

# Integrated Framework for Sustainable Port Development



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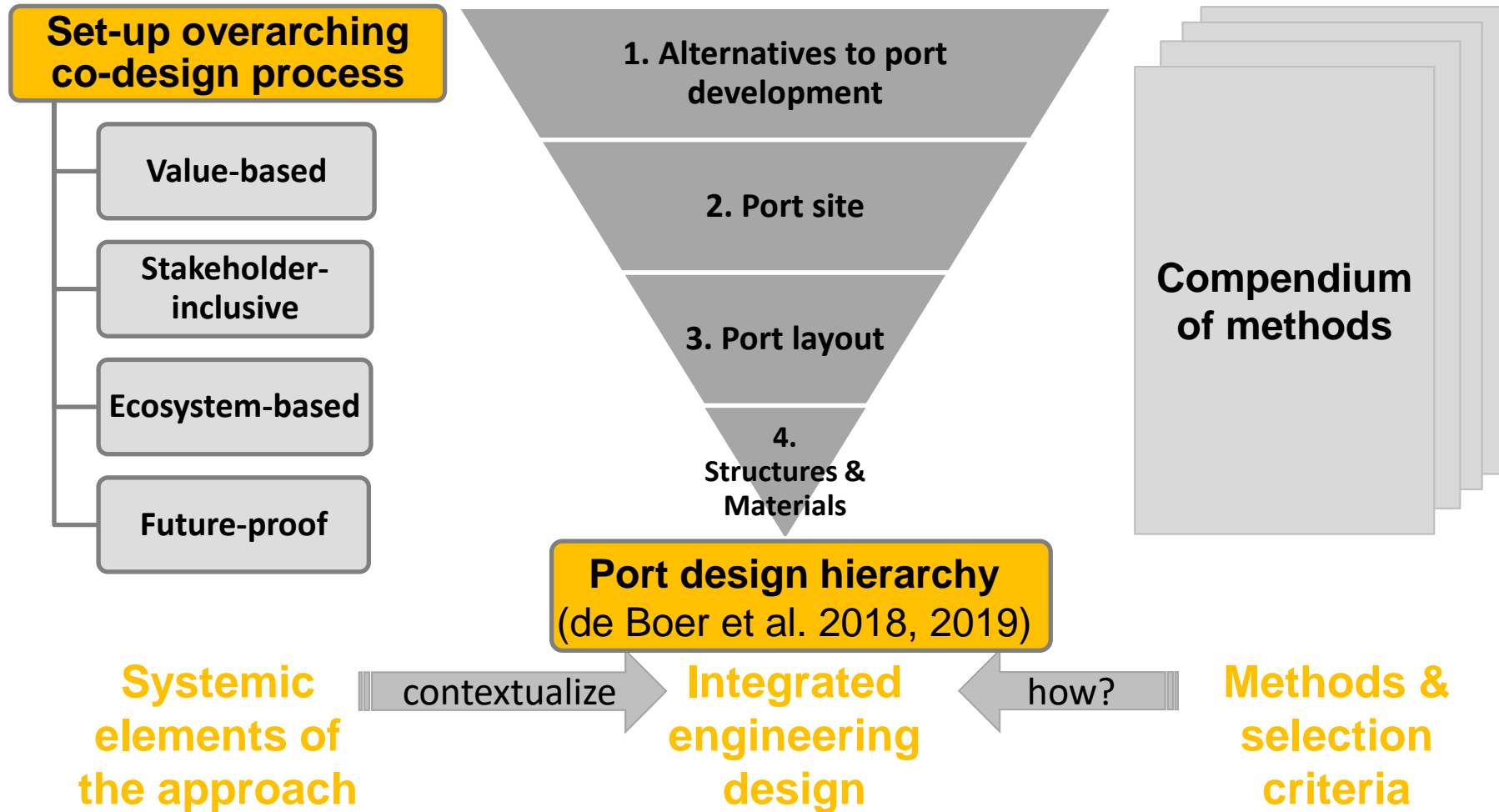
**The Netherlands and Ghana**



