Insurers’ role in enhancing development and utilization of environmentally sound technologies: a case study of Nordic insurers

Lara Johannsdottir, Brynhildur Davidsdottir, Michael E. Goodsite, Snjolfur Olafsson

School of Business, University of Iceland, 1st Floor, Sæmundargata, 101 Reykjavik, Iceland
Faculty of Economics and Faculty of Environmental and Life Science, Iceland
AU Herning, Aarhus University, Denmark
School of Business, University of Iceland, 1st Floor, Sæmundargata, 101 Reykjavík, Iceland

A R T I C L E   I N F O

Article history:
Received 14 June 2013
Received in revised form 27 September 2013
Accepted 27 September 2013
Available online 7 November 2013

Keywords:
Environmentally sound technology
Non-life insurers
Development
Utilization

A B S T R A C T

During the last decades numerous environmental problems have been exacerbated, and in some cases created. Traditionally, such problems have been addressed through environmentally sound technologies. The diffusion of such technologies has, however, been slow, where the focus has primarily been on high-polluting sectors. This paper explores the environmental actions of a relatively low-polluting sector, the insurer industry, in regards to environmentally sound technologies, by schematizing the concept of environmentally sound technologies as it is defined in Agenda 21. The Agenda 21 definition is critical when discussing environmentally sound technologies, as typologies of academic scholars are defined from the perspective of manufacturers ignoring the role of relatively low-polluting sectors when dealing with environmental issues. Five focus points from a climate change statement issued by the Nordic insurance industry are then integrated into the schematic framework. Case study examples from 16 Nordic insurance companies and secondary data of insurers’ activities are used to illustrate insurers’ role in enhancing development and utilization of environmentally sound technologies. Although the insurance industry offers many examples of its role in the development and utilization of environmentally sound technologies, this paper highlights the following points: (1) there are still areas for improvements, (2) there is a large capacity that could be utilized, and (3) business opportunities are expected to increase once climate change consequences become more apparent. Due to the slow uptake of environmentally sound technologies, it is important to strengthen the focus on the role and obligation of low-polluting sectors as a part of the supporting infrastructure dealing with environmental sustainability issues. This paper shows the potential of opportunities arising from the synergies between environmentally sound technologies and finance and service providers to address such issues.

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1. Introduction

There are number of emerging environmental issues that needs to be dealt with, although climate change is the most pressing one (Ki-moon, 2009). Carbon emissions need to be greatly reduced with the intention of stabilizing the climate, and that requires new technologies (Ackerman, 2008). Other serious environmental issues include chronic shortage of fresh water, pollution of ground water, threats from hazardous and radioactive waste, use and disposal of toxic chemicals, solid waste disposal and reduction, depletion of resources, biodiversity losses, land degradation, deforestation, and undesirable transfer of modified genes in agriculture (UN System-Wide Earthwatch, 2007). Many of these environmental sustainability issues can be mitigated through environmentally sound technologies (EST). However, uptake of such technologies has been inadequately slow (United Nations Environment Programme, 2003), due to economical, institutional, technical, and social barriers (dei Rio González, 2005). A higher level of collaboration, than exist today, is of utmost importance as it may eventually lead to the transition towards more sustainable societies (Lozano, 2008).

The year 2012 was, in record, third-highest in economic losses due to natural catastrophes and man-made disasters, according to insurers (Swiss Re, 2013). According to the Swiss Re’s study, in total, 318 catastrophic events were registered, claiming 14,000 lives and economic losses of US$ 186 billion, of which US$ 77 billion were insured losses. Loss of lives, new diseases, rising sea levels, hurricanes, violent storms, floods, torrential rainfall, wildfires, landslides
and pollution are examples of risk insurers need to deal with (Mills, 2009a; The Geneva Association, 2009). All categories of insurance core businesses are vulnerable to climate change consequences (Association of British Insurers, 2007; Mills, 2005; Vellinga et al., 2001). Insurers are affected directly through claims and indirectly through their investments by changes in the business environment of their clients, or in retrograded terms of trade from reinsurers.

The insurance sector is believed to have a fairly moderate environmental ‘footprint’, compared to various industrial sectors in terms of emissions, resource consumption and waste, as its core business is service (Cone, 2008; The Geneva Association, 2009). The situation is, however, more complicated, as large insurance companies use a great deal of electricity in their buildings and IT processes, and business travel has a major environmental impact, as well (Mills, 2008). The indirect impact of insurers is, furthermore, very high, particularly property and vehicle claims, but claims handling is to a large extent executed by third parties, thereby reducing insurers’ direct environmental impact. Despite that, solving claims is still a part of insurers’ core value proposition to the clients and a part of their legal obligation. Development and utilization of EST for the purpose of reducing negative environmental impact therefore applies to insurers’ operations, directly and indirectly. Literature on the role of insurers in dealing with EST and utilizing opportunities resulting from, environmental issues by enhancing and utilizing technologies is non-existent. In light of environmental issues and the role of insurers in dealing with such issues, this paper aims to answer the following questions:

- How does the concept of environmentally sound technology apply to the insurance industry?
- Can the insurance sector enhance development and utilization of environmentally sound technologies? If so, how?

We begin the paper by discussing insurance in the context of EST. We then schematize the definition of EST from Agenda 21. The research methods are then discussed. In the result chapter, we combine our Agenda 21 schematic framework with emphasis from a climate change statement from the Nordic insurance sector. Subsequently, we strengthen the discussion about insurers’ role in enhancement and utilization of EST by using case study examples from the Nordic non-life insurance sector and secondary insurance data. In the discussion section we compare our findings with the literature. Finally, we discuss the need for strengthening the focus on the role and obligation of less polluting sectors in dealing with challenging sustainability issues.

2. Insurers in the context of environmentally sound technologies

The literature on environmentally sound technologies and insurers is non-existing, but the literature on the greening of the service sector with respect to technologies has some bearing on insurers. This includes greening of information technologies (IT) (Dadashzadeh and Wharton, 2012; Flucker and Tozer, 2013), open collaboration processes as part of research and development (Idelchik and Kogan, 2012), collaborative effort in implementing photovoltaic solar energy systems (Stambouli and Koinuma, 2012), green maintenance in design and development of mechanical systems (Ajukumar and Gandhi, 2013), planning of infrastructure for electric vehicles and battery swapping (Mak et al., 2012), and car-sharing mobility systems (Finkorn and Mueller, 2012). Others include implementing energy efficiency projects in industrial facilities (Aflaki and Kleindorfer, 2013), green procurement of building materials (Tarantini et al., 2011), evaluation of green building schemes (Valentova and Bertoldi, 2011), barriers and drivers for sustainable buildings (Häkkinen and Belloni, 2011), green infrastructures, forestry and spatial planning (Andersson et al., 2013), how to achieve carbon neutrality (Das, 2012), and risk management in cleaner production (Wu et al., 2013).

