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1 OVERVIEW OF THE REGION

Characteristics of the Region
Tampere City Region is an inland region located in Western Finland approximately 200 km away from Helsinki and Turku, the two main coastal cities in Finland. Tampere City Region consists of the central city Tampere and seven surrounding smaller municipalities: Kangasala, Lempäälä, Nokia, Orivesi, Pirkkala, Vesilahti and Ylöjärvi.

Figure 1 – The location of Tampere City Region (tampereenseutu.fi)

The surface area of the region is 4,977 km^2 and it hosts approximately 365,000 inhabitants. It is the leading economic region in Western Finland and the second largest economic region in Finland after Helsinki Metropolitan Area, the capital region. The GDP of the region was €12,265 M in 2010 (Statistics Finland, 2014a), or €33,600 per capita which is just above the average in Finland. The unemployment rate has increased rapidly in Tampere Central Region during the economic crisis of the recent years. At the end of 2013 the unemployment rate was 15.3% (Tampereen kaupunkiseutu, 2014) which is well above the national average of 8.7% in Finland (Statistics Finland, 2014b).

Tampere City Region is one of the fastest growing economic regions in Finland. The population of the region is estimated to increase by 90,000 by 2030, mostly due to domestic migration from smaller rural and semi-urban municipalities in Finland (Tampereen kaupunkiseutu, 2010).

The governance of the region consists of a joint authority formed by the municipalities of Tampere City Region and of the municipal governance within each of the region's eight municipalities. The first development strategy for the region was accepted in 2005 and a board was selected to steer the execution of the strategy. The regional governance is based on voluntary cooperation of the municipalities. The aim is to coordinate, for example, land use planning, traffic infrastructure development and energy services within the region. The municipalities have agreed to intensify the cooperation in the near future. An important step in this development was the signing of a joint 2030 climate strategy in 2010 by the mayors of the municipalities of Tampere City Region, and the regional council (Tampereen kaupunkiseutu, 2010). With the strategy, the municipalities in the region committed to jointly work towards a more sustainable region, and devote significant resources to achieving the set target of reducing the per capita GHG emissions of the region by 40% by 2030 compared to the 1990 levels.

Energy demand and supply of the Region
The overall electricity use in the region was slightly over 3,100 GWh in 2010 (Tampereen kaupunkiseutu, 2010). The largest share was used by private households and industry

as *Figure 2* shows. In addition to *Figure 2*, approximately 340 GWh/a of electricity is used for space heating.

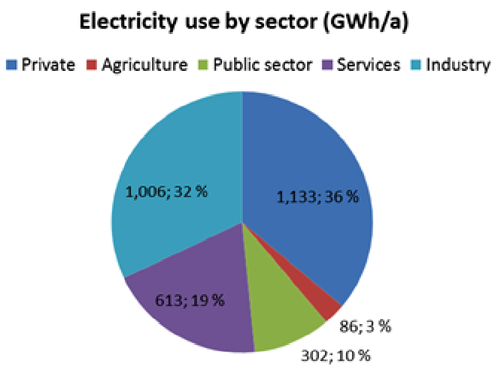

Figure 2. Electricity use by sector in Tampere region in 2010

The majority of spaces are heated with Combined Heat and Power (CHP) heat or with heat produced by the specific heat production plants in the region. The biggest provider is Tampereen Sähkölaitos, but there are smaller scale heat plants in the smaller municipalities.

Of the property specific heat sources, oil is the most commonly used. Heat pumps are implemented at an increasing pace, but their overall share is still low. In addition, in low-rise areas property specific fireplaces with wood heating is also an important mode of heating. According to the Finnish Forest Institute, METLA, as much as of 40% heating energy requirements is produced by firewood in detached houses in Finland on average, meaning 4.6 m^3 of wood being burned per annum in each detached houses (Torvelainen, 2009). *Table 1* comprises the heat use and fuels/production modes.

