Technology Collaboration Programme
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INTERNATIONAL ENERGY AGENCY
TECHNOLOGY COLLABORATION PROGRAMME ON
DISTRICT HEATING AND COOLING

SUMMARY FOR NON-TECHNICAL AUDIENCES

SOCIAL SUSTAINABILITY IN THE CONTEXT OF DH BUSINESS MODELS

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Content

1 Project Objective and Methods for Data Collection

A background to District Heating is provided first (1.1). Next, the methods for data collection are presented (1.2).

1.1 District Heating

District Heating (DH) is a technology that provides buildings that are connected to a distribution network with space heating and, often, domestic hot water. The heat is either generated in a production unit (it can be a combined heat and power plant or a plant for heat generation only) or obtained from an industrial process, or the urban infrastructure, and the heat carrier is water. Sustainability is discussed in the context of ensuring that current needs are met without compromising the needs of future generations. It considers economic, environmental and social sustainability. Depending on the heat supply, the impact on the environment of DH varies and it can be environmentally sustainable. The conventional DH configuration is based on economy of scale where the central heat supply is optimized so that the cost of producing one more unit of heat is minimized. DH operations can therefore be economically sustainable. However, when addressing social sustainability less is known about the way that DH generates or erodes social sustainability values. In this project, an attempt to understand social sustainability and if it can impact the competitiveness of DH business models is made.

1.2 Methods for Data Collection

Social sustainability impact on business model competitiveness is an unexplored field of research. Information has therefore been collected by a number of complementary methods. First, an analysis of DH value chains in two mature DH markets (Sweden and Denmark) and in two maturing DH markets (Belgium and Canada) was made. A value chain encompasses value adding activities. A distinction is made between primary and supporting value activities. Primary value activities are needed to make and provide the product to customers (inbound logistics, operations, outbound logistics, marketing and sales and services) whereas supporting value activities (firm infrastructure, human resource management, technology development and procurement) are needed to make the cycle from production to sales work.

Next, literature was screened followed by the design of an interview guide to collect data on social sustainability in the context of DH of a case study. The case was chosen based on three criteria. First, the case needed to be situated in a DH market that was not yet mature. Second, the DH system should still be in the planning phase, allowing the research team to engage early and contribute to discussions around alternative and desirable business model features. Third, the DH project had to demonstrate strong potential for both economic and environmental sustainability: such a system would enable the research team to focus on exploring the

dimension of social sustainability, rather than concentrating on the already well-addressed economic and environmental aspects. According to the descriptions provided by the City of Burnaby in Canada, their foreseen network qualified on all items. Canada is a maturing DH market, the system is foreseen to be commissioned in 2026-27 and it is foreseen to make use of the waste heat from the waste to energy plant in the Metro Vancouver area (operating 24/7 since 1988) at a competitive price. In total, 28 interviews were conducted with stakeholders linked to the DH project of Burnaby. Based on the results oft he value chain analyses, literature screening and interviews, a social layer for DH was derived using the tool of business model canvas. The canvas has an economic, an environmental and one social layer.

2 Results

Results are presented in conjunction to different activities undertaken in the project. Results from value chain analyses are presented first (2.1). Next, results from literature screening are summarized (2.2). Thereafter interview results are provided (2.3) followed by the results from analyzing the competitiveness of DH business models when resorting to social values (2.4).

2.1 Value Chain - Results

Analyses of economic, environmental and social sustainability values were made for DH value chains in Sweden, Denmark, Belgium and Canada. In Canada the analysis was linked to the case study whereas it was made on a generic, national value chain in the other three countries. Comparing the different parts of the value chain of the case to the generic features identified for the Swedish, Danish and Belgian DH markets it is identifiable that the value chain of the case study is more advanced on waste heat dialogues. It also appears as if a foreseen ownership of substations can support the control of the system as well as the ability to offer various win-win arrangements and services. In table 1, similarities and differences of the value chain of the case and of the generic DH value chains in Sweden, Denmark and Belgium are summarized.

Table 1: Similarities and differences of value chain characteristics based on review of the Burnaby case. Similarities and differences are compared to the value chains in SE, DK and BE

Inbound Logistics	**Operations**	**Outbound Logistics**	**Marketing & Sales**	**Post Sales Activities**
The fuel supply is waste heat supply	Like value chains in SE, DK and BE	Control of substation facilitates energy services	Waste heat recovery dialogue exists, co-creation & collaboration will come	Different service offerings are foreseen
Forthcoming: low temperature waste heat from sewage		Forthcoming: manage Legionella in cooling		

2.2 Literature Screening - Results

The first result from the literature screening was that there is limited knowledge on how sustainable business models generate value and even less so on how socially sustainable values materialize. It is also concluded that there does not seem to be any previous study on the topic of socially sustainable business model in DH.