2.1. The insurance business and environmentally sound technologies

In the context of EST, the insurance business can be subdivided into four key areas including 1) direct environmental/climate footprint, 2) investments, 3) insurers’ products and services, 4) loss prevention and claims settlement. The first two categories are not unique to insurers, but the second two relate to insurers’ core business as risk experts and risk managers (The Geneva Association, 2009). Each category is briefly explained below.

The direct carbon footprint of insurers is claimed to be relatively moderate (The Geneva Association, 2009), as they operate primarily in the service sector. Insurers’ emissions come from energy intensive buildings, business travel and data centers (Mills, 2012). Reducing direct environmental impact through intelligent vehicle and building technologies, and compensating for direct greenhouse gas emissions is emphasized, e.g. carbon-neutrality, purchasing of renewable energy, and an enhancement of the Clean Development Mechanism (CDM) of the Kyoto Protocol (Mills, 2003; Stahel, 2008; The Geneva Association, 2009). This is, however, a minor contribution to solving environmental issues, compared to the major contributions related to insurers’ investments and core activities.

As one of the largest industries in the world (Bacani, n.d.; Mills, 2005), with a premium volume of US$ 4.34 trillion in 2010 (Bloomberg, 2011), the insurance industry has the ability to influence global markets and economies, including enhancing the development of EST. As an example, it is projected that biofuels, wind power, and solar photovoltaic markets, which totaled US$ 188.1 billion in 2010, will grow to USD 385.8 billion over the next decade (Clean Edge, 2012). In addition, Clean Edge (2012) illustrates that U.S.-based venture capital investments in clean technologies have increased from US$ 5.1 billion in 2010 to US$ 6.6 billion in 2011, an increase of 30 percent. This opens up investment opportunities for insurers within the field of EST, as well opportunities related to insuring the technologies.

With respect to products and services, insurers and reinsurers are already exploring new EST business opportunities. According to Ishihara (2010, p. 596) insurers emphasize green technologies and low emission appliances by underwriting “leading edge environmental technologies, such as carbon capture and sequestration facilities or wind–power generators”. Insurance and reinsurance giants such a Swiss Re, Munich Re, American International Group (AIG), and Zurich Insurance Group have financed projects as a part of the Clean Development Mechanism (CDM) of the Kyoto Protocol, and experimented with carbon trading (Hashimi, 2010; Janssen, 2000; Michel-Kerjan and Morlaye, 2008). In this sense, insurers can be influential in the successful transfer and uptake of EST as an actor in assembling information on new technology options, providing knowledge and skills to various stakeholders and economic incentives influencing the actions of actors contributing to technological development and transfer (United Nations Environment Programme, 2003).

Development of energy-saving insurance coverage is also taking place, including wind power, solar photovoltaic and geothermal energy. Development of such solutions involves risks, particularly at early stages, which can be mitigated with appropriate insurance solutions. Studies have shown that the energy sector expects to use a broader range of risk transfer solutions in the future, including insurance, weather derivatives, and hedge contracts (Economist Intelligence Unit and Swiss Re, 2011).
Insurers are moreover involved in the development of ‘green built environment’ technologies and practices (Kunreuther and Michel-Kerjan, 2007; Marsh Inc., 2008) but their effort in the green building sector is still seen modest compared to insurers’ overall business operation (Mills, 2009b). The same applies to electric vehicles (EV), but owners of EVs can expect lower insurance premiums as they are regarded as lower-risk clients (Boney, 2012).

Technology is important when underwriting and pricing risks, e.g. by utilizing Geographic Information Systems (GIS), and when working with developers of climate models such as Risk Management Solutions (RMS) and the Benfield Hazard Center in modeling weather-related impacts. Mobile technology is additionally used to notify clients about imminent crisis, e.g. extreme wind speeds and floods (Jónsdóttir et al., 2012).

Pressure from policyholders expecting insurers to cover the cost of regaining green building certificates in case of losses, and to rebuild private and commercial buildings by using green solutions after insured losses, appears to be growing (Ishihara, 2010). Among known solutions is “green coverage”, which includes extra payments to rebuild commercial properties in accordance to LEED (Leadership in Energy and Environmental Design) building rating system (Mills and Lecomte, 2006), and loss of earnings from alternative energy sources, e.g. solar panel-generated power (Fersko, 2010). Price incentives for customers to utilize energy-efficient appliances when compensated for losses are also used (Jónsdóttir et al., 2012).

The connectivity of the insurance sector is widespread, as insurers interconnect with most parts of the economy. As a result, the insurance sector is a powerful catalyst in addressing environmental issues by influencing development and diffusion of EST, e.g. through sustainable investments, by insuring new technologies, in daily operation (Stahel, 2008), and by persuading behavioral changes, and promoting EST, thus being an agent for change.

2.2. Schematized framework of environmentally sound technologies

Technologies with the aim of contributing to sustainable development are in the engineering literature labelled as ‘clean technologies’, ‘cleaner technologies’, ‘green technologies’, ‘environmental technologies’, ‘environmentally sound technologies’, and ‘best available technology’ (Heng and Zou, 2010; Kuehr, 2007; Lin and Ho, 2011; Perrings, 1994), sometimes used as synonyms, or used with cross-references, e.g. by the Organisation for Economic Co-operation and Development (OECD), because of their close ties.

Clean technology has been defined as “technology which systematically diminishes or even eliminates emissions and waste at the source and, additionally, reduces the use of raw materials, materials and energy continuously” (Radonjic and Tominc, 2006, p. 711). Clean technology includes renewable energy such as wind and solar, waste-to-energy production, energy and water efficiency technologies, wastewater treatment, electric and hybrid vehicles, and carbon capture and sequestration. Perrings (1994, p. 308) suggests that clean or cleaner technologies apply to assessment of inputs and outputs, “without reference to the external environment”, while environmental or environmentally sound technologies relate to “safety of the technology with respect to the environment”.

To incorporate sustainability into business operations, a three stage approach has been proposed. 1) pollution prevention, 2) product stewardship, and 3) clean technology (Hart, 1996). Kuehr (2007), in comparison, classifies environmental technologies into four categories; 1) technologies measuring impact on the environment, 2) cleansing technologies or end-of-pipe approaches, 3) cleaner technologies and, 4) clean technologies or zero impact technologies. The transition has been from end-of-pipe solutions in the 1970s, to a whole-system approach, e.g. closed-loops, which simultaneously use resources more effectively and efficiently while minimizing waste (Lozano, 2012).