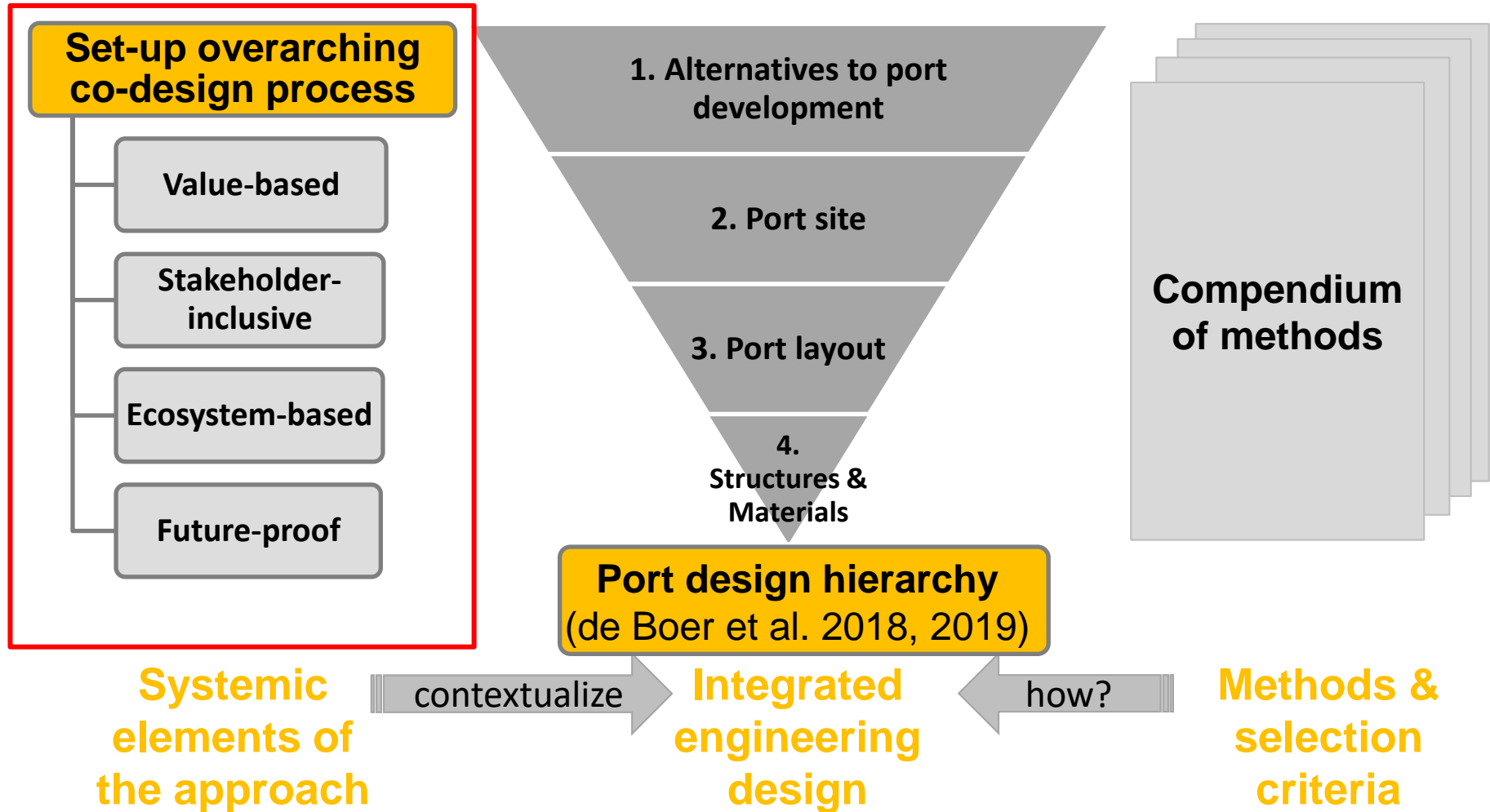
# Aim and Challenges

- To develop a generic framework and tools for the design of integrated and sustainable ports through a stakeholder inclusive and bottom-up approach
- Pilot (case) study – Tema port in Ghana
- Associated challenges
  - to integrate and synthesise across disciplines
  - to work with stakeholders, drawing in diverse sources of knowledge in a sustained manner
  - to work in a data poor environment, developmental context
  - to clarify when and how the framework can be applied

