate scientific research on productive knowledge interactions in river-estuary-coast systems. It is envisaged that the PROD national facility to advance the science of productive knowledge interactions can in turn contribute to achieving societal impact and the uptake of Δ-Enigma research.