According to Kuehr (2007), the first category of pollution prevention includes tools, machines, and systems measuring, controlling, or harnessing the environment. Measuring technologies are used to understand the environment and how negative environmental impact affects people, with or without the goal of reducing human impact on the environment. As an example are technologies providing essential background “information on deviations from the natural balance” (Kuehr, 2007). In the second category are cleansing and pollution processes and materials used to reduce damaging effects owing to their use, without altering original processes, for instance when end-of-pipe pollution is treated. The third category includes technologies used to reduce or remove effects harmful to the environment, e.g. integrated technologies to reduce fuel consumption. The last category includes technologies that do not have known negative environmental impacts. Kuehr claims that this type of clean technology does not yet exist.

In Section IV of Agenda 21 EST are defined in articles 34.1, 34.2, and 34.3 (United Nations, 1992). Article, 34.1, states that EST protect the environment by using resources in a sustainable manner, creating less pollution, recycling more waste and products and handling residual waste in a more acceptable manner than technologies for which EST substitute. Article 34.2 defines pollution reduction more specifically, saying that EST is a process and product technologies that create low or no waste for the purpose of preventing pollution. In addition, EST covers “end-of-pipe” solutions, treating pollution which has been generated. Article 34.3 defines EST not just as individual technologies, but also as know-how, procedures, goods and services, equipment, and organizational and managerial procedures. Furthermore, when technological transfer takes place, human resources development and local capacity building, including gender-related aspects, have to be included. Finally, the article also states that EST ought to be compatible with socio-economic, cultural and environmental priorities determined nationally.

EST is, according to the Agenda 21 definitions, broad, as it takes into account how technologies are promoted and transferred, developed and managed, as well as the collaborative participation and arrangement required in the process (United Nations, 1992). Furthermore, it covers ‘hard’ technologies of material products, and ‘soft’ technologies of human skills and capacity, management and organizational procedures, and information networks, systems, guidelines and so forth (United Nations Environment Programme, 2003, p. 49), emphasized in article 34.3. It can therefore be assumed that EST are tangible tools or intangible means for preventing or solving environmental problems. Whether labeled as clean technologies, EST, hard or soft technologies, these are all solutions used in the transition towards sustainability.

The main contents of articles 34.1–34.3 of Agenda 21 (United Nations, 1992) are presented in our schematic framework in Fig. 1, with the key categories of 1) soft technologies, 2) sustainable use of resources, 3) less pollution, and 4) less waste. The gray boxes are the key categories of EST as presented in the articles, while the white boxes represent sub-categories leading to less pollution, or less waste generation. Although Kuehr’s (2007) typology is more recent than the classification offered in Agenda 21 (United Nations, 1992), it is similar to the three stage approach offered by Hart (1996) in the sense that it is defined with respect to manufacturers rather than service providers. The same applies to the characteristics of best available technology (BAT) which is defined as 1) the technology itself including the design, maintenance, and operation, 2)
accessibility of the technology, and 3) and mutual economic and environmental benefits (Xi et al., 2013). Another recent term is eco-
inovation aimed at improving corporate environmental performance, both through incremental change of minimizing negative environmental impacts through end-of-pipe solutions, and through radical changes with the aim of delivering positive environmental change through redesigning systems to gain eco-
effectiveness (Carrillo-Hermosilla et al., 2009, 2010). Mont (2002, p. 239) brings up the product-service dimension in eco-innovation, referring to “products, services, supporting networks and infrastructure that are designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional business models”. However, in the conclusions Mont (p. 244) discusses product-service solutions in the context of “eco-design, optimisation of distribution, product customisation, added services, take-back systems, remanufacturing, and recycling”, in many cases with limited relevance to service providers, rather than as an add-on to the service provided by manufacturers. Agenda 21, particularly article 34.3, offers relevance to non-manufacturing firms by discussing soft sides of technologies, and thus their approach is more appropriate for the insurance sector than some of the typologies offered by academic scholars.

3. The research approach

The aim of the paper is to investigate whether the insurance sector has a role to play in enhancing the development and utilization of EST. The research objectives was met by integrating the definition of EST with the main priorities identified in a Nordic insurance climate change statement issued in 2009, and by exploring examples of EST initiatives provided by interviewees in this case study. Additionally, we use secondary data published on insurers’ websites, and in their annual corporate social responsibility, sustainability or climate change reports to enhance international relevance of the results, adding depth to the discussion about the role of insurers in enhancing and utilizing EST, and for triangulation.

3.1. The Nordic case

The Nordic countries have a strong environmental profile within the European Union (EU), regarded as pioneers when it comes to protecting the environment, besides having strong views and interests regarding the environmental policy of the EU (Magnúsdóttir, 2009). According to Magnúsdóttir’s findings, Nordic countries are believed to be more influential than their small size indicates, able to act as environmental forerunners by using their positive image based on their expertise and/or national examples. Nordic nations believe they have a role to play in European and global developments in the environmental arena (Norden, n.d.), as one of their shared values is “respect for nature” (Lindholm et al., 2005). The Nordic environmental forerunners’ role was an influential factor when selecting Nordic insurance companies as a case for the study, as it offers the possibility of discussing best practice examples with regards to EST.

Tables 1 and 2 list the biggest insurance companies operating in the Nordic region, in terms of market share, either on a national and/or on a regional scale. Insurance companies in the islands communities (Table 1), Åland, Faroe Islands, and Iceland, are small and medium sized (SMEs), meaning that they employ between 50 and 249 persons (Eurostat and Schmiemann, 2009). All of these companies permitted access to their executives and specialists for interviewing.

Companies operating on the mainland, Denmark, Finland, Norway and Sweden, are listed in Table 2. These companies are large, with 250 or more persons employed, in this case between 400 and 7 thousand employees. Companies marked with the same gray-scale color belong to the same insurance group, meaning that that these are 12 individual insurance entities. Of these 12 insurance companies/groups, 8 allowed primary data to be collected through interviewees at their sites.

Primary interview data was collected in the participants’ natural setting by visiting companies’ sites to interview insurance executives and specialists. Interviews took place from September 2009 through September 2010. A series of interviews with 74 persons from different functional areas were conducted. Furthermore, 6 interviews with outside specialists were carried out (see Table 3).

