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# Integrated and Sustainable Port Development in Ghana

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## Abstract

Africa is on the rise and new ports are essential to unlock production and trade opportunities and enable future growth. A growing consensus recognizes the need for sustainable port development, aimed at finding the right balance between human, environmental and economic aspects. However, an integrated inter-disciplinary approach to sustainable port development, which embraces the four perspectives of engineering, ecology, economy and governance is lacking. The ongoing NWO-UDW project “Integrated and Sustainable Port Development in Ghana” addresses this gap. It aims to develop a generic framework and a set of tools for stakeholder inclusive design of integrated and sustainable ports in Africa. It proposes a bottom up approach whereby research in all four disciplines is directed at relevant and practical cases in Africa. The Ghanaian port of Tema has been selected as a pilot project. This paper describes the project including the underlying vision and the objectives, the work-plan and the expected project results. It also describes the results of a workshop in Ghana in July 2015 to identify needs and values of relevant stakeholders with respect to Tema port development.

**Keywords:** Integrated port development, sustainable port, stakeholder-inclusive, pilot project; green ports in Africa

## 1 Introduction

Africa is on the rise and the development of ports is essential for facilitating the rapid growth of local and regional economies. However, large scale infrastructure development usually has lasting impact on the surrounding environment. A growing consensus acknowledges this fact and recognizes the need for more sustainable approaches for port development aimed at balancing social, environmental and economic aspects. In spite of this, an integrated inter-disciplinary approach to sustainable port development, which embraces the four perspectives of engineering, ecosystem services (ecology and economy) and governance is lacking.

The ongoing NWO-WOTRO<sup>i</sup> UDW<sup>ii</sup> project “Green ports in Africa: Integrated and Sustainable Port Development in Ghana” (NWO-WOTRO, 2015) addresses this gap. The research project, spanning three years, aims to create new knowledge and guidelines for

developing integrated and sustainable ports in Africa.

This paper describes the on-going project, including the underlying vision, the challenges and the objectives, the selected pilot project in Ghana, as well as the results expected from the research project. It also presents the results of a workshop, held in July 2015 in Ghana, that gave a promising start to the project. The paper aims to share knowledge and learning over the development of sustainable ports; the principles are of course applicable to other large scale infrastructure development.

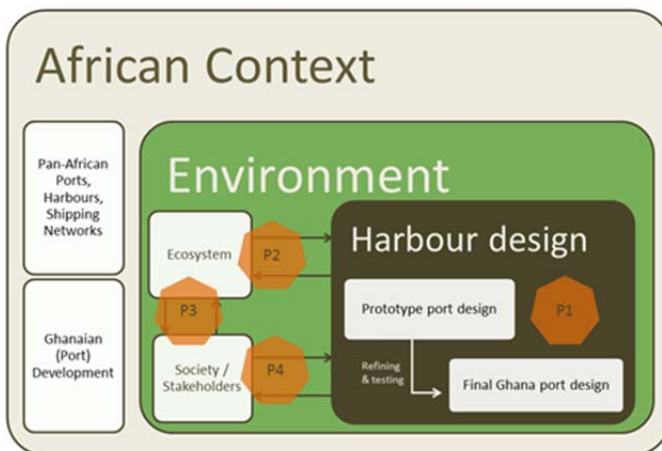
## 2 Sustainable port development: research gap and the proposed solution

There is no universal consensus on the definitions of sustainability or sustainable development. This is because these concepts are context, place and time related. Based on the

widely used definition of Brundtland Commission, AAPA<sup>iii</sup> (2007) defines port sustainability as “business strategies and

and approaches for implementation.

Numerous conceptual methods for sustainable development have been proposed in recent years, yet, tools and frameworks which incorporate all the aspects mentioned above, and are based on practical experience, are missing. The aim of the current research project is to develop tools and a generic design framework for the development of integrated and sustainable ports in Africa in which environmental, economic and public benefits are balanced.



**Fig. 1** Research project and sub-projects

activities that meet the current and future needs of the port and its stakeholders, while protecting and sustaining human and natural resources.” In line with this definition, we view sustainable port development as a long-term dynamic effort, based on continuous learning and improvement, requiring the simultaneous pursuit of economic prosperity, environmental quality and social responsibility.