# Sustainable Ports Framework



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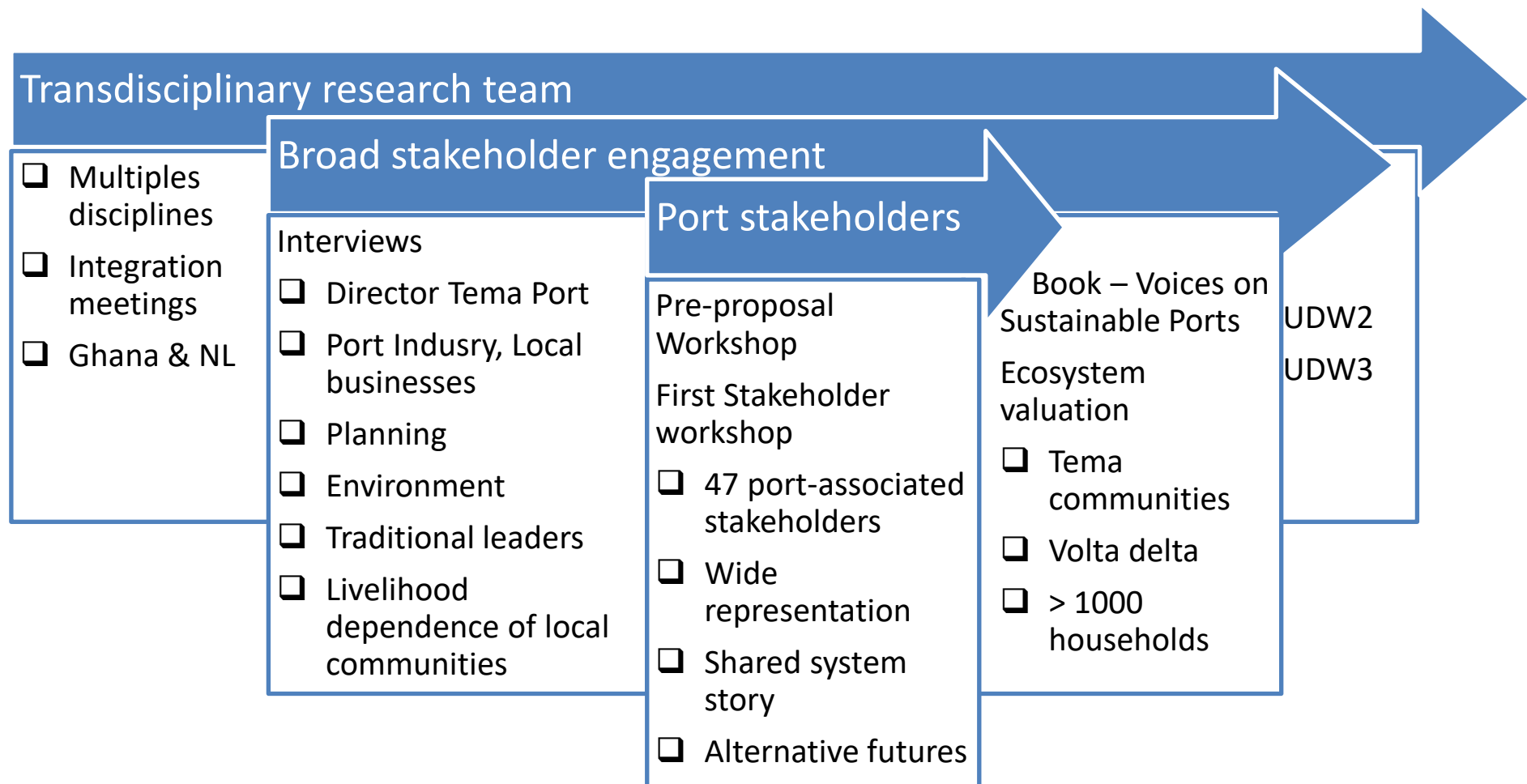