In the literature there are numerous studies on how companies can work with their employees to ensure a rewarding, social workplace. It can be things like work safety, gender equality, ethnicity, age, the opportunity for training on the job etc. Such factors are the social factors that are part of the concept of Environmental, Social and Governance factors (ESG). We concluded that such factors are managed by legislation (worker safety for example) whereas other aspects are voluntary (employee satisfaction, the reputation of the company etc.). In this study, we wanted to understand what social values can be realized that can enhance the competitiveness of the DH business case. We concluded that the social aspects of the ESG framework are already known and decided to focus the attention of this study beyond the social values that can be generated by the social dimension of the ESG framework.

The second result from the literature screening was that 24 social key performance indicators (SKPIs), beyond ESG factors, could be identified as relevant to the supply of heating and/ or cooling. Revisiting the value chain analyses with the SKPI factors a third result was that social values can be generated across DH value chains.

2.3 Interview - Results

28 interviews were performed with stakeholders linked to the Burnaby DH project. At an overall level, the results show that factors that should have the largest potential to generate social sustainability values in the Burnaby DH project context are (i) to create local jobs, (ii) ensure transparent communication across the value chain, (iii) invest in buildings to signal sustainability value, (iv) keep the DH price at the same level or lower as other heating alternatives, (v) engage in partnerships with the local community (local heat supply recover, joint co-creation of commercial values), (vi) offer both heating and cooling and (vii) consider sector coupling between DH and electricity.

2.4 Social Sustainability Impact on the Competitiveness of DH - Results

To understand if the social dimension of sustainability can change the business models of DH companies the results from the value chain analyses and the interviews performed were used to identify what a potential, social layer of a DH business model can look like (the methodology of a triple layered business model canvas was applied). The layer is summarized in figure 1.

When it comes to **employees** the ESG factors were taken for granted (conditions of work, diversity, gender balance, fair remuneration, development etc.). In the context of social values and **governance** we identified that several choices could be made at governance level, that could have a social impact. Such are for example, lower investment criteria for sustainable investments (longer pay back accepted, lower rates of return accepted), the will to co-create and co-invest with customers (sharing investment costs), undertake philanthropic activity (in support of the local community), educate the young and the wider society (in energy efficiency/ energy use), build new knowledge through research & development engagements (knowledge that benefits the company and the wider society), efforts for empowering customers/ heat providers (investing in digitalization for example) and have a policy of transparent dialogue across the value chain. Based on the interview material it appears as if only a few of the possible choices to foster social values are identified in the context of the Burnaby DH case.

Concerning **societal culture** DH companies can foster a culture of circularity where waste and the negative impacts on the environment are minimized. Beyond environmental impact there is also a possibility to foster a sharing economy by co-creating business opportunities (such as recovering local heat sources) in the local community. In the context of Burnaby, the main fuel is waste heat from waste combustion. The waste comes from several municipalities in the metro Vancouver area and the reuse of it is therefore a first step towards joint use of local heat assets. Apart from the waste heat from the waste combustion plant there is a practice to recover waste heat from municipal sewage water in the metro Vancouver area, since the successful use of waste heat from sewage water to the Olympic Village. Hence, at municipal level there seems to be a first steppingstone for a culture of sharing. However, public-private collaborations are not yet in place (for making use of locally available heat sources).

When it comes **to the scale of outreach** DH activity is per definition geographically delimited to the region where the DH assets are. In the context of Burnaby there are several DH companies that are operating in parallel. Hence, there could be a potential to spread the idea of a sharing culture across these entities. In terms of stakeholders a sharing community would benefit some stakeholders directly (those involved in the sharing activities) and the wider community indirectly (ensuring the most cost efficient heat sources are used increasing affordability of heat and hot water supply, the use of local and environmentally sustainable fuels leading to reduced levels of air pollution and possibly a culture of sharing knowledge to the young/ wider community etc.). The scale could be further expanded by resorting to inclusive, aesthetic and signaling buildings.

Addressing the **end user** we found that social values that the end user benefits from are a carefree, resilient heat and hot water supply of high indoor comfort. Another possible benefit is to have access to recreational spaces at building level (saving space), be engaged in one's heat and hot water supply (empowered through digital tools allowing the customer to follow his/her consumption patterns, joint collaboration with the energy company to become a

prosumer), affordable heating and enjoy the feeling of being included and part of a resource efficient and sustainable heating solution. Viewing the aspect of local communities there is a possibility to engage with local heat supply owners to establish win-win solutions. As mentioned above, this engagement is underexplored both in mature DH markets and in the context of Burnaby. Other ways than heat supply to engage with the local community are to make governance decisions leading to an impact for many stakeholders in society, either directly or indirectly (research & development, education of the young, philanthropic activities etc.).

