

Ports as urban transition actors towards zero-emission transport

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Abstract. The transition to sustainable mobility and zero emission transport requires clear visions and engagement from actors with agency to influence and drive transition processes. Ports can be such actors, contributing to the development and diffusion of innovative zero emission and low carbon solutions in transport both on land and at sea. It is however still not clear how ports should act to reach such goals, and sustainability practices of ports are still largely understudied. This paper discusses how to strengthen energy and sustainability transitions and the capability of ports to engage in such transitions through co-creation of transition agendas, visions and role development. The paper demonstrates how ports themselves, if acting as urban community managers may drive transitions in zero-emission transport and how sustainability transitions as a result can become both wider and deeper, which is needed for the Net Zero transition to happen. The paper builds on studies of three Norwegian ports, transition management exercises in these ports and interviews with port actors in Norway.

Keywords: Ports, Transitions, Zero-emission transport, Policy, Urban actors

1 Introduction

1.1 Ports as sustainability transitions actors

Ports and harbors have historically played a central role in urban environments, as infrastructure nodes connecting land and sea-based transport of both goods and people. Many of the world's largest cities are also founded because of them being strategic harbors. Still, the role of ports has been largely ignored when discussing the key challenges such as climate change and sustainable urban development.

This paper is based on the ACES project where the aim is to explore how ports may take more proactive roles in the sustainability transition including energy and

transport. Building on insight from sustainability transitions research, we have explored the potential of ports to become transition actors that may accelerate transitions. By use of action-oriented methods as described in the Transition Management (TM) literature (1) we have strived to increase the capability of ports to engage in driving such transitions through co-creation of transition agendas, visions and role development. As nodes in transport systems, ports may shape and transform the energy use in the three domains intersecting: the port domain, the sea transport domain, and the hinterland transport domain (2). This paper particularly focuses on ports as actors driving urban transitions towards zero-emission transport.

Research on port governance and sustainability has grown during the last years and provides some, yet limited, perspectives on how ports may be governed in more sustainable directions. The Norwegian government has declared that all domestic ports should be zero-emission by 2030. National targets are, however, not enough as emissions continue to grow despite ambitious goals. Reviewing 70 articles exploring potential measures for mitigating emissions connected to port operations, Bjerkan and Seter (3) found more than 26 available tools and technologies, demonstrating the existence of a plethora of potential low emission technologies that may be used. Less attention has been given to how port decision makers may incentivize, implement, prioritize, and decide which technologies to implement. Consequently, Bjerkan and Seter (3) suggest directing the attention towards how to engage port actors and ways to develop their agency in sustainability transition processes so that they may drive changes towards low-emission transport. Previous research has also demonstrated that the port domain, the sea transport domain, and the hinterland transport domain differ to what degree port actors succeed in identifying a particular pathway towards transition (e.g., electrification) and whether they see themselves as having the capacity to intermediate processes that could lead to such changes (4). Bjerkan et al. (2) identified that ports that took on roles as community managers also acted in an intermediary role linking intermediation activities with more progressive transition work. In sum, a focus on how to nurture and empower port actors to govern transition processes towards more sustainable systems including zero emission transport is needed.

2 Methods

Transition Management (TM) is a prescriptive framework (1) which enables policy makers to nurture and govern transitions through strategic, tactical, operational, and reflexive activities (1). TM recognizes that transitions do not come about through a top-down process, but by interactions among a plurality of actors through which actors are empowered to reach sustainability goals by challenging, transforming, or replacing existing socio-technical regimes (1). At the core of TM lies Transition Arenas (TA), which bring together actors from science, policy, civil society, business, and industry to foster collaboration and visions that enable and accelerate transition work.

In the study, three local transition arenas were created following the approach of Notermans et al. (5) in relation to three ports; the Port of Bodø, Port of Borg and Port of Kristiansand. An actor and a system analysis were conducted before a transition team

consisting of frontrunners and a broad range of stakeholders was established. In the TA participating actors created a vision and future pathways and means to get there were co-created through back casting exercises. In the following, findings from the TM process are reported, using the Port of Bodø as an example. Findings from the other two ports are used to show nuances or contrasts where relevant.

3 Empowerment through transition management

The developments in the Port of Bodø could be summarized as a shift from incremental change to transformative reorientation. This shift is apparent in the expansion of visions, the widening of networks, and the reorientation of fundamental perceptions. These developments – visions, networks, and reorientation – are considered core processes of sustainability transitions (6) and will be elaborated further in the following.

3.1 Renewed visions

Firstly, TM in the Port of Bodø was accompanied by a renewal of visions for the future. Visions, or expectations, represent shared perceptions about how the future could (or should) be. Transitions scholars (e.g. 6) argue that shared perceptions provide a navigation tool, by which actors can direct technology searches, initiate collaboration and mobilize resources. As a shared venture point, visions install a certain legitimacy in actions that support the realization of co-developed ideas of the future.

The TM process in Bodø displayed a clear shift in the vision-making of the port. Initially, the port's vision focused on the terminal project, connecting the port to "the development of a modern and forward-looking multimodal freight hub". This vision derived from the port's work with designing a new logistics terminal for more efficient handling of goods and person traffic. This 'terminal project' was already initiated to strengthen the Port of Bodø's position as a logistics and mobility hub for the region and could be seen as contributing to incremental change. An essential element of the TM process is however, enabling vision-making through identifying ways in which alternative futures could remedy fundamental challenges facing the actors. By discussing challenges pertaining to the continued development of the port, stakeholder involvement in TAs produced an increasing recognition of port development as an aspect of broader societal change. For the Port of Bodø, this implied recognizing how their own challenges were connected to developments far beyond their terminal and daily operations and a shift from short-term challenges and near realization solutions (such as how to implement low emission port solutions) towards more visionary thinking, looking for ways to contribute to longer term goals. Through co-creation workshops, actors related to the port developed a new vision seeing Port of Bodø as "a cornerstone of sustainable development" where the port was seen as an engine for industrial and sustainable development in the region, encompassing both energy and transport systems: an energy positive zero emission hub and an important logistics and preparedness center in the Nordics.