Literature related to sustainable ports (AAPA 2007, PIANC 2008, PIANC 2010, Vellinga 2014) advocates common sustainability guiding principles and suggests that a more sustainable port can be realized through embracing the four perspectives of engineering, ecosystem services and governance in an integrated approach to port development. This requires an early and transparent stakeholder engagement to encourage open dialogue, accountability and collaboration; working with nature; incorporating sustainability and uncertainty considerations in all port activities across the supply chain (including infrastructure design, maintenance, and operations). Literature also mentions that sustainable port development requires communicating the goals of sustainability across the entire supply chain; allocating resources for implementation and building upon and sharing existing sustainability best practices, keys to success, lessons learned

### 3 The NWO UDW Project

The NWO UDW project “Integrated and Sustainable Port Development in Ghana” aims to apply the principles mentioned in Section 2 in a pilot project, which is the Port of Tema. The project, which spans three years (start date May 2016), will be carried out by a multidisciplinary consortium, wherein academia, applied research institutes, knowledge institutes, practitioners and potential users collaborate as partners and interact with a broad range of local stakeholders. The project will employ a bottom up inter-disciplinary approach and integrate different aspects of sustainable port development, namely engineering, ecology, economy and governance. These aspects will be researched in four sub-projects P1-P4:

- P1: Port engineering and design
- P2: Marine ecosystems and coastal erosion
- P3: Economic valuation of ecosystem services
- P4: Governance of green port development

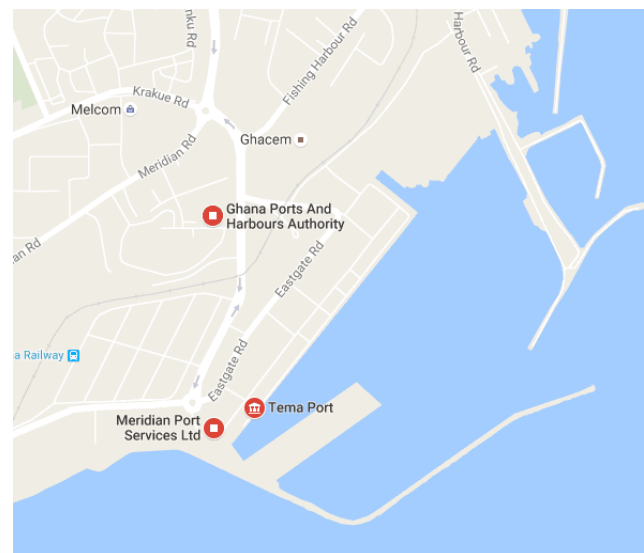
Fig. 1 shows the proposed research project, the focus of each sub project and their relations. The inter-disciplinary approach, combining various aspects of port development will create new knowledge for design-framework and a set of design tools that can be applied for developing more sustainable ports. Subsequently replication of practices is expected in Ghana and beyond, and the eventual institutionalization through bottom-up adoption and Pan-African networks as shown in Fig. 2.

promote a stakeholder inclusive design process encompassing issues such as trust building and value transfer between various stakeholders will also be addressed.

