



Securing a port's future through Circular Economy: Experiences from the Port of Gävle in contributing to sustainability



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ABSTRACT

Ports are an important player in the world, due to their role in global production and distributions systems. They are major intermodal transport hubs, linking the sea to the land. For all ports, a key requirement for commercial and economic viability is to retain ships using them and to remain accessible to those ships. Ports need to find approaches to help them remain open. They must ensure their continued economic viability. At the same time, they face increasing pressure to become more environmentally and socially conscious. This paper examines the approach taken by the Port of Gävle, Sweden, which used contaminated dredged materials to create new land using principles of Circular Economy. The paper demonstrates that using Circular Economy principles can be a viable way of securing a port's future and contributing to its sustainability, and that of the city/region where it operates.

1. Introduction

Ports are an important player in the world, due to their role in global production and distribution systems, by trading over 10.3 billion metric tons annually (UNCTAD, 2017). Globally, in 2012, 36 out of the 50 most competitive cities were port cities, while of the top 20 cities ranked according to Human Capital Indicators, 14 were port cities (Girard, 2013). More than 75% of Europe's external trade and 37% of internal trade is seaborne. Ports in European Union (EU) Member States play a vital role in the movement of goods and passengers both within the EU and globally, with more than 90% of goods imported into the EU entering through such ports (Saxe and Larsen, 2004). Ports are major intermodal transport hubs (Wakeman, 1996) and are gateways between the sea and land through transporting goods and people. They are, generally, man-made locations where ships can take shelter in rough weather. Port activities frequently dominate local and regional economies, providing a source of economic wellbeing and instilling a sense of place and identity for local and wider communities (Pinder, 2003).

Ports differ widely in terms of size (from very large container ports to very small fishing ports), in ownership (including publicly owned and operated, privately owned and operated, and charitable trust ports, for example), and in the wide range of activities that take place in them (e.g. unloading/loading of cargo, cruise ship or passenger ferry

terminals, oil terminals) (Bichou and Gray, 2005).

For all ports, a key requirement for commercial and economic viability is to retain the business of the ships using them and to remain accessible to those ships. With the growth in ship sizes, many industrial ports have been unable to continue to operate without significant investment in dredging channels, improved transport links, and new cranes. Ports must ensure their continued economic viability through safe and successful commercial operations (Wooldridge et al., 1999). In addition, ports are under increasing pressure to become more environmentally and socially conscious (European Sea Ports Organisation (ESPO), 2010; Dinwoodie et al., 2012; Hall, 2007; Wooldridge et al., 1999). A myriad of environmental impacts of port related industrial activities have long been recognised (releases to water, air and soil, waste production, noise, and dredging, for example) (Carpenter and Macgill, 2003; Dinwoodie et al., 2012; Hall, 2007; Wooldridge et al., 1999), as well as social issues including loss of jobs (Wooldridge et al., 1999). These phenomena have forced ports to comply with ever stricter regulatory requirements for environmental protection, and they are increasingly being held responsible for their sustainability performance to ensure community support. These developments pose great challenges to ports' current business models and their competitive advantage, with ports facing challenges to find new ways to use their assets, for example their waterfront zones, as efficiently and

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productively as possible in economic, environmental, and social terms (Daamen and Vries, 2013), including legal, organisational, and technical (Dinwoodie et al., 2012; Wooldridge et al., 1999).

The port industry is facing many challenges globally including: the need to accommodate very large ships; competition from new ports; environmental issues such as air, land and water pollution from ships; and transport bottlenecks for the movement of goods, raw materials and people between the land and the sea; and the need of ports and the companies operating them to remain viable, competitive and profitable. Circular Economy (CE) can help ports to respond to such challenges, and ensure their competitiveness in a resource-constrained world, while fostering innovation, and reducing environmental impacts (Cerceanu et al., 2014; Hollen et al., 2015; Merk, 2013; Van Dooren and Braam, 2015). Research on CE in ports is limited, although there are a number of practical examples in European ports. This paper builds on port life-cycle literature and Circular Economy literature to present a case study which demonstrates how both can be combined to help secure a sustainable future for one of Sweden's largest container (industrial) ports.

This paper is structured in the following way: Section 2 examines the lifecycle of ports and their integration of sustainability; Section 3 discusses CE; Section 4 presents the approach taken by the Port of Gävle in Sweden, where the port has used dredged contaminated material to create entirely new land to expand the existing footprint of two areas of the port, including expanding the port's cargo terminal outward into a deepened shipping channel; and Section 5 provides the conclusions.