# Overarching co-design process

- Place-based
- Stakeholder-inclusive
- Ecosystem-based
- Design-oriented
- Bottom-up
- Aiming to meet societal,  
economic & management challenges

# Overarching co-design process



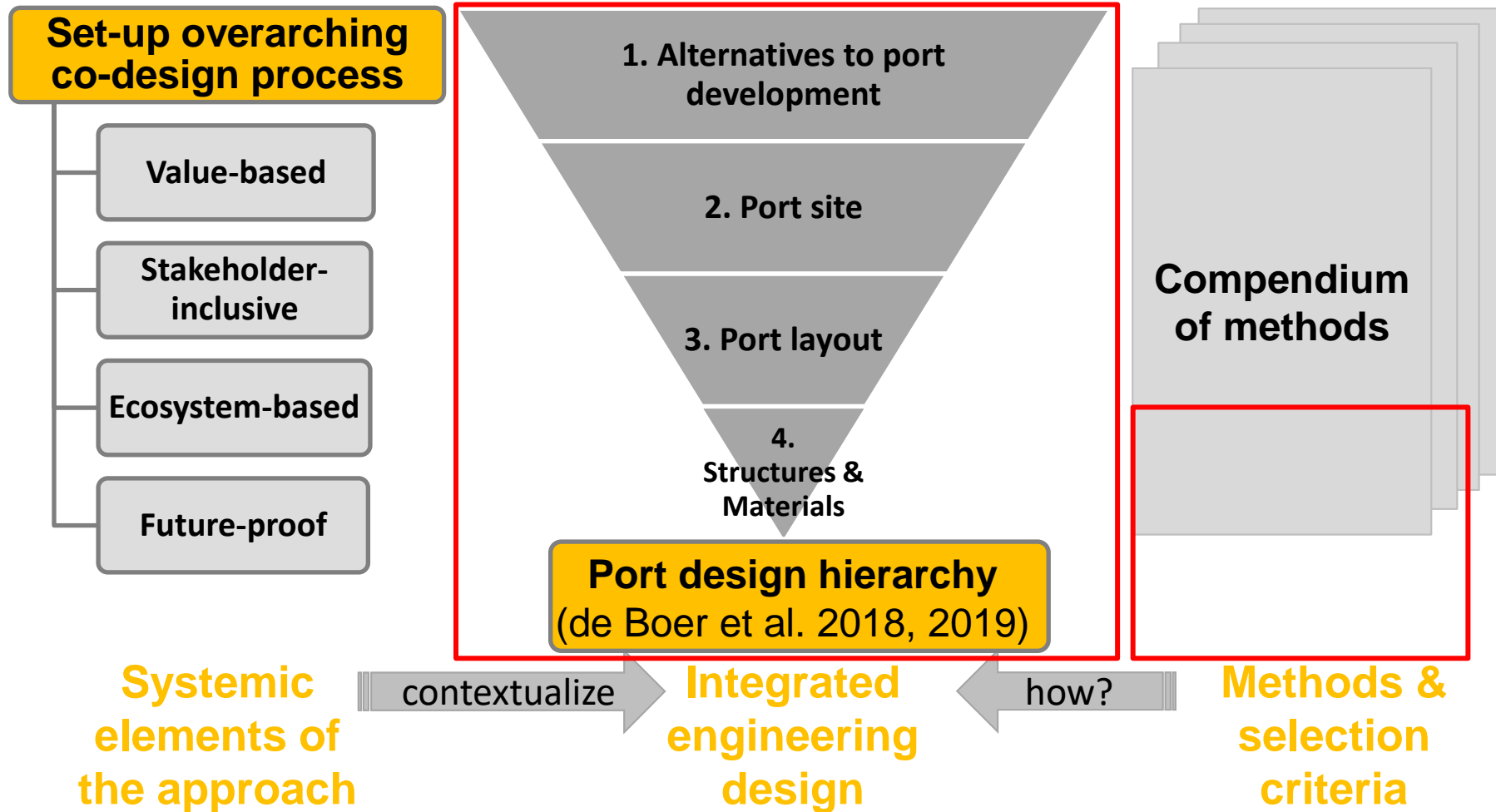
# Transdisciplinary, game structuring workshop

