Evaluating Port Development On Sustainable Port-city Land-use Development; Case Study Of Mombasa Port-city

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Background
Past approaches to port-city planning have focused on the port and the city as two separate entities instead of them being an interlinked system. The port and the city make up the port-city system through the various urban linkages in the socio-spatial, economic, environmental and governance spheres of the port-city region. Globally, ports have over the years been undertaking projects to increase their cargo handling capacity with little regard to sustainability over the years. These activities are majorly large-scale infrastructure projects characterized by the construction of new port facilities and terminals as well as dredging operations.

In the Western Indian Ocean (WIO) region, such developments often happens within the context of limited land within and around the port and the general port-city region. ‘Artificial land’ is thus created by port authorities through sea reclamation to host the port developments. Alternatively urban land uses including public land are converted for port related activities. Hence the permeability or porosity of port land uses presented a challenge to sustainable port-city development. The spatial extent of such porosity is especially prevalent where governance systems involving port and city authorities are less coherent leading to fragmented land-use patterns within the port city.

In the port-city of Mombasa, such actions bring about the dominance of port related land use to other land uses. Subsequently open and green spaces, conservation areas, fishing grounds and residential areas were converted to port related land uses over time.

Port related land uses tend to be predatory in nature and would penetrate the urban fabric of the port city leading to competition in land use. This causes an imbalance in sustainable port-city development. Examples include where port facilities would be established in residential areas leading to the mixing of passenger and freight traffic, thus increasing traffic congestion within the port city. The increased traffic congestion is a contributor to Nitrogen Oxide and other pollutants. The proliferation of the port related land uses within the city also results in greater urban heat island effects within the port city as they tend to be made of impervious surfaces that tend to exhibit a high level of heat reflection.

When port development is coupled with such effects it creates unsustainable city development that does not meet the SDGs (Sustainable Development Goals) and, in particular, goal 11.

Study Objectives
1. To investigate the inter-connection of port development and city development over-time.
2. To interrogate performance of port development in Mombasa on land use.
3. To propose measures that could be adopted in port development which would promote sustainable development.

Description of the Problem
In regards to port-cities in the WIO region more so Mombasa port-city, city development was historically linked to port development. Past city development plans outlined areas for port expansion as well as designated land uses within the city. In the mid-2000s the Kenya Ports Authority (KPA) embarked on increasing its cargo handling capacity leading to a shift from this position.

Over time the KPA and government agencies built new berths, container handling terminals, dredged the Kilindini channel and developed freight corridors during this period. In order to accommodate the increased cargo volumes, the port sought to create new port lands through sea reclamation. Additionally, the reclaimed areas were still unable to handle the high volumes of cargo, forcing the KPA to license private cargo handling enterprises. These private players operated as CFSs (Container Freight Stations) and ECTs (Empty Container Terminals). Mombasa has limited land capacity and is currently the smallest county in Kenya.

As a result of this unilateral policy direction by the KPA; public lands, open and green spaces and the coastal shoreline were altered. The port city of Mombasa thus began to see fragmented land use patterns, loss of open spaces, degradation of the shoreline, and the loss of fish landing sites.

Method
Desktop surveys, context analysis of available literature and archival records were perused to establish the inter-connection of port and city development over time. Mapping of port development, facilities as well as port related enterprises was conducted using participatory approaches and remote sensing to evaluate port performance in the port-city. In addition, social surveys were carried out among households and commercial areas to inform on the desired outcomes as envisioned by the port-city residents.

Results
The high levels of porosity of port-related land uses within the port-city results in high levels of pollution in the port city. This leads to a negative correlation between port development and sustainable port city development. The expansion of the port through sea reclamation for instance led to the loss of the Kwaskembu fish landing site in Jomvu leading to the disruption of livelihoods to the local fishermen. It was also submitted that the 75% of the CFSs and ECTs within the Mombasa port-city island were former public spaces dealing as open spaces, transport facilities or the coastal shoreline. This occurrence gave rise to fragmented land use patterns within the port-city of Mombasa. The CFSs and ECTs handled approx. 400,000 TEUs (Twenty Foot Equivalent). Consequently, this brought about traffic congestion due to increased freight traffic which had direct links to greenhouse gas emissions, noise pollution and urban heat island
effect in Mombasa. Sea reclamation on the other hand reduced the fish stock in the ocean and the degradation of the shoreline.

**Conclusion**
Port-city development needs an integrated approach by the port and city authorities especially with regards to the location of port related land uses in order to promote sustainable development in the WIO port regions.