

Ports in Transition

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Abstract

Ports worldwide are confronted with a changing environment in terms of global economy and a rising awareness of the necessity of balancing economic, social and environmental interests. Therefore, in recent years, a lot of research has been directed towards studying sustainable port development. However, the focus has been on greenfield ports, while little has been said about ports in transition. This paper presents a framework for sustainable development of ports in transition and applies it to the re-development of bay of Havana in Cuba.

1. Introduction

Worldwide, the global trade growth is driving continuous challenges between ports, cities, regions and countries. The increasing awareness of the Green Growth concept is motivating port planners and policy makers to aim for a more sustainable port (PIANC, 2014). Traditional methods of port planning result in inflexible ports that are not functional under changing requirements and neglect social and environmental interests, creating a merely economic focused project that does not serve the ecosystem as a whole. Clearly, new approaches are required. As a feasible alternative for traditional port planning, sustainable ideologies and frameworks have been developed, such as Port of the Future (Schipper et al., 2015), the Ecosystem-Based Design (Vrolijk, 2015) and the Integrated Sustainable Port Design (Zheng, 2015). Majority of the research focuses on new or expanding ports. Ports with a fundamental change in its main function (e.g. tourism, industry, production) due to certain national or international reasons (geopolitics, economics, environment, etc.), termed as ports in transition, are not included. This paper presents a framework for sustainable development of ports in transition and applies it to the re-development of the bay of Havana in Cuba. It aspires to support port planners by providing better understanding of how this transition should be organized and a layout of a preferable port transformation.

2. Design framework for a port in transition

“A sustainable port is a port which has achieved and is maintaining a balance in economic, environmental and social extent for the surrounding region whilst using a long-term vision to anticipate on future developments and the needs of future generations. A sustainable port uses the Earth’s resources for its own benefit without affecting its capacity for future generations.” (Zheng, 2016)

As port planners and researchers start to acknowledge the need to adapt traditional port planning, research into alternative port planning methods based on more sustainable design philosophies is ongoing and includes Ecosystem Based Design Approach (Vrolijk, 2016), Integrated Sustainable Port Development (Zheng, 2016), Port of the Future (Schipper, 2015), The Flexible Port (Taneja, 2013) and research on brownfields (Leger, Balch, & Essex, 2016).

The proposed framework for development of a port in transition, based on preceding research in the field of Greenfield port development, has the following features. Instead of only embracing economic and governance related disciplines, the sustainable framework attempts to ensure a balance in economic, social and environmental interest. The location choice and the morphology of the port are therefore very significant. It considers uncertainties and deals with them by incorporating flexibility in the system. It is based on a continuous learning design process.

The proposed framework consists of the following steps, which are demonstrated by applying them to a case study in the following section:

1. Understand the system
2. Prioritize remaining elements
3. Define project goals
4. Develop alternative designs
5. Test the design alternatives
6. Evaluate each alternative
7. Create the final design

3. Case Study

After 55 years of political and economic isolation, the Western world is preparing to restore diplomatic relations with Cuba (Rathbone, 2015). Although Cuba's future remains uncertain, the transition is expected to lead to the restoration of international trade relations, growth of the private sector and an increasing number of international tourists (Roberts, Watts, & O'Carroll, 2016). The activity of the port of Havana is shifting towards the port of Mariel, which is designated as a Special Development Zone.

The Masterplan for the redevelopment of the bay as proposed by the governmental workgroup PID-BH - further referred to as the 'reference project' - is based on conventional port planning methods. The goal of the Masterplan is clearly to target the international tourism market by focusing on constructing cruise terminals, hotels, marinas and large commercial zones in nearly all areas of the bay (Figures 1-3). However, this Masterplan does not take an integral sustainable approach at heart. Other governmental directed organizations aspire to improve the environmental quality of the bay (GTE-BH, 2015; PID-BH, 2014). Perhaps these seem infeasible and conflicting with the masterplan.