Slinger et al. (2014), Cunningham et al. (2014)

- 6-Step workshop
- Inputs from stakeholders and scientists
- Integrated shared system story of Tema port
- Producing utopian, dystopian visions

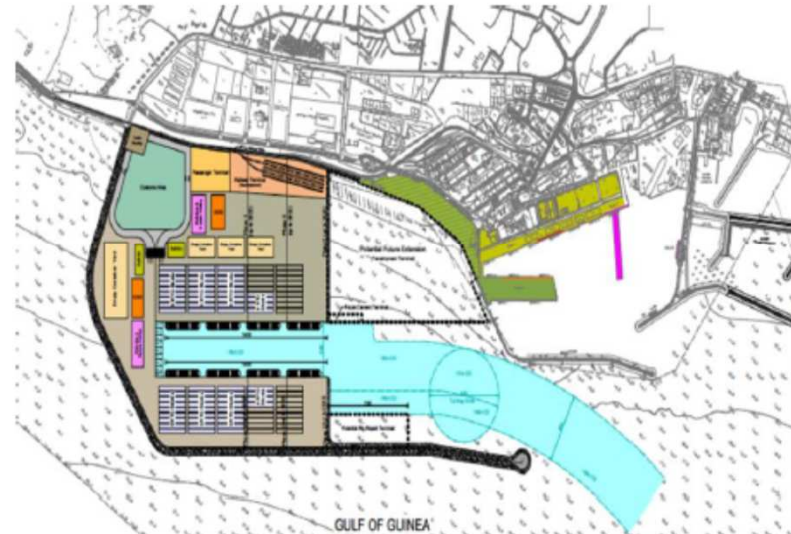


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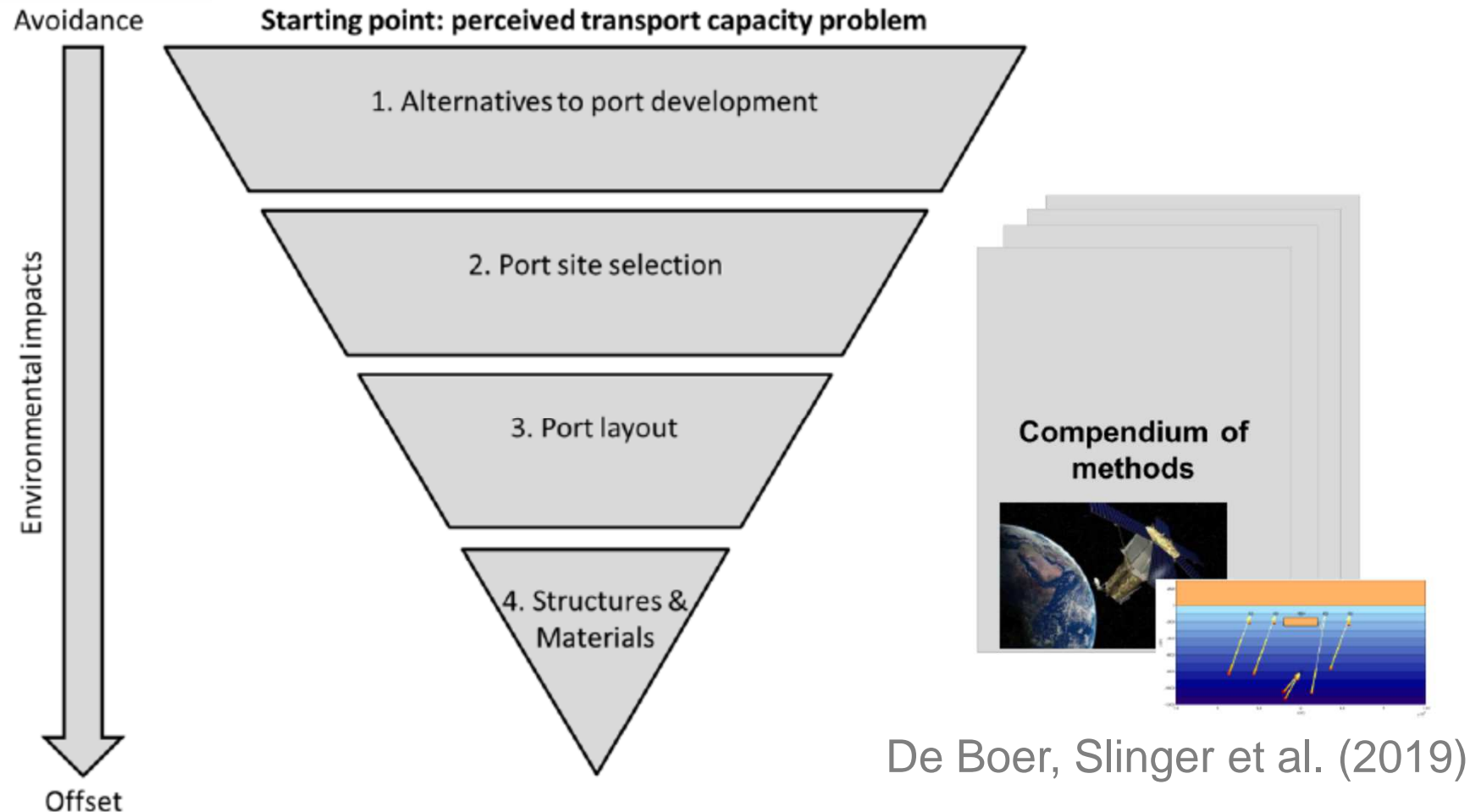