The housing sector is by far the largest sector with close to 1,300 GWh annual heat demand (2010 reference year) as presented in *Table 2*. From this perspective, industry appears to be a small scale heat user with its only 200 GWh annual demand, but industry's own excess heat use covers the majority of the need and is not included in the statistics in *Table 2*. Other sectors use a noticeable amount, approximately 700 GWh. *Table 2* presents the heat purchase by end-use sector and the distribution between different producers within the region.

Fuel/production mode	GWh
District heat	2,182
Electricity used for heating	363
Property specific firewood	306
Oil	265
Heat pump production	170
Other	54
Total	3,238

Table 1 – Heat supply by fuel/production mode for the region.

Locality	Producer	Industry	Housing	Other
		GWh	GWh	GWh
Kangasala	Kangasalan lämpö	2.7	40.2	19.7
Lempäälä	Lempäälän lämpö	3.9	24	16.2
Nokia	Fortum Power and Heat	11.1	56	33.9
Pirkkala	Tampereen sähkölaitos	5.5	29	9.8
Tampere	Tampereen sähkölaitos	166.7	1,102	600.3
Ylöjärvi	Tampereen sähkölaitos	9.5	23.6	19.6
Ylöjärvi	Pirken Oy	0	4.3	5.6
Total		199	1,279	705

Table 2 – Heat purchases by end-use sector and producer in 2010 in Tampere City Region.

Energy production in the region is predominantly based on CHP production. The production volume is dominated by Tampereen Sähkölaitos, the biggest CHP provider in the region, which thus defines the energy production related GHG emissions as well. In 2011 Tampereen Sähkölaitos produced 1,502 GWh electric energy (gross) and 2,173 GWh thermal energy.

The fuels used for electricity generation consisted of natural gas (76%), peat (13%), and wood fuels (11%). For district heating natural gas (66%), peat (17%), wood fuels (15%), and oil (2%) was used (Tampereen Sähkölaitos, 2013). The other two important power plants rely heavily on fossil fuels as well, as depicted in *Table 3*.

Because of the high share of CHP production in the region, the region's GHG emissions can vary significantly between different reports. With CHP production, the GHG emissions intensities depend heavily on the adopted allocation method, not just on the fuel-mixes of the power plants.

Plant	Heat (Gwh/a)	Power (Gwh/a)	Fuels (Gwh/a)
Tampereen sähkölaitos: Naistenlahti 1	690	688	1,582 natural gas
Naistenlahti 2	561	283	211 wood, 782 peat, 10 natural gas, 4 oil
Lielahti Hydro power	752	731 48	1,732 natural gas
Nokian lämpövoima	367	388	1,108 natural gas

Table 3 – The production volumes and used fuels of the CHP and power plants in the region.

For example regarding the largest provider in the region. Tampereen Sähkölaitos, the emissions intensities are 266 gCO2eq/kWh for both heat and electricity according to the energy method (the overall emissions divided according to the produced amounts of heat and electricity). However, if the shared benefit method is taken, which is the most common in Finland since it credits heat more as a co-product of electricity production, the intensities are 178 gCO2eq/kWh for heat and 388 gCO2eq/kWh for electricity. A third number is provided by the annual report of Tampereen Sähkölaitos, according to which the GHG intensity of their overall production was 191 gCO2eq/kWh (Tampereen Sähkölaitos, 2013a).

Furthermore, the emissions of the sold energy differ significantly from the production emissions. All the electricity is first sold to the grid and then bought back according to the demand. Because of the high share of Norwegian hydropower in the Nordic grid, the GHG intensity of sold electricity of Tampereen Sähkölaitos in 2012 was only 115 gCO2eq/kWh (Tampereen Sähkölaitos, 2013b).

2. CURRENT SITUATION: TARGETS RELATED TO ENERGY POLICY

The GHG reduction targets set by the Tampere City Region municipalities, announced in the 2030 climate strategy, are derived from the 20-20-20 target and the long term goal of 85 – 90% reduction by 2050 of EU, and the 80% reduction target by the year 2050 compared to year 1990 for Finland set by the Finnish government (Government Foresight Report of 2009).