Table 1

<table>
<thead>
<tr>
<th>Insurance companies operating in islands communities (SMEs).</th>
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<tbody>
<tr>
<td>Åland</td>
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<tr>
<td>Ålands Ömsesíða</td>
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<tr>
<td>Tryggingafélag Íslands Sjóvá-Almennar</td>
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Table 2

<table>
<thead>
<tr>
<th>Insurance companies operating on the mainland (large companies).</th>
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<tr>
<td>Denmark</td>
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<tr>
<td>Codan</td>
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<td>Alm Brand</td>
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<tr>
<td>TrygVesta (now Tryg)</td>
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<tr>
<td>TopDanmark</td>
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</table>
Table 4 shows interviewees’ roles within the companies. Each company selected interviewees based on their expert knowledge in this field. In the islands companies, most of the interviewees came from administration and claims and loss prevention divisions. In the mainland companies, many of the interviewees came from Corporate social responsibility (CSR)/sustainability divisions, in addition to the same division as in the case of islands companies.

3.2. The research methodology

Figure 2 is a flow-chart showing the key steps of the research methodology. The first step was to define research boundaries and select companies to be approached. Companies were selected based on their size, but research boundaries were based on an insurance climate change statement issued at the Nordic insurance climate conference in 2009. According to the statement, insurers’ core activities with respect to climate change include 1) products, 2) loss prevention and claims settlement, 3) investments, 4) own operation, and 5) follow up/benchmarking of actions. The second step in the process was to contact potential companies. Conference participants’ e-mail addresses were used to contact the biggest Nordic insurance companies to gain access to the potential companies. The third step was making field trips to the companies. The focus was also on multiple sources of data, including companies’ presentations, reports, and information on websites for triangulation purpose, and to get a broader view on insurers’ environmental activities. A field note framework was developed and filled out for each interview. It included the following topics; 1) access to the company and pre-interview communication, 2) entering the field, 3) field description, e.g. photos, 4) information about interviewee, 5) activity, 6) office equipment and layout (e.g. drawings or photos), 7) events, 8) timeframe, 9) word-by-word interview transcript, 10) leaving the site, 11) and reflections. Additionally, the latest information presented at the Nordic insurance climate conference (NICC) in September 2012 serves as an update for the interview data. The fourth step was analysis of the data, described below. The fifth and final step was a member check, meaning that in some cases interviewees or insurance experts were asked to review drafts of the findings for verification.

3.3. Analysis of findings

The analytical process started parallel to data collection. Interviews were transcribed word-by-word. During and after the transcription of each interview the text was read thoroughly, line-by-line, to see which themes emerged from the data. This was done as an open coding process. A mind-map was created for each company in MindManager 8 in a parallel process. This was done to keep track of themes, cluster ideas, and provide details supporting the themes, see one branch of a company map as an example in Fig. 3.

Multiple methods were used for data analysis, e.g. open coding process, theme analysis, content analysis, cross-case analysis and the constant comparative method (Glaser and Strauss, 1967; Kvale and Brinkmann, 2009; Yin, 2003). The purpose was to find examples of how Nordic insurers deal with environmental issues affecting their business. An example of content analysis is provided in Table 5.

4. Findings: environmentally sound technologies and the insurance sector

Three climate conferences have been held by Nordic insurers in 2008, 2009, and 2012 with the aim of strengthening Nordic insurance climate collaboration. At the 2009 Nordic Insurers’ Climate Conference (NICC conference), the trade associations of Nordic insurers issued a joint statement on how Nordic insurance companies plan to actively meet the climate change challenge (Bosse et al., 2009):

- developing and offering climatically sustainable products within life and non-life insurance;
- incorporating climate aspects into investment strategy considerations;
- using climatically sustainable methods in loss prevention and claims settlement;
- following up systematically on climatically sustainable activities implemented in the industry;
- and striving for climate smart ways of organizing and conducting our business.

All of these focal points relate to EST, although the first three are the most critical ones, i.e. development and uptake of the technologies through insurance products and subsequent claims processes, and investments in EST. In addition to committing to the climate change solutions themselves, the presidents of four of the biggest Nordic insurance companies also challenge other industries to leverage climate change opportunities, daring them to consider the future they will hand over to forthcoming generations (Newsmill, 2010), but this type of pressure can influence the actions of others, as well in the area of EST.

In Fig. 4, we demonstrate how the climate emphasis of the Nordic insurance industry based on the climate statement (grid lines boxes) applies to our previously presented framework of EST based on the Agenda 21 definition (United Nations, 1992) schematized in Fig. 1. In some cases, insurers’ emphasis applies directly to the key categories, e.g. soft technologies and the sustainable use of resources, but in other cases they apply to sub-categories of less pollution and less waste.

In the following sections, we will explain how insurers can enhance and utilize EST in categories of 1) soft technologies, 2) sustainable use of resources, 3) pollution, and 4) waste, using numerous examples of insurers’ initiatives related to the grid line boxes in the figure. Often there is an inter-linkage between categories, meaning that some examples apply to more than one category. Focusing on EST issues is considered to be of strategic importance, covering all aspects of the business.

- So it’s a journey, but the idea is that we just go through everything, from communication, electronic policies, to how we buy from suppliers, and through to new products, for example trying to proof the market for electrical cars and so on.

4.1. Soft technologies

Benchmarking and follow-up on actions taken (grid line box in Fig. 4) supports soft technology by encouraging continuous improvements in dealing with environmental issues, and by sharing of best practices. This was mentioned by many interviewees as an enabling condition when focusing on environmental sustainability issues.

- First of all, we did a lot of research on what is best practice [and] we looked at competitors.
- You know we always use cases from all over the world.

In relation to the 2009 NICC conference, the Nordic insurance and financial service associations furthermore collectively sponsored a climate survey to find industry best practice examples with respect to the environment. The 2009 conference was the second
Nordic climate conference enabling industry leaders to discuss climate change impact on the sector, and their role in solving the issue. The third conference was held in 2012, continuing the Nordic insurer’s climate debate, advancing insurance knowledge about the topic. The debate is a precondition for development of insurance solutions supporting development and uptake of EST.

- The starting point of the conference was in fact that the CEO [Chief executive officer] of TrygVesta in Denmark started to discuss “what can we do more on a Nordic scale”, because both TrygVesta and us, we are still two biggest companies in the Nordic region and we have big activities in all countries so we said why should we only focus on one specific country.
- We can do it as a company, but we can also do it as an industry. We of course are using the Nordic insurance sector to push for more climate friendly solutions, especially [by influencing] the politicians.