# Approach to developing an ecosystem-based port design hierarchy (EPDH)



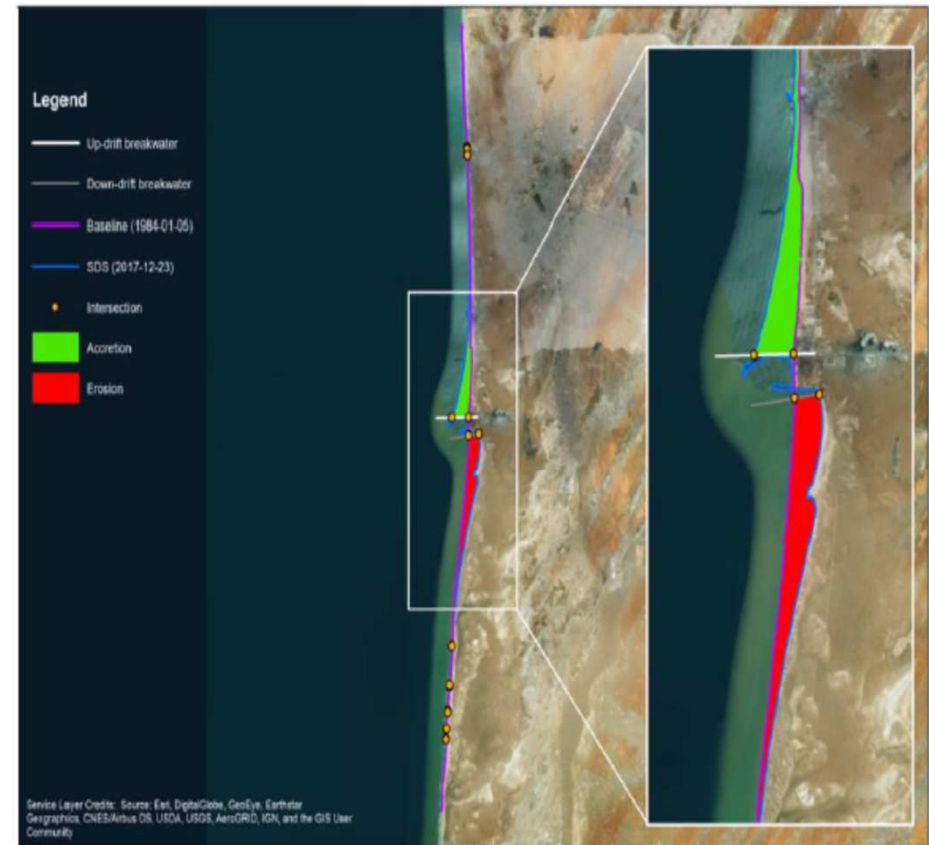
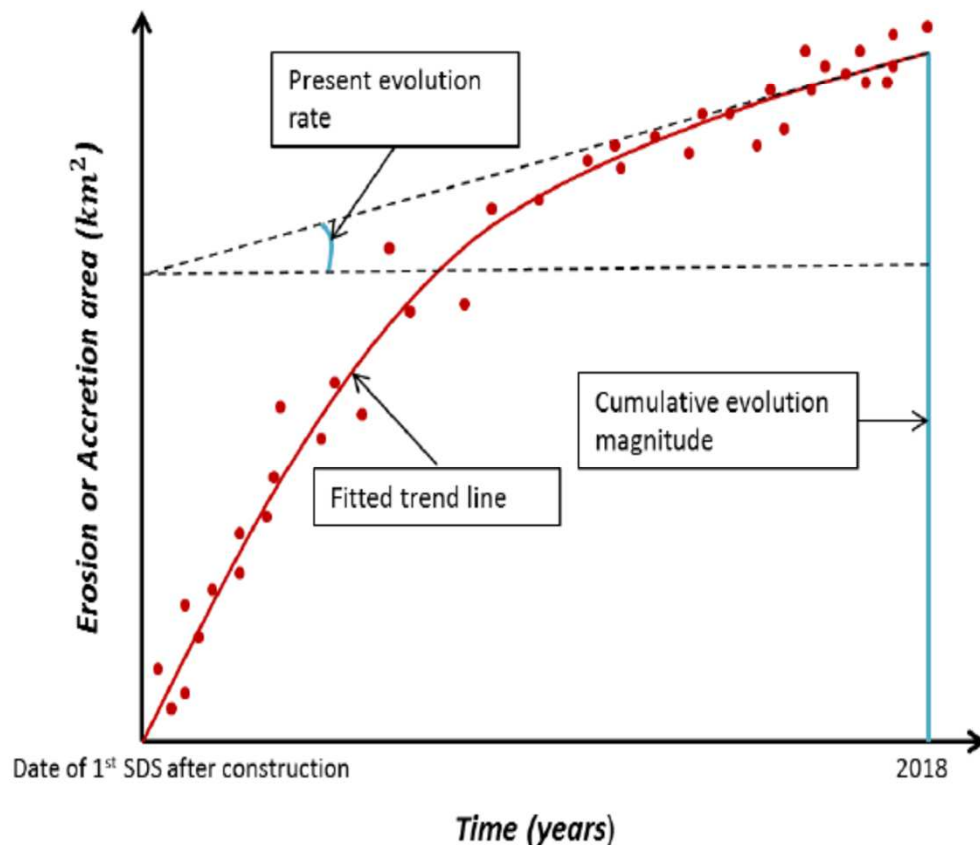
- What's possible -> What's done -> Improvements

