Sustainability challenges and business in society: the case of maritime energy efficiency

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> We are not students of some subject matter but students of problems
>
> *Karl Popper*

1. Introduction

By enabling international trade at a low cost, shipping is an essential facilitator of global economic growth. Shipping is also a truly global business in itself: ships moves goods all over the world, the sector is mainly regulated internationally, and the companies involved in a typical shipping service may be based anywhere in the world.[1] There are, however, many problems to formulate and solve before the shipping sector could be argued to be *sustainable* (Cabezas-Basurko, Mesbahi, and Moloney 2008): combustion of fuel in ship engines impact global warming, acidification, eutrophication and human health (Winnes 2010); invasive species spread through ship ballast water (Bax et al. 2003); scrapping old ships on beaches cause heavy metal contamination (Reddy et al. 2004); crew may be abused to the extent that their ships can well be referred to as "slave ships" (ICONS 2000); etc.

Policy and regulation targeting the sustainability impact of the shipping industry are mainly created through international negotiations within the International Maritime Organization (IMO).[2] In these discussions, industrial organizations have a large influence, despite only member countries having a formal right to vote (Svensson 2011). Thus, a discussion of corporate social responsibility in the shipping industry ought to go be more complex than "activities beyond regulation" (as in, for example McWilliams and Siegel 2001). Regulatory processes affecting shipping do not take place in a vacuum, and there is a need for companies to actively support these. Moreover, as will be elaborated further below, there are ways in which companies can contribute to both society and directly the bottom-line, that are nevertheless foregone. It is difficult to argue whether or not these are *voluntary* activities—another common definition of CSR.

While it is rare to see articulated CSR strategies by shipping companies (Vilsted 2004, p. 11), socially responsible companies often refer to themselves as working with "quality shipping" (Shinohara 2005). The demand for shipping is derived from the need to transport goods between businesses; end consumers see little of how their goods was transported and cargo owners are may be reluctant to pay for more expensive transportation. For these reasons more "responsible" companies often call for "a level playing-field" with more strict regulation and enforcement (Tunell 2013).

One highly political and complex sustainability problem is that of the shipping sector's green house gas (GHG) emissions.[3] Shipping contributes to about 3% of global GHG emissions, but this is expected to continue rising exponentially along with the expanding global economy, so that emissions from the shipping sector may even exceed the global carbon budget by 2050 (Gilbert and Bows 2012). At first glance, there seems to be a win-win situation for the industry. Large reductions in emissions are possible through low-cost energy efficiency measures, implying cost-savings in the order of hundreds of billions of USD per year (Bazari and Longva 2011). On the

other hand, this very same potential indicates a paradox. Why haven't these measures already been implemented? Companies could contribute to society and their bottom line at the same time but fail to do so![4] The same situation exists in many sectors and is typically referred to as an energy efficiency "gap" (Jaffe and Stavins 1994). It has been attributed to the existence of barriers in markets, organization and institutions (Sorrell et al. 2004).

To complicate matters further, known measures are not enough to counter the growth of the sector (Eide et al. 2011). There is thus a complex problem of why the sector does not assimilate cost-efficient measures and how this can be remedied, while concurrently ensuring that even more innovative (expensive) measures are developed for the future (cf. Sandén and Azar 2005), combined with the over-all need to convince all stakeholders that some kind of regulatory system supporting this should come into force. What should be the contribution of academia in solving these kinds of problems? Campbell (2007), for example, proposed that companies are more likely to engage in CSR if the existing regulatory system was well enforced and created through consensus processes between industry and others stakeholders. What kind of research projects could contribute to such an increased awareness and consensus of sustainability problems?

Proponents of *sustainability science*, *post-normal science, mode-2 research* or *transdisciplinarity* often highlight that knowledge needs to be "co-produced" in close collaboration between researchers and practitioners if it is to have this kind of impact (e.g. Clark and Dickson 2003). This paper will discuss such joint-production of knowledge in the context of on-going action research project managed by the author, on implementing more energy efficient practices in shipping companies.

This paper is structured as follows: Section 2 will briefly discuss the rationale for "co-production" of knowledge. Section 3 details the action research project. Section 4 concludes with some reflections.

2. Science, sustainability and society

Popper (2002) urged us to not loose sight of *problems* when working within a scientific discipline, problems "which may cut across the border of any subject matter" (p. 88). Disciplines, he argued, were largely there for historical reasons. Confinement within disciplinary research is attractive, however, as it enables scientists to be really efficient at solving certain kinds of problems. He or she does not need to worry about what others think, nor choose problems because they need to be solved quickly (Kuhn 1996, pf. 164). Society, on the other hand, seems to continue demanding solutions from researchers to its own tricky problems, especially problems associated with both uncertainty and urgency (Funtowicz and Ravetz 1993). In particular, society might pose tricky problems to scientists when it comes to policy issues related to the effects of human activity on the natural environment. First, human and natural systems are "coupled" in the sense that the one always affects the other (Liu et al. 2007). Second, the solutions need to be useful in practice, bearing in mind that there are no blue-prints that apply equally everywhere (Ostrom 2007). For these reasons, it is necessary to deviate from the traditional definitions of objectivity and disinterestedness. Proponents of sustainability science typically argue that in order to really contribute to solving sustainability problems, knowledge "needs to be 'coproduced' through close collaboration between scholars and practitioners." (Clark and Dickson 2003, p. 8059).