The main target is to reduce the GHGs by 40% by 2030 relative to 1990 level. In the strategy the main target is divided into sectorial targets and action plans. The key elements of the action plan are:

- dense infill development around a lively downtown;
- public transport as the easiest alternative with an overall modal share of 25% of all trips within the region;
- high quality and diverse housing areas with highly energy efficient buildings;
- increased overall energy efficiency produced predominantly with renewable fuels.

(Tampereen kaupunkiseutu, 2010).

The ECO^2 programme of the City of Tampere proposes even more rigorous targets: the GHG reduction target should be 30% for the year 2020, 50% for year 2030, and 80% for the year 2050.

The GHG emissions from the region can be measured in several different ways. From the production perspective, including the emission actually occurring within the region, the emissions would seem to be on an increasing path, although primarily due to increasing population. Total GHG emissions have been estimated with the so called Kasvener model (Finnish Environment Institute, 2014) for the City of Tampere and for the whole region (Tampereen Kaupunkiseutu, 2010). According to these assessments, in the City of Tampere the GHG emissions have increased from slightly over 1,500,000 tons of CO2eq/yr in 1990 to over 1,600,000 tons in 2007, which is the newest available year data. At the same time the population of the region has increased from 172 000 to approximately 208 000, which means that the per capita emissions have somewhat decreased during the same period to slightly below eight tons of CO2eq/yr per capita.

Regarding the whole region, the only assessment with Kasvener is from 2006 (the base year). According to that, the emissions in 2006 were approximately 2,300,000 tons of CO2eq or 6.4 tons per capita (Tampereen Kaupunkiseutu, 2010).

The majority of the emissions in the region originate from energy production. District heat and electricity cause over 50% of the overall emissions, followed by transportation with a share of over 20%. Other fuel combustion causes approximately 10% of the overall emissions. Waste management and agriculture are other included categories with minor shares.

From the consumption perspective, including all the emissions caused by the residents of the region regardless of the geographic location where the emissions actually occur, the emissions for Tampere region have been estimated by Heinonen and Junnila (2011) for the year 2006. They divided the region into three groups of municipalities, where Tampere as the most densely populated central city forms one group; the more urbanized surrounding municipalities of Lempäälä, Nokia and Pirkkala one group (UCT in *Figure 2*); and the more rural type of municipalities Kangasala, Orivesi, Vesilahti and Ylöjärvi the third group (RCT in *Figure 2*).

According to their assessment, the annual average per capita emissions vary relatively little within the region, from 10 to 11 tons of CO2eq with the lowest emissions found from the group of urbanized surrounding municipalities, and the highest from the more rural type of surrounding cities. When compared to the above presented production-based figures, their study depicts how the assessment perspective affects the results. Tampere region is a relatively affluent region and the high consumption volume is largely satisfied with imported goods from elsewhere in Finland and abroad, the residents thus causing a significant amount of emissions outside of the region. *Figure 3* shows how energy and transport-related emissions still dominate, but how consumption of goods and services adds a significant share as well.

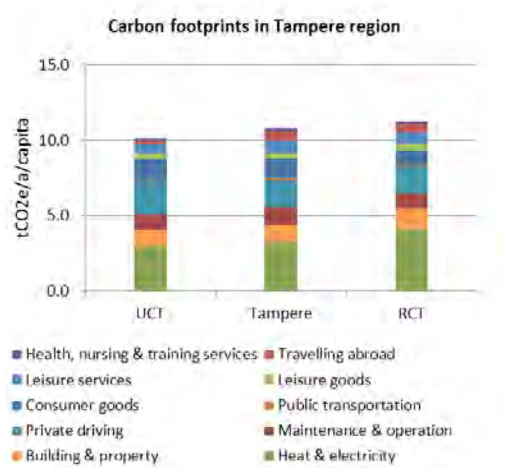

Figure 3 – The average per capita consumption-based GHG emissions (carbon footprints) in Tampere region in 2006.