## 4 Port of Tema

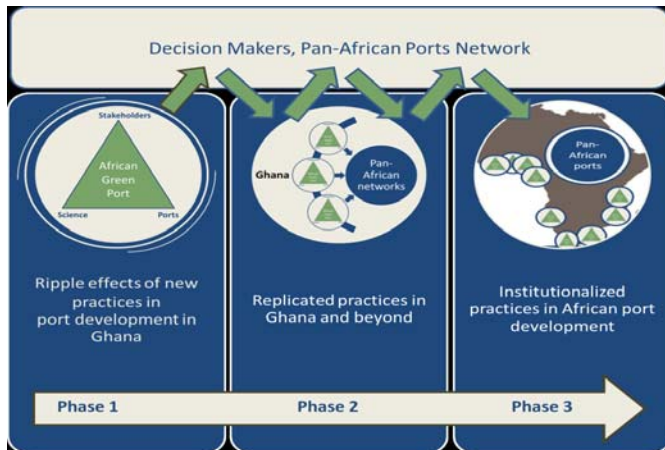
The Port of Tema<sup>iv</sup> is located in the southeastern part of Ghana along the Gulf of Guinea (Fig. 3) and has evolved from a small fishing village to Ghana's leading industrial center and seaport in the last decade. In order to meet rising cargo traffic as Ghana's economy maintains its high rate of growth, the port is undergoing expansion. As per the current expansion plan, the port (Fig. 4) will be extended to the Sakumono area, and is expected to offer employment to about 5,000 people, when completed. Feasibility studies have been conducted to forestall the displacement of people and communities in the area in question, as most activities, officials say, will go on in the sea. The expansion of the Tema Port will enhance its efficiency and make it more competitive within the sub-region.

The project includes (see Fig. 4 for numbers 1-4) 3.85 km breakwater (2) to be constructed within the dredged port access channel (1) 19 m deep and 250 m wide, reclaimed land of 120 ha (4) and new 1.4 km of quay walls (3) for 4 container berths with 16 m draft.



**Fig. 3** Port of Tema

Meridian Port Services Limited (MPS, 70% owned by a joint venture between APM



**Fig. 2** Envisaged results of the project

The current situation in the Port of Tema is described in Section 4 and highlights the potential of the region for creating additional economic value for stakeholders. A description of the sub-projects P1-P4 follows.

P1 will develop alternative layouts of the port expansion of Tema. Hereby, the principle of working with nature will be gainfully applied where possible and the impacts of each alternative on the ecosystem (i.e., changed water velocities, effects on the wave system, and morphological changes in the vicinity of the port), as well as the societal impacts will be studied.

P2 will study the port ecosystems, identify relevant ecological elements and investigate the effects of the proposed alternatives on the functioning of the ecosystems and investigate opportunities to create added value for the surroundings, e.g. through studying biotic processes to counter erosion problems and integrating ecological habitats.

P3 will apply the state-of-the-art methods for the evaluation of the ecological effects so that they can be included in the socio-economic analysis of various port development alternatives. Herby the relevant social aspects identified in P4 will be valued.

P4 will formulate an opportunity-oriented implementation model for port development in which port authorities, contractors, nature conservation organizations, ecologists, engineers and local stakeholders cooperate for a better fit between ports and their social-ecological landscape. The issue of how decision makers can

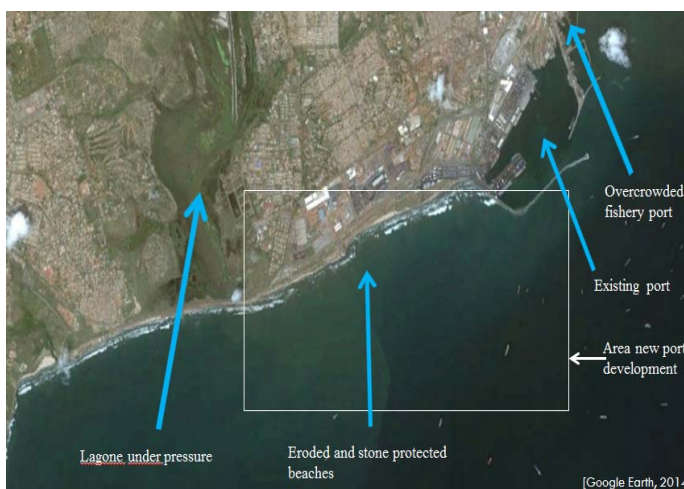
Terminals and Bolloré Africa Logistics, and 30% owned by the Ghana Ports and Harbours Authority (GPHA) is responsible for developing the new terminal.