2.1 When co-production may be especially useful

Co-production may not only important because of its role in consensus building. Such an approach may also be beneficial when studying change processes, for example in organizations. Without the mutual interest that a co-production setting may give—between the researcher and those involved in the realm of interest—the researcher may not get the understanding or data he or she had hoped for. An intervention setting, on the other hand, may enable the researcher to get closer to stakeholders' "theories-in-use" rather than their "espoused theories" (Argyris 1976); what they actually do, rather than what they say they do. In that sense, action research provides a *direct* access to management reality. Traditional sources of data can be complemented with "naturally occurring data in the form of expressed experiences, views, action-centred dilemmas, actions of participants and events in the life of practitioners" (Huxham and Vangen 2003, p. 385). Finally, the researcher is simply believed to learn more when actively participating in the change processes rather than observing (Gummesson 2000, pf. 80). Participatory studies on energy management in organizations have also been called for to complement existing studies, which

have mainly used interviews and questionnaires (Thollander and Palm 2012, pp. 89-91).

2.2 What co-production should not be like

I perhaps haphazardly stated above that "it is necessary to deviate from the traditional definitions of objectivity and disinterestedness". Does this not impact on the credibility of science, often believed to be based on impartiality (Ziman 1996)? Many have indeed argued for caution, and some examples can be elaborated: Silverman (2011), for example, emphasised that researchers need to take care when working with socially "relevant" problems, such as homelessness, HIV or problems pointed out by managers in their organizations. It is important to give the problem a theoretical twist. Flyvbjerg (2001, p. 132), in advocating a reflexive social science focused on issues of value and power, found it necessary that the researcher has a lot of interaction with their surroundings—including mass media (Flyvbjerg 2012)—yet also that he or she needs to take care not to accept problems directly as formulated by others; the researcher needs to avoid "going native".

In summary, in his or her quest to be useful, the researcher needs to enter co-production with integrity.

3. A case study: "Implementing Energy Management Systems in Shipping"

In the following three subsections, I will present my research project as consisting of a problem-and-solution formulation phase, a problem-solving phase, and a reflective phase. This is, in hindsight, similar to what others have pointed out as typical of transdisciplinary projects (e.g. Lang et al. 2012, Pohl and Hirsch Hadorn 2008). However, there was no such structure designed from the start. Rather, it evolved out of responsiveness to the dynamics of the project and its participants.

3.1 Prestudy: understand the problem & formulate solutions

After having spent half-a-year outside academia after my graduation, I was hired in 2009 for a one-year project at the Department of Shipping and Marine Technology to see if implementation of an energy management system (EMS) could be beneficial in a shipping company. Such systems, similar in design to environmental and quality management systems such as ISO 14001 and ISO 9001, had been success factors in energy intensive industry (foundries, paper and pulp industry etc.) in Sweden (Stenqvist and Nilsson 2011). In order to do so, I reviewed literature and performed a series of interviews with managers in energy intense industry, and managers, ship crew and consultants in the Swedish shipping sector (Johnson and Andersson 2011). During this process I chanced upon two companies who became interested in implementing an EMS, and a continued program was drafted and funded. In hindsight, this project can thus be seen as a pre-study to my PhD project.

3.2 Joint industry project: implement solutions

My PhD was created around a joint-industry project, which started in Autumn 2010, was to implement an EMS in each company according to the international ISO 50001 standard (ISO 2011). The research problem concerned understanding best practice concerning energy efficiency in shipping companies, to feedback into education as well as policy. In discussions with the project partners, an observatory methodology was never really on the table. Even "facilitation" was too weak a word for one of the involved companies. As a senior manager explained it: "'Facilitation' is when we have a meeting and [the researcher] serves us coffee. We need more than facilitation."

The project consisted of four partners: Chalmers University (me), the shipping companies Laurin Maritime and Österströms, and the consultancy Det Norske Veritas (DNV). Laurin Maritime is a chemical product tanker company operating mainly around the Mexican Gulf, while Österströms was a short sea dry bulk (i.e. goods like wood chips, grain, steel) serving mainly industries in the Baltic. The two companies were both Swedish family owned, but different in their organizational structure and strategies for ship owning and management. Both companies had some energy management activity going on at the start, but neither had a structured way of working.

From a research design perspective, this would thus be a multiple and embedded case study (Yin 2009, pp. 46-64). Multiple, because there were two shipping companies. This would enable triangulation strengthening the internal and external validity of our findings. Embedded, because the intention was to describe parts of the processes as separate case studies. DNV was included to ensure that the knowledge developed was relevant in a broader perspective. They had been working with energy management for years, enabling greater external validity.