2. Strategies for keeping ports open

Many ports are located in urban areas - towns and cities which grew up around them over centuries - and have a varied and unique history and culture (Wakeman, 1996; Girard, 2013), with many of them having a strong naval tradition (Pinder, 2003; Gordon, 1999). In recent times, a number of factors have led ports to adapt in order to continue to operate and to meet the needs of shipping (and other) companies operating through them (for example Haralambides et al., 2002). These include: the distance between ports serving a common hinterland and levels of cooperation and competition between those ports (Heaver et al., 2001); ports lacking the space to expand to accommodate the increasingly large ships without port functions having to move into deeper waters (Hoyle, 2000); the relationship between urban ports and other parts of the metropolitan area leading to competing demands for space (McManus, 2007); lack access to adequate transport links (road, rail, inland waterway) necessary to operate as modern intermodal transport hubs, especially for older ports (Wakeman, 1996); derelict buildings and abandoned spaces due to improved working practices or operations where goods transit the port area more rapidly via improved road and rail links and a consequent reduction in need for on-site warehousing, (Wakeman, 1996); decline of traditional industries within, or in close proximity to, the port, such as the port of Cardiff, which had been the dominant port for the export of coal from South Wales since 1860 (Pinder, 2003); and threats from newly developed mega-ports, e.g. in the Middle East, where space is not limited, regulations are often less stringent, and there is room for the warehouses, large equipment, processing plants, transport connections and infrastructure necessary to accommodate very large vessels and operate a modern port (Haralambides et al., 2002; Hall, 2007).

Many ports face obsolescence and dereliction resulting from industry changes, such as limited access to large ships and no room for necessary infrastructure and transportation links. They, therefore, need to consider how they can achieve some form of redevelopment or adopt new activities which will allow them to continue to operate and generate an income for their owners, rather than leave port areas derelict and abandoned.

Successful redevelopments should capitalise on any instrument that can bring in the maximum possible benefit to the community around the port, or a waterfront area, taking into account the preferences and

tastes of the local population (Vayona, 2011). Success may also be the result of recognition that there is a need to preserve the cultural heritage and history of a port and its wider urban environment.

The examples of Millers Point in Sydney (Waite and McGuirk, 1997) and the Old Town waterfront in Mombasa (Hoyle, 2001) illustrate that problems can exist about the cultural heritage of a port area, and the reason why is it being considered for redevelopment. Heritage tourism was a driver of the waterfront redevelopment at Millers Point in the late 1980's but the heritage being retained was its history as the oldest British colony (established 1788) in Australia, and as a merchant society during the second half of the 19th century and ignored many aspects of Australian national identity such as its indigenous population, and the area's more recent 20th century industrial heritage (warehouses, wharves, overcrowded housing with inadequate sanitation in the 'company town' constructed by the Sydney Harbour Board) (Waite and McGuirk, 1997). This industrial area fell into dereliction during the mid-20th century and although the area has been redeveloped, only what was deemed significant to the founding of the modern Australian nation was prioritised as part of the heritage of Millers Point, ignoring the experiences and knowledge of the (ageing and dwindling) local community.

According to Hoyle (2001), the Old Town waterfront in the Mombasa area of Kenya had become neglected and disassociated from modern urban growth on Mombasa Island, and had reached the dereliction stage in the life-cycle model set out in Fig. 1. It had also been replaced by the development of the new Port of Mombasa/Kilindini deep-water port located away from the original port area. Redevelopment had to take into account factors such as the very long history of trading through the Old Town (since the 11th Century), conservation of historical buildings including a mosque and an old fish market, improving public spaces, finding new uses for buildings, cultural attitudes of the local population, and identify how to bring money and jobs into the local economy (through tourism for example) and benefit the local community (education and training facilities).

While redevelopment has taken place in these examples, the final result has been a complete change of use and the port no longer exists. In the Millers Point example, the local community was effectively excluded from the decisions on how change should take place, while tourism was the viewed as the highest priority. In the Mombasa Old Town waterfront example, the community and its needs were included in the redevelopment process, and while the needs of tourists were included in the process, so too were the needs of local people living in the area.

In both these examples, the port has effectively ceased to exist, and there has been no redevelopment of port facilities. This is illustrated in the linear life cycle set out in Fig. 1, which provides a representation of the two examples discussed above.

In the linear life-cycle, the time taken between each stage becomes shorter. Ports will have grown over time in response to customer/industry needs until they reach maturity and are achieving their full potential. However, they are no longer able to change under this approach, due to lack of space or other reasons, and so reach a position of obsolescence where they begin to lose business to more modern and higher capacity facilities elsewhere. As business is lost, the number of ships calling into a port falls and its berths become abandoned through lack of use, and there is a consequent decline in the need for land and buildings. At this stage ports are faced with a decision about what, if anything, they can do to continue operating (perhaps at a much smaller, more local scale), and should also take into account sustainability in any decisions about how they proceed in the future.

2.1. Port life-cycle

The traditional life-cycle (see Fig. 2) identifies how facilities within a port area, rather than the whole port, progress through five stages (Wiegman and Louw, 2011): i) *growth*, where investment helps create

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