Other Regional targets, barriers and drivers
Tampere region is one of the fastest growing regions in Finland, and as much as 20,000 new inhabitants are expected to move to the region by 2030. To fulfil the special needs of this migration requires a significant amount of new residential and other space construction. To mitigate the impact from this construction,

the climate strategy for Tampere region for 2030 requires all new buildings to be built according to 'class A' energy efficiency. This should improve efficiency by 30% compared to year 2009 and over 50% in comparison to the average of the existing building stock. Several demonstration projects are on the way or proposed to construct and plan for better energy efficiency, 'even exceeding the 'class A' energy efficiency requirement (e.g. for energy town plans and nearly zero and zero energy projects).

Mobility is another main issue in the climate action plan of the region. The main objectives for climate-friendly mobility pertain to public transport, cycling and other light traffic. For the City Council's term of office 2009 – 2012, the objective for the modal share of public transport was a minimum of 18%. In the climate vision for 2030, the target share for public transport in 2030 is at least 25%, and for walking and cycling also 25%. Simultaneously, GHG emissions from transport should have diminished by at least 20% (compared to year 1990). The announced means to achieve these targets are increased density through infill development and an increase in the use of biofuels. Partially the means to achieve the targets have been left open for now as well (Tampereen Kaupunkiseutu, 2010).

Certain challenges for the execution of the regional climate policies and action plans are set by the structure of the regional decision-making bodies. Currently the municipalities of Tampere region possess the majority of the executive power. In the future the effectiveness of the regional policies could be increased with closer regional cooperation and regional planning. Also state subsidies are important drivers. Furthermore, connections between land use and transportation issues should be improved and the decisions coordinated at the regional level.

Energy production

Whereas the region is relatively well covered with district heating infrastructure and the majority of heat is produced in CHP plants, the dominating fuels are currently non-renewable. In 2012, natural gas formed a share of approximately 70% of the CHP production of Tampereen Sähkölaitos and peat a share of well over 10% (Tampereen Sähkölaitos, 2013a). This situation sets an important barrier for achieving the climate targets of the region, and thus Tampereen Sähkölaitos has committed to increase the amount of renewable fuels to as high as 30% by the year 2020. In the production of CHP this would mean replacing oil and natural gas by forest residues. In heating, technological innovations favour the use of wood chips, pellets and chopped wood. Biogas, biomass fuel, and solar energy would be appropriate for small-scale CHP as well. In addition, refuse incineration is a developing and promising technology, although the GHG impact of this production mode depends heavily on certain assumptions.

3. CASE STUDY: HÄRMÄLÄNRANTA RESIDENTIAL DEVELOPMENT

The case study area Härmälänranta is located five kilometres southwest from the centre of the city of Tampere, on the waterfront of lake Pyhäjärvi.

Figure 4 – The location of Härmälänranta residential area (Skanska Kodit, 2013).

The properties are located in a former industrial area which will now be turned into an eco-efficient high quality residential area. Sustainability has been an important driver in the planning of the area. High energy efficiency of the buildings and diverse selection of local services which reduce commuting are among the key means to achieve high eco-efficiency. In addition, efficient public transport connections to the city center are planned to further reduce private driving. Brownfield development replacing a former industrial area will increase the eco-efficiency as well, since energy and transport infrastructures are already there (Skanska Kodit, 2013).

The area will be built in two phases of which the first one is currently under development. The first phase includes seven similar multi-story apartment buildings, each with approximately 3,000 gross square metres. The buildings will contain 28 apartments each, and about 500 residents will reside in the area once finished. Altogether 160,000 gross square meters of living space and at least 4,300 gross square meters of office space will be built to the area, and it will be home to approximately 3,200 residents.

Skanska Kodit is the main building contractor responsible for the development of the area. To create an appealing brand for the area Skanska collaborates with several architect companies and branding specialists (Skanska Kodit, 2013). For the city of Tampere, Härmälänranta is one important step in its attempts to reach the climate change mitigation goals set for the near future.