When it comes to soft technologies, as explained in Section 2.1, the key role of insurers is to share their risk management ability and loss prevention expertise, within and across industries, and by offering new insurance solutions in developed and developing countries. Dialog with industrial clients, with respect to technologies, takes place, also used when communicating with suppliers.

- We talk about how they are handling the waste, waste material from production, from canteen, IT-equipment [and] other controlling equipment. Are they using re-circulation, have they any sending back arrangement with their suppliers. Do they have any special waste, how do they treat that and things like that. We are also talking a little bit about the energy. Do they make a measurement of the use of energy? Are they making any energy reducing improvements? Do they have any recommendation you know, demands on equipment when they buy new equipment?

The argument for this client dialog is, for instance, the following one:

- If they have focus on this they will also have focus on other risk areas. And then they will be better customers, the one we will like to cooperate with.

Assessing and pricing risks is a part of insurance solutions, as well as the option of insuring new technologies with high risk attributes which individuals, organizations, or institutions cannot tolerate, but insurers can because of their ability to spread risk nationally, regionally, and globally. This means that appropriate insurance solutions can speed up EST innovation by insuring against risk associated with new technologies, and thus facilitating diffusion and technological development. According to interviewees, this was actually the case for EST such as windmills, as well as for technologies minimizing water consumption, and will be for other energy sources including solar energy and biofuels.

- In Denmark, 30 years ago we saw some really great potential in renewable energy. And we were the first insurer to go out and actually insure not only the building of the wind turbines but also the operations. … It was quite a gamble to be an insurer at that stage… But we saw the potential and we knew already then that this was going to be a big market… And that give us today a huge advantages. We have build a unique expertise and competences and capabilities, that we not only insure the market, we also give them feedback and inputs on how they can improve standards. Because we have been a part of this from the beginning and we’ve build up all those capabilities, the customers see us as a preferred partner. … We are part of the journey, exploring how we can also use solar energy and hydro energy and bio energy and of course the wind energy… We have a center of excellence in this building, in renewable energy and renewable energy is of course one of the crucial things if the entire world should fight against the climate change.

- How can we improve technology? … So we work really close with clients in developing new solutions. We have an agreement with EnergiMidt and also a water supplier and we strive to go into every household in Jutland, part of Denmark, as we want to reduce the water usage, but also reduce leak from the water. We can actually go in and find out whether the toilet is leaking, before it starts to leak a lot of water. So it has the risk side, but also the environmental side.

- We see especially the solar energy as a huge market in the future.

- I think biofuel as well, is going to play an increasingly important role.

One theme frequently mentioned by interviewees is external engagement and communication with various stakeholders. During the United Nations (UN) Conference of the Parties (COP15), Pan-Nordic insurers used the opportunity to raising awareness among different group of stakeholders concerning climate change, renewable energy, risk and solution in the Arctic region, and places at risk due to rising sea levels, thereby providing the foundation for necessary actions, both behavioral changes and development of technical solutions.

- During the COP15 we sent out brochures … in both Denmark and Norway to all our industry customers talking about climate change, talking about what we do and talking about this [risk] screening tool we have.

- There was sort of official task of the COP15 program. We invited a lot of experts and politicians and investors to discuss how we can develop renewable energy in Africa and Asia. What are the barriers

### Table 3
Number of sites, interviews, interviewees and participants observation.

<table>
<thead>
<tr>
<th>Companies location and size</th>
<th>Number of insurance sites visited</th>
<th>Number of interviews</th>
<th>Number of interviewees</th>
<th>Participants observations</th>
<th>Interviewees with outside specialists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees &lt;250</td>
<td>2</td>
<td>7</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Åland</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Faroe Island</td>
<td>4</td>
<td>14</td>
<td>16</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Employees &lt;7000</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>1</td>
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<tr>
<td>Finland</td>
<td>2</td>
<td>9</td>
<td>10</td>
<td>1</td>
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<tr>
<td>Norway</td>
<td>2</td>
<td>8</td>
<td>9</td>
<td>2</td>
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<td>17</td>
<td>62</td>
<td>74</td>
<td>7</td>
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and how can we actually solve the problems? We are having a program together with UNEP, United Nations Environmental Programme, and together with a lot of investors, where we set up packages so it is lot easier and it is lot more safe to invest in renewable energy in Africa and in Asia.

- We were a part of a major business initiative with some of the really big companies in Norway. We were the only insurance company here to give advice to the government on how they can harvest a potential from the business community concerning climate.

After a period of heavy rain and flooding, insurers in Åland and Sweden discussed the issue with local authorities and technicians, in order to raise awareness and discuss solutions. Focus on costly solutions takes years, but in collaboration with authorities, some of the insurers aim to find feasible low-cost adaptation solutions.

- We have to find feasible efforts to promote adaption. Ok if the draining system is too small, so to speak, how can we then work with the water problems on the ground? How can we lead the water away alternative roots? We have to have a practical take on it so we just don’t end up pointing fingers.

Related to this issue is the development of interactive climate vulnerability maps of Norwegian municipalities and the development of VisAdapt, a climate change decision-making tool for homeowners and insurance professionals. These are examples of collaborative effort between the Nordic insurance industry, the academia (NORD-STAR, n.d.), and municipalities.

4.2. Sustainable use of resources

Insurers can have a positive impact on the sustainable use of resources in their own operation, by utilizing technologies, and by putting forth requirements on suppliers or selecting suppliers offering environmentally sustainable solutions.

- Related to the flights, we have installed a lot of more video e facilities in our offices so we don’t need to fly to Stockholm and to London every time we have a meeting. ... that has helped reducing the flights dramatically.
- In Stockholm we have agreement with one of the biggest taxi companies, that they only send climate friendly taxis.
- And we have made a quite big project called green IT, where we just replace all our computers and printers with new and more efficient computers so we reduce the energy, I think actually by half.
- We are in a middle of a process of virtualizing servers, which means we have about 800 physical servers today in 3 sites. We will consolidate them and then virtualize them to about 30 or 40 physical servers ...so that will decrease our energy usage by I don’t know 70 or 80% which also saves us money.
- We buy all our wind energy from a wind turbine.