Figure 1 - Impression of the reference project: integral development plan of the bay of Havana. Legend: 1, 4, 5, 6, = marina for yachts and mega yachts, 2, 7 = cruise terminals, 3, 13 = maritime services (PID-BH, 2014)



Figure 2 – Location 7: proposed use: cruise terminal for large vessels, bioclimatic hotel. (PID-BH, 2014)

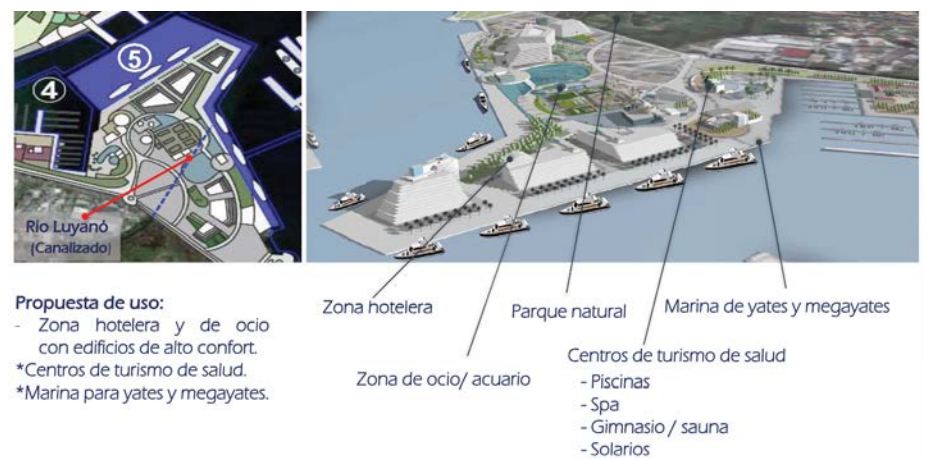


Figure 3 – Location 5: proposed use: hotel zone and leisure area with high comfort buildings, health tourism centers, marine for yachts and mega yachts. (PID-BH, 2014)

We apply the proposed framework to the redevelopment of the port of Havana and propose a layout for a possible design. By means of the case study we investigate the differences from traditional port planning methods and test the feasibility and applicability of the proposed framework.

Future Scenarios

Since Cuba's future is highly uncertain, four scenarios were composed, comprising the two most important 'driving forces', which will strongly influence the future of the bay of Havana, Cuba : climate change ((Honey, 2016), (IPCC, 2014)) (Table 1) and political environment (Table 2) (Canazzi et al., 2016; Honey, 2016; IPCC, 2014). Accordingly, these driving forces compose the four future scenarios, which are relevant to take into account when designing a port masterplan (Figure 4).

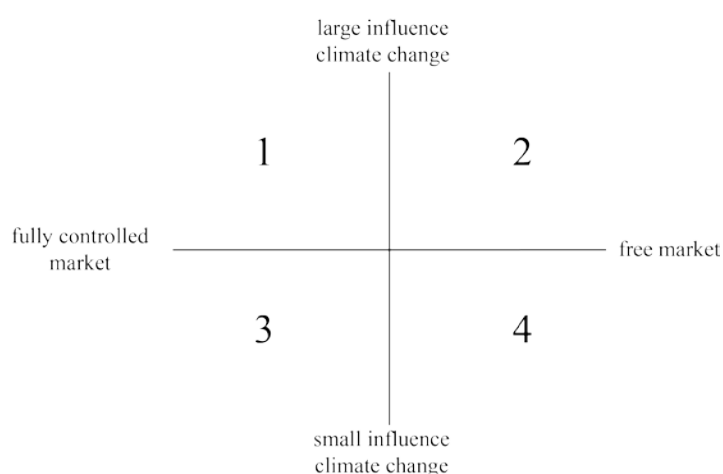


Figure 4 – The four scenarios (own work)

Table 1 - Effect of climate change on the bay of Havana (Canazzi et al., 2016; IPCC, 2014)

Climate change		
	<i>Large effect</i>	<i>Small effect</i>
<i>Air temperature (rise by 2100) [°C]</i>	4.5	1.5
<i>Sea level (rise by 2100) [m]</i>	0.85	0.26
<i>Extreme weather events (storm surges, tornados, etc.)</i>	- Higher intensity (+12%) - Possible higher frequency	- Same intensity - Same frequency
<i>Social impact</i>	- Disrupted livelihoods - Health issues: more diseases, casualties and victims	None
<i>Economic impact</i>	Costs of critical services will increase (e.g. networks and infrastructure)	None
<i>Environmental impact</i>	Increased pollution of (natural) water, flora and fauna, loss of certain biodiversity and ecosystem goods	None

Table 2 - Effect of political environment on the bay of Havana (Canazzi et al., 2016)