The current proposed development has potential significant diverse environmental and social impacts, including (i) coastal erosion and sedimentation / accretion, especially in the near field of the breakwater, potentially affecting the



**Fig. 4** Proposed expansion Port of Tema

outfall of the ecologically sensitive Sakumo Lagoon Ramsar site that is located less than 2 km west of the project site; (ii) sediment mobilization and seawater quality effects due to dredging and reclamation; (iii) increase of truck and vessel traffic due to construction and operation of the new terminal; (iv) influx of job seekers and management of community expectations; (v) resettlement of a resort; and (vi) effect on a natural feature (a rock) of cultural significance. GPHA has conducted an ESIA (Environmental Social Impact Assessment) for the Tema Port infrastructure development in accordance with Ghanaian requirements.



**Fig. 5** Expansion plan of Tema

The Ramsar site includes coastal brackish-saline lagoon with surrounding floodplains, areas of freshwater marsh and coastal savannah grasslands, in addition to a coastal narrow sand-dune on which a main public road connecting Accra and Tema is located. The site supports diverse populations of migratory and resident water birds, estimated at over 70 species and 30,000 individuals, which depend on the site's resources during migratory and reproduction periods. The lagoon is also important for some marine and freshwater fish species and provides livelihood resources (fishing) to local communities. Part of the site is converted to agriculture and industrial development. The Sakumo lagoon is currently connected to the sea by a sluice and a culvert, built in 1953 to prevent flooding of the coastal road. The sluice is non-operational and there is free exchange of water between the lagoon and the sea, with the direction of flow depending on the tide. In order to protect the outfall and to control erosion, revetment has been installed using rock armor.

During the ESIA preparation, the following key stakeholders were consulted by the ESIA consultant to obtain their views on potential environmental and socio-economic issues: (i) GPHA Tema Office; (ii) local authorities and agencies (Tema Metropolitan Assembly and Tema Development Corporation); (iii) regulatory institutions (EPA, Ghana Maritime Authority; Ghana National Fire Service; Ghana Navy; Forestry Commission; and Fisheries Commission); (iv) Sakumono fishing community; (v) Tema Traditional Council; (vi) management of the Ave Maria resort; and (vii) Tema Community 3 Site A and Site B Residents Association. The summary of concerns raised during stakeholder consultation is presented in the ESIA.

Since 2004, MPS has operated within the existing port and did not need to have a formalized stakeholder engagement mechanism and program. The preparation of the ESIA allowed for key stakeholders to have initial knowledge of the expansion project.

## 5 Work plan NWO UDW project

A work-plan that will serve as a documented basis of the common vision of a wide-range of stakeholders at different levels over the project objectives, and the approach followed by the

consortium to achieve these objectives in the given time frame, has been made. It also covers aspects such as the research plan, project deliverables, communication, monitoring and evaluation activities as well as knowledge sharing activities.

The overall project will go through following stages:

- gathering relevant data for the pilot project through desk studies, field research and workshops;
- exploratory studies related to alternative port layouts, ecosystem services, and stakeholder values;
- integration of preliminary findings into conceptual port layouts which include status quo as reference layout, the proposed port expansion plan, an incremental port development plan with a focus on value addition by considering sustainability and an innovative layout;
- assessment of stakeholder inclusive approach as applied in the above steps, with a focus on the process;
- detailed assessment of proposed layouts with respect to functionality of port operations, morphological effects, environmental impacts on marine ecosystem, and economic value of ecosystem services;
- specific conclusions over the ecological value created through a stakeholder inclusive approach, the effects of the resulting designs on the financial performance of the port;
- detailed assessment of options to take other stakeholder values (not related to the ecosystem services) into account. Final advice over the proposed approach for conducting a multi-objective stakeholder inclusive design within a broader African context;
- preparation of a final report in which the generalized findings leading to the development of a generic framework and tools for the stakeholder inclusive design of sustainable ports in an African context are presented and discussed, and
- knowledge dissemination in accordance with a well-formulated research uptake strategy.

## 6 Proposal development workshop with stakeholders

As stated earlier, stakeholder inclusive design is

an essential feature of the proposed approach and includes many levels of stakeholder participation as described in Harts's Ladder of Participation (Hart 1997) than merely providing information to stakeholders. The participatory processes focus on co-learning, co-creation and co-operation and are expected to result in a more sustainable port design and operations. This enhances symbioses with the surrounding environment and gives the port a license to grow.