Less fuel consumption by customers can be achieved through better terms on electric and energy-efficient vehicles. Furthermore, in loss prevention and claims settlement, insurers can reduce the amount and types of material used directly or indirectly through claims partners (grid line box). Pressure on claims partners to deliver more sustainable claims solutions can influence development in this area. According to interviewees, it is challenging for insurers to put pressure on suppliers, claims partners, authorities, and customers to develop or utilize EST if they are not leading in this area themselves. Reducing a corporation’s own environmental impact, such as minimizing the use of energy, water, and raw materials was therefore frequently discussed by interviewees. Among reasons behind insurers’ own actions is the “license to speak” about
environmental issues, a better image, and the possibility to put pressure on different stakeholders. One of the interviewees explains this in the following manner: “We can’t go out and talk all high and mighty about climate adaptation and mitigation if we don’t do what we can ourselves”. The emphasis is on walking the talk and being trustworthy even though insurers are seen having a relatively low environmental footprint:

- We are not a production company, so we are not using lot energy. In Denmark and in Scandinavia last year we reduced our emissions by 8%. Together with the WWF we have a target that in 2020 we [will have] reduce it by 40%. So we really want to show that we are serious about this and then we need to work quite systematically with it.

Loss prevention is one of the biggest environmental contributions insurers can make. Focusing on preventing claims has a greater positive environmental impact than dealing with waste and pollution after claims occur. This emphasis is likely to increase in the future. Furthermore, it is claimed that there is value for insurers in different types of renewable energy and energy-efficient technologies that can “make infrastructure less vulnerable” (Mills, 2009a, p. 338), thus being important from the loss prevention perspective. This focus is evident in the interview data.

- It is absolutely necessary to focus even more [on loss prevention]. This does not mean that we haven’t been working with loss prevention but we need to focus even more on it going forward.

One of the companies included in the study has developed a full service claims solution for electronics, both simple and complex technologies, including computers, televisions, and cell-phones, instead of emphasizing cash payments, with a positive environmental impact on resource consumption, pollution, and waste. Design of the process was complicated, requiring redesigning of insurance terms, claims processes, contracts with repair shops, etc.

Insurers can use their claims statistics and models to influence physical risk of properties for the purpose of influencing improvements in building codes and spatial planning. In that sense, data from insurers about claim frequencies, seriousness of claims, and financial compensation are valuable indicators on where, and to what extent risk mitigation is needed and what technologies can be used. Fewer or less severe claims result in benefits in three categories, i.e. less use of resources, less pollution, and less waste.

- A very important issue … one which is growing in importance by the day [has to do with] the Baltic Sea. We actually just released the report mapping all the different commercial activities there. … So what we are doing there is really, we project the future risks in 20 years. Next year we are going to overlay where our claims are, and see if these overlapping areas are the causes of claims. And if that’s true can we promote safe zones of usage?

AudaTex, DBS, and WinCABAS are systems widely used by Nordic insurers to improve and streamline claims processes, enabling insurance companies and repair shops to estimate repair times, costs, and materials and parts used for vehicle body repairs. Such systems store data and allow electronic transmission of digital

Table 5

<table>
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<tr>
<th>Country, interviewees’ fictitious names, page number in interviewees field notes</th>
<th>Environmentally sound technology</th>
<th>Purpose</th>
<th>Environmental benefits</th>
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<tr>
<td>Åland Kaj p 11; Lasse p 8–10; Hasse p 26</td>
<td>Windmills</td>
<td>Investments; Insurance solution/coverage for windmills</td>
<td>Renewable energy; mitigation</td>
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Fig. 3. Theme analysis in MindManager 8.

Fig. 4. Integration of insurance climate emphasis and clean technologies.
pictures and claims reports between repair shops and insurance companies. The insurance companies then authorize the claims handling process and reduce unnecessary travel, both on behalf of insurance surveyors and clients. Utilizing claims systems has allowed Nordic insurers to influence claims handling, through the reuse of car-parts, plastic repairs, materials chosen, waste handling etc. resulting in environmental benefits of less resource consumption and proper waste handling. Furthermore, IT solutions are used to search for and purchase reused spare parts in the claims handling process. Plastic repairs are also emphasized, which addresses the so-called ‘replacement mindset’ in the insurance industry, meaning that replacement of damaged assets take place instead of repairs with lower economic and environmental costs (Meyricke and ClimateWise Sustainable Claims Steering Group, 2010). The ratio of reused spare parts in one of the Swedish insurance companies was 12.86% and plastic repairs 21.20%.

Sustainable use of resources, including energy consumption and efficiency, is emphasized by Nordic insurers in property claims processes.

- **When rebuilding your house after fire for example, flood or fire or whatever, we give up to, in one insurance called an extra insurance, we go up to 50 thousand kronars on top of the normal insurance to install energy efficient appliances in the building, for example heating pump.**

Other examples include one of the biggest solar cell systems in the Nordic region placed on the roof of the headquarters of a Danish insurance company. Nordic insurers have also been focusing on energy optimization technologies in their own operations, including installation of heat pumps.

### 4.3. Less pollution

Fig. 4 demonstrates how insurers can reduce pollution by focusing on end-of-pipe solutions in their own operations, investments, and claims settlement, and in process and product technology through product development, loss prevention, and claims settlement (grid line boxes).

According to interviewees, the investment side is an area where insurers can have a substantial impact, as they have enormous amounts of funds available for investment opportunities. In the above-mentioned climate statement of Nordic insurers, they claim that they will take climate aspects into their investment strategies. Some of the Nordic insurance companies take this role very seriously, ensuring that their assets are handled in accordance with their investment policies.

- **If we don’t talk about investments then we are not talking about the whole picture because so much money lies in insurance companies. There is such enormous impact we can make through the investments so that’s also what our clients ask, you know. You are doing all these recycling of paper in the office that does not really matter, if you at the same time are putting so much of your money into something that totally ruins the planet.**

Several of the Nordic insurance companies have signed the PRI Principles for Responsible Investments, which serve as a guideline for institutional investors striving for responsible investments.

- **We have signed the United Nations Principles, PRI, and we are really taking it seriously.**

This means that screening techniques are used to screen in or out particular options with social and/or environmental benefits, for instance by focusing on alternative energy sources, e.g. windmills.

- **We are going to invest more and more in the windmills.**

However, screening investments is not unique to insurers, but nevertheless an important aspect of the business with respect to addressing environmental issues through technologies. Through investments, insurers can influence the development of more sustainable product and process technologies that cause less pollution, while expanding their business. AXA WF Clean Tech fund is an example of how insurers can invest in companies developing environmentally sound technologies with less of a negative impact on the environment, including impact on climate change, pollution, and depletion of natural resources by focusing on renewable energy, energy efficiency, pollution control, and waste treatment (Mills, 2009b). In some cases, Nordic insurers identify companies they exclude in their sustainability/corporate social responsibility reports, and for what reasons they are excluded. Shareholder advocacy was also mentioned by some interviewees. In that case, investors take an active role as companies’ owners to influence sustainable actions.