3.2 Expanded networks

The TM processes also included a shift in the port's building and utilization of social networks. Social networks are crucial components of transition processes because they represent a pool of resources that actors can draw on to pursue and protect innovation and engage in collective action (7). The building of social networks are important aspects of transition work because the broadening of networks gives access to different and complementary resources and because building strong and committing relations enhance the ability to initiate and follow through with actions.

In the Port of Bodø, the TM process enhanced both the actor diversity and the level of integration in the port's network, which is a typical characteristic of high-performing networks. The early phases of the process mainly involved actors relating to port operations and the logistics terminal. A broad spectrum of stakeholders was however invited and included into the TAs. The actors were logistics operators, industry, and cargo owners and as the TM process proceeded, an increasing number of actors were attracted to the arena, thus representing an increasingly complex and broader set of perspectives than had initially been the focus of the port. The final arena meetings also included actors representing the regional development council, tourism, and national environmental NGOs. The expanded network also spurred concrete activities such as the municipality taking part in new projects. Also, the port became interested in how to embed politicians, as well as other (previously unidentified) stakeholders and actors in future developments and plans to develop the region. Thus, how to organize cooperation between different institutions in a new way was made key to the transition process.

3.3 Normative reorientation

Finally, the TM processes produced knowledge that altered the port's perception about its own place and role in the systems of which it is part. Learning processes are key in sustainability transitions because they enhance our understandings of technologies and innovations for decarbonization, as well as aspects that support their successful implementation, such as regulations, impacts, market potential and user acceptance (6). Hence, network building could enable learning because it secures access to different types of expertise. However, for learning to produce more transformative action and change, transition scholars argue that it needs to induce a fundamental reorientation of institutionalized assumptions, values and world views that are currently taken for granted (e.g., 8) – A type of unlearning that allows an individual or group to develop novel perspectives, skills, and practices.

During TM processes in the Port of Bodø, we saw examples of reorientation of perceptions. Such reorientation largely revolved around how the Port of Bodø started to perceive itself and its operations as part of a larger socio-technical system, moving from its traditionally operational and commercial *raison d'être*. As evident from its vision, the port stated to consider itself “a cornerstone”, “a building block” and “an engine” driving desirable and required changes in the region. This implied that the port renewed its idea of own potential interaction with its surroundings, expressed in a more holistic understanding of the needed dynamics for it to foster industrial and regional development and tourism.

Thus, we observed how learning processes changed role perceptions in the Port of Bodø, which also had a direct impact on the ways in which the port worked to integrate its network. The port increasingly took on the role as a community manager that engages relevant stakeholders in the process of establishing funding and support for a new solution deemed necessary to connect sea and land transport in a better way. This renewed perception of the port's role evolved from aspects of the TM process in which TA participants deliberated on ways to develop future transitions pathways, specifically identifying what aspects of existing socio-technical systems should be retained, phased out, or supported to transform the sociotechnical port system in the desired direction. During the TM processes, three pathways were identified as particularly important, and they all rested on the port's renewed sense of responsibility for facilitating better ways of cooperating with other actors to ensure manifestation of these transition pathways. Hence, by engaging in TM, the port became part of a broader societal change process, which enabled the port of Bodø to increasingly see their own role as a community developer.

Similar transitions dynamics also manifested themselves in the other two ports because of the transition management process. In Borg the normative reorientation was particularly evident as the port identified the need for formalizing a new role related to industry coordination.

4 Concluding discussion

The analysis reveals that it is not only the port actors' abilities and capacity to drive socio-technical change processes that develops due to applying a TM approach. The nature of the transitions that the actors drive also seem to change; they become *broader*, spanning system boundaries and *deeper*, target more fundamental elements of the transport system (in line with new needed directions of the Net-Zero transition (see eg., 9). Thus, we see a shift from incremental changes - from focusing on implementing single low emission solutions in energy and transport systems to focusing on real transformative systemic changes that more fundamentally target the broad spectrum of stakeholders and institutions.

The TM methods, thus, demonstrates that ports may become important transition drivers towards low emission transport when transition agendas are co-created with a broad number of stakeholders, as this seems to create long term shared visions that target the regime (the systemic level) rather than focus on incremental change. This seems to add to the intermediary role of ports as a role they cannot do alone but is dependent on collaboration precisely because of their node positions between different sectors and stakeholders.

Existing visions, policies and regulations may contribute to drive transitions. However, they are seldom deeply anchored in related domains and practices outside the policy domain and often do not contribute to more systemic changes needed for the system to transform in a more sustainable direction. Developing roles so that more actors experience agency and commitment towards driving transitions in the same direction is central to this.

The paper demonstrates that ports can be key urban transition actors towards zero-emission transport in interaction with a broad number of actors, all empowered to reach sustainability goals by challenging, transforming, or replacing existing socio-technical regimes. The paper points to how working systematically with TM may give port actors new ways of working strategically with transition dynamics that could have both wider and deeper systemic impacts for sustainability transitions beyond the port domain. The paper demonstrates that coordinated alignment and actions of a multitude of port related actors are needed for transition to zero emission transport in ports to evolve and for urban ports to act as enablers for transitions to zero emission transport. Creating arenas where actors from different sectors meet to focus on co-creating zero-emission transition pathways may be seen as a successful tool to accelerate the transition in ports and beyond.

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