The project started with a one-day meeting at DNV headquarters in Hovik, outside Oslo. Since then, such meetings have been held with representatives from all companies twice a year, on Chalmers campus. The purpose was to give company staff the opportunity to exchange knowledge and discuss challenges. Both companies created energy management teams. I was made part of both, working with gathering and analysing data, making presentations, writing reports, and participating in project team meetings as well as larger company meetings.

The first written case study, on Österströms, brought new perspectives to existing energy efficiency research and discussed problems organizations might face that have not been discussed before (Johnson, Johansson, and Andersson 2012; journal version is in peer-review). Previous researchers have often used a deductive approach and searched for theoretical "barriers" derived in particular from neo-classical economics, principal-agent theory and transaction cost economics (Sorrell et al. 2004), while our approach was more inspired by grounded theory.

Laurin Maritime has implemented their energy management system, and a paper on their process is being drafted. When the larger, privately held shipping company Transatlantic acquired Österströms in summer 2011, the project continued with them as partners and the scope of the project was broadened to the whole of Transatlantic. The Transatlantic efforts are also to be discussed in a future paper.

3.3 Post-project work: further understand the specific cases, expand knowledge through education, explore more implications for policy

The joint-industry project formally ends this fall, and the remaining time will be spent writing up papers and understanding further implications of the results. A first step to do so is through creating a new M.Sc. course in maritime energy management. Kaplan (1998) endorsed teaching to broaden the researcher's understanding, as it motivates more systematic and conceptual understanding.

4. Reflections

I introduced the purpose of this short article by claiming that the shipping sector needs to take greater responsibility for its impact on sustainability, also by co-creating more strict regulation. I also asked what could be the role of academia in this process, and then proceeded with discussing co-production of knowledge.

This project can be seen as providing basic research towards understanding such problems. We have, based on knowledge developed in this project, argued that there are gaps in the present regulatory system (Johnson et al. 2013). If such systems are to be effective, they need to be based on an understanding of what energy efficient shipping *is,* and what (institutional, organizational etc.) mechanisms need to be changed for this to happen. What would then be a *good* regulatory system? Or even broader, what does a world look like where energy efficient shipping companies are the norm (cf. Shove 1998)? These are questions I would like to continue explore.

There was a clear value proposition for the project. My proposal to implement an EMS might have come at just the right time. The price of oil was still high after the crisis, and freight rates were really low (Gregory et al. 2010), also due to the fact that a record amount of new ships were being delivered that were ordered in the good times *before* the crisis (UNCTAD 2011). My hunch is also that the cooperation between Chalmers and DNV (known for their energy management competence) was attractive.

The quality of an action research study needs to be assessed also in terms of its results. The project has been successful in the sense that it brought real change in one of the companies (Laurin). For the other company,

progress is still uncertain, which is interesting given the substantial cost-savings we identified—it should be cost-efficient and it would help society.

The inherent drawback of studies such as this is that it focuses on local processes; things that went on in a particular company with particular people at a particular time. But there are also expectations on academics to produce generalizable knowledge. My view is that the results of an action research project needs to be seen in a longer perspective: in the terms of leading to positive change as well as the effects it has on the individual researcher and his or hers ability to pose ever better research questions. I now see myself moving on to surveys or interviews, and also moving (back) into quantitative research (I am actually originally a physicist) before setting out on another participatory study.

If I were to design an action research project again, there is one aspect in particular I could treat differently. Now that I know more about energy management—the actual problem area—I would spend more time on designing the research aspects of the project. I would consider including specific data-collection sessions, for example focus groups, to further triangulate data as the project proceeded. There was often little time for breaking the workflow to conduct formal interviews on a meta-level (about what we were doing). Now, all comparison between companies will come after individual analysis has been made.

To conclude, participatory methodologies are useful for understanding change processes like the implementation of an EMS. Despite its immediate effect on the bottom-line and the environment, companies may still struggle to do it effectively. In combination with educational efforts, other forms of research, and further participatory projects, drawbacks inherent to the methodology such as generalizability may be overcome. Hopefully, a virtuous circle of more projects on practices, better education and feedback into policy processes will lead to a shipping industry (including academia) that takes its responsibility to society seriously.

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[1] Vilsted (2004) gave the example of a Greek company listed in Liberia with a ship built in Japan and registered in Bahamas,

[2] Though labour related issues are mostly dealt with in the International Labour Association (ILO). On a completely different note, the story is that IMO is pronounced letter-by-letter because *imo* (芋) is Japanese for hot potato (Lampe 1983).

[3] International shipping was excluded from the Kyoto protocol because countries could not agree on how to allocate emissions to individual countries (Oberthür and Ott 1999). The task of managing the climate impact of shipping was handed to countries to solve in the IMO. Progress has been slow, partly due to a conflict between the UN Framework Convention on Climate Change (FCCC) concept of ”common but differentiated responsibilities” and the IMO preference for ”no more favourable treatment” of ships, i.e. all regulation should apply equally to all ships world-wide (Kågeson 2011).

[4] Why would they even consider activities that do not directly contribute to the bottom line?