Codan/Trygg-Hansa uses dialog with suppliers to influence environmental performance. A Code of Conduct, a procurement policy, is being implemented in all procurement processes used when renegotiating contracts and in tenders.

- **We always discuss environmental issues when negotiating or changing anything.**

The policy puts forth climate and human rights standards which suppliers have to meet. A number of sustainable measures are applied, as well. For instance, a windscreen repairs contract with Beijer Byggmaterial, which supplies environmentally friendly building materials to contractors, and requesting printed material to be FSC (Forest Stewardship Council) certified (Codan and Trygg-Hansa, 2011) are examples of collaborative efforts between insurers and claims partners, or requirements placed on suppliers.

### 4.4. Waste

The Swedish Non-governmental organizations (NGO) Naturskyddsföreningen (Swedish Society for Nature Conservation (SSNC), governs the Bra Miljöval (Good Environmental Choice) eco-labeling standard for different products, including insurance. SSCN uses four criteria for eco-labeled insurance, which cuts across categories of waste, pollution, and resources, although waste is the biggest category because of impact from claims handling. The categories used are 1) company behavior (energy efficiency, paper consumption, electricity etc.), 2) claims handling (repairs, substitute of products, chemical consumption, re-use etc.), 3) capital management of insurance premiums (positive and negative screening based on environmental and ethical principles, and follow-up), and 4) advice on energy efficiency and eco-driving to encourage an environmentally-friendly lifestyle among policyholders. The first insurance products have been approved for the Bra Miljöval eco-labeling. These are car and house insurance products from Folksam. Other companies are interested in eco-labeling their products as well, or are in the process of assessing the eco-labeling criteria (Naturskyddsföreningen, 2011a, 2011b).

The logic behind different kinds of recycling insurance offered to farmers by Länsförsäkringar in Sweden is handling of residual waste and loss prevention. This is done in cooperation with an
NGO named “Håll Sveriget Rent” (Keep Sweden Clean). Annually, and early in the spring, farmers phone the NGO to order a cleanup service. The NGO then organizes the pickup of the waste. The product was launched in 2007. Over a period of two years, close to 2.3 million liters of waste oil, 291 tons of oil filters, 534 tons of pesticides, 60 tons of fluorescent lamps, 299 tons of paint waste and 30,000 tons of agricultural metal scrap were collected (Petersson, 2010). Länsförsäkringar pays for the service but uses repayments from selling metal scrap to finance the project. The aim is not to gain financially from this service, but to prevent future environmental claims, thus mitigating financial loss. Due to the success of the product, it was extended so that household medicine waste will also be collected and treated in a safe manner (Löfquist, 2010).

In 2008, Länsförsäkringar launched a new concept for large-scale wind farms, providing recycling insurance which guarantees decommissioning and recycling of wind farms after their life span is over (Länsförsäkringar AB, 2008). Länsförsäkringar also offers recycling insurance for producers, where the aim is to promote environmentally friendly products. The easier it is to recycle the product, the lower the premiums. Recycling insurance can also cover the dismantling and recycling of heavy vehicles, machines, technical installations in properties, and personal computers (Länsförsäkringar, 2008).

- The insurance concept for wind power parks, the idea behind that is that if you put something up like a windmill, what will happen 20 years down the road, when it is not working anymore? Who will then take it down? So what you do is that we have a policy with that, saying that we guarantee that this will be taken care of in an environmentally friendly way.

Another example is how the negative environmental impact of the renovation process of headquarters of Tryg, a Nordic insurance company, was crafted.

- I believe we are first, at least among the Norwegian companies. We have prioritized this much higher than anyone else. We have people, one of them working full time on how to dispose our building materials and our furniture to others who need them, instead of throwing them away.

This is a good example of how waste can be minimized when insurers take on huge renovation projects. In this case, the company assigned a full-time employee to oversee the process of distributing building materials and furniture to schools, charities, volunteering organizations, NGOs and others. Ambitious, measurable goals were put forward and the company made an effort to ensure that the receivers obtain high quality (though used) office furniture, electrical equipment and other items that might otherwise be thrown away. A sustainability committee reviewed the process regularly, and reported the results to the firm and the public. Although this is an example of internal actions, this can also be used as a best practice example transferred to waste handling processes in claims.

Loss prevention has a positive impact on waste, as claims prevented do not result in waste creation. Reusing spare parts in vehicle claims is also a way to reduce waste creation. Using, for instance, the EU Waste Framework Directive (2008/98/EC), which classifies the waste hierarchy from the least preferred to the most preferred option in the following order; disposal, energy recovery, recycle, re-use, and reduce, can guide insurers and their suppliers in how to deal with insurance related waste. According to interviewees, systems allowing tracking and purchasing of reused spare parts support this process.

In general, insurance companies do not measure carbon dioxide (CO₂) emissions by claims or waste as it is challenging technologically to develop measuring and reporting tools. However, few examples of how to calculate emissions were found. Insurance Sweden published a study report called CO₂ Emissions associated with the management of water and fire damage in the Nordic countries (Moberg et al., 2009). The aim of the study was to promote loss prevention measures, influence construction measures, claims logistics, and waste handling (CEA, 2009). The main conclusion was that hundreds of thousands of fire and water damage to buildings in the Nordic countries cause inconvenience for policyholders, high restoration costs, and negative environmental impacts due to CO₂ emissions when material is destroyed. The total CO₂ emissions associated with fire and water damage in 2007 was estimated to be 126,000 tons. Calculations for water claims are based on material waste, new material, claims-related transport of people and material, and electric power used for dehumidification/drying, resulting in 300 kg of CO₂ emissions per claim. Similar calculations were done for fire damages, resulting in an outcome of 2310 kg of CO₂ emissions per claim. Knowledge about CO₂ emissions from building claims is of importance as it can influence collaboration of different parties with the purpose of reducing the impact of claims, using soft and hard technologies.

5. Discussion

Schematizing the Agenda 21 definition (United Nations, 1992) in Fig. 2 highlights how EST applies to insurers, thereby answering the question: How does the concept environmentally sound technology apply to the insurance industry? The Agenda 21 definition is critical when discussing EST in the context of insurers, as the EST related terminology (e.g. Hart, 1996; Kuehr, 2007; Radonjic and Tominc, 2006; Xi et al., 2013) does not emphasize the role of relatively low-polluting sectors in the transition towards environmental sustainability (Lozano, 2008). Preference for using EST synonyms (Heng and Zou, 2010; Kuehr, 2007, Lin and Ho, 2011; Perrings, 1994) did not come forth in the insurance literature, perhaps because of a gap in the existing literature. This study, however, shows that greening of the service sector has some meaning for the insurance sector when discussed in the context of technologies, such as green IT, implementing photovoltaic solar energy systems, green building material, carbon neutrality, and risk management in cleaner production (e.g. Dadashzadeh and Wharton, 2012; Das, 2012; Stambouli and Koinuma, 2012; Tarantini et al., 2011; Wu et al., 2013), either in relations to their own operation and/or their core business.