Stakeholder engagement for the pilot project requires:

- Identifying relevant stakeholders in Ghana at various levels, including researchers, public sector, industry and end-users;
- Organizing stakeholder workshops in Ghana for understanding local situation and drivers of port development in Africa thereby aligning research design to stakeholder-needs, sharing knowledge and insights with them, as well as receiving constructive feedback over the findings.

This section describes findings of the proposal development workshop that took place in July 2015 and initiated the process of co-creation with local policymakers, port authorities, private sector, civil society and academia on African Green Ports. The stakeholders related to the development of the Port of Tema were identified and invited to the workshop. The central objective was to create an understanding of the green port philosophy and discuss as to how to apply it to the Port of Tema. In order to achieve this, the experiences with Maasvlakte 2 project in the Netherlands, which is a showcase worldwide for sustainability efforts, were shared with the stakeholders. Next the issue of 'how' to apply this knowledge in the setting of Tema was addressed. A short description of the objectives, stakeholders and the workshop results follows.

### *Objective*

- a. Engage stakeholders for Green Port in Ghana including key stakeholders such as Port authority, Port community system, Local communities, Government. Include the marginalized, e.g. artisanal fishermen; fisher folks, community leaders in and around Tema environmental agencies/NGOs
- b. provide input to the concept of Green Port
- c. Identify all policy issues associated with the project and adequately engage policy makers to ensure total commitment to both

government and private operatives

#### *Relevant stakeholders*

- Government: Min. Transport, Trade and Industry, Finance, Agriculture, Communication, environment science and technology, Roads and Highways, Aquaculture, Water resources, Power, Tourism, Interior, Local government, Health, Current affairs, Education, Defense, National development planning communication
- International bodies: ECOWAS, WTO, World Bank, OHADA, IMO, Union of African shippers councils, UNCTAD, Port Management association of West and Central Africa, MOWCA, USAID trade hub, Borderless Alliance, Global shippers forum, EU, African Union
- Civil society: Trade unions, Imani (think tank), DANQUAH institute, ports environmental network, Fisherman's Association
- Private sector: AGI (association of Ghana industries), Chamber of Commerce, Federation of Ghana exporters, Ghana institutes of freight forwarders, Private enterprise foundation, Shipping lines SAAG, MPS
- Parastatal: Security agencies (7 in the port), TMA, VRA, TDC, Cacao Board, GPHA, Ghana Shippers Authorities
- Traditional: Municipalities, chiefs, Tema development cooperation
- Financiers: AFDB, Ecobank, WB, IFC, ECOWAS, IMF, JICA
- Academics: University of Cape Coasts, dpt. environmental studies, University of Mines, University of Ghana, Water research institute, KN university of science and technology.
- NGO: Wildlife society, friends of water bodies
- Media: GhanaWeb, Business and Financial times, Graphic communicate, Oxford Ghana Guide, Maritime and transport digest, GTV, radio stations

#### *Results of the workshop*

The responses of the workshop participants have been placed in categories as can be seen below. An analysis and conclusions follow.

#### Infrastructure

- Open up the road to hinterland
- Focus on land-side port congestion and hinterland facilities
- Sustainable infrastructure

- Connect to Volta lake supplies
- Extend the port
- Automated cargo clearance system

#### Organizational

- Streamline activities within the port
- Full outsourcing of port operations: GPHA should be a landlord port authority not an operator
- Minimize the number of agencies within the port and reduce conflict
- Smarter ways of doing the job must be encouraged: develop new technology
- Reduce bottlenecks in port operations

#### Regulation/governance

- Deregulation of government procedures
- Local authority involvement
- Commitment from the political authority
- Private sector participation (PPP)
- Trade facilitation primary goal!
- The port authority should articulate a clear vision which must be carried out together
- Multiple objectives
- Multidisciplinary approach