An existing infrastructure for district heating is available in Härmälänranta. However, since the local power plant relies heavily on non-renewable fuels, alternative local site-specific production possibilities have been investigated as explained further in the next section. Located within the existing city structure and thus being an infill development site, transportation infrastructure is already present. Local bus lines serve the area and freeway connections are located nearby. The existing neighbourhoods that surround Härmälänranta also offer diverse services in close proximity.

Objectives and methods

Härmälänranta aims to contribute to environmental and social sustainability of the region by offering the residents a neighbourhood with diverse local services, which are expected to reduce the need for private transportation and to create a local community that enhances the social wellbeing in the area. From the environmental sustainability perspective one main expectation for the case area is to be one of the key projects leading the development towards a less carbon-intensive Tampere.

The key methods for reducing GHG emissions are high energy efficiency levels of the buildings and the existing infrastructure for district heating. These are expected to lead to significantly lower use phase GHG emissions from Härmälänranta than in the region currently. The economic and environmental feasibility of further reducing the use phase GHGs with selected local site-specific renewable production options have been studied as well. Below, these potentials are presented according to the recent study of Ristimäki et al. (2013), who utilised simultaneous life cycle assessment (LCA) and life cycle costing (LCC) to analyse the costs and GHGs in different time horizons.

The construction phase emissions, including the embodied emissions in the construction materials, create an additional perspective to GHG mitigation potential of such new residential developments as Härmälänranta. Tampere is expecting the high energy efficiency of the new buildings to decrease the buildings related energy demand and GHG emissions relatively quickly, by 30% by 2030 according to the 2030 climate strategy of the region (Tampereen Kaupunkiseutu, 2010). However, these estimated values omit totally the construction phase emissions and look only at the use phase energy use and the derived emissions. According to Säynäjoki et al. (2012) it is possible that the construction phase emissions of a new residential building are high enough to actually only increase the combined cumulative emissions from the construction phase and use phase until 2030. Kyrö et al. have actually calculated for the city of Tampere that the building stock cumulative emissions increase for decades as the result of renewing the building stock at the current rate even if the new buildings are very energy efficient compared to the existing stock (Kyrö et al. 2012).

Thus, even if the use phase of a building causes the majority of the emissions over the whole life cycle, in short-term and even in middle-term the construction phase emissions may dominate and thus hinder the GHG potential of increased building energy efficiency.
In Härmälänranta this perspective has been partly taken into account. The building contractor Skanska Kodit has tried to minimise the material requirements by design

optimisation. In addition, new insulation materials are utilised in the first phase buildings in Härmälänranta. The impact of these choices is still largely unknown, however, but underway is a GHG assessment focusing on the construction phase emissions which will shed light on the issue during 2014.

Long term focus

Many of the planning and design choices in Härmälänranta are targeted to increase the long-term eco-efficiency and sustainability of the area, especially the energy demand and production related decisions studied by Ristimäki et al. (2013). Ristimäki et al. investigated the mid and long-term economic, and greenhouse gas impacts of selected alternative site-specific energy production methods with life cycle costing and life cycle assessment. Their study included four possible options:

1. Business As Usual (BAU) option of district heating and electricity from the local provider;
2. District heating and 90% of electricity from the local provider and 10% with local on-site photovoltaic panels;
3. Ground source heat pump producing the heat, electricity (including operating power for the pump) from the local provider;
4. Ground source heat pump producing the heat, 90% of electricity coming from the local provider and 10% with local on-site photovoltaic panels.

The study covered 25, 50 and 100 year time-spans.

Results

In the Finnish Energy Audit system (Motiva Oy, 2013) the Härmälänranta buildings will be placed in the highest category A in an A-G classification with the estimated overall use phase energy (heat and electricity) of slightly less than 100 kWh/m2yr. The energy efficiency will thus exceed the minimum requirements of the 2010 National building Code, which already reduces the energy use by over 50% in comparison to the average of the existing building stock. Notwithstanding, the study of Ristimäki et al. (2013) shows that further reductions could be achieved in a life cycle affordable way. According to the study, option 4 would be the most effective to decrease the emissions caused during the use phase of the buildings with regard to the BAU option.
The GHG assessment results from Ristimäki et al. (2013) are shown in *Table 4*.