# EPDH Core to Framework



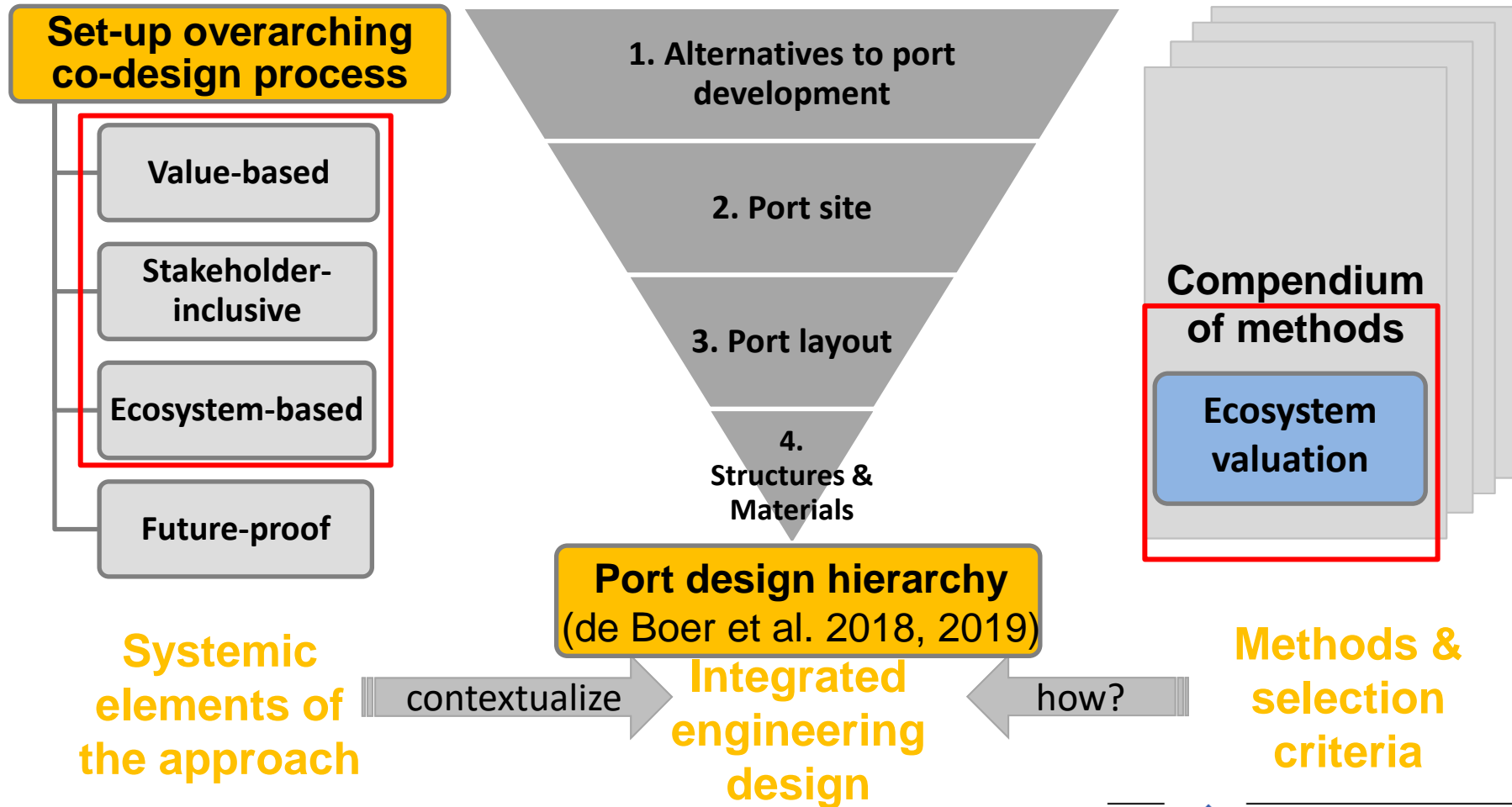
Earlier and wider identification of ecosystem-based alternatives for a port's marine infrastructure in future seaport developments

# Approach: coastline evolution (CE)



Innovative method (de Boer, Mao et al. 2019)  
Pan-African Seaports Database

# Sustainable Ports Framework





# References

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7. Kangeri, A. et al (2018) Mapping ecosystem change in a data poor e description of research steps to gain system understanding, Arno Ka