Political environment		
	<i>Fully controlled market (i.e. socialism)</i>	<i>Free market (i.e. capitalism)</i>
<i>Type of government</i>	Large and centralized	Small and decentralized
<i>Entrepreneurship</i>	Allowed for small and middle-sized companies in certain (regulated) industries	Allowed for all industries and all size of companies
<i>Decision making process for the port of Havana</i>	All government (related) organizations control the process	Private and public sector allowed in the process
<i>Foreign investment</i>	Regulated or restricted	Fully allowed

The case study starts with a thorough analysis of the bay area of Havana. Next, the remaining elements in the bay of Havana (infrastructure, companies, etc.) are prioritized to determine which must remain. Afterwards, the project goals are determined and eventually a preferable design layout will be presented, while considering the uncertainty of Cuba's future.

Step 1: Understand the system

In this context, the 'system' includes the location (i.e. the bay of Havana, Cuba) and all stakeholders (e.g. governments, businessmen, citizens, etc.) or processes (e.g. port activities, natural processes) that (actively or passively) influence the port of Havana. With stakeholder analyses, comparisons are made between the current situation and future scenarios to investigate possible shifting power and interest structures.

Currently, Cuba has a clear centralized power structure. The importance of tourism for the Cuban economy is large. In 2016, 3.7 million tourists were expected; this accounts for 10 % of the GDP and 9.6 % of employment (Gonzalez, 2016; Laitamaki et al., 2016) and without travel restrictions Havana becomes more attractive for U.S. tourists. Assets for tourism in Cuba and Havana are: a healthy, well educated work force, significant natural and cultural attractions (the latter particularly in Havana); a strong government role in tourism planning, policies, investment and operations; dynamic small-scale private sector: *paladares* (local restaurants) and *casas particulares* (local bed & breakfasts); opportunities to create and capture the high value tourism market that is distinct from the Caribbean's typical mass market sun & sand tourism (Globe Media Ltd., 2016; Gross, 2016; Honey, 2016).

According to governmental plans, cruise tourism would play a significant role in the redevelopment of the Bay. Nevertheless, cruise tourism raises concerns regarding infrastructure, operational, distribution, use and waste impacts (Butt, 2007; Carić, Klobučar, & Štambuk, 2016; Carić & Mackelworth, 2014; Poplawski et al., 2011; Wood, 2000). "Although the cruise industry is a relatively small contributor to the number of tourists in Havana or Cuba, the impact for Havana and the environment is significant" (Klein, 2011). Adding to the environmental consequences of cruise

tourism, is the already existing issue of pollution in the Havana bay, which comes both from domestic and industrial sources and is very complex to solve (GTE-BH, 2015; Cubadebate, 2016; Redacción IPS Cuba, 2014).

Step 2: Prioritize remaining elements

This step examines, in collaboration with stakeholders, which elements of the bay are Essential (must-have), Preferable (nice-to-have) or Unnecessary for a transition of the bay of Havana. An element in this context can be a specific company, location or construction, but also more general, such as, scenery or ambiance. Several cultural and environmental elements have been marked as essential, to be taken into account in the design: historical waterfront buildings, adjacent natural banks, ...

Step 3: Define project goals

Determining the project goals (must-haves and should-haves, (Vliet, 2008)) is usually done beforehand, but in this alternative approach this is postponed till after steps 1 and 2 (i.e. the analyses) are finished in order to include a more comprehensive set of goals based on a deeper understanding of the system.

Must haves

- Create an equitable, viable and livable port to be sustainable and embrace flexibility
- Focus on tourism, local industry and businesses as main functions. (Chase, 2016; Mcmah, 2016; Miller, 2016)
- Improve positive environmental impact
- Regulate waste impact of vessels (waste, operational and use impacts) and provide the facilities for vessels and operators. (WPCI, 2015; Butt, 2007)
- Maintain regulation for (remaining) polluting parties. (GTE-BH, 2015)
- Find a balance between (allowed) number of tourists and available infrastructure. (Miller, 2016)
- Ensure active stakeholder and citizen involvement
- Ensure clear responsibilities for concerned parties

Should haves

- Preserve characteristics of the natural bay and its historic content. (Honey, 2016)
- Encourage brownfield development. (Leger et al., 2016)
- Create a mix between large, middle and small-sized companies
- Encourage entrepreneurship. (Honey, 2016)

Step 4: Develop alternative designs

Normally, this step would include different designs for the same scenario. For this study, however, the alternatives designs consist of one design per scenario to provide port planners insight in the influence of the driving forces (i.e. climate change and political environment) on the layout of the port. Each scenario hence, counts as one alternative design.

