Operationalizing the concept of Sustainability for Sustainable Port Design

Case of Port of Tema, Ghana

Heleen Vreugdenhil, Jill Slinger, Poonam Taneja, Wiebe de Boer, Tiedo Vellinga, Arno Kangeri

Delft University of Technology
Wageningen Marine Research
Research approach

How is sustainability in ports perceived?

(Grey) Literature
Expert survey and PoF game results (NWO project)

Case port of Tema Ghana
Scoping workshop 2015
Extended stakeholder workshop 2017
Interviews
Sustainability in Ports – theory and practice

- Theory: General definition (Poonam!)
- Main indicators (Eg Peris, Mora 2005, Schipper 2017?)

Some sustainability plans (ESPO, Port of Vancouver, North Queensland)

Little uniformity in sustainability policies, practices and reporting across ports > difficult to compare performance (Schipper et al 2017)
<table>
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<tr>
<th>PT-C1</th>
<th>See notes</th>
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<tbody>
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<td>Poonam Taneja - CITG; 17-4-2018</td>
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<th>PT-C2</th>
<th>Wiebe has compiled a list of specific indicators. At a general level, you could mention the following (see notes)</th>
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A Sustainable Port… *(survey results sept 2016, N=22)*

…Accounts for people, planet, and profit needs
…Is Future oriented *(flexible, adaptive)*
…Has an Integrated, stakeholder inclusive, design
…Has an Ecosystem based design and operation
…Includes monitoring

**To be avoided:**
Pollution, Social issues, Damage to physical system *(coast, essential ecological processes)*, Lack of ambition with respect to sustainability
Sustainability in the Port of Tema, Ghana
Project Approach

- \( T_{-1} \) Historic development
- \( T_0 \) Existing port (status quo)
- \( T_1 \) Expansion (standard design)
- \( T_1^+ \) Incremental value addition (green port)
- \( T_1^{++} \) Out of the box (green port ++)

SHAPING THE PORT OF THE FUTURE
The societal, economic and management challenges

TU Delft
S.P.E. AFRICA
SUSTAINABLE PORTS IN AFRICA
Stakeholder workshop Tema – Developing a story line
Development of the Area and issues at hand

- Eroded beaches
- New port development area
- Existing port
- Crowded fishing port
- Lagoon under pressure
- Flood risk
- Congestion
- Poverty
- New port development area
- Existing port
Visions: Utopia and Distopia

1a. Cool Africa
- Economic interests and ecology are in balance although there is limited land, growing population
- Improved transportation including an inland port
- Estuaries are designated as a critical habitat e.g. sakumono, Chemu lagoons
- GPHA incorporates the lagoon systems into their development, in an ecologically sensitive way
- Meridan Rock will also act as a artefact of tourist interest
- Tema wastewater treatment sewage system is broken now, but then it will be working
- Tema administration needs to be fixed
- Port development - 10 million euros
- Offshore docks will be linked by rail systems to the mainland and hinterland
- 5°C water from deep sea will be used to cool facilities and improve export potential

1b. Cannibalism
- Chemu and Sakumono lagoons have almost vanished
- No humans are living in Tema or near the port
- Containers abound
- There is cannibalism, as food is short and only port development counts

2. Hate Ghana
- Business as usual
- Loss of revenues/economic opportunities
- Development agenda driven from elsewhere; (Strong) Investor influence
- Only containers in the port, no room for anything else
- Congestion of port
- Slums- more poverty
- Increased pollution: river, marine, terrestrial
- Loss of biodiversity
- Loss of Sakumono lagoon in the next 10 years
- Flooding and coastal erosion
- Depicted below
NEEDS AND VALUES

- Increase Economic value (e.g. ecotourism opportunities)
- Improving efficiency of port functioning
- Coastal erosion
- Hinterland connections (Congestion)
- Quality of Livelihoods
Some results (2): Why we care and who cares

1. Civil society organizations
2. Private Sector
3. International
4. Education and Research
5. Ministry of Transport & Agencies
6. Local and Traditional
7. Ministries
8. Environmental Regulators
9. Politicians
Major conditions for sustainable port design

4 perspectives

- Governance
  - Stakeholder inclusive
  - Broaden the scope
  - Integration across (administrative) boundaries
  - Future oriented

- Engineering
  - Accessibility
  - Wave conditions
  - Hinterland connections

- Ecology
  - Ecosystem-based/ Env. Flows
  - Location choice
  - Conserve
  - Rehabilitate (based on reference site)
  - Create value (BwN, variations)
  - Maintenance (dredging practices)

- Economy
  - ESS (including for the city)
  - PPP
  - SCBA
The Sustainable Ports design framework…

Set-up overarching co-design process

- Value-based
- Stakeholder-inclusive
- Ecosystem-based
- Future-proof

Port design hierarchy
(de Boer et al. 2018)

1. Alternatives to port development
2. Port site
3. Port layout
4. Structures & Materials

Compendium of methods

Systemic elements of the approach

contextualize

Integrated engineering design

how?

Methods & selection criteria
EXPLORATION PORT LAY-OUT DESIGNS

Port behind a breakwater

Natural port

Offshore berth

Open port

Port behind an (artificial) island
Contact details

Heleen Vreugdenhil
Delft University of Technology, The Netherlands
h.s.i.vreugdenhil@tudelft.nl