Focusing on **social values** DH can generate social values to multiple stakeholders. Examples are:

- Employees: by providing positive working conditions
- Customers: providing a carefree, resilient heat and hot water supply that is environmentally sustainable making use of local assets (generating a pride in the customer), an affordable heat and hot water supply and the possibility to engage in one's consumption of heat
- Wider society: job creation, improved air quality, affordable heating and hot water, recreational spaces, inclusion, knowledge/ education and other

Lastly, the **social impacts** of DH can be both positive and negative. If the fuel supply is not environmentally sustainable many of the positive social values are lost (improved air quality, making use of resources otherwise lost and the co-creation element with local community stakeholders). If government choices are made that isolate the DH activity from other stakeholders, the positive social impacts are further reduced (by minding its own business, the DH companies in mature DH markets reduce their potential to generate social value or to mitigate negative impact related for instance to unfair access to energy).

<table>
<tr>
<td>Local communities

Local collaboration on heat supply

<u>Governance choices</u>

Educational actions
Philantropic activity
Sustainable investment thresholds
R&D activities</td>
<td>Governance

<u>Governance choices</u>
Educational actions
Philanthropic activity
Sustainable investment thresholds
R&D activities
Co-create & co-invest
Customer empowerment

Employees

Working conditions</td>
<td>Social values

<u>Employees</u>
Positive working conditions

<u>Customers</u>
Carefree
Resilient
Affordable
Empowerment

<u>Wider society</u>
Jobs
Improved air quality
Recreational spaces
Inclusion
Knowledge transfer</td>
<td>Societal culture

Circularity and shared economy

Scale of outreach

Geographical area of the DH system

Across stakeholders

(employees, customers, wider society)</td>
<td>End User

Carefree

Resilient

Affordable

Empowerment</td>
</tr>
<tr>
<td colspan="5">Social impact drivers (positive or negative will depend on configuration of driver)

Fuel (fossil/ renewable)

Sourcing of fuel (remote/ local)

Governance decisions (promoting social sustainability or not)</td>
</tr>
</table>

Figure 1: The social layer of the DH business model (Source: result from study)

To make changes to business models that are in operation and functional is challenging, however, shifting towards social value creation has many upsides for the DH system because it anchors it to the local community.

3 Discussion

The principal objective of the project was to understand if the social dimension of sustainability can change the business models of DH companies and increase their competitiveness.

One main result of the study is the design of a potential, social layer of the DH business model. Several of the factors that can add social value are linked to choices of the companies themselves (setting sustainability thresholds, educating the young, empowering customers, engaging in co-creation activities and other). It is, however, well known that it is difficult to change the way things are done if a business model is in place that still generates profit. Indeed, pursuing social value creation is a strategic task and needs to be included in the way that companies are undertaking both operational activity and investment decisions. Doing so, it appears possible to capitalize on social values in DH.

Depending on the ecosystem in which the DH company is located, there will be different levels of incentives to pursue social values. Institutional structures like public goals and procurement standards that support social sustainability would likely support social value creation at company level. For example, establishing clear social requirements in DH procurement could be one way forward. Indeed, a supportive surrounding will also make outreach to local heat suppliers easier, which lowers the hurdle of co-creation and co-investments. However, even in the absence of institutional incentives it appears as if social values can generate new, profitable business opportunities (directly by saving money in the fuel procurement process and indirectly by anchoring the company to the local community making it difficult to be outcompeted in the mid-long term).

Circling back to the principal objective of understanding if the social dimension of sustainability can change the business models of DH companies, we conclude that, yes, that is the case.

If the DH companies decide on integrating social value creation as part of the main strategy and work actively to capitalize on them, then yes: competitiveness can increase. If not, there is a risk that social values are diluted and reduced to a tick in the box rather than generating competitiveness. Hence, taking action is important to realize the potential, social values.

Last, based on the results in the study, companies that are interested in assuming the strategic position of including social values in their business case are recommended to take the following steps:

1. Review the value chain and understand where there is room to include factors that can generate social values.

2. Turn to the surrounding ecosystem of stakeholders and engage in dialogue with them to identify where there is potential interest and room for co- creation and co-investment.

3. Make social sustainability a management matter, establish a strategy and identify relevant social key performance metrics to follow up on.

4. Revisit the business model logic and understand how the ongoing activities need to shift to pursue social values. Do any risks or opportunities occur? Can contracts be standardized?

5. Start small: identify social values that can generate both economic gain and anchor the company to society. For DH companies, engaging in local waste heat recovery would be an interesting case to pursue.

As mentioned, our project was conducted around a case study limiting the possibility to generalize the results.