If heavy storms like the one in 2015 hit Havana more often, the urge to intervene in the city's infrastructure will more likely be supported by the general opinion (Alex Wellman, 2015). This implies that in case of severe influence of climate change a long decision-making process would be unfavorable, whilst a need for investment in infrastructure is urgent. Industries such as tourism that are easy to develop for fast economic gains, would be a way of doing so. For instance, hosting cruise ships in the bay of Havana would be an easy solution as the infrastructure already (partially) allows for it. Little influence of climate change allows for more time in the process to develop an integral approach that serves economic, environmental and social aspects.

The political climate is currently organized around a centralized government, which might continue with this traditional approach. Interestingly, some aspects that are important to Cuba's government, such as healthcare and education are of very high standards. (InterNations, 2016). Perhaps, if the Cuban government would take a sustainable transformation of the bay of Havana to heart, it would be able to do so. Full privatization of the bay of Havana is unlikely. Currently, only small or middle-sized companies are allowed. Therefore, port privatization without regulation could lead to challenges in terms of social and environmental goals.

Step 5: Test the alternatives

For a quantitative feasibility decision, several aspects must be investigated. Considering the wide scope of the design, there is a more extensive list of methods than in conventional designs. These are: a financial evaluation model, hydrodynamic simulations, traffic flow models and environmental impact assessments. Note that the financial evaluation should include a monetary value including the ecosystem services Furthermore; flexibility should be included and valued in all variables in order for the project to adapt to unknown future scenarios.

Step 6: Evaluate the alternatives

The evaluation discusses the outcome of the design alternatives, hence the outcome of the designs of the different scenarios.

If a centralized government aspires to a sustainable outcome of the transition of the Bay, it will have more power to control the outcome of the project than a decentralized government. However, early and active stakeholder involvement is more likely to be expected from a liberal approach.

The reality will lie in between the extreme scenarios. Likely to be implemented in the real design are flexibility measures, stricter regulations on polluting parties, preservation of cultural and natural characteristics, (small-scale) entrepreneurship, brownfield development and infrastructure improvement. Less likely or challenging to be implemented is a limit on the tourist influx, strict environmental regulation on cruise ships, sufficient public transportation, active and early stakeholder involvement and a mixture of company sizes and industries. Especially this list of challenging measures to implement deserves extra attention from port planners to find means of implementing them in the Bay of Havana.

Step 7: Create the final design

The final design should be interpreted as an advice for the responsible port planners of Havana on how the transition of the bay could take place. It depicts an ideal outcome, while acknowledging the large influence that, for instance, politics and climate change can have on the outcome of the design. Figure 5 shows the spatial outcome. While evaluating the design on the criteria on this framework is based on, it shows that a mere focus on tourist industry is not enough, but instead, a more diverse economic development of tourist industry and local entrepreneurship is recommended (1. Economic). Including stakeholders in the design process is very important. The standpoints of the stakeholders should be investigated and early and active stakeholder involvement should be pursued (2. Social). The natural character of the bay should be cherished and local policy should be used to regulate water discharges in the bay. National policy should regulate the larger industries such as (cruise) tourism (3. Environmental). A clear distinction of responsible parties for the design, construction and maintenance phase is necessary to avoid paradoxical goals (4. Governance). Due to the large areas previously occupied by the port industry becoming available, possibilities for brownfield development will arise (5. Green-/brownfields). The port should host several functions. These functions should be appointed to their location in an “opportunity-driven” way (6. Location). The entire design should merely function as a best estimated solution for the time being. The future developments are highly uncertain and therefore the design should be flexible. This could for instance be done by phased construction or multi-functional use of elements (e.g. piers, buildings). Furthermore, a continuous learning process should encourage an ongoing adaptive port layout and stimulate innovation (7. Flexibility). An incentive for innovation can be encouraged through local policy. This is for instance applicable for cruise vessels, which might be restricted unless they meet certain sustainability demands regarding pollution (8. Innovation).