The ties between EST and insurers’ climate change focus areas are exhibited in Table 6, answering the research questions: Can the insurance sector enhance development and utilization of environmentally sound technologies? If so, how? Categories of the Nordic insurance climate statement correspond to the insurers’ key areas discussed in Section 2, with the exception of follow-up/benchmarking which was not evident in the literature, but emphasized strongly in the NICC statement and by interviewees as an enabling factor when solving environmental issues.

Ties between soft technologies (United Nations Environment Programme, 2003) and insurers’ key areas are evident in the interview data as well as in the secondary data. These include Nordic insurers’ climate conferences, investment screening techniques, external engagement and communication, raising awareness among different groups of stakeholders, and influencing suppliers.

Ties between insurers core activities and sustainable use of resources, less pollution, and less waste are also evident with the exception of follow-up/benchmarking, and investments in the case
of less waste. These ties may exist as well, although they are not evident in the interview data. Some insurance products cut across more than one area, for instance eco-labeled insurance coverage which positively affects soft technologies by raising awareness of customers and suppliers, and requirements of less use of resources, and less generation of waste and pollution.

Sustainable use of resources is emphasized in insurers’ own operations, e.g. by focusing on energy optimization and instillation of solar systems. Principles of responsible investments, screening techniques, guidelines and best practice examples, clean tech funds, and active ownership are emphasized by insurers, as well as investments in windmills, solar cell systems, etc. Better terms and conditions for EST, e.g. electric and energy efficient technologies are examples of new and existing products supporting more sustainable use of resources. Pressure on suppliers and claims partners can influence product development supporting less use of resources.

Less pollution can be influenced through purchasing policies, mandatory requirements and codes of conducts, dialog and tenders, both for the office as well as in claims. The same applies when insurers renovate houses after claims using energy efficient, low-polluting and environmentally friendly materials.

Less waste creation was emphasized in a building renovation process. The best examples found to deal with waste were different types of recycling insurance, e.g. for farmers, producers, and large scale projects such as wind farms.

The conclusion drawn from these examples is that insurers’ effects on EST are more evident in soft technologies than hard technologies (United Nations Environment Programme, 2003). This is nevertheless of vital importance, as human development and local capacity-building are important aspects of technology choice, as stated in article 34.3 of Agenda 21. Insurers are, however, in a position to influence hard technologies and material products (Del Rio Gonzáles, 2005) through sustainable investments (Stahel, 2008), procurement, risk management, pricing, policy terms and conditions influencing behavioral changes and supporting uptake of new technologies, and examples of such actions are evident in our data.

Examples discussed above can also be placed in the context of the literature, e.g. Kuehr’s (2007) categories of environmental technologies. Just as Kuehr suggested, the category of clean/zero impact technology is almost non-existent, except perhaps if taking into account zero impact related to loss prevention initiatives.

This qualitative study offers insights in the actions of 16 Nordic insurance companies that are large on a national or regional scale, in a region where countries are considered to be forerunners with respect to protecting the environment. The examples presented in this study may therefore serve as best case examples, although a generalization of the industry as a whole cannot be made, meaning that further research in this field is needed.

Our findings suggest that insurers can be critical players in the supporting infrastructure necessary for development and utilization of EST, by extending conventional insurance products and solutions, as well as through financing, as business opportunities are perceived to increase with the changing climate (Mills, 2009b) and environmental issues that need to be dealt with. There is, however, still room for improvement within the insurance sector as, for example, no examples of biofuel projects (Clean Edge, 2012), or carbon trading and CDM projects (Hashmi, 2010; Janssen, 2000; Michel-Kerjan and Morlaye, 2008; Ishihara, 2010) were brought up by interviewees.

6. Conclusion

The role of manufacturers and ‘heavy pollution firms’ in solving environmental issues by developing and utilizing hard technologies is more evident than the role of low-polluting firms in this respect. This focus is, however, too narrow, restricting potential actions to address environmental issues utilizing technologies. EST is generally not discussed in the context of finance and service providers, including insurers. There is, therefore, a gap in the academic literature with respect to low-polluting sectors and soft technologies, which offer research opportunities to study how these sectors may enable development and uptake of hard and soft technologies, helping us move towards environmental sustainability.

Theoretically, we add to the literature by placing a non-manufacturing and relatively non-polluting sector in the context of EST. Practically, our work helps insurers and other stakeholders understand what role insurers have to play in enhancing and utilizing EST. Policymakers can also focus on the role of these sectors in achieving environmental and climate goals on national, regional, and global levels. Such firms are important actors in solving environmental problems that appear as either risks or opportunities, as we have discussed in this paper. The implication for insurers is that their EST actions are of great importance in dealing with environmental issues, and offering solutions can create new business opportunities for the sector. Schematizing the Agenda 21 definition has demonstrated how environmentally sound technologies apply to the insurance industry. We have furthermore revealed that the insurance industry supports the development and utilization of environmentally sound technologies by tying the Agenda 21 categories with insurers’ core activities of products, loss prevention and claims settlement, and investments. Additionally, the importance of follow-up/benchmarking and communication should not be overlooked, as these elements contribute to increased knowledge and dissemination within the industry and outside it among customers, suppliers, and in the society at large.

Acknowledgments

We wish to thank Nordic insurance experts and specialists for the permission to be interviewed and the anonymous referees for helpful suggestions that have substantially improved this paper. We would also like to thank those partly providing funds for the study, including Landsvirkjun Energy fund, Orkuveita Reykjavíkur Environmental and Energy fund, Erasmus Programme of Student Mobility for Study or Placement, Pálmi Jónson Nature Conservation Fund, RioTintoAlcan Community fund, the Nordic Centre of Excellence for Strategic Adaptation Research (NORD-STAR), Nordic Climate change Adaptation research Network (NORDCLAD-Net), Nordic Climate Mitigation, Adaptation and Economic Policies (N-CMAEP) Network, School of Business University of Iceland, and SHÍ Student fund.

The research presented in this paper contributes to the Nordic Centre of Excellence for Strategic Adaptation Research (NORD-STAR), which is funded by the Norden Top-level Research Initiative sub-programme ‘Effect Studies and Adaptation to Climate Change.’