Year	1. District heating	2. District heating incl. 10% photovoltaic panels	3. Ground source heat pump	4. Ground source heat pump incl. 10% photovoltaic panels
25	45,832	44,425	35,167	33,738
50	68,857	65,946	46,916	43,983
100	112,599	106,483	68,087	61,949

Table 4 – Life-cycle GHG emissions of the compared four energy options in 25, 50 and 100 years time-spans (tons of CO2eq) (Ristimäki et al., 2013).

Option 4 would actually be both the most GHG effective as well as life cycle affordable from the cost perspective. Compared to the BAU option (1), all the alternative solutions would reduce the GHG emissions over all the covered time-spans, and even the life cycle costs over the longest 100 years period.

In option 4 the GHG reduction would be more than 20% even over the shortest 25-year time-span and increase up to approximately 40% over the 100-year time-span. The cost differences remain much smaller, but with the assumed price changes the lowest GHG options are the most life cycle affordable as well.

Outcomes

Härmälänranta is expected to contribute to achieving the regional GHG mitigation targets. High building energy efficiency will assure that the use phase emissions from energy use in the area will be significantly lower than the regional average, over 50% in comparison to the average of the building stock of the region. According to Ristimäki et al. (2013) the use phase GHGs could be reduced further by local site-specific renewable energy production.

There are two important shortcomings in the presented emissions assessments:
Firstly, only the use phase emissions are taken into account. While these have traditionally dominated in the overall life cycle of a building, the relative importance of the construction phase (direct and embodied) emissions is increasing as the use phase energy efficiency increases. In addition, when the currently set rather short-term GHG reduction targets are concerned, the construction phase emissions may actually arise into a major role, as shown by Säynäjoki et al. (2012). They call the hidden phenomenon "the carbon spike" of construction, since when put into a temporal perspective, the construction phase emissions appear very high in the beginning and the payback time may be decades long even with the highest energy efficiency buildings. Taking this phenomenon into account depicts how difficult short-term GHG reductions are to achieve with infrastructure development.

Secondly, the study of Ristimäki et al. (2013) does not assess the grid-level impacts of the local site-specific energy production options. While the local options in their study seem to favour district heating, the results contain an important uncertainty. In the end the effectiveness of a certain local energy system is relative to the overall grid impacts, particularly if the system is not totally independent.
For example, the ground source heat pumps in the study of Ristimäki et al. would use electricity from the grid to operate. It would thus be possible that the use of the ground source heat pumps would actually lead to an increase in the electricity demand in the grid and potentially result in more excess heat waste from the CHP plant. Furthermore, if the increased electricity demand would require spare production capacity to be utilised, the production fuels would be predominantly coal and natural gas. Thus the results of a GHG assessment would actually rely heavily on whether the electricity would be assumed to be the grid average or the so called marginal production. These uncertainties depict that further information about the potential of the local solutions to replace the (least GHG effective) grid production would be needed to assess the real GHG impacts.

Finally, increasing building energy efficiency might lead to a rebound-effect, which can significantly reduce the GHG benefits.
If the increase in the energy efficiency leads to monetary savings in energy costs, not compensated by the cost of the residence, the money will the most likely be spent elsewhere with the consequence of new GHG emissions. The same applies to private transportation and reduction in the degree of household motorisation, as Heinonen et al. (2013) demonstrate.

An interesting thought can be derived from these remarks on the actual eco-efficiency of the area. If sufficient local service supply can be attracted to the area to really create local lifestyles among the residents, the local low-GHG energy solutions would reduce the GHGs from all the local services as well and support low-carbon living even if the service demand would be increased as a rebound effect of reduced driving and housing energy costs.

4. CONCLUSIONS

The Härmälänranta development demonstrates a conversion from former industrial to new residential use, where industrial history has been used in branding. Even if many of the industrial buildings on the area have been demolished, a few of them will be converted to new uses, like sports and cultural services. A combination of lakeside nature and outdoor activities, industrial heritage, urban infrastructure, and the availability of services are cornerstones of the marketing strategy for home buyers (Skanska Kodit, 2013).