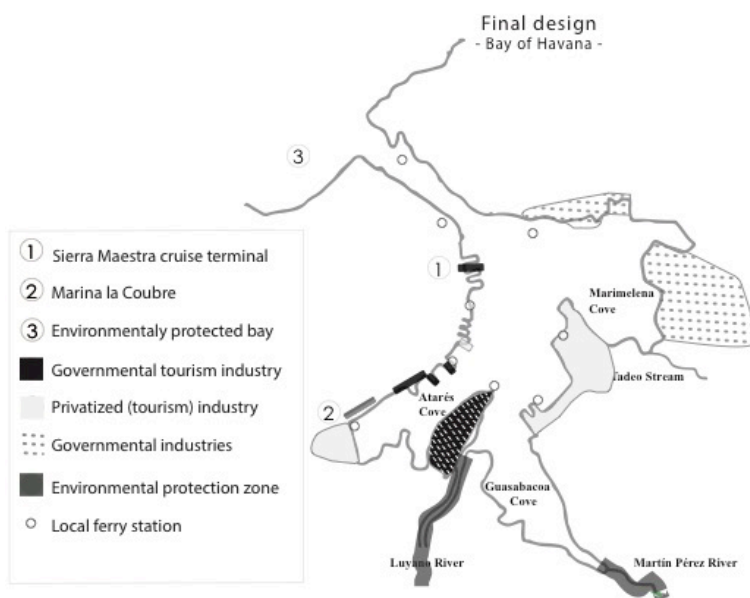


Figure 5 – Spatial outcome of the bay of Havana (own work)

Evaluation

Application of the framework does lead to a different design for the port of Havana than the reference project. As proposed in the framework, postponing the project goals until after the analyses promotes a critical view towards the project goals. Consecutively the design develops from a different set of criteria that include a more complex understanding of the system (Table 3). This seems preferable regarding a more sustainable outcome. However, resources (e.g. time, money) can still limit the scope of the analyses (step 1 and 2). Furthermore, the system still relies on traditional testing tools.

Table 3- Comparison of traditional vs. alternative approach

<i>Goal</i>	<i>Reference project</i>	<i>Alternative approach</i>
<i>Economics</i>	Focuses solely on tourist sector.	Focus on tourism and local economy.
<i>Social</i>	Main stakeholders are included in the decision-making process. Isolated project area, little connection with surrounding neighborhoods.	More inclusive approach towards stakeholders. Larger focus on the concerns of opposing parties. Project area aspires social inclusion.
<i>Environmental</i>	Environmental aspects in some regards inferior to economic aspects. Project design seems to be inconsistent with environmental goals of the government.	Strong focus on improving the (neglected) environmental state of the bay and the goals of the government through (inter)national policy.
<i>Governance</i>	Unclear division between decision making/operational/designing/constructing parties.	Responsibilities highly dependent on stakeholders' outcome, i.e. the future (political) scenario.
<i>Green-/brownfields</i>	Strong focus on greenfield development.	Possibility to incorporate more brownfield development. Dependent on governance.
<i>Location</i>	Location of design based on decision by client (function driven).	Location of services determined after extensive analysis (opportunity driven).
<i>Flexibility</i>	Focus on flexibility in design. Investment based on return of investment.	Attempt to incorporate additional flexibility measures in the design. Continuous learning encouraged by building in phases.
<i>Morphology</i>	Extensive morphological analysis.	Extensive morphological analysis.
<i>Innovation</i>	Innovation not specifically encouraged.	Innovation highly encouraged by restrictions on passenger numbers, pollution by vessels, emissions, etc. International reward system like current ESI (WPCI, 2015)

4. Conclusion and recommendations

Applying the design framework for a port in transition, results in a master plan, with a more sustainable inclusion of social and environmental aspects. Havana has many strong assets to develop tourism, and should take the chance to develop a distinct type of tourism. For instance, large scale cruise tourism, which is an important part from the reference project, does not seem so beneficial if all side effects are considered. The influx of foreign capital can be positive for economic growth, but should be managed carefully. Segregation could become a threat if the incoming wealth is not spread equally. The existing master plan only focuses on the commercial transition and ignores the social inclusion of many inhabitants around the bay, but also ignores the capacity of the city to host and transport these tourists. Furthermore, it is important to incorporate a more flexible port layout to be able to adapt to unforeseen future trends.

Additional research to investigate the feasibility of the framework is recommended. This paper proves theoretically how this framework could improve the traditional port in transition design. These conclusions could serve as guidelines for port planners to be tested and, eventually improved, in an actual port redevelopment.

Acknowledgments

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