#### Livability of Greater Accra Region: Tourism/ Livability/ human environment/society

- The port needs to educate the individual to understand their activities
- Make stakeholders understand the benefits of incorporating other activities in the port
- The port can use tourism to generate some revenue and create expansion
- Design consideration:
  - Value creation through ecotourism
  - Recreational facilities
  - Inland water transport service Tema Accra, Tema North
- Stakeholder relations need to go beyond operational issues
- Create nice clean beaches for tourism
- Improve accessibility to the port for customers/consumers.
- Education/awareness creation
  - Sensitize local communities around the port development area
  - Develop inter-agency collaboration
- Maintain culture and community /National ownership
- Conduct impact assessment to ascertain its socio-, i.ee, economic and cultural impact on society

- Combine port construction with soft solutions beaches for recreation nature & fisheries
- Make port operations relevant to community

#### Livability of Greater Accra Region: Sustainability/climate/natural environment

- Synchronize Green Port with acceptable environmental standards
- Foster environment and sustainability
- Research program/initiatives in Ghana at Universities
- Ecosystems valuation
- Clean air
- Cherish Ramsar lagoon site & present it as an asset in the port vision document
- Open up lagoon
- CO<sub>2</sub> reduction program for cargo trucks
- Understand the impact of port activity on the ecosystem

#### *Identified Needs*

The responses of the stakeholders have been categorized into 5 main needs.

**Need 1: Insight into economic value of Green ports**

Stakeholders want an insight in the economic value of a 'green port'. Short and long-term economic values are key to decision-making and amongst the most pressing information needs.

**Need 2: Improving port efficiency**

One of the major challenges is improving the efficiency of Tema Port operations. The debate about the port's future is to a large extent dominated by current problems.

**Need 3: Improved hinterland connections**

A critical aspect is the congestion problem due to heavy traffic and container movement in and out of the port. Hinterland connectivity is key to integrated port development and needs to be taken into consideration.

**Need 4: Protection of (eco)tourism opportunities**

(Eco-)tourism provides opportunities for (economic) growth for Ghana. The sector is already seeing an increasing interest in investments in the country; however, concrete plans to increase tourism are not included in the existing Tema Port plans. Opportunities for creating long-term value from eco-tourism, integrated with the port extension plans, should be a logical element of analysis in the project.

**Need 5: Protection of living quality and livelihoods**

The development of Tema Port, as currently planned, negatively impacts the living quality as well as livelihoods of populations in the port region and hinterland, Greenport development may be beneficial for the populations.

The workshop participants signed endorsement letters after the workshop to express their support for sustainable and integrated development for the Port of Tema, The proposal-development workshop formed the starting point for a stakeholder-informed port development process.

#### *Next Step*

In subsequent public participation activities, the stakeholders, identified through a snowballing approach, will be asked to share their visions of what a sustainable port means in Ghana. The social and ecological factors deemed to determine the degree of sustainability will be translated into criteria against which the port development plan and the design process will be evaluated.

## **7 Conclusions**

In this paper, an integrated approach based on principles of sustainable port development has been presented. This approach will be applied for development of Green Ports in Africa. The first steps and the ensuing results of the application of the approach a pilot project are discussed with a view to share the learning with rest of the port world. As a part of the research dissemination, intermediate as well as the final results will be disseminated through various media.

## **Acknowledgements**

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<sup>i</sup> NWO-WOTRO Science for Global Development programmes, funds and monitors innovative research on global issues, with a focus on sustainable development and poverty reduction. <http://www.nwo.nl/en/about-nwo/organisation/nwo-divisions/wotro>; accessed 30 September, 2016.

<sup>ii</sup> Urbanising Deltas of the World (UDW) aims to increase knowledge about river delta's worldwide and to contribute to water safety, food security, and to sustainable economic development in these areas. <http://www.nwo.nl/en/research-and-results/programmes/Urbanising+Deltas+of+the+World>; accessed 30 September, 2016.

<sup>iii</sup> American Association of Port authorities

<sup>iv</sup> <http://www.slideshare.net/informaov/victoria-cobbah-ghana-investment-promotion-centre>; <http://www.oxfordbusinessgroup.com/news/ghana-port-expansion-handle-rising-cargo>"; <http://portside.ch/update-1-5-billion-expansion-of-port-tema-in-2015/>; accessed 30 September, 2016.