Industrial heritage cannot be regarded a factor of sustainability as such, but often such locations bring about factors that contribute to the sustainability of a new development at the same site. Firstly, the existing buildings that are saved and renovated to be part of the new development reduce the need for new construction, which often causes higher construction phase carbon spike than refurbishment of an existing building according to Säynäjoki et al. (2012). Secondly, the potentially favourable position of the site, as with Härmälänranta, makes development practicable and can reduce for example the infrastructure related emissions.

The process in Härmälänranta follows international patterns of urban renewal and city branding. Sustainability adds to the achieved urban image. When assessing the possibilities of generalisation, these two factors have to be distinguished.

On urban level, the most important factors affecting sustainability are good connections inside the city, density, proximity of services, and the availability of district heating. These attributes are location-dependent. The basic residential layout and house typologies are relatively common in Finland. The apartment buildings do not form downtown-type closed blocks but are widely applied in suburban areas. Furthermore, the primary methods for diminishing GHG impacts, high building level energy-efficiency and the use of district heating, are widely applicable for various buildings.

As stated before, various solutions for heating may be applied. Even if district heating is common in Finnish urban areas, also ground source heat pumps can be used. The systemic integration of the demonstration project is relatively loose and allows various technological choices.

To sum up, the possibility of creating similar residential areas is partly dependent on attractiveness factors that are not easily generalised. However, the solutions affecting energy efficiency are widely applicable in other circumstances. In addition, the presented uncertainties in the GHG reductions assessments regarding the Härmälänranta case area depict how difficult achieving true emissions reductions can be, especially in the short-term.

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The COST Action TU1104 Smart Energy Regions brings together over 70 researchers from European institutions to investigate the drivers and barriers that may impact on the large scale implementation of low carbon technologies in the built environment. The book "Smart Energy Regions" is the outcome of the Working Group 1 of the Action and collects analysis and case studies from 26 European countries. For more information about the Action and COST please visit www.smart-er.eu and www.cost.eu.

ESF Provides the COST Office through an EC contract

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RTD Framework Programme

COST DESCRIPTION

THE ORGANISATION OF COST

COST - European Cooperation in Science and Technology is an intergovernmental framework aimed at facilitating the collaboration and networking of scientists and researchers at European level. It was established in 1971 by 19 member countries and currently includes 35 member countries across Europe, and Israel as a cooperating state.

COST funds pan-European, bottom-up networks of scientists and researchers across all science and technology fields. These networks, called 'COST Actions', promote international coordination of nationally-funded research.

By fostering the networking of researchers at an international level, COST enables break-through scientific developments leading to new concepts and products, thereby contributing to strengthening Europe's research and innovation capacities.

COST's mission focuses in particular on:
- building capacity by connecting high quality scientific communities throughout Europe and worldwide;
- providing networking opportunities for early career investigators;
- increasing the impact of research on policy makers, regulatory bodies and national decision makers as well as the private sector.

Through its inclusiveness, COST supports the integration of research communities, leverages national research investments and addresses issues of global relevance.

Every year thousands of European scientists benefit from being involved in COST Actions, allowing the pooling of national research funding to achieve common goals.

As a precursor of advanced multidisciplinary research, COST anticipates and complements the activities of EU Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries. In particular, COST Actions are also open to participation by non-European scientists coming from neighbour countries (for example Albania, Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Jordan, Lebanon, Libya, Moldova, Montenegro, Morocco, the Palestinian Authority, Russia, Syria, Tunisia and Ukraine) and from a number of international partner countries.

COST's budget for networking activities has traditionally been provided by successive EU RTD Framework Programmes. COST is currently executed by the European Science Foundation (ESF) through the COST Office on a mandate by the European Commission, and the framework is governed by a Committee of Senior Officials (CSO) representing all its 35 member countries.

More information about COST is available at www